

Statement of Facts.

on that identical question, Rector can in this suit correct the errors of the tribunal in its decision. I think he cannot. If he can, it is difficult to see why all the decisions of the tribunal are not open to revision by the courts.

I am authorized to say that Justices HARLAN, WOODS, and BLATCHFORD concur with me in this opinion.

COCHRANE & Others v. BADISCHE ANILIN & SODA
FABRIK.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR
THE SOUTHERN DISTRICT OF NEW YORK.

Argued March 26th, 27th, 1884.—Decided April 14th, 1884.

Patent.

If the claim of reissued letters patent No. 4321, Division B, granted to Charles Graebe and Charles Liebermann, April 4th, 1871, for an "improvement in dyes or coloring matter from anthracine" (the original patent, No. 95,465, having been granted to them October 5th, 1869), namely: "Artificial alizarine, produced from anthracine or its derivatives by either of the methods herein described, or by any other method which will produce a like result," is construed so broadly as to cover a dye-stuff, imported from Europe, made by a process not shown to be the same as that described in No. 4321, and containing large proportions of coloring matters not shown to be found to any practically useful extent in the alizarine of the process of No. 4321, such as isopurpurine or anthrapurpurine, it is wider in its scope than the original actual invention of the patentees, and wider than anything indicated in the specification of the original patent. If the claim is to be construed so as to cover only the product which the process described in it will produce, it does not cover a different product, which cannot be practically produced by that process.

This was a suit in equity for the alleged infringement of a patent for improvement in dyes from anthracine. The nature of the invention, the extent of the claims, and the facts which went to show the infringement or to affect the validity of the patent are fully brought out in the opinion of the court, from the large mass of testimony in the record. Judgment below sustaining the validity of the patent, from which the alleged infringers appealed.

Opinion of the Court.

Mr. Edward N. Dickerson for appellants.

Mr. Benjamin F. Thurston for appellee.

MR. JUSTICE BLATCHFORD delivered the opinion of the court.

This is a suit in equity, brought in the Circuit Court of the United States for the Southern District of New York, by Badische Anilin and Soda Fabrik, a corporation organized under the laws of the Grand Duchy of Baden, in the Empire of Germany, against the appellants, for the infringement of reissued letters patent No. 4,321, granted to Charles Graebe, of Frankfort-on-the-Main, and Charles Liebermann, of Berlin, Prussia, April 4th, 1871, for an "improvement in dyes or coloring matter from anthracine." The original patent, No. 95,465, was granted to the same persons, October 5th, 1869, for an "improved process of preparing alizarine." It was reissued on two separate amended specifications, Division A and Division B. No. 4,321 is Division B.

The following is the text of the specifications of No. 4,321 and No. 95,465. Reading in it what is outside of brackets, and what is inside of the brackets, omitting what is in italics, gives the specification of No. 4,321. Reading what is outside of brackets, including what is in italics, omitting what is inside of brackets, gives the specification of the original patent:

"Be it known, that we, Charles Graebe, of Frankfort-on-the-Main, and Charles Liebermann, of Berlin, in the Kingdom of Prussia, have invented a [new and useful improvement in the manufacture of alizarine ;] *process for preparing alizarine from anthracine* ; and we do hereby declare the following to be a full, clear and exact description thereof, which will enable those skilled in the art to make and use the same. We first change the anthracine into anthrakinson (oxanthracine), a substance known to [the] chemists by the investigations of Anderson. For this purpose we take one part, by weight, of anthracine, two and half parts, by weight, of bichromate of [potash,] *potassa*, and ten or fifteen parts, by weight, of concentrated acetic acid, and we heat these substances together in a vessel, either of glass or clay, to about 100° centigrade to 120° centigrade, till nearly all of the bichro-

Opinion of the Court.

mate of [potash] *potassa* is dissolved and the liquid has acquired a deep green color. We then recover the acetic acid not consumed in the reaction by distillation, and treat the residuum with water to remove the chromic acetate. From the insoluble mass we obtain the anthrakinon in a pure state by distilling the whole from a retort of glass or iron. In the place of *the* acetic acid, sulphuric acid, diluted with one or two parts of water, may be employed. Instead of the method just described, we also employ the following one: We heat *the* anthracene in a vessel of glass or of clay, with ten parts of concentrated acetic acid, to about 100° centigrade, or a little higher, and we add nitric acid of about 1.3 specific gravity, in small portions, till the violent reaction ceases. After distillation of the acetic acid we purify the residuum, as before. We then convert the anthrakinon, prepared by one of the methods described, into bibromanthrakinon. For this purpose we take three parts of anthrakinon, five parts of bromine, and we heat these substances for ten or twelve hours, or until nearly the whole of the bromine has disappeared, to a temperature, by preference, of about 100° centigrade, in a suitable close vessel, either of glass or enameled or glazed iron, which is capable of sustaining the pressure [which is] generated by the reaction. The apparatus is then allowed to cool. It is opened in order to permit the escape of [bromic] *hydrobromic* acid, which can be recovered by absorption either in water or in *an* alkaline solution. We purify the bibromanthrakinon remaining in the vessel, as a solid substance, by crystallization from benzole. Instead of the method above described for preparing bibromanthrakinon, we also employ the following: We convert first the anthracene, into a bromine derivative, into the tetrabromanthracene, known to chemists by the investigations of Anderson. We take one part of this tetrabromanthracene, and we heat it in a retort of glass or clay with about five parts of nitric acid of about 1.3 specific gravity to 100° centigrade, as long as vapors of bromine are evolved. We distil off the greater portion of the nitric acid, wash the residuum with water, and purify it by crystallization from benzole. We thus receive the bibromanthrakinon as before, *in the form of* a yellow, solid mass. We then convert the bibromanthrakinon into alizarine. For this purpose we take one part of bibromanthrakinon, two to three parts of caustic potash or soda, and so much water as is necessary to dissolve the alkali, and

