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April 19-21, 24-28 May 1.

July 29.

BETWEEN:

NORTHERN ELECTRIC CO. LTD., AND WESTERN ELECTRIC CO. INC. ..... PLAINTIFFS;

AND

BROWN'S THEATRES LIMITED..... DEFENDANT.

Patents—Infringement—Subject-matter—Combination patent—Invention—Utility—Patentability—Industrial value—Benefit to the public.

The action is one for infringement by defendant of five patents owned by plaintiffs. The Harrison patent claimed an invention for a horn constructed according to the exponential law and having a mouth diameter approximately one-quarter the wave length of the critical frequency of the horn; the Court found that there was no infringement of this patent because the defendant's construction does not fall within the ambit of the particular construction described and claimed by Harrison.

The invention claimed in the Wente patent relates to improvements in acoustic devices such as are used in receiving and transmitting sound, and ordinarily referred to as loud speakers; the distinguishing characteristic is the use of a spherical plug in the sound chamber for the purpose of decreasing the cross-sectional area of a portion of the sound chamber. The Court found that the sound chamber employed by the defendant and that described by Wente are not alike, nor can defendant's sound chamber be said to be the equivalent of Wente's sound chamber, and there was no infringement.

The object of the Miller patent is stated to be a film sound reproducing system operating on alternating current. This patent was held to lack subject-matter and therefore there was no infringement. The Wilson patent relates to improvements in electron discharge devices. The Court found that there was subject-matter in Wilson and there had been infringement by the defendant.

The DeForest patent claims an invention for the control of electric currents by and in accordance with variations of light; this patent was found to be without utility and therefore void and without subject-matter.

Held: That a claim for a particular means to effect certain purposes is not infringed where the same purposes are effected by different means; nor is a combination to effect certain results infringed by a combination of similar parts operating in a different manner, though the results effected are the same.

2. That it is not permissible to claim an article which as an article requires no inventive ingenuity merely because, if used in a particular way, it will be useful in achieving a particular purpose.

3. That the combination disclosed in the Wilson patent is in principle to be differentiated from that disclosed in prior patents, and is novel and possesses subject-matter.

4. That an invention to be patentable must confer on the public a benefit; utility, as predicated of inventions, means industrial value and no patent can be granted for a worthless art or arrangement.

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ACTION by plaintiffs herein to have it declared that five patents owned by them are valid and were infringed by defendant company.

The action was tried before the Honourable Mr. Justice Maclean, President of the Court, at Ottawa.

O. M. Biggar, K.C. and *R. S. Smart, K.C.* for plaintiffs.
H. N. Chauvin, K.C. and *Frank B. Chauvin* for defendant.

The facts and questions of law raised at the trial are stated in the reasons for judgment.

THE PRESIDENT, now (July 29, 1939) delivered the following judgment:

This is an action for the infringement of five patents owned by the plaintiffs. The applicants for these patents were Harrison, Wente, Miller, Wilson and Deforest respectively, and by these names I shall designate the several patents here in question. The evidence, and arguments of counsel, were directed to these patents in the order named, and this order I shall observe in my discussion of them.

It was admitted in writing by the defendant that it has installed and is operating at the Community Theatre located in Toronto, Ontario, a sound reproducing and amplifying equipment according to the arrangement shown in certain drawings of the Cincinnati Time Recorder Company attached to the admission. It was also admitted that the sound reproducing and amplifying equipment employs a high frequency loud speaker constructed as shown in certain drawings of the Jensen Radio Manufacturing Company accompanying the admission.

The Harrison patent, No. 302,394, issued on July 22, 1930, and is a reissue of patent No. 258,045, dated February 9, 1926, and that is the first to be considered. The

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following paragraphs extracted from the specification will reveal the main characteristics of the invention and its objects:

This invention relates to acoustic devices such as horns used in conjunction with loud speaking receivers and phonographs, an object being to produce a horn capable of faithfully and efficiently transmitting sound vibrations over a broad range of frequencies.

Another object is to produce a horn which is adapted to be constructed in compact form suitable for mounting in a cabinet.

In accordance with the general features of the invention a horn is provided in which the progressive increase in cross-sectional area follows the exponential law. Specifically this feature contemplates a horn having a rate of taper such that the areas of successive wave fronts increase by a constant per cent per unit of length, and a mouth opening properly related to the other constants of the horn as is more particularly explained hereinafter.

After a definition of certain technical terms, and reference to certain formulæ, the specification proceeds:

Although any horn constructed in accordance with the above formulæ will have a uniform rate of change of impedance, for best results it is preferable to proceed as follows:

First, the two end areas should be chosen The area of the small end is preferably chosen to correspond with the opening in the receiver or acoustic device with which the horn is to be used. The mouth area is usually determined from the conditions under which the horn is to be used and the larger it can be made, granted there is sufficient horn length, the lower are the frequencies it can effectively radiate. It has been found that the mouth of a horn is a poor radiator of vibrations having wave lengths greater than twice its diameter, vibrations having longer wave lengths being largely reflected.

