CELLULOID MANUF'G CO. *v.* AMERICAN ZYLONITE CO. AND OTHERS.[1]

Circuit Court, S. D. New York. March 5, 1886.

1. PATENTS FOR INVENTIONS—CELLULOID.

Letters patent No. 156,353, of October 27, 1874, to John W. Hyatt and Isaiah S. Hyatt, assignors to the Celluloid Manufacturing Company, sustained against the defenses of want of novelty, non-patentability, and public use.

2. SAME—UTILITY OF THE INVENTION.

To the process set forth in this patent, and the knowledge and skill which grew out of an acquaintance with it, is due the present commercial success of zylonite or celluloid as an article which can be devoted to a very great variety of uses.

In Equity.

Frederic H. Betts and *William D. Shipman,* for complainant.

Horace M. Ruggles and *Benjamin F. Thurston,* for defendants.

SHIPMAN, J. This is a bill in equity to restrain the defendants from the alleged infringement of letters patent No. 156,353, granted October 27, 1874, to John W. Hyatt and Isaiah S. Hyatt, assignors to the complainant, for "an improvement in the manufacture of celluloid." The defenses are want of novelty, non-patentability, and public use, in the United States, of the alleged improvement for more than two years before the application for the letters patent, with the consent and allowance of the patentees. Under the defense of want of novelty, the patents which the defendants introduced in evidence and relied upon were three American letters patent to Daniel Spill: No. 91,377, dated June 15, 1869; No. 97,454, dated November 30, 1869; and No. 101,175, dated March 22, 1870.

An understanding of the case depends materially upon a knowledge of the state of the art at the

date of the patent in suit, and I therefore give a brief history of the article which is now known as "zylonite" or "celluloid." Pyroxyline or gun-cotton, "an explosive obtained by immersing vegetable fiber in nitric and sulphuric acids, and subsequent drying," (Knight, Mech. Dict.,) was invented by Schonbein in 1846. The great anticipations which were originally had of the invention, as a substitute for gunpowder, were never realized. It proved to be too dangerous and uncertain to be used as an explosive material. In 1847 or 1848, Dr. Maynard, of Boston, discovered that it could be dissolved in alcohol and ether, and used as a vehicle for medicines, and as a substitute for sticking plaster, and gave the name "collodion" to this solution. Passing by the introduction of collodion by Frederick Scott Archer, in 1851, to the art of photography, Alexander Parkes, of England, discovered, in 1855, that a solution of pyroxyline, mixed with other articles, could be 693 made, after the solvent was evaporated, into a substance having the qualities of ivory or of horn, and which could be easily moulded or worked and receive any desired color. Mr. Parkes suggested a number of solvents, took out a number of patents, entered vigorously upon the manufacture of the material, which he called "Parkesine," and made exhibitions of the various articles into which it was wrought; but from some cause his enterprise lacked success, and was abandoned in 1867.

The general question of solvents lay at the bottom of the practical difficulties in the manufacture. After the pyroxyline had been dissolved, the problem was how to get rid of the solvent, so that the conversion of the dissolved material from a semi-fluid state into a hard substance, or a substance that would become hard, was practicable. Evaporation was the method which was used. In 1869, Mr. Daniel Spill, of England, received the American patent No. 97,454, which fairly represents the extent of information which the public

or any individual had at that time on the question of pyroxyline solvents. His subsequent patent, No. 101,175, also represents the point which had been reached, at its date in 1870, in the process of transforming dissolved pyroxyline into zylonite, the name which Mr. Spill gave to the completed article. In No. 91,377, dated June 15, 1869, he had described an invention relating to the production of compounds containing zyloidine which, in "the admixture of zyloidine with animal, fish, vegetable, or mineral oils, oxidized or otherwise, such, for example, as vegetable or mineral tar, lard oil, cod-liver oil, linseed oil, or heavy coal oils, or with mixtures of the same, together with the admixture of other ingredients, such as paraffine, camphor, resins, fat, wax, India rubber, gutta-percha, or balata gum, or mixtures of the same, so as to produce a material or materials which may be employed, either alone or in conjunction with pigments or other inert bodies, for the production of a compound which may be applied for useful purposes in the arts, such as for moulding into forms, or for rolling into sheets or otherwise, for spreading either upon or between fabrics, or otherwise, or for the coating of metals and wood." No. 97,454 related, the patentee stated in his specification, "to the preparation and use of certain solvents of zyloidine, and which differ from the ordinary or known solvents of zyloidine, in that those *menstrua* which are employed are not necessarily in themselves solvents of zyloidine, but become so by the addition of the bodies, compounds, or substances herein referred to." The inventions consisted in the employment, as a solvent of zyloidine, of one of seven described combinations of ingredients, and "in the employment of any two or more of any of the before-mentioned solvents, either in the proportion of about equal parts, or in other proportions." The second solvent which the patentee described was "camphor or camphor oil, or mixtures