Opinion of the Court.

we heat the whole in an open vessel of glass, glazed or enameled iron, or silver, to about 180° to 260° centigrade for one hour, or [till] *until* the mass has acquired a deep blue color. We then dissolve it in water and filter the violet solution, from which we precipitate the alizarine by *an inorganic or organic* acid. We collect the yellow flocks of alizarine thus obtained on a filter and wash them with water. By these methods we receive the alizarine in a form in which it can be employed in the same manner as the different preparations from madder. In the place of bromine, chlorine [also] may *also* be employed, but not so conveniently, as the reactions above described are more difficult to accomplish with chlorine than with bromine. *Having thus described the nature of our invention and the manner of performing and carrying out the same, we would have it understood that we do not confine ourselves to the exact details hereinbefore given."*

The claim of No. 4,321 is as follows: "Artificial alizarine, produced from anthracine or its derivatives by either of the methods herein described, or by any other method which will produce a like result." The claim of the original patent was in these words: "The within described process for the production of alizarine, by first preparing bibromanthrakinson or bichloranthrakinson, and then converting these substances into alizarine, substantially as above set forth."

The bill of complaint alleges that No. 4,321 was issued "for a distinct and separate part of the same invention, on a corrected specification," on the surrender of No. 95,465; and No. 4,321 states, on its face, that, on such surrender, new letters were ordered to issue "on two separate amended specifications." But Division A, No. 4,320, is not in the record before us. The bill alleges the infringement to have been committed by making, selling, or using the invention or dyes containing it. The answer denies the manufacture of alizarine, but avers that the defendants have sold in the United States alizarine lawfully made in Germany, and imported as an article of commerce, which was not made by the process described in No. 4,321, or any process substantially the same, but was made according to processes which were invented subsequently to the date of No. 95,465, and are the subject of different and independent letters

Opinion of the Court.

patent. The answer also avers "that alizarine is a natural product, having a well-known definite constitution; that it is not a composition of matter, within the meaning of the statute, but has been well known in the arts, from time immemorial, for the purpose of dyeing, and has generally been extracted from 'madder root,' and from other analogous products, by various processes suitable for that purpose; that, therefore, there can be no valid patent granted for alizarine; and that No. 4,321 is void." The answer refers to "Watts' Chemical Dictionary, published before 1869, under the title *Alizarine*, to show that alizarine was well known long before the said patent;" and also sets up that the patent had expired because prior patents granted to the patentees in foreign countries, for the same invention, had expired.

Proofs were taken, and, on final hearing, the Circuit Court decreed that No. 4,321 was valid, and had been infringed, and ordered a reference as to profits and damages, and a perpetual injunction against the making, using, or selling of the article designated in No. 4,321 "artificial alizarine," or dyes containing the invention described in and secured by No. 4,321. Afterwards, there was a final decree against the defendants for \$13,326.65 and costs, of which \$12,871.86 was for profits made by the defendants, "by the sale of artificial alizarine, in infringement" of No. 4,321. From this decree the defendants have appealed.

This reissued patent No. 4,321 has been adjudicated in the Circuit Courts in several cases. It was before the Circuit Court in Massachusetts, in February, 1878, and the decision of Judge Shepley is in *Badische Anilin and Soda Fabrik v. Hamilton Manufacturing Company*, 3 Banning & Arden, 235, and 13 Off. Gaz. 273. It was also before the Circuit Court for the Southern District of New York, in September, 1878, and the decision of Judge Wheeler is in *Badische Anilin and Soda Fabrik v. Higgin*, 15 Blatchford, 290, and 3 Banning & Arden, 462, and 14 Off. Gaz. 414. The decision of Judge Wheeler in the present case, in April, 1879, is in 16 Blatchford, 155, and in 4 Banning & Arden, 215. The patent was also before the Circuit Court in Massachusetts, in September, 1879, and the decision of Judge

Opinion of the Court.