Next the rate of taper of the horn is determined as this in properly designed horns determines the length of the horn. A rate of taper should be chosen such that the horn freely transmits all frequencies which the mouth can radiate. The rate of taper should be such that the wave length of the critical frequency is several times the mouth diameter, a wave length of four times the mouth diameter has been found satisfactory. The critical frequency is that frequency below which the surge impedance of an infinite length of horn is a pure reactance.

The claims entering into the controversy are 1 and 17, which are as follows:

1. A horn having an opening in which the progressive increase in cross-sectional area is substantially according to the exponential law, and a mouth diameter approximately one-quarter the wave length of the critical frequency.

17. A horn having a substantially constant rate of increase in cross-sectional area per unit of length throughout its length, and a mouth opening equivalent in area to that of a circle whose diameter is approximately one-quarter the wave length of the critical frequency of the horn

These two claims mean substantially the same thing.

The invention claimed by Harrison is a horn constructed according to the exponential law and having a mouth diameter approximately one-quarter the wave length of the critical frequency. What is claimed is not a horn made according to the exponential law but a horn made according to that law and which has a mouth opening whose diameter is approximately one-quarter the wave length of the critical frequency of the horn. The critical frequency is that frequency below which the horn ceases to function satisfactorily; it will not radiate satisfactorily frequencies below the critical frequency. A horn may be regarded as a transmission line or link between the loud speaker diaphragm and the outside air. The exponential horn is a device for coupling the motion of the loud speaker diaphragm to the volume of air which it is desired to excite, and the shape of the horn follows a known mathematical equation.

According to the exponential law the taper of the horn increases constantly, so that the cross-sectional area of the opening enlarges as the flare increases. The exponential law does not, as I understand it, fix the rate of taper; it requires only that the cross-sectional area increase constantly. The rate of increase may be selected, but it is the constant increase of whatever rate is selected that is taught by the exponential law. And the exponential law does not prescribe any rule as to where one should stop in the construction of a horn, that is, so far as length is concerned. A horn made according to the exponential law would not be patentable, and in fact I do not understand this to be claimed by Harrison. The mathematical formula for the law of rythmic or logarithmic shape was conceded by Harrison to have been long known. It was disclosed and explained in the article of Webster, which was read at a meeting of the American Physical Society in 1914, and which was published in 1918. Webster gives the transmission characteristics of horns of different forms, including the cylindrical, the conical, and the exponential, and he works out these characteristics mathematically. He states the fundamental mathematical principles of these horns from which one skilled in mathematics and in the acoustic art may arrive at the complete solution of the problem of acoustical transmission by means of exponential horns. The formulæ mentioned by Webster are the

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same as those shown in Harrison. The latter sets forth in his specification the same fundamental equations but expresses them in different symbols. All that Harrison purports to add to Webster is to teach where the length of an exponential horn might end and at the same time give a satisfactory radiation of the frequencies desired to transmit. And the rule he lays down in this connection is that the mouth diameter is to be approximately one-fourth the wave length of the critical frequency, though limits above and below that dimension are stated. To state it with greater precision Harrison discloses where one may terminate the length of a horn and yet radiate and transmit the low frequencies as well as the higher frequencies.

Harrison, who gave evidence at the trial, admitted that there was no difficulty in radiating the higher frequencies beyond the audible limits. The problem Harrison sought to solve was the construction of a horn that would radiate the lower frequencies and yet be of a usable or convenient size. He had in mind horns of six feet and over in length and he was concerned with the dispensing of horns of great length and bulk, and the construction of the shortest horn possible according to the exponential law, but one which would radiate the lower frequencies desired, as well as the higher frequencies. That was his problem, and his solution, as stated in claims 1 and 17, was to make a horn according to the exponential law, and which had a mouth diameter approximately one-quarter the wave length of the critical frequency, and it is claimed that if a horn were so constructed it would be of a convenient dimension and would radiate the low frequencies as well as the higher frequencies, that is to say, it would transmit sound vibrations over a broad range of frequencies. Harrison states a formula, number 5, for ascertaining the critical frequency of any exponential horn, and, I think it has been established quite clearly by the evidence that this formula corresponds with one of the formulæ set forth in Webster's paper for ascertaining the critical frequency of an exponential horn.

Now, as I have more than once stated, the particular type of horn described and claimed by Harrison is an exponential horn the mouth diameter of which is one-quarter the wave length of the critical frequency. When the critical frequency is ascertained that must be accepted

definitely as the stage at which the horn will just operate and below which it will not operate, and consequently the theoretical point between operativeness and inoperativeness is not a useful one to rely upon for fidelity in the transmission of low frequencies. In order to be on the safe side Harrison, as I understand it, after ascertaining the critical frequency suggests doubling the critical frequency, to ensure a clear radiation, and this has the effect of reducing the wave length by one half. This is a new frequency for transmission, reached by doubling the actual critical frequency, and the mouth diameter of the horn is then to be one-quarter the wave length of that frequency instead of one-half, as mentioned at one stage in Harrison's specification wherein he says that the wave length should not be greater than twice the diameter of the horn. I am not certain that I have succeeded in stating this clearly, or perhaps quite accurately, but, if I have failed, it is not, I think, a matter of great consequence.