of the same, in conjunction with alcohol or spirits of wine, the same to be employed in about equal proportions." It has been decided 694 by Mr. Justice BLATCHFORD that the public had been previously informed by Mr. Parkes that dehydrated or strong alcohol was of itself a solvent of pyroxyline, and was instructed to mix it with camphor as such solvent, and that, therefore, Mr. Spill's improvement, so far as the use of camphor and alcohol was concerned, was not patentable. *Spill* v. *Celluloid Manuf'g Co.,* 22 Blatchf. 441; S. C. 21 Fed. Rep. 631.

This somewhat vague patent was followed by No. 101,175, which was for a method of converting vegetable fibers into zyloidine, for a process of bleaching, and for a process of dyeing it, and for a mode of preparing it for spreading upon surfaces of fabrics in a semi-fluid condition, and for a process of treating it so as to bring it to a nearly dry condition for the production of solid articles. From the patent it appears that Spill's practice was to dissolve one part of zyloidine in from five to twelve parts of solvents,—five parts would produce a stiff paste,—to which solution pigments were added, and the paste was then "strained through a fine sieve, under pressure, to remove any mechanical impurities, after which operation it is in a fit condition for spreading upon surfaces or fabrics in a semi-fluid condition." When the compound was to be prepared for the production of solid articles, the paste, after it had been strained, was placed in an airtight chamber provided with mechanical stirrers, the chamber being "in connection with a condenser and a reservoir, and also, by preference, being in connection with an exhausting or vacuum-producing apparatus." Heat being applied to the mixing apparatus, and the agitator being set in motion, the solvents are evaporated and conveyed away to the condenser for future use. It thus appears that Mr. Spill first made a paste, then strained the solution to remove mechanical

impurities or undissolved particles of zyloidine; and, to make solid articles, the excess of volatile solvents was then evaporated in an air-tight machine connected with a condenser for saving such solvents. By this process, zylonite was made at and prior to 1874. The article had defects incident to its method of "manufacture. By reason of an imperfect admixture of zyloidine, and an unnecessary amount of liquid solvent, there remained lumpy particles of undissolved fiber; the excess of liquid must be mechanically evaporated; and, notwithstanding the evaporation, the solid article was too soft unless made hard and strong by the admixture of some other substance.

In 1870, John W. Hyatt, Jr., and Isaiah S. Hyatt made the important discovery that camphor alone, when mixed with pyroxyline, the mass being treated to from 150 deg. to 200 deg. Fahrenheit, and subjected to heavy pressure, was a solvent of pyroxyline, the heat vaporizing or liquifying the camphor. The discovery and the new resulting process of making celluloid are described in the first reissue of No. 105,338, known as reissue 5,926, dated June 23, 1874, as follows:

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"In the practice of our invention, we prepare pyroxyliae by grinding it in water to a fine pulp, in a machine such as is used in grinding paper pulp. We strain off the water as far as practicable, and then subject this pulp to a powerful pressure,—for example, in a perforated vessel,—to further expel the aqueous moisture, and to bring it to a comparatively solid and dry state, yet still retaining sufficient moisture to prevent it from burning in the further stages of the process. We comminute gum-camphor by grinding it in water, or, preferably, by pounding or rolling it, and thoroughly incorporate, with the pyroxyline pulp in the condition last above described, this finely comminuted camphor, in about the proportion of one part, by weight, of camphor to two parts, by weight,