Lowell is in *Badische Anilin and Soda Fabrik v. Cummins*, 4 Banning & Arden, 489. In all of these cases the validity of No. 4,321 was sustained.

In the case before Judge Shepley, it was held that No. 4,321 was a valid patent for a manufacture and composition of matter, an artificial dye-stuff, called artificial alizarine, being a new product, produced by a new process, not a chemically pure alizarine, but having combined with the alizarine in it anthrapurpurine, isopurpurine and other bodies, not known to have existed before they were produced by Graebe and Liebermann, the presence of some of which bodies appeared to much enhance the value of the dye-stuff. It was decided that the defendants had used that article.

In the case against Higgin, it was held that the product of the process described in No. 4,321 contains isopurpurine, anthrapurpurine, monoxanthraquinone and other ingredients which were not only not ingredients in pure alizarine or madder alizarine, but did not exist in any dye-stuff with chemically pure alizarine, $C_{14}H_8O_4$, before that of Graebe and Liebermann, and are useful coloring agents, so that the product invented is a new composition of matter. It was decided that the defendants had used or sold dye-stuffs substantially the same, though claimed to be the product of a different process.

In the present case, it was insisted in the Circuit Court by the defendants, that the patented product was the same thing as the natural dye-stuff, alizarine, found in the root of the madder plant and chemically known by the formula $C_{14}H_8O_4$ and not patentable. But it was decided that the article which Graebe and Liebermann had made synthetically from anthracine, though having the same chemical formula as madder alizarine, was essentially different, in capabilities and properties, from chemically pure alizarine, madder alizarine, or any coloring matter before known; that the article dealt in by the defendants was produced by the process of United States letters patent No. 154,536, granted July 28th, 1874, to Heinrich Caro, Charles Graebe and Charles Liebermann; that the use of sulphuric acid, in the process of the latter patent, performs the same office, in the same way, as the

Opinion of the Court.

bromine in the process of No. 4,321; and that the products of the two processes are identical.

In the case before Judge Lowell, he held that what Graebe and Liebermann sought to discover, and supposed they had discovered, was the alizarine which is the dye-stuff of madder; that which is called "artificial alizarine" contains important dyeing substances not found in madder, namely, anthrapurpurine and isopurpurine (accordingly as these may be two substances or one and the same substance) and flavopurpurine, which substances produce valuable effects not produced by any extracts from madder; that, although the defendant insisted that those new purpurines were not found in the artificial alizarine made by the bromine process of No. 4,321, and were found only in artificial alizarine made by methods invented since Graebe and Liebermann invented that process, and the evidence on that point was in much conflict, yet it was shown that pure alizarine, pure isopurpurine and pure flavopurpurine were all contained in the patented article; that the artificial alizarine of No. 4,321 is different in some important respects from any article known before; that the new article of manufacture claimed in No. 4,321 was new in fact; and that the infringement was made out.

In Watts' Dictionary of Chemistry, volume 1, page 113, published in 1866, *Alizarin* is stated to be a red coloring matter obtained from madder, first prepared by Robiquet and Colin. This was in 1826. The correct formula of alizarine, $C_{14} H_8 O_4$, was first arrived at by Strecker, in 1866. It means that there are 14 atoms of carbon, 8 atoms of hydrogen, and 4 atoms of oxygen, in each molecule. At this stage Graebe and Liebermann took up the subject, and treated madder alizarine with the view of determining what was its mother substance. They tell the story themselves, in a paper in the record, entitled "Artificial Alizarine," which is a translation from the original, prepared in German by them, contained in the Official Report of the Vienna Exhibition of 1873, and also published separately in 1876. They heated madder alizarine with zinc dust, and made the alizarine give up its 4 atoms of oxygen, and take up 2 atoms more of hydrogen. They thus obtained a hydrocarbon, identical with that found in coal-tar, called anthracene,

Opinion of the Court.

and having the formula $C_{14}H_{10}$. They then conceived the idea of converting anthracene into alizarine. Anthracene was difficult to obtain, and the experiment was conducted on a small scale. But it resulted in the process described in No. 4,321, of converting anthracene into anthrakinon, the formula of which was $C_{14}H_8O_2$, and then heating the anthrakinon with bromine and obtaining bibromanthrakinon, and heating that with caustic potash or soda and obtaining alizarine. Graebe and Liebermann thus solved the problem of the synthesis of alizarine. It was a matter of great scientific interest, and gave them much reputation. The paper states that the first method described in No. 4,321 for preparing the bibromanthrakinon was so laborious that they devised the other method described, of first converting anthracene into tetrabromanthracene, and then treating that with nitric acid to obtain bibromanthrakinon. "This method," they state, "made it possible to obtain the alizarine more readily, and aroused hopes of its technical execution," although it involved two more reactions than the first method.