The defendant was concerned not with a broad range of frequency as was Harrison, but with a narrow range of the higher frequencies, from 1,200 up to 6,000 cycles, and it claims that in the use of its horn there was no relationship between the mouth opening and the wave length of the critical frequency, as is claimed by Harrison. The frequencies that Harrison was concerned with were those as low as 100 or 200 cycles and up as far as the horn would transmit. The defendant's horn has a mouth diameter of 5·1 inches, and the wave length of the calculated critical frequency is 11 inches.

If a horn has a mouth diameter substantially greater than one-quarter the wave length of the critical frequency the radiation will be more satisfactory for the high frequencies than one made according to Harrison, but it would not radiate the low frequencies as satisfactorily as would a horn made according to Harrison. The defendant's horn, having a larger mouth opening than that prescribed by Harrison, will not radiate the lower frequencies but it will function more satisfactorily for the higher frequencies, and for this it was particularly designed and is used.

The contention made on behalf of the defendant is that there is no infringement because the mouth diameter of the defendant's horn is substantially greater than one-quarter the wave length of the critical frequency, or the

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limits above and below that, as stated in Harrison. It was argued by Mr. H. N. Chauvin that if the mouth diameter is greater than one-quarter the wave length of the critical frequency, there would be no problem to solve, because the ratio between the mouth diameter and the wave length of critical frequency is such that there could be no doubt as to the capacity of the horn to radiate satisfactorily the higher frequencies. Harrison, he states, was seeking a horn which would radiate low frequencies, which, I think, is correct, and there would be no problem about the higher frequencies. Harrison was not concerned with a device such as the defendant's where the frequencies do not go below 1,200 cycles; he was attempting to demonstrate that a horn might be designed to transmit the low frequencies and still be of a reasonable size, and if there is any invention in Harrison it lies in that. In the construction described and claimed by Harrison there is the factor of mathematical precision, which in turn demands an arbitrary requirement as to the physical dimensions of the mouth diameter of his horn, and to that, I think, he is tied. When he claims an exponential horn having "a mouth diameter approximately one-quarter the wave length of the critical frequency" those words are, I think, to be regarded as words of physical description of the apparatus claimed. The defendant's horn cannot, I think, be said to fall within any such description of Harrison's alleged invention.

I need not decide whether or not there is subject-matter in Harrison, and I did not understand defendant's counsel to contend that there was not. I think, however, that there is no infringement because the defendant's construction does not fall within the ambit of the particular construction described and claimed by Harrison.

Next, I come to the Wente patent which issued in February, 1929, on the application of Edward C. Wente filed in May, 1927. The invention is said to relate to improvements in acoustic devices such as are used in receiving and transmitting sound, and ordinarily referred to as loud speakers. A specific object of the invention was to improve the transmission characteristics of loud speaking receivers at the upper portion of the sound frequency range.

A great deal of evidence, and elaborate arguments by counsel, were directed to various phases of this patent and its alleged infringement by the defendant, to which I have given full consideration, but, I think, the real question here at issue may be disposed of in fairly brief terms.

This patent was fully considered by me in the case of *Western Electric Co. Inc., et al.* v. *Baldwin International Ld.* (1), and I need not repeat what I there said. I held the patent to be valid and to have been infringed, for the reasons there appearing.

The elements of Wente's combination patent are set forth in claim 4, the claim in suit here, as follows: "An acoustic device comprising a piston diaphragm having a flexible peripheral portion and a substantially dish-shaped central portion, means for driving said diaphragm at the periphery of its central portion, a horn, a sound chamber between said diaphragm and said horn, a plug in said sound chamber for decreasing the cross-sectional area of a portion of the sound passage therethrough." Loud speakers, so called, were known and in use prior to Wente. I think it is quite correct to say that the claim to invention in Wente resides in the inclusion in the combination of a sound chamber having a dome shaped plug inserted therein, which decreases the area of a portion of the sound passage. The diaphragm and plug are so shaped and arranged that converging sound passages are formed thereby, extending from the centre of the diaphragm and from its peripheral portion to a common sound chamber. The detailed description of the invention relates almost entirely to the sound chamber and the spherical plug, and the method of construction and assemblage.

The vital importance attached to Wente's sound chamber, that is, a sound chamber having a plug secured therein, will be recognized from the following excerpt from Wente's specification, wherein he states:

> When employed in conjunction with a horn having no inherent losses, a loud speaker constructed in accordance with the above description has an efficiency of approximately 30 per cent, measured from the electrical energy input to the acoustic energy output, over a wide range of frequencies. Measurements made on a loud speaker of this type, from which the plug 23 has been removed from the sound chamber, and which employs a diaphragm about 2·75″ in diameter, show that the frequency

(1) (1933) Ex. C R. 13.

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response falls off at frequencies above about 3,000 cycles per second at such a rate that practically no radiation takes place at a frequency of about 6,300 cycles. By inserting the plug into the sound chamber the frequency response characteristic of the loud speaker is improved to such an extent that the point of low radiation is moved up to a frequency of about 14,000 cycles per second and the efficiency of the loud speaker is practically uniform up to a frequency above 5,000 cycles

It will therefore be observed that the distinguishing characteristic of Wente is the use of a spherical plug in the sound chamber for the purpose of decreasing the cross-sectional area of a portion of the sound chamber, and the favourable results produced thereby are described in that portion of the specification which I have just quoted. A sound chamber associated with a diaphragm, in acoustic devices, being old, it was the particular arrangement of parts, including a sound chamber with a plug secured therein, that gave novelty and utility to the combination of Wente, and the evidence in *Western Electric Co.* v. *Baldwin, supra,* appeared sufficient, in my opinion, to establish invention for the combination.

