QUARTZ AND MARL AS WOOD FILLERS.

A very interesting law suit was decided not long ago by Judge Shipman, U. S. Circuit Court, Connecticut, in which the various processes of finishing and varnishing fine woods, and the values of fillers for that purpose, were elucidated. The suit was for infringement, brought by the Bridgeport Wood Finishing Company, owners of Wheeler's quartz filler patent of January 18, 1876, against Hooper. The latter denied the infringement, and showed to the court that he was working under a patent similar to Wheeler's, for a filler issued in 1856, or twenty years prior to the date of the Wheeler patent. It both cases it appeared that the basis of the filler is the same, namely, oxide of silicon or quartz. This curious question, therefore, appears to have presented itself: How can the use of a patent granted for an oxide of silicon filler, granted in 1856, infringe a patent for an oxide of silicon filler not granted until 1876? This is answered and much valuable information given in the following extracts from the decision of the court:

In the cabinetmaker's art, says Judge Shipman, it is neces sary that the grain or the pores of the wood upon the surface should be filled with some material in order that the surface may be smooth, resist moisture, and receive a permanent polish. Divers materials and combinations of materials, such as beeswax, copal, starch, pumice-stone, plaster of paris, and various gums have been used, but all proved ineffectual. They absorbed the varnish which was used for polishing, shrank, rolled out, or discolored the wood.

What was needed was a non-absorbent transparent article which would fill the pores and make a permanent, hard, smooth surface. The process of finishing cabinet work without the use of a filler involved a large expenditure of money and of time. It is described by the patentee as follows:

"I found [in the Wheeler & Wilson Company's finishing department] the system or process of finishing to be, first, as the work came from the cabinetmaker, to give it a heavy coat of oil, to let that dry a week or more, then sandpaper the work with boiled linseed oil until the gum of the oil, the fiber of the wood, and the sand that came off the sandpaper produced a sort of gummy paste, which, in the process of rubbing, would lodge in the open pores of the wood, and which required much time and hard rubbing to fill the grains passably. This gum, being composed of oil, required much time to dry; otherwise, if varnished before it was dry it would shrink in drying and crack and displace the varnish. This was the process for finishing all the ordinary work. The finer quality of work, known as 'hand-polish finish,' required to be varnished with from three to five coats of what is known as 'scraping varnish,' which, when dry, was scraped off with a cabinetmaker's steel scraper, leaving none of the many coats of varnish on the work except that in the grains of the wood below the surface, after which from three to five coats of polishing varnish were applied. Then the work was rubbed down with pumice stone and water and polished up with rotten-stone and the hand, the palm of the hand bringing the polish up. This process is the same as heretofore used by all piano makers in the country."

The invention and the difficulties which it was intended to obviate are thus described in the specification:

"Heretofore various materials have been used to fill the grain in processes of finishing woods, such as pulverized marl, clay, flour, chalk, starch, and different gums, but all are found to have objectionable features in use, which my new process is designed to obviate. In some of the substances employed the particles when powdered are round or spherical and without angles, and consequently do not readily adhere to each other and unite with the pores of the wood, and others are wanting in durability and subject to injurious atmospheric action.

"I am also aware that various forms of infusorial silicates have been used in mixtures for filling the grain of wood, but these are all very powerful absorbents of liquids and carry the moisture by the quality of their capillarity into the wood itself, which has to be removed by evaporation before the varnish can be applied to the surface of the wood, and which opens the pores when said moisture is evaporated and prevents it from being solidified or producing a hard or smooth surface ready for the varnish.

"I use finely powdered flint, quartz, or feldspar, which are non-absorbents of moisture or liquid of any kind, and which fill the pores of the wood by the particles packing together similar to a concrete, and which are combined with any fluid substance that will permit their being rubbed into the surface, such as oil or varnish or other similar fluids. The finely powdered flint or quartz being so mixed to about the consistency of jelly, and colored, if desired, to match the wood to be filled and polished, I apply the mixture with a pad of cloth or leather to the wood and rub it into the pores until they are full, when, by a little continuous rubbing, the surplus material will adhere to the pad or cloth until the whole surface of the wood is cleaned off, leaving the pores of the wood entirely packed, and when dry presenting a smooth, hard, and glassy surface of great durability, upon which one coat of varnish will produce all the finish desired for fine furniture."

The claim is—

"In the art of filling wood, the employment of finely powdered flint, quartz, or feldspar, mixed with oil or other fluent substance, substantially as described."