In regard to the alizarine thus obtained, the same paper says: "The artificial alizarine, besides having the same composition, had also the same properties as vegetable alizarine. In hydrated alkalies it is soluble, with a blue violet to purple color. The solutions of the alkali salts give, with lime, baryta, lead, iron, alumina and tin salts, lakes corresponding to the madder lakes. Cloth printed with mordants dye exactly alike with both coloring matters. From these salt-like compounds yellow flocculent alizarine is set free by the addition of a mineral acid. The artificial coloring matter shows the same solubilities, and the solutions of the alkaline salts the same absorption spectra, which are known of the natural coloring matter. The free coloring matter sublimes in beautiful yellow to red needles, which cluster together like feathers. On oxidizing with nitric acid, phthalic acid and oxalic acid are formed. Heated with zinc dust, the artificial alizarine is again converted into anthracene."

The paper then proceeds: "The above methods, which now, from a technical point of view, have only a historic interest,

Opinion of the Court.

and are therefore described without further detail, make up the subject of the patents taken out in England on the 18th of December, 1868, and then also in France, Prussia, most German States, Austria, Russia and America." The provisional specification deposited in the English Patent Office, December 18th, 1868, which was the date of the patent, gives a short description of the process and says: "The alizarine prepared in this artificial way is perfectly pure, and can be employed in all the applications for which the different preparations of madder are used." The full specification, filed June 17th, 1869, is substantially identical with the specification of No. 95,465, and claims "the artificial production of alizarine, by first preparing bibromanthrakinon or bichloranthrakinon, and then converting these substances into alizarine, as herein described."

In further pursuing the history of the matter the same paper proceeds: "The discoverers of the synthesis of alizarine soon found it necessary to enter into connection with some large dye factory. This was necessary in order that the raw material could be more easily obtained, and that the experiments could be made on a large scale and further developed. This could be done best with an establishment already in existence, where the doubtful question, whether this might be the basis of an industry, with hopes of success, could be solved. One of the chief difficulties experienced was the fact that the raw material was not only unknown in commerce, but also in the tar industry, and it was difficult to say whether it could ever be obtained in sufficient quantity. It was also doubtful whether the artificial alizarine could compete with the natural. Furthermore, there was much difficulty in transferring the above methods to a large scale. Graebe and Liebermann, therefore, entered into connection with the Baden Anilin and Soda Works, in Ludwigshafen, on the Rhine, the largest works of the kind in Germany, even on the Continent. [Originally, the experiments were limited to the purification of the anthracine and the manufacture of anthrakinon by the second mentioned bromine method, because this, notwithstanding its difficulties, showed some hopes of success.]" The passage above in brackets by

Opinion of the Court.

another translation, reads thus: "The first trials principally embraced the purification of anthracine, the manufacture of anthrakinon, and the practical application of the second above mentioned bromine method, as the same, notwithstanding the great difficulties, still gave assurance that it could be used practically."

The paper then goes on: "The latter" (meaning the second mentioned bromine method) "was dropped as soon as the observation was made that the alizarine could be made more simply by means of anthrakinon sulpho-acids. Graebe and Liebermann had originally attempted to obtain anthrakinon sulpho-acids, by acting on anthrakinon with sulphuric acid. But they made the mistake of using too low heats. The temperatures they employed were not high enough, being not greater than those generally employed in the preparation of sulpho-acids. They had also been misled by the observation that anthrakinon could be sublimed unchanged from strongly-heated sulphuric acid. Therefore they hoped little from sulpho-acids, and gave all their attention to improving the above methods. This mistake was avoided, and the modification of the synthesis of alizarine which forms the basis of the industry of to-day, was discovered first by Heinrich Caro, who, as an officer at the Baden Anilin and Soda Works, made it his task to give, in combination with Graebe and Liebermann, life to the alizarine industry. Caro first noticed that anthrakinon, if heated with sulphuric acid to above 200° , would give sulpho-acids, which, on fusing with hydrate of potash, formed alizarine, the same as the bromine compound. Perkin noticed the same fact shortly after or at about the same time. This method was further developed by Caro and the original discoverers, and the English patent was taken on June 25th, 1869 (Caro, Graebe and Liebermann, English patent, 1869, No. 1,936). The patent of Perkin is dated June 26th (Perkin, English patent, 1869, No. 1,948). Two methods were discovered, analogous to the two bromine methods. In the first and most important, the anthracine is oxidized to anthrakinon; this is converted into sulpho-acids by heating with sulphuric acid to 200° to 260° ; and these, by the beautiful method of Kekulé, Wurtz,

Opinion of the Court.

and Dusart, by fusing with caustic potash or soda, are converted into alizarine. The first process is, therefore, identical with the first bromine method given above. In the second method, the sulphuric acid acts on the anthrakinon in such a manner that, besides the anthrakinon monosulpho-acid, as principal product, a small amount of anthrakinon bisulpho-acid is also formed. This was subsequently determined analytically by Graebe and Liebermann. In the patent only the anthrakinon sulpho-acids are mentioned. From analogy, Perkin, in his paper (Jour. Chem. Soc. (2) viii., 133, and Ann. Chem. Pharm. clviii., 335), considered the bisulpho-acid only. It is also formed in larger quantity by the excess of acid he employs in his method, than it is by the method of Caro, Graebe, and Liebermann."