The defendant's sound chamber is simply an open aperture, the walls of which are diverging. It is, I think, the conventional sound chamber used in a loud speaker and which I apprehend anyone might use in any such device. The defendant's sound chamber is entirely different in conception and form from that of Wente, and I see no room for debate about this, so significant and obvious is the distinction between the two sound chambers. One could hardly be heard to say that these sound chambers are alike, or that the defendant's sound chamber is the equivalent of Wente's sound chamber.

It has been laid down time and again that a claim for a particular means to effect certain purposes is not infringed where the same purposes are effected by different means; nor is a combination to effect certain results infringed by a combination of similar parts operating in a different manner, though the results effected are the same; but the claim is infringed when a variation in detail which amounts only to a colourable imitation is used. Wente chose a certain combination of parts, and in particular a combination with a sound chamber in which was inserted a plug, and to that he must be held, and though the form of his sound chamber required a particular shaped dia-

phragm, that is of no consequence. I do not think it can be said that the defendant's combination is merely a colourable imitation of Wente.

I think the defendant's sound reproducing device is in fact a combination different from that described and claimed by Wente. The plaintiffs, by cutting from the walls of the defendant's sound chamber, a spherical plug shaped section, and suggesting in some way its replacement in the sound chamber from whence it came, sought to establish a similarity between the two sound chambers in question, but with this effort I was not impressed.

My conclusion is that there is no infringement of Wente by the defendant.

The Miller patent will next be considered. This patent issued in June, 1933, on the application of Miller made in September, 1931. This patent relates to sound reproducing systems, and more particularly to sound reproducing systems operated from an alternating current source.

The specification first points out that various types of sound reproducing systems such as known types of phonographs and radio sets, have been operated from alternating current sources with reasonable success. However, it is said, difficulty has been experienced in operating an alternating current film sound reproducing equipment suitable for sound picture systems, due to the very high amplification between the photoelectric cell and the sound radiator and the high quality of reproduction necessary.

The specification then states:

> Heretofore, known types of film sound reproducing systems have been mainly or entirely operated by direct current sources.
>
> Commercial types of direct current generators are not suited to service of this type due to the pronounced ripple produced in their output by the usual method of commutation which produces a steady hum in the reproduced sound. Special generators designed to overcome this difficulty are difficult to construct due to the small power and size required and have not proved an entire success. As a result, the direct current used in sound reproducing systems has been mainly supplied by storage batteries. The storage batteries required, however, are bulky, require skilled operation and maintenance and a separate current supply and apparatus for charging.
>
> Owing to the disadvantages attending the use of storage batteries, attempts have been made to replace the storage batteries with a source of supply derived from commercial alternating current circuits due to the constancy and reliability of these circuits and the ease with which the voltage may be transformed to any desired value. Rectified alternating current has been successfully used on the amplifiers feeding

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directly into the sound reproducers and has resulted in a system having economic and operating advantages over the use of storage batteries. The use of rectified alternating current as a power supply for the other circuits in the reproducing system, has not heretofore proven commercially successful. Due to the very high amplification of the output of the photo-electric cell, it has been found that in known systems the ripple remaining due to incomplete rectification produces a hum in the output of the sound reproducer which is detrimental to the enjoyment of the sound. By using extreme precautions, it is possible to produce a supply of rectified alternating current which is practically as constant as the supply from the storage battery but the elaborate and complicated installation required has prevented these systems from becoming commercially successful.

In known systems of film sound reproduction, a certain amount of noise is produced by the sound radiator even during supposedly silent periods. This noise is caused by various irregularities in the system such as fluctuations in the output from the amplifiers, lack of cleanliness and uniformity in the sound record, and many others. The total volume of noise due to these causes is kept low enough that no disagreeable effect is produced on the listener. The volume of noise is generally near to or below the threshold of audibility of the listener. J. C. Steinberg has shown in his article "The Relation Between the Loudness of a Sound and its Physical Stimulus," the Physical Review, Second Series, Vol. 26, October, 1925, that when the components of a complex sound near the threshold of audibility have values less than the values required for them to be audible when heard alone, they do not contribute to the loudness of the complex sound. In the present invention, the power supply is so arranged that the noise produced by variations in the supply is reduced to near the threshold of audibility and thus does not contribute to the loudness of the noise due to other causes. The total noise produced is thus not appreciably greater than the noise produced when the system is operated by storage batteries. At the same time, the system is so arranged that the irregularities in the power supply do not tend to cause a modulation of the sound frequency currents. It has been found that a system having the degree of imperfection in rectification limited as described above voids the complications which have prevented the systems producing practically constant current from an alternating current source from becoming commercially successful.