of the pyroxyline in the pulp. These proportions may, however, be somewhat varied with good results. The moisture in the pulp serves to counteract any tendency of the camphor to prematurely develop its converting power under any stimulus incident to its being incorporated with the pulp, or to the further stages of the process. With the camphor we also thoroughly incorporate, with the pulp, any pigments, coloring matter, or other materials that may be adapted to the requirements of the articles into which the product is to be manufactured. The camphor, or camphor and other ingredients, having been thus thoroughly mixed with the pulp, we next subject the mass to a powerful pressure, in order to expel the remaining aqueous moisture, and thereby not only dry the mixture, but force the camphor into more intimate contact with the pyroxyline throughout the mass, so that every atom of the camphor shall be in condition and place to exert its utmost converting power as developed. The dried and compressed mass is next placed in a suitable mould or vessel open at the top, and into this open top is fitted a platen or plunger. The vessel is then placed in a hydraulic or other powerful press, and a heavy pressure, applied to the platen or plunger, is brought to bear upon the mixture, which, while thus under pressure, is heated up by steam or other convenient means, to a temperature of from 150 deg. to 300 deg., varying according to the quantity of the mixture, and the mixture is kept at this temperature and under this pressure until the converting power of the camphor shall have been exerted upon the pyroxyline throughout the mass; the heat developing the latent converting power of the camphor, and the camphor exerting this converting power actively upon every atom of the pyroxyline, with which the pressure maintains it in close contact. The process of transformation is rapidly effected, and is completed almost as soon as the mass attains its maximum

temperature, the resulting product being a homogeneous product, solidified collodion, or collodion compound having the qualities or properties hereinbefore specified. This product, as it comes from the press, is of a consistency resembling that of sole-leather, but upon exposure to the atmosphere it hardens, by reason of a slight evaporation of the camphor. The ultimate product includes, however, a large proportion of the camphor as a permanent accretion to the mass, which accretion is not only a great gain over the use of ether, alcohol, or other solutions or volatile solvents, which would be entirely expelled or lost, but by its presence gives the solidified collodion or compound the new capability of being again rendered plastic by heat, and remolded into any desired form or shape, without requiring the use of solutions or volatile solvents, or the addition of fusible gums, as heretofore."

The discovery that camphor was a solvent of pyroxyline without the admixture of a liquid, though chemically important, was not practically available in the art, by reason of the danger of explosion of the pyroxyline when the camphor was heated to a melting point. The patentees therefore devoted themselves, with the knowledge they had gained that liquid solvents could be dispensed with, to the discovery 696 of a process which should be safe, and yet possess the mechanical advantages in which the process of No. 5,928 was the pioneer. The invention described in the patent in suit was the result. The specification describes the invention as follows:

"In our reissued letters patent No. 5,928, granted June 23, 1874, camphor is set forth as a solvent of pyroxyline when the same is subjected to intimate mixture, and then to heat and pressure. Our present invention is made for lessening the quantity of camphor or equivalent solvent made use of; also the degree of heat required in the manufacture of

celluloid. We prepare a compound pulp composed of pyroxyline, gum-camphor, etc., as described in the said above-named reissued letters patent, but in different proportions, the proportions suited to this new process being about one hundred (100) parts of dry pyroxyline, and from twenty-five (25) to forty (40) parts of gum-camphor, (varying with the consistency required in the finished product,) together with such coloring or other material as may be desired. When these ingredients are thoroughly intermixed, as set forth in such reissued letters patent, and the aqueous moisture expelled therefrom, which may be advantageously accomplished by the plan set forth in our letters patent of November 19, 1872, and numbered 133,229, from twenty (20) to forty (40) per cent. of alcohol is added, and the whole mass kept within a closed vessel until the alcohol is evenly diffused throughout all its parts, the proportions named in the reissued letters patent referred to being one hundred parts of dry pyroxyline to fifty parts of gum-camphor. After this even diffusion the mass is well masticated between rollers heated to 135 deg. Fahrenheit. The particles of pyroxyline and other materials, such as coloring matter, are brought intimately into contact with the camphor by the action of the alcohol and the mastication, and a semi-transformation takes place, and the material is in a better condition for the final heating and converting process, so that from fifty to seventy-five degrees less heat is required to complete the transformation of the pyroxyline and solvents into celluloid than is required where no alcohol is used. Nitrous ether and some other solvents of gum-camphor may be substituted for alcohol in this process."