The reactions in the second method are then given by formulas, in reference to anthrakinon monosulpho-acid and anthrakinon bisulpho-acid, and it is then said: "On fusing the two sulpho-acids, they give alizarine, exactly like the monobrom- and bibrom-anthrakinon. The anthrakinon bisulpho-acid behaves, for the greater part, if not altogether, like the monosulpho-acid, and furnishes, instead of the corresponding bioxy-anthrakinon" (which is the alizarine of the process of No. 4,321), "essentially trioxyanthrakinon, the isopurpurin." They then give the two sets of chemical equations, one producing alizarine and the other producing isopurpurin. Further on, in the same paper, they say: "As far as has been observed, it seems that only the anthrakinon monosulpho-acid will produce alizarine, while the anthrakinon bisulpho-acid produces isopurpurin."

In an article by Graebe in the New Handbook of Chemistry, published in 1871, he had said: "Alizarine, lizaric acid, madder red, *matière colorante rouge*, first prepared from madder by Robiquet and Colin, 1826; artificially by Graebe and Liebermann, 1868, from anthracine; formula, $C_{14}H_8O_4$; is derived from anthracine, and is to be considered as bioxyanthrakinon, $C_{14}H_6(O_2)''(OH)_8$."

In another publication by Graebe and Liebermann, in 1868, they had said: "By treating alizarine with zinc dust, a hydro-

Opinion of the Court.

carbon was produced, having the composition $C_{14} H_{10}$, and coinciding exactly in its properties with anthracene. . . . According to our experiments, alizarine, which is hence a derivative of anthracene, must have the formula $C_{14} H_8 O_4$."

In another publication by them, in 1869, they had said: "We have produced from anthracene artificial alizarine. The properties of the product obtained by us, as well as the colors which we have produced with the same on mordanted cotton, exhibit perfectly the identity of the artificial alizarine with that obtained from madder root. . . . The methods which have led to the above results, and which we shall describe later, confirm the accuracy of the rational formula for alizarine, recently advanced by us." Again, in a further publication in 1869, they had said: "In our first notice we have already hinted that we have detected no difference between the natural and artificial alizarine, and that the very characteristic colors which both possess, when fixed on cotton mordanted with alumina and iron, are perfectly identical. We believe, therefore, that it is with one and the same chemical individual we have to deal, and not with isomeric compounds, of which an extraordinarily great number is conceivable, and of which an example already exists, as we have hinted, in chrysophanic acid. In conclusion, we will call attention to the fact that our production of alizarine is the first example of the artificial formation of a coloring matter occurring in plants."

The various papers thus referred to are, it is understood, put in evidence, by stipulation, with like effect as if the authors of them had testified to the facts stated in them.

In Prussia, a patent for five years was granted to Graebe and Liebermann, March 23d, 1869, for their bromine process, on condition that it should be put into practical operation in 12 months within the kingdom. On the 7th of July, 1870, after several notices to them, the patent was declared extinct, because proof had not been produced of the carrying out of the patented methods. In view of what Graebe and Liebermann themselves state, in the publication before cited, it is manifest that the Prussian patent was revoked because the process described was not a practical one. There was nothing

Opinion of the Court.

practical until the sulpho-acid discoveries were made. In regard to this the paper first cited says: "The patent of Caro, Graebe and Liebermann is dated one day earlier than that of Perkin. If any value at all is to be placed in the date, then Caro must certainly be mentioned first, since the application for a patent by the German chemist was delayed by an error. The signing took place at the patent agent's in Berlin. In reference to the above two English patents, Perkin and the Baden Anilin and Soda Works, proprietors of Caro and Graebe and Liebermann's patent, made an agreement in consequence of which the patents became common property. By the publication of these patents, the sulpho-acid methods of preparing alizarine became known, and a series of works were erected in States which gave no, or insufficient, protection to the patentees." This shows that the only methods practised commercially were the sulpho-acid methods. The English patent for the bromine methods expired December 18th, 1871, for the want of payment of a further fee.