The object of the invention is stated to be a film sound reproducing system operating on alternating current. The particular features of the invention are said to be the use of rectified and filtered current to supply the power required by the system, the reduction of undesired noise due to operation on alternating current to a value less than the value of the undesired noise due to other causes in the system, and the arrangement of the system so that the variations in the filtered current are prevented from producing a modulation of the sound frequencies. By reason of these features it is claimed that the noise effects of the various parts of the system individually are maintained below certain limits, by means of proper filtering

or "smoothing" of the rectified current supply to each element respectively, and that the total noise effect is thus held within such limits that the final sound output is of a high standard of quality. The noise or "hum" which it is desired to reduce or eliminate is due to the fact that the current alternates, and this noise or hum is inherent in any alternating current system.

All the claims of the patent seem to be very similar, and claims 1, 2 and 3 may be mentioned. They are as follows:

1. A system for reproducing sound embodying, in combination, a source of illumination, a photoelectric cell, a photographic record of sound, means to cause said record to travel between said source and said cell, means for reproducing said sound controlled from said cell a source of alternating current, a rectifier and a filter in the supply circuit for said source of alternating current, said filter being arranged to reduce variations in the current supply to said source of illumination to such an extent that the effect of said variations is less than the effect of variations in the remainder of the system.

2. In a sound reproducing system, in combination, a source of illumination, a photoelectric cell, a film having a photographic record of sound, means to cause said film to travel between said source and said cell, means controlled from said cell for reproducing said sound a source of alternating current, a supply circuit for said source of illumination comprising a rectifier and a filter operated from said source of alternating current and arranged to reduce the variations in said alternating current to such value that the noise caused by said variations produces no perceptible increase in the noise produced by other irregularities in said system.

3. A method of reproducing sound embodying in combination a source of illumination, a photoelectric cell, a photographic record of sound, means to cause said record to travel between said source and said cell, means for reproducing said sound controlled from said cell, a source of alternating voltage, a rectifier and a filter operated from said source of alternating voltage to supply a polarizing potential to said cell and arranged to reduce the variations in said potential to such value that the noise produced by said variations causes no perceptible increase in the noise produced by other irregularities in said system.

It is to be observed that these claims state that a rectifier and filter are elements in the combination of parts described, and so "arranged" as to reduce the variations in the alternating current to such value that the noise caused by variations in the current supply cause no perceptible increase in the noise produced by any other irregularities in the system. There is no suggestion of any particular type of rectifier. What is disclosed are half wave rectifiers, and the usual filtering devices of choke coil and condenser. Miller concedes in his specification that rectified alternating current had been successfully used on the

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amplifiers feeding directly into the sound reproducers, and he concedes that by using extreme precautions it was possible by such means to produce a supply of rectified alternating current which was practically as constant as the supply from a storage battery, that is, a direct current supply.

But Miller's means for substituting a rectified alternating current in place of a direct current from storage batteries do not appear to disclose anything novel. Diagrams put in evidence, Exhibits 21, 22, 23 and 24, show that Miller's means of procuring the desired result by the use of a rectified alternating current is the same as that earlier in use for the same purpose. He does not appear to introduce any new element in his circuit, and we have the old elements in a rectifier to rectify the alternating current, and a filter consisting of condensers and choke coils, to smooth out the variations in the rectified current. He appears only to suggest that it is not necessary to smooth out entirely the ripple of the alternating current, because there is inherent in the system, due to various causes, a certain amount of noise, and that with a rectified alternating current it is not necessary to go below this because any hum remaining after a certain amount of filtering of the alternating current would not be objectionable, providing that such hum or noise were below the threshold of hearing.

Now, that idea or suggestion is put forward as a patentable one, but Miller does not suggest any other than well known means of putting the idea into practice, which in patent law is necessary, if the idea is a patentable one. Essentially, all that Miller says is to rectify and filter the alternating current by the usual means until you remove the noise of the ripple until it no longer contributes to the noise caused by other irregularities in the system, for example, such noises as are caused by fluctuations in the output from the amplifiers, or lack of cleanliness and uniformity in the sound record, and which are ultimately reproduced by the sound radiator. The plaintiff led evidence to show that the defendant's sound reproducing device was free of the objectionable hum or noise. This has the appearance of saying, as was well put by Mr. Chauvin, that if by the careful use of known rectifying

and filtering means one obtains a satisfactory sound reproduction, Miller is therefore infringed. Such a proposition would, I think, be untenable.

I perhaps should state that it was the hum inherent in an alternating current which prevented its earlier adoption in reproducing systems. For this reason the direct current was used to operate the system and to carry the signal impulses so as to avoid distorting the signal impulses. Then there arrived the time when it was found that the alternating current could be rectified and the hum eliminated or satisfactorily reduced.

Miller, in my opinion, seems to me merely an exposition upon the use of operation of known means and method for the rectification and filtering of an alternating current when employed in a sound reproducing system. It merely points out that it is not necessary to filter the rectified current to the extreme capacity of the means employed therefor, and it explains why it is not necessary to go beyond a certain degree of filtering. But no means are described for determining when that point has been reached. It is a matter of judgment and appreciation as to when the hum has been sufficiently smoothed out, or as to when it is of no greater value than the other noises which are to be found in the system. The idea may be meritorious but I do not think it is a patentable one. I might further add that what Miller claims is an article, a combination of elements, which did not require inventive ingenuity to produce. I do not think it is permissible to claim an article which as an article requires no inventive ingenuity merely because, if used in a particular way, it will be useful in achieving a particular purpose, as was said by the Master of the Rolls, Sir Wilfred Greene, in *Mullard Radio Valve Co. Ld.* v. *British Belmont Radio Ld.* (1).