The invention has proved to be a great success, the filler has gone into extensive use, and has effected a very large saving of time and expense in the manufacture of furniture, and is used upon the finest work. It makes a hard, permanent, and glassy or transparent surface, impenetrable to oil or moisture, leaves the wood in its natural color, and requiring the application of but a single coat of varnish. The reasons of its superiority consist in its non-absorbent quality and mainly "in the peculiar nature of the ground quartz. The particles, being angular, sharp, and, I might say, needle-pointed, they readily enter into and unite with the fiber of the wood, and when once united with the fiber of the wood it is impossible to displace them; and when large orifices require to be filled the particles readily pack one upon another and become permanent and solid." The jelly-like mixture of oil and varnish with the quartz forms, when rubbed into the pores of the wood, "a hard, impenetrable substance, which in itself forms a protection to the wood."

The defendants made and sold, prior to the date of the bill and after the assignment of the patent, wood-filler which is substantially the plaintiff's article, and, like the plaintiff's, made from powdered quartz. It is not denied that the manufacture and sale of this material is an infringement of the plaintiff's patent.

The principal defense is that the defendants had the right to use the material under a license from James Perry, to whom was granted a patent, dated September 11, 1856, which, it is claimed, includes the Wheeler patent. The claims of the Perry patent are:

1. The use of silicious marl or infusorial earth for the purpose of filling and polishing wood, substantially as herein set forth.

2. The combination of silicious marl with any or all of the substances herein named—sulphate of zinc, muriate of ammonia, gum-arabic, gum-tragacanth, and oil—substantially in the manner and for the purpose herein set forth.

The theory of the defendants is this: Flint and quartz are chemically silica more or less pure, or what is known to chemists as "silicic acid." Feldspar is a silicate of alumina and potash, and contains silica in large quantities. Quartz and flint contain from eighty-five to one hundred per cent of pure silica. Infusorial earth is a fine grained earth formed by the deposition of the silicious coatings or shells of microscopic plants, called "infusoria," on the bottom of ponds or lakes of water, and is mostly silica mixed with carbonate of lime and other impurities. Silicious marl is a mixture of clay and carbonate of lime and silica in the form of sand or infusorial shells. Silicious marl contains from twenty to fifty per cent of silica. As, therefore, quartz or flint contains from eighty-five to one hundred per cent of silica, and infusorial earth and feldspar are mostly silica, and silicious marl contains fifty per cent of the same chemical substance, a grant of the exclusive right to use infusorial earth or silicious marl gave also the right to use quartz, flint, or feldspar, the five articles being substantially silica.

The sufficient answer to this theory is that, acknowledging the facts which have been stated to be true, and that these articles are chemically very similar, yet practically for use in the arts the respective classes of articles which are named in the two patents possess very different properties. Infusorial earth is a vegetable tissue, "porous and delicate in structure," friable, and of chalky texture, and not possessing the hardness and sharp angles and needle-like points of powdered quartz, flint, and feldspar, qualities which cause the quartz, flint, or feldspar to find a permanent lodgment in the pores of the wood and thoroughly fill them, so that a new, hard, unabsorbent surface is formed.

As charcoal and the diamond are alike chemically composed of carbon, yet are very different substances in the arts, and are used for different purposes, so quartz and infusorial earth, though chemically similar or substantially identical, are dissimilar in the uses to which they are adapted. Infusorial earth, though chemically silica, is unfitted for the purposes of filling wood, for the reasons which render chalk or starch unfitted, while powdered quartz has been found to possess qualities which make the plaintiff's article the only efficient and useful filler known to the cabinet manufacturers of the country.

Silicious marl is as ill adapted as infusorial earth, because, while marl contains more sand than is found in infusorial earth, yet the sand is in rounded and not angular grains. Feldspar breaks, like quartz, into angular fragments, and is also non-absorbent.

The chemical character of the articles named in the two patents and the differences for practical use between the two classes of articles are tersely and clearly stated in the following extract from the testimony of Professor Samuel W. Johnson, one of the experts called by the plaintiff. Professor Johnson testified:

"Quartz, chemically, is oxide of silicon. It contains no hydrogen and yields no water when heated. Its specific gravity is 2·65. It will not readily dissolve in a boiling aqueous solution of potash or soda, even when finely pulverized. This specimen of infusorial earth, Exhibit 'M,' which consists very largely of the skeletons of microscopic plants, is chemically oxide of silicon plus water, and when heated gives off several per cent of water. Its specific gravity is less than that of quartz. It is softer than quartz. It dissolves with the greatest ease, to a large extent, in a boiling aqueous solution of potash or soda. It is, therefore, chemically distinct from quartz, and is classed by mineralogists with the opal, as a mineral species distinct from quartz.