The statement of Graebe and Liebermann is, that Caro discovered that, by using anthrakinon with sulphuric acid, he could obtain sulpho-acids, and then, with hydrate of potash, procure alizarine, "the same as the bromine compound," that is, the alizarine of the process of No. 4,321; but that the bisulpho-acid process, developed by Perkin, produces not the alizarine of the process of No. 4,321, which is bioxyanthrakinon, but trioxyanthrakinon or isopurpurine. The article sold by the defendants is this last substance, made by the bisulpho-acid process carried on abroad at the present day, and containing large proportions of coloring matters not shown to be found to any practically useful extent in the alizarine of the process of No. 4,321, such as isopurpurine or anthrapurpurine, one or both—two articles, if they are different, or one, if they are the same, as seems to be shown. No. 4,321 furnishes no test by which to identify the product it covers, except that such product is to be the result of the process it describes. The process by which the defendants' article is made is not shown to be the same process as that described in No. 4,321. Graebe and Liebermann, as appears from their own statement, experi-

Opinion of the Court.

mented with sulphuric acid and failed. It was not obvious that sulphuric acid would accomplish any result, nor was it obvious how to employ it. Their experiments with it led them to hope little from it, and to withdraw their attention from it and devote themselves to improving the bromine and chlorine methods. They state that Caro avoided their mistakes, and was the first to discover the modification which led to success, and that Perkin was an independent discoverer of it about the same time. It is, therefore, impossible to say that the sulphuric acid process was a known equivalent process at the time. It is easy now, after the event, for scientific men to say, with the knowledge of to-day, that the thing was obvious. But the crucial facts contradict the assumption.

It does not satisfactorily appear that the process of No. 4,321 will produce the defendants' article to any useful extent, if at all. The process of No. 4,321 never was, and is not now, practically carried on anywhere. The article of No. 4,321 was called "artificial alizarine," and the article now in the market is called by the same name, but the identity, in the sense of the patent law, between them and between the processes for producing them, is not shown.

The English patent to Caro and Graebe and Liebermann having been granted June 25th, 1869, and the full specification filed January 13th, 1870, an application for a patent in the United States for producing artificial alizarine by the sulpho-acid processes, was filed by them January 26th, 1870. It was granted as No. 154,536, July 28th, 1874. The full specification of the English patent and that of No. 154,536 are identical. The specifications state that the invention relates to improvements on the invention described in the English patent to Graebe and Liebermann, of December 18th, 1868, and in No. 95,465, "in which the preparation of artificial alizarine is based upon the action of caustic alkalies upon bibromanthrakinon or bichloranthrakinon." They then proceed: "We have now discovered that a similar result may be obtained by substituting sulphuric acid for bromine or chlorine in the above process. We thus obtain the sulpho-acids of anthrakinon, which, by being dissolved in and heated with an excess of caustic alkali,

Opinion of the Court.

are converted into alizarine. This invention relates to improvements in the production of coloring matters, and more especially to improvements in the method of producing what is known as artificial alizarine, from anthracine, a method of producing which was described in "the English patent of December 18th, 1868, and in No. 95,465, "and consisted in the production of artificial alizarine by converting anthracine into either bibrom-anthrakinon or bichloranthrakinon, and then acting upon the same by means of an alkali, and precipitating the alizarine contained in the alkaline solution by means of an acid. In the complete specification of the aforesaid letters patent granted to Charles Liebermann and Charles Graebe, two different series of processes are described for obtaining the brominated or chlorinated derivatives of anthrakinon. In the first of these processes, the anthracine is submitted to the action of oxidizing agents, as is well understood, and the oxidized anthracine or anthrakinon is then treated with bromine or chlorine. In the second of these processes, the anthracine is first treated with bromine or chlorine, and subsequently submitted to an oxidizing process, in order that the desired compounds, videlicet, bibromanthrakinon or bichloranthrakinon, may be obtained. In an analogous manner, we now employ sulphuric acid as a substitute for the bromine or chlorine employed in the processes above referred to, and we thus obtain the sulphuric acid derivatives of anthrakinon, which we call the sulpho-acids of anthrakinon." The specifications then go on to describe the two new processes. The first is, to alter the anthrakinon by heating it with sulphuric acid. The product is then put in solution and treated with carbonate of lime, and then with carbonate of potash or of soda, and potash or soda salts of the sulpho-acids of anthrakinon are produced. These are treated with caustic soda or potash, under heat, and the artificial alizarine is precipitated by an acid. In the second process, anthracine is heated with sulphuric acid, the product is put in solution, and treated with peroxide of manganese, under heat. Caustic lime is then added in excess, till there is an alkaline reaction, the mixture is then filtered and carbonate of potash or soda is added to it, and the potash or soda salts of the sulpho-acids of anthrakinon are pro-

Opinion of the Court.

duced. These are treated with caustic potash or soda, under heat, the product is put in solution, and the artificial alizarine is precipitated by an acid. It is stated, in regard to this substance, made by either of these two processes, that it "may be employed for the purposes of dyeing and printing, either in the same way as preparations of madder are now used or otherwise." In each of the two specifications there are two claims, in these words :

"1. The manufacture of coloring matters by submitting anthraquinon to the action of sulphuric acid, so as to obtain soluble compounds, which we have called sulpho-acids of anthraquinon, treating the products of such operation with an alkali, and precipitating the coloring matters therefrom by means of an acid, as herein described. 2. The manufacture of coloring matters by submitting anthracine to the action of sulphuric acid, oxidizing the product thereby obtained, heating such oxidized product with an alkali, and subsequently precipitating the coloring matters therefrom by means of an acid, as herein described."