Upon a construction of the patent itself it would seem clear that all Miller suggests is the idea of arranging the system so that the variations in the alternating potential or current will be reduced to such value that the noise produced by them is not materially greater than the noises produced by the irregularities in the sound record, caused by one reason or another. A rectified alternating current,

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properly filtered, was old in the art as a source of energy in vacuum tube devices, and its application to energize an amplifier in sound reproduction from film would not constitute invention. Miller shows a circuit arrangement for rectifying and filtering an alternating current but in that there is nothing novel. Both the descriptive portion of the specification and the claims of Miller emphasize filtering as the method for minimizing the irregularities of current which produce hum. If there is any other effect in Miller's arrangement which contributes to the accomplishment of this object, it is not disclosed. He refers constantly to filtering but he does not explain how any vacuum tube circuit of itself goes beyond the effects of the filter itself. After he is through with filtering he suggests something in the arrangement of the system which goes beyond the filtering in minimizing the effects of the variations in the filtered current, but he does not disclose what it is.

In my opinion therefore Miller is without subject-matter and it follows that there is no infringement.

I come next to the Wilson patent. This patent relates to improvements in electron discharge devices and issued in May, 1922, on the application of Wilson made in October, 1919.

Wilson claims to have put a negative bias on the grid through a resistance in the circuit by means of a space current supplied to the plate or cathode. The specification states:

> This invention relates to electron discharge devices in which the impulses to be amplified, repeated or rectified are applied to a control electrode such as a grid. It has been found that in devices of this type, a coated filament having been employed, that a potential difference which may be called a contact difference in potential actually exists between the grid and the filament when a current is flowing from the filament to the plate. This potential difference assumes different values for different tubes even in the case where precautions are taken to employ as near as possible the same material for the grid and the same sort of alkaline earth oxide coating for the filament. This difference in potential makes it impossible to always use precisely the same circuit arrangement for the vacuum tube if identical results are to be obtained. In any case, however, this difference in potential is such as to cause no serious difference in the operation of the tube, especially if it is to be employed for amplifying large impulses, but in case the tube is to be employed as a detector or amplifier of weak impulses, it is desirable from a manufacturing standpoint that identical circuit arrangements should give identical results.

It will be observed that the specification points out that the difference in potential causes no serious difference in the operation of the tube, if it is to be employed for amplifying large impulses, but employed as a detector of weak impulses the potential may cause variations and it is accordingly desirable from a manufacturing standpoint that identical circuit arrangements should give identical results.

The specification then proceeds:—

If the contact difference in potential has a tendency to a positive value, it is found necessary in certain circuits, such as amplifier circuits to apply a negative potential to the grid in order to make it negative with respect to the filament. This effective value is desirable in order that no current can flow in the grid-filament circuit of a vacuum tube.

The usual method of applying the negative grid potential is to employ either a separate source, such as a dry cell, or to employ a resistance in the filament circuit, the drop in potential across this resistance being supplied to the grid. In both cases the negative potential is applied to grid irrespective of the value of the contact difference in potential between grid and cathode, so that although in general it may improve the action of vacuum tubes, in many cases, that is, where the contact difference in potential is a large negative value, it is detrimental.

An object of the invention is stated as follows:—

An object of the present invention is to compensate to some extent at least for the variations in this contact difference in potential between grid and cathode.

This is accomplished by supplying to the grid or control electrode a potential derived from the drop across a resistance which is in circuit with the source supplying the space current between the cathode and anode. This resistance is so connected that the grid acquires a negative potential equal to the drop across it. The drop across this resistance is proportional to the space current and consequently is dependent to some extent on the value of the contact difference in potential, since a positive value thereof will increase the space current, which would increase the negative potential of the grid, thereby cutting down the space current; on the other hand, a negative value of the contact difference in potential will decrease the space current which results in a grid potential tending to increase the space current. Hence the arrangement compensates for variations in this contact difference in potential.

The specification then presents the details of the invention by reference to the drawing which represents diagrammatically a circuit embodying the invention. The invention claimed by Wilson would thus appear to be confined to placing the resistance, designated by the numeral 6 in the drawing, in the circuit with a source supplying the space current between the cathode and the anode. Previously, he states, it was in the grid filament circuit

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and he now proposes to place it in the circuit with the source supplying the space current. In further details of the invention he refers to a choke coil 8 which he states maintains substantially constant the current from battery through resistance 6, and the outgoing impulses are led off to the device 9, the telephone or loud-speaker, by a separate circuit which is connected in shunt to the circuit containing the elements 6, 7 and 8.

The claims said to be infringed are 1 and 5 and they are as follows:—

1. An electron discharge device having grid and anode circuits, a source of space current, an impedance common to said grid and anode circuits, and means for maintaining substantially constant the current through said impedance.