"Again, the quartz powdered as specified in the Wheeler patent is seen under the microscope to consist of sharp, angular particles, which, when applied to the surface of wood by rubbing with a cloth or leather pad, are forced into the pores of the wood, where they firmly lodge and effectually fill these pores with an impervious material. The hardness of quartz is such that in the process of filling its particles are not further pulverized to any appreciable extent, but are simply forced into the wood, from which they can not be easily dislodged. Infusorial earth, on the other hand, is friable under pressure and friction, and has a chalky rather than a gritty texture. It presents no angular fragments which can be rubbed into the pores of the wood so as to fill them with an unabsorbent material. Quartz is a crystallized silica of a mineral origin, and, in common with all crystals of such origin, has no porosity that can be detected by the highest magnifier, and is in mass absolutely impenetrable to water, oil, or other similar liquids. Infusorial earth, on the contrary, is a hydrated silica that has been organized into the structure of a plant, and, in common with all vegetable tissues or organized structures, is porous and delicate in structure, so that in respect to texture, hardness, sharpness, it is quite the opposite of powdered quartz in its application as a wood filler."

The sand or silica found in silicious marl is chemically identical with pulverized quartz, "inasmuch as both consist of oxide of silicon or quartz, but, physically and practically, for the purposes of wood filling, different, because the sand, mixed with infusorial earth, being a geological sediment, consists of rounded water-worn grains, while powdered quartz of the Wheeler patent consists of angular, sharp-edged fragments and splinters."

The Wheeler patent was accordingly sustained.

MECHANICAL INVENTIONS.

Messrs. Francis Seymour and Augustus Bannigan, of Paterson, N. J., have patented an automatic stop-motion for spinning-machines, whereby the operation of the machine is arrested if a thread breaks. It is more particularly an improvement in the class of silk doubling and spinning machinery in which a faller-wire is hung by its eyelet end to the thread, and with the breakage of the latter falls upon the arm of a balance-lever and actuates a detent. In this invention the action of the spinning and doubling devices is arrested when a thread breaks by the depression of a spring-lever, which operates by gravity upon other devices so arranged as to raise or depress the bands of the several spindles, and thus shift them from fast to loose whirls or pulleys. Simultaneously with this operation and result the doubled thread is removed from between the drawing rolls by the action of the doubling device, which is suitably connected with the band shifters.

Intermittent Luminous Signals.

In the ordinary use of lamps for lighthouse signals the intermittences are produced by a diaphragm which moves before the light, so that the fuel is wasted during the eclipses. At present the average waste of light is about 65 per cent, but if a signal was sent twice a minute, sufficient to indicate the first two letters of the lighthouse, there would be a waste of about 90 per cent. In order to remedy this extravagance Mercadier proposes to adopt a Dubosq lamp with a round wick and a tube in the center of very small diameter, through which a jet of oxygen can be discharged upon the top of the wick. In spite of the high temperature of combustion, the lamp does not heat much; it consumes little petroleum, and the wick does not crust. Therefore it will operate for many days without being trimmed or filled anew. The intense flame is produced by the combustion of petroleum vapor at the center of the jet, and the surrounding film of air being a bad conductor the lamp heats only at the top of the burner. The oxygen is inclosed in a reservoir, under suitable pressure, which in his apparatus does not exceed 4 millimeters (0·157 inch) of mercury; it first passes through a manipulator, which has a form similar to that of the key of a Morse instrument, traversing a caoutchouc tube, which is pressed together when the key is at rest. Upon depressing the key the pressure upon the tube ceases, and the oxygen reaches the flame; when the key is released the oxygen jet is stopped. In this manner the flow of oxygen is manipulated as simply as the electric current in the Morse system. The rapidity of manipulation is more than sufficient for all the requirements of optical telegraphy. A method somewhat similar has been contrived by Mercadier for the electric light.—*Compt. Rend.*

Decomposition of Light by a Wheel.

It occurred to me that light might be decomposed by interrupting, with a reflecting surface, a ray of light in such a manner that the interruptions may be proportional to the wave length period of any particular ray forming a part of a composite ray. The experiment is effected in the following way:

A wheel, having bright spokes (the large wheel of a bicycle answers well) is caused to revolve between an observer and the sun, so that a ray of light is reflected to the observer by a bright spoke; then, when 120 spokes pass before the observer per second, violet light shines out vividly; when 65 pass red appears, and different rates of revolution give different colors. There seems to be a marked relationship existing between the number of spokes which pass by and the wave-length of the two colors mentioned, that of the violet being one sixty-thousandth of an inch, and that of the red one thirty-four-thousandth of an inch.

I am now investigating this apparent relationship between spoke interruption and wave length for the other colors of the spectrum of white light, and I hope to be able to make known the results shortly.—*Frederick J. Smith, in Nature.*

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