After the granting of the English patent for the sulpho-acid process, on June 25th, 1869, to Graebe and Liebermann, and their application for the United States patent on January 26th, 1870, it became apparent that the sulpho-acid processes and products were to be commercially valuable. Then, during the interval of the four years and a half delay in the issuing of No. 154,536, No. 95,465 was surrendered and reissued in two parts, April 4th, 1871, one for the process and the other for the product, the claim in the latter, No. 4,321, being so worded as to cover "artificial alizarine, produced from anthracine or its derivatives, by either of the methods herein described, or by any other method which will produce a like result." Afterwards, Graebe and Liebermann assigned the two reissued patents of April 4th, 1871, to the plaintiff, on March 1st, 1872.

It is very plain that the specification of the original patent, No. 95,465, states the invention to be a process for preparing alizarine, not as a new substance prepared for the first time, but as the substance already known as alizarine, to be prepared, however, by the new process, which process is to be the subject of

Opinion of the Court.

the patent, and is the process of preparing the known product alizarine, from anthracine. The specification states that "the alizarine" is precipitated, that "the yellow flocks of alizarine" are obtained, and that "the alizarine" is in such a form that it can be employed in the same manner as the different preparations from madder; and the claim is for the "process for the production of alizarine." The provisional specification deposited in England, December 18th, 1868, states that "yellow flocks of alizarine are precipitated," and that "the alizarine prepared in this artificial way is perfectly pure;" and the full specification, filed in England, June 17th, 1869, claims "the artificial production of alizarine." No other conclusion can be reached than that Graebe and Liebermann, in the specification of No. 95,465, intended by "alizarine" the chemical substance known by the formula $C_{14}H_8O_4$, and thought that was what their process produced. There is no suggestion of anthrapurpurine or isopurpurine, or of any process for producing them. Their published statements show that it was the synthesis of the alizarine of madder which they were making, the specification of No. 95,465 shows that and nothing else, and it is not contended that the alizarine of madder contains anthrapurpurine or isopurpurine. It is very clear, from the testimony, that it is to anthrapurpurine or isopurpurine that the artificial alizarine sold by the defendants owes its efficiency as a dye-stuff, and its practical success in the market, and that such product is produced by the bisulpho-acid process of Perkin; and it is not satisfactorily shown that the monosulpho-acid process of Caro or the bromine process of No. 4,321 will either of them practically produce that product.

Inasmuch as the defendants' article is produced from anthracine or its derivatives by some method, and is a dye-stuff called artificial alizarine, it is contended that the sale of it infringes No. 4,321. The articles in market, called artificial alizarine, at the present day, are substances all of which are made from anthracine, but they vary all the way from nearly pure alizarine, made by the monosulpho-acid process, through the products of the bisulpho-acid process, which contain combinations of alizarine and anthrapurpurine, up to an article of pure

Opinion of the Court.

purpurine, free from alizarine. All of these are used as dye-stuffs, according to the shade of color and other qualities desired. The specific article put in evidence in this case as an infringement contains about 60 per cent. of anthrapurpurine. It is claimed by the plaintiff to be the artificial alizarine described in No. 4,321, and to be physically, chemically, and in coloring properties similar to that. But what that is is not defined in No. 4,321, except that it is the product of the process described in No. 4,321. Therefore, unless it is shown that the process of No. 4,321 was followed to produce the defendants' article, or unless it is shown that that article could not be produced by any other process, the defendants' article cannot be identified as the product of the process of No. 4,321. Nothing of the kind is shown. On the other hand, the defendants' article is made abroad and by a process different from that of No. 4,321. It, therefore, cannot be the product of that process. If the words of the claim "by any other method which will produce a like result" mean any other method which will produce the only product mentioned in the description, namely, alizarine, as then understood, having the formula $C_{14}H_8O_4$, the defendants' article is not that product, for it contains other dyeing ingredients which the alizarine of the patent does not contain. If the words of the claim are to be construed to cover all artificial alizarine, whatever its ingredients, produced from anthracine or its derivatives by methods invented since Graebe and Liebermann invented the bromine process, we then have a patent for a product or composition of matter, which gives no information as to how it is to be identified. Every patent for a product or composition of matter must identify it so that it can be recognized aside from the description of the process for making it, or else nothing can be held to infringe the patent which is not made by that process.