5. An electron discharge device comprising an anode, a cathode, a grid, a source of space current, and means for supplying between said cathode and grid a potential dependent in value upon the current supplied by said source and substantially independent of the value of the outgoing impulse.

From these claims it appears, having reference to the numerals employed in the specification and drawing, that choke coil 8 is the means adopted for maintaining constant the space current, and the outgoing circuit is divided, one branch leading off the impulses through a condenser to the device of telephone 8, and the other leading the space current down through the choke coil 8 to the battery 7, and then through the resistance 6.

The Canadian patent to Mathes, No. 185,275, which was cited as an anticipation of Wilson, shows a circuit arrangement comparable only in part to Wilson. The complete circuit is led off in Fig. 2, through condenser 12 down to the primary of the transformer, and then the current carrying the impulses is brought back to the cathode, in the same manner suggested by Wilson. The steady current then goes down through the choke coil 11, through the battery 5, and back to the cathode through the condenser wire connecting the common point of batteries 5 and 6 to the cathode and to ground. The cathode is also connected through battery 6, choke coil 4, and resistance 15, to the input circuit. As a result of this the resistance 8 in Mathes is not directly in the circuit which carries the space current from the anode to the cathode, whereas in Wilson the resistance is in that circuit. Wilson's method of providing a grid bias went into extensive application, and, I understand, is embodied in most modern receivers.

I think it would be correct to say, as claimed on behalf of the defendant, that Wilson would not be entitled to claim as invention the use of a choke coil for keeping the current constant, or for the condenser and choke coil for the purpose of dividing the output current and leading the impulse current back to the filament without going through the battery and the resistance. That was a means, I think, well known to the art at the time of his alleged invention, and Mathes shows this. But that still leaves Wilson's combination for producing a grid bias by a drop of potential through a resistance in the circuit carrying the space current from the anode to the cathode. Therefore, I think, it must be conceded that the combination of Wilson is in principle to be differentiated from Mathes, and that it is novel and possesses subject-matter. I do not think Wilson's arrangement can be said to have been obvious. Mathes obtains his grid bias by means of a resistance in the input circuit shunted across a battery different from the output battery, and nowhere does he suggest that this resistance might be inserted in the anode output circuit, which is the plate circuit, and that is what Wilson does. Patents to Lowenstein and Langmuir were also cited on behalf of the defendant, but I do not think they are relevant upon the real point in debate here, that is, whether there is invention in the circuit arrangement whereby a grid bias is obtained from the plate current and not from the filament current.

My conclusion is therefore that there is subject-matter in Wilson. So far as I have been able to understand the defendant's circuit it seems to me that the negative bias is there obtained substantially in the manner described and claimed by Wilson. I am therefore of the opinion that Wilson is infringed by the defendant.

I turn now to the fifth and last patent involved in this case, the De Forest Patent, which issued in December, 1923, the application therefor having been filed in October, 1920. The title given to this invention is "Method of and Means for Controlling Electric Currents by and in Accordance with Light Variation."

The invention is directed to the control of electric currents by and in accordance with variations of light. The specification states that useful applications of a system

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of this nature are many, one of which being the reproduction of photographically recorded sounds for sound reproduction purposes, for example, in talking moving pictures. The invention is said to consist substantially in the construction, combination, location and relative arrangement of parts together with the method involved and the circuital arrangements employed in accordance therewith. The patent drawings diagrammatically illustrate four different views of the system embodied in the invention.

The claims sued upon are 7, 8 and 9, which are embodied only in Fig. 4 of the drawings. Those claims are as follows:

7. The combination with an audion, of a light sensitive device included in a circuit connecting the grid and filament electrodes of said audion, and a source of current included in said circuit and shunted around said device.

8. The combination with an audion, of a light sensitive device included in a circuit connecting the grid and filament electrodes of said audion, and a potentiometer included in said circuit and shunted around said device

9 The combination with an audion, of a light sensitive device included in a circuit connecting the grid and filament electrodes of said audion, a source of current and a potentiometer included in said circuit and each shunted around said device.

With reference to Fig. 4, De Forest in his specification states:

In Fig 4 I show another method of connecting the light sensitive device 21 to the grid leak of an audion 5 which may or may not be in an oscillating state Here a polarizing battery 40 is connected around the device 21, as is also a potentiometer resistance 41 from which a sliding contact 42 leads off to the grid electrode 11 of the audion 5. A "ballast" resistance 43 is connected in this last lead as shown. By this arrangement I am enabled to obtain an exceedingly sensitive adjustment and consequent efficient control of the modulating or best effect produced by the light variations.

It is agreed that the arrangement just above described, and as embodied in Fig. 4, is inoperable, and any circuit arrangement made in accordance with such directions, and the drawings and claims, would wholly lack utility. This, it is agreed, is in consequence of the failure to include a resistance in the circuit arrangement, either immediately above the numeral 40 in Fig. 4, or somewhere between the battery 40 and the light sensitive device; I understood Mr. Biggar to say that the kind of arrangement shown in Fig. 4 was known as a shunt feed and was well known for use in connection with vacuum tubes but not

with photoelectric cells, and I understood his contention to be that when this shunt feed was shown to be applied in association with photoelectric cells the use of a resistance became obvious, and that this would be known to those skilled in the art at the date of the specification. There is conceded also to be an error in the drawing Fig. 4 wherein is shown a double connection to the battery 40, which error it is claimed would be obvious to any electrician. This error was not, I think, put before me by counsel for the defendant as being fatal to the claims in question, and probably it was a drafting error. In any event, in my view of the case, it may be disregarded. At any rate it does not appear to be of such serious importance as the absence of a resistance.