The claim is as follows:

"The process herein set forth of manufacturing celluloid by the addition to the mass, composed of pyroxyline and camphor, of a solvent of camphor,

in about the proportion set forth, and previous to mastication, heat, and pressure."

To this process, and to the knowledge and skill which grew out of an acquaintance with it, is due the present commercial success of zylonite or celluloid as an article which can be devoted to a very great variety of uses.

The question of prime importance in the case is as to the patentability of the process. The plaintiff insists that reissue 5,928 disclosed an invention which is admitted to have been novel and patentable, which broke the control theretofore held by liquid solvents, relied upon beat and pressure to develop the action of the solid solvent, and pointed the way towards success in the manufacture of solid celluloid, and that the patent in suit is an improvement upon the process of No. 5,928, and is therefore patentable. The defendants say that the patent in suit is simply a return to the well-known spirits of camphor solvents, and that, if the time of the application of the alcohol 697 to the camphor is not an immaterial matter, yet, when it is once known that spirits of camphor are a solvent, there is nothing patentable in the order in which the liquid or camphor is introduced into the tub, but the changes or modifications in the manner of applying the solvent are only a carrying forward of the original thought, which does not constitute invention.

It is true that it was well known in 1874 that spirits of camphor were a solvent of pyroxyline, and a mode in which the solvent could be applied was well known, and if the alleged invention consisted merely in a new and different method of mixing the spirits of camphor with the pyroxyline, whereby a better result was produced, it would contain nothing patentable. But the invention had a wider scope. It must be noted that the question is not whether the process was a patentable improvement over what was practiced in 1882 under the name of the Spill process,

but whether it was an invention, in view of the state of the art in 1874. It was for an improved process whereby, instead of mixing a solid and a liquid, and straining the mass to remove undissolved particles, and evaporating the liquid in an air-tight condenser, the invention mixed two solids and added a liquid; then, having pressed out the moisture and masticated the compound in rolls, they relied upon heat and pressure to effect or complete the transformation with solid celluloid, the pressure being that described, and the degree of heat being less than that described, in No. 5,928. The discussion in regard to these processes should not be confined to a comparison between the different methods of introducing the liquid solvent to the mixture, but the difference extends to the respective methods subsequently used in the process of transformation.

It cannot be denied that No. 5,928 was clearly a new and patentable process, and that it radically differed from its predecessors. I think it is plain that the patent in suit is not an abandonment of No. 5,928, and a mere return to the old liquid solvent process, which consisted in first dissolving the solid pyroxyline in a large amount of liquid, and then evaporating the solvent, but was a retention of the new process of perfect admixture of two solids, and then a transformation by heat and pressure, except as modified by the introduction of alcohol to the mixture of pyroxyline and dry camphor. Neither was the process of the patent in suit a mere change of proportions from those given in the Spill formula.

The defendant corporation has used from time to time, since its organization in 1882, the patented process, unless the fact that it mixes dry camphor with pyroxyline, rendered abnormally dry, and then adds the alcohol, and does not subject the mixture to pressure for the purpose of expelling dampness, constitutes a departure from the process described in the patent.

Bach method starts with wet pyroxyline. Hyatt brings the pulp in the first place to a comparatively dry state, adds the camphor, and then expels the remaining 698 moisture. The defendants made the pulp abnormally dry in the first instance. They omit no step which the patent describes, and there is no substantial difference in the methods in which the process is used.

The defendants also say that the process was publicly used for more than two years before the date of the application for a patent. During the experiments which resulted in the discovery of the patented process, some poor dental plates were sold. Without going carefully into an examination of the testimony, the case is within the principles announced in *Pitts* v. *Hall,* 2 Blatchf. 229, and *Elizabeth* v. *Pavement Co.,* 97 U. S. 126.

Let there be a decree for an injunction and an accounting.

[1] Reported by Charles C. Linthicum, Esq., of the Chicago bar.