The Circuit Court found as a fact that the defendants' article was produced by the process described in No. 154,536. But it regarded that process as the same process chemically as the process of No. 4,321, on the view that the bromine used in the latter was merely a vehicle, and in the former sulphuric acid

Opinion of the Court.

was substituted as a vehicle, and, though superior, performed the same office in the same way; and so, as it regarded the two processes as the same, it held the two products to be the same. We consider it, however, to be established that the defendants' article is not made by the process of No. 4,321, but is made by the bisulpho-acid process of Perkin, which yields anthrapurpurine, and which, while it may involve the process of No. 154,536, goes beyond it. The bisulpho-acid process puts in two atoms of anhydrous sulphuric acid instead of one, and additional oxygen is carried in, and anthrapurpurine is produced, the formula of which is $C_{14}H_8O_5$. Aside from this, it is shown that the dyeing qualities of the defendants' article depend on the anthrapurpurine or isopurpurine it contains, and not on the alizarine. As the only alizarine mentioned in No. 95,465, or in No. 4,321, is alizarine the formula of which is $C_{14}H_8O_4$, the alizarine of madder, the process described in those patents, to be a sufficient support for a valid patent, as being properly described, must be a process which will produce that article and no other; and No. 4,321, to be valid as a patent for a product, must be a patent which will produce, by the process it describes, that article and no other. Unless that process will practically produce the defendants' article, No. 4,321 is not infringed; and it is not established, by the evidence, that it will.

There is another view of the case. According to the description in No. 95,465, and in No. 4,321, and the evidence, the article produced by the process described was the alizarine of madder, having the chemical formula $C_{14}H_8O_4$. It was an old article. While a new process for producing it was patentable, the product itself could not be patented, even though it was a product made artificially for the first time, in contradistinction to being eliminated from the madder root. Calling it artificial alizarine did not make it a new composition of matter, and patentable as such, by reason of its having been prepared artificially for the first time from anthracine, if it was set forth as alizarine, a well known substance. *The Wood Paper Patent*, 23 How. 566, 593. There was, therefore, no foundation for reissue No. 4,321, for the product, because, on

Opinion of the Court.

the description given, no patent for the product could have been taken out originally.

Still further, the claim of No. 4,321 is not a claim merely for the product of the process described in it, but is a claim for anything which may be called artificial alizarine, produced from anthracine or its derivatives, by either of the methods described, or by any other method, equivalent or not, which will produce anything called artificial alizarine. The scope of such a claim is seen in this suit. An article is sought to be covered by the reissue, which it is demonstrated Graebe and Liebermann never made by their bromine process, which they knew that process would not produce, which they recognized as produced first by some one else by a different process, and which has become the subject of a large industry abroad and an extensive use in this country, through discoveries made, as they acknowledge, since their bromine process was invented. After those discoveries were made, after it was seen that the bisulpho-acid process would produce desirable dye-stuffs, and could be worked practically and profitably to that end, it was sought to control the market for the product in the United States, by obtaining this reissue No. 4,321.

We have not deemed it necessary to consider more particularly the question whether the reissued patent, No. 4,321, is or is not for a different invention from that described in the original patent. It certainly is, unless the product claimed in the reissue is precisely that product, and no other, which the process described in the original patent produces. There can be no better evidence, as against the appellee, of what that product is, than the declarations of the original patent itself, and of the patentees elsewhere, as already shown. Nor have we deemed it necessary to inquire or determine whether, even if the product claimed in the reissue were the same as that which the process described in the original patent produces, it could have been made the subject of a reissued patent at the time when, and under the circumstances in which, this reissue was made. It is so clear that the defendants are not shown to have infringed, that we have not deemed it necessary to consider other questions any further.

Statement of Facts.

It results, from these considerations, that, if the claim of No. 4,321 is to be construed so broadly as to cover the defendants' article, it is wider in its scope than the original actual invention of Graebe and Liebermann, and wider than anything indicated in the specification of the original patent; and that, if it is to be construed so as to cover only the product which the process described in it will produce, it is not shown that the defendants' article is that product or can be practically produced by that process. In either view,

The decree of the Circuit Court must be reversed, and the case be remanded to that court, with direction to dismiss the bill of complaint.

ARMOUR v. HAHN.

IN ERROR TO THE CIRCUIT COURT OF THE UNITED STATES FOR THE
DISTRICT OF KANSAS.

Argued April 3d, 1884.—Decided April 14th, 1884.

Master and Servant.

The obligation of a master to provide reasonably safe places and structures for his servants to work upon does not oblige him to keep a building, which they are employed in erecting, in a safe condition at every moment of their work, so far as its safety depends on the due performance of that work by them and their fellow servants.

Carpenters, under charge of a foreman, and bricklayers, all employed by the owner through his superintendent, were engaged in the erection of a building, with a cornice supported by sticks of timber passing through the wall (which was thirteen inches thick) and projecting sixteen inches, and to be bricked up at the sides and ultimately over the top of the timbers. When the wall had been bricked up on a level with, but not yet over, the timbers, the foreman of the carpenters directed two of them to take a joist for the edge of the cornice, and to push it out to the ends of the projecting timbers. In so arranging the joist, a carpenter stepped on the projecting part of one of the timbers, which tipped over, whereby he fell and was hurt. *Held*, That the owner of the building was not liable to him for the injury.

This is an action brought by Hahn against Armour and others (of whom Armour alone was served with process), to recover damages for injuries suffered by the plaintiff while