In Fig. 1 there is shown a resistance and the specification refers to it thus: "I prefer to provide a high resistance leak path 19 between the grid and filament electrodes of audions 6, and in a similar grid-filament circuit of oscillating audion 5 I provide in addition to the resistance 19, a source of current 20 and a light sensitive device 21 through which the system is controlled." A resistance is also shown in Fig. 3, but not in Fig. 2. But Fig. 4, and the reference thereto in the specification, apparently was intended to present a method, different from anything earlier described or shown in the other drawings, for connecting the light sensitive device to the grid leak of an audion.

The absence of a resistance, and therefore the utter lack of utility in De Forest, was known to the plaintiffs prior to the bringing of this action, and no effort was ever made to amend the specification, in the manner prescribed by the Patent Act. I find it difficult to assume that De Forest ever concluded in his own mind that a resistance was imperative in his arrangement shown in Fig. 4, or that his failure to indicate plainly the necessity for the inclusion of that element was a mere inadvertence. It is impossible to say that either assumption would be well founded. The probable reason for the absence of a resistance is, I think, to be found in Mr. Biggar's explanation, that is, that the arrangement that De Forest had in mind, and which is shown in Fig. 4, was one that had been used in association with vacuum tubes, and which would be well known to De Forest, and that he adapted it for use in

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connection with photoelectric cells, believing that it would be sufficient and effective in a circuit arrangement for controlling electric currents in accordance with light variations. And it transpires now that it will not work. That cannot be considered, I think, at this date, as being an obvious omission or an inadvertent deficiency in description, from the consequence of which the inventor should now be relieved. The specification here was prepared in 1920, nineteen years ago, and upon the evidence before me as to the state of the art at that time, I cannot say that it would be obvious to those skilled in the art that a resistance would be a necessary element to make operable the device then described and claimed by De Forest, and as illustrated in Fig. 4. It was incumbent upon De Forest to disclose his suggested circuit arrangement in operable form, so that when his patent expired the public would readily know how to construct and use it, that is to say, the consideration for his monopoly should have been clearly and accurately stated.

I am not prepared to go so far as invited by plaintiffs' counsel, and to hold that the absence of a resistance in the circuit of De Forest was something which would be obvious, in 1920, to a competent engineer engaged in the designing and construction of an apparatus for controlling electric currents in accordance with light variations. As I have already suggested, it is probable that De Forest intended to associate with his photoelectric cell the arrangement which was then known as a shunt feed, and which had been used in connection with vacuum tubes, and that he shows in Fig. 4. But De Forest was mistaken in thinking this arrangement was adaptable for the purpose he had in mind, and his invention was therefore incomplete. The defendant's system includes the resistance spoken of here, and it would appear to be more reasonable to say that whoever designed the defendant's device made an invention rather than De Forest, who made a disclosure of an inoperable device.

An invention to be patentable must confer on the public a benefit. Utility, as predicated of inventions, means industrial value. No patent can be granted for a worthless art or arrangement. Here there is described and claimed something that lacks utility, because it is inoperable for the purpose for which it was designed. In the circum-

stances here it does not appear reasonable to say that the worker competent in the art would at the date of the specification,—and that is the date to which we must go—at once recognize the necessity for the insertion of a resistance in the circuit arrangement and at once supply it, in order to make the apparatus operable. I am not prepared to go that far. The structural defect in De Forest is not of the character that invites one to read and construe the specification in a way to support the patent, and I do not think this should be done. If I found that the defendant infringed De Forest it would be saying that the defendant infringes an article which is inoperable and useless, and which never went into use. That would seem an unreasonable and illogical conclusion to reach.

I find very little in the way of decided authority to assist one in a case of this kind under discussion. In the notes following the case of *Darcy* v. *Allin* (1), I find the following: "The utility of the invention is distinctly recognized in all of them, as part of the motive or consideration; but this condition would appear to differ from the others, in admitting of degrees. If an invention be totally useless, the purposes and objects of the grant would fail, and such grant would consequently be void, not only on the ground of false suggestion and failure of consideration, but also on the ground of its being prejudicial, as having a tendency to stop improvement." Those grounds seem to me to be substantial. And practically the same view was expressed by Parke B., in *Morgan* v. *Seaward* (2).

I am of the opinion therefore that the patent to De Forest, wholly lacking utility, is void and without subject-matter, and the action of the plaintiffs, so far as this patent is concerned, must therefore fail.

In the result, the plaintiffs succeed in their action for infringement of the Wilson patent, and with costs, and the defendant succeeds in respect of the other patents sued upon, and with costs, the costs taxed by the plaintiffs to be offset against those taxed by the defendant.

Judgment accordingly.

(1) 1 W.P.C. at p. 8.

(2) (1837) 1 W.P.C. 187 at p. 197.