

CELLULOID MANUF'G CO. v. AMERICAN ZYLONITE CO. AND OTHERS.

*Circuit Court, D. Massachusetts.*

September 7, 1887.

1. PATENTS FOR INVENTION—PATENTABLE NOVELTY—IMPROVED PROCESS FOR MAKING CELLULOID.

In an action for the infringement of letters patent issued to John W. Hyatt, February 5, 1878, for an "improvement in the manufacture of sheets of celluloid and other plastic compositions," the specifications and claims describing the invention as relating to an apparatus and process consisting in piling a number of rough sheets of celluloid upon a grooved plate in a chase or mould; subjecting the celluloid to heat and great pressure, by which it is solidified into a single compact, rectangular slab, and portions of it are forced into the grooves; then cooling it, so that it shrinks, and those portions operate as clutches to hold the slab firmly in place; then planing the slab into sheets; and finally stretching these sheets upon a frame to prevent their wrinkling or warping while drying: *held*, that the process and apparatus was a patentable novelty.

2. SAME—INFRINGEMENT.

Letters patent issued February 5, 1878, to John W. Hyatt, for an improvement in the manufacture of celluloid and other plastic compositions, describing in the apparatus the plate for retaining the plastic composition in place, provided on its upper surface with grooves, apertures, or indentations, upon which the material in shrinking can exert tension, *held* infringed by defendant's device employing an iron plate perforated by holes with screw threads, with plugs of zylonite screwed in, and depressions left around the heads of the plugs, into which portions of the celluloid are pressed and welded to the zylonite plugs, and pressed into the apertures around the heads of the plugs.

3. SAME.

Letters patent issued February 5, 1878, to John W. Hyatt, for an improvement in the manufacture of celluloid and other plastic composition, the process consisting of subjecting the slab of celluloid to pressure, then heating

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the mass from below, then applying the heat above, *held* infringed by defendant's process, in which the heat is first applied from above and afterward from below.

This was a bill in equity for the infringement of letters patent issued to John W. Hyatt, February 5, 1878, for an "improvement in the manufacture of sheets of celluloid and other plastic compositions." The material parts of the specification were as follows:

"The invention relates to an improved apparatus, and process for the manufacture of sheets of plastic composition, and in the present instance is applied to the article known as 'celluloid.' Heretofore the great obstacle to successfully planing or reducing plastic or pliable material to sheets, by securing it upon a surface and then feeding it to a fixed cutting-edge, has been that the material was apt to rise from the surface supporting it and ride up the knife, thus cutting the material irregularly, or arresting the operation. Hence, to hold the slab of material firmly upon the surface sustaining it, pending the operation of shaving or planing it into strips, has been esteemed a great *desideratum*, and is one of the objects effected by the mechanism and process hereinafter set forth.

"The objects of the invention are accomplished by causing the union in a single slab of a number of Sheets or pieces of celluloid, this being effected by means of pressure and heat, which contemporaneously amalgamate the sheets into a slab, and also force portions of the under side thereof into channels or inclined grooves, in the surface upon which the slab rests, which grooves are so arranged that, upon the hardening and shrinking of the material, the portions thereof in the grooves operate as a series of hooks or clutches to retain the slab in place, after which the plate supporting the slab is placed upon a machine for planing, whereby the material is shaved or planed off in sheets or pieces of any desired thickness, according to the capacity of the machine; the sheets being subsequently dried in open frames, whereby they acquire and retain formation.

"Unseasoned celluloid, When heated above 150° (one hundred and fifty degrees) Fahrenheit, becomes plastic, and can be easily manipulated so long as it is warm, but becoming cool it hardens, and, while losing its caloric, has a slight tendency to shrink.

"In the accompanying drawings, A represents a plate having a tongue, *a*, along its edge, and nozzles, *d* and *e*, intended, respectively, to be connected, when required, with pipes supplying steam or water. The plate, A, is hollow, for the purpose of receiving either steam or water, as circumstances demand, and is provided near its edge with suitable bolt-holes *f*, to afford a means of securing the chases hereinafter mentioned. The central portions of the upper surface of the plate, A, are occupied by a slightly raised boss, B, the entire upper surface of which is covered by the grooves, D, and the intermediate ridges or elevations, *I*. The grooves, D, upon one side of the vertical-longitudinal center of the boss, incline inward and downward toward the vertical, central-longitudinal plane of the plate, A, and upon the other side of said center incline in a similar manner towards said plane.

“The purpose of this construction is hereinafter set forth, and may be effected, though not so satisfactorily, by means of apertures of any desired form which have an inclination downward towards the said plane, the apertures, or certain thereof, on opposite sides of the said center of the plate having similar inclinations towards the said central plane.

“The edges of the plate, A, above the boss, B, are level, for the purpose of receiving the side and end chases, E, which are hollow, and provided with suitable inlets and outlets for steam, or other suitable means of heating, or water, or other means of cooling; or they maybe provided with apertures leading

into their cavities, which can be placed over apertures in the plate, A, and the supply of heating or cooling agent thus derived. The screws, *x''*, are provided at the end of the chases for the purpose of opening the chases after the slab has been formed. These chases are firmly secured in a vertical position, and in a steam-tight manner, about the boss, B, forming a rectangular inclosure, open above, the walls and bottom of which can be heated or cooled, as desired. The plate, A, with the chases, E, is placed upon the platen, F, of a hydraulic press, a non-conducting surface, H, preferably composed of a sheet of metal superposed upon a sheet of paper, being interposed between the lower surface of the plate, A, and the upper portion of the platen, P. The plate, A, is secured upon the platen, F, by means of the brackets, I, that extend over the tongues, a, on each side of the plate. The platen rests upon two upward-acting hydraulic rams, I, operated by the hydraulic cylinders, L, which are placed upon the base, M, of the press, in such position as to sustain the platen, F, horizontally. Upon the under surface of the top of the press, and separated therefrom by a sheet of non-conducting material, is firmly secured the dependent platen, T, of such dimensions as to nicely, but not in an air-tight manner, fill the inclosure between the chases, E. This platen, T, is also made hollow, and provided with suitable means for supplying its cavity with either steam or water, or other heating or chilling agents.

“The operation is as follows: The requisite number of sheets of celluloid are superposed, one above the other, upon the boss, B, which is placed exactly below the platen, T, the chases being in place, and there secured by the frame, V, and its clamp-screws. Hydraulic pressure is now communicated to the rams, I, which elevate the platen, F, plate, A, chases, E, and material therein, until the dependent platen, T, enters the space between the chases, compressing; the material between its lower surface and the upper surface of the boss, B, which pressure is continued until equaling two hundred and fifty (250) pounds, more or less, to the square inch, which pressure is maintained! throughout the entire operation. It is plain, however, that the degree of pressure must be varied to suit the nature of the material to be affected through its action. The requisite pressure being reached, the heating agent is next admitted into the cavity in the plate, A, until it is properly affected. Now, as this heat is communicated from below, the lower stratum of the celluloid upon the boss is first heated and solidified, which expels the air from the bottom upward through the material, and through the spaces between the edges of the material and the faces of the chases. Meantime, under the action of the heat, the lower surface of the celluloid has become plastic, and, the pressure being continued, the parts thereof above the same are gradually forced into and completely till the grooves, D. The pressure and heat are maintained until, the air is thoroughly expelled from the material, When the, heating agent is gradually introduced into the cavity in the dependent platen, T, now in contact with the celluloid, which, under the operation of the heat thus being

supplied, becomes plastic, and under the pressure is solidified into a single compact slab. The pressure being still sustained, the next step is to fill the plate, A, chases, and platen, T, with water or other suitable cooling agent, which forthwith chills the celluloid, whereupon it hardens in place, any lateral shrinkage being prevented, by the pressure, while the plate and platen, being placed upon non-conducting material, are not affected by the temperature of the adjacent surfaces. The chases are now removed and the material, is found in a homogeneous slab secured upon the boss, B. Being exposed to the air, the celluloid shrinks somewhat, which causes the, portion thereof which has been forced into the inclined grooves to operate as clutches or hooks, grasping the metal with immense power, and holding the slab firmly by a tension towards the center against any movement or force, either lateral or upward.

"Thus is the prime object of the invention accomplished. It is plain, however, that pieces of scrap celluloid "of other form than sheets may be placed upon the boss, and compressed into a slab, and similarly attached to the plate, suitable solvents, such as spirits of camphor, being mingled with the fragments to expedite the reunion and improve the result of the operation. It is also plain that the above mechanism may be effectively used to secure various substances that become fluid or plastic under the action of heat upon a surface, preparatory to further manipulation.

"The apparatus next involved relates more immediately to the planing or shaving the material into sheets. This mechanism consists of a frame of any desired strength and construction, provided with a traveling bed-plate, a, held in place by brackets or other suitable means, and operated by means of a traveling screw, or any other means which will give the bed-plate, a, a reciprocating movement.

"The operation of planing is effected simply by securing the plate, A, carrying the slab of celluloid, upon the bed-plate, a, and causing the latter to move, thereby bringing the material secured upon the plate, A, in contact with the edge of the plane, which is depressed as desired, according to the thickness of the sheet to be removed from the slab. It is obvious that after one of the slabs has been shaved off, leaving only a thin film of celluloid upon the plate, a second slab may be secured thereon by means of collodion, cement, or other suitable solvents, that will cause the slab to unite homogeneously with the film remaining upon the plate, when the slab thus attached may be manipulated the same as though secured upon the plate in the manner first-above detailed. The sheet of celluloid is now placed in the frame, Z", so that its edges are between the two sections, X", thereof, which are clamped together by means of the bolts, z", and nuts, x", holding the material securely within the frame, where it is permitted to dry, during which operation it shrinks slightly, which draws it taut and straight across the frame, so that it hardens into a flat, smooth sheet, after which it may be removed from the frame, being now finished. The plate, A, may be grooved laterally or otherwise, and bars of wood secured in the grooves so as to be flush with, or slightly above, the surface of the plate, and the slab formed upon this formation. The purpose of retaining the slab in position may be effected, also, by vertical apertures in the plate, or, in fact, apertures or elevations of any order, in or upon or about which the plastic composition can be forced, and there permitted to harden, the essence of this element of the invention being to affix a plate of plastic composition upon a plate immovably, by combined heat and pressure and subsequent cooling. Obviously, the plate, A, may be utilized, even if it be solid and not hollow, since the material may be made plastic before being put thereon, when it can be crowded into the grooves; or it may be crowded therein by great pressure.

"What I claim as my invention, and desire to secure by letters patent, is—(1) A slab of material secured upon a surface, through the operation of the power it exerts in shrinking,

acting upon two or more elevations or depressions on or in the surface on which the slab is placed, substantially as set forth.” “(3) A plate for retaining plastic composition in place, provided on its upper surface with apertures or indentations, upon which the material in shrinking can exert tension, substantially as set forth. (4) A plate for retaining plastic composition, provided with apertures or grooves inclining towards the longitudinal central plane of the plate, substantially as set forth.” “(6) A hollow plate or table, provided with means of receiving a heating and cooling agent, and having its surface grooved, indented, or corrugated, substantially as set forth, and for the purpose specified.” “(20) The process of solidifying pieces of composition, which consists in subjecting them to pressure, then heating the mass from below, then applying heat above; the pressure

being sustained pending the heating operations, as and for the purpose specified. (21) The process of solidifying pieces of composition, which consists in subjecting them to pressure, then heating the mass from below, then heating it from above, then cooling it while still under pressure, substantially as set forth.” “(23) The process of simultaneously consolidating several pieces of composition and affixing the slab thus formed to a plate, which consists in rendering it plastic while under pressure, whereby a portion of it is forced into suitably-shaped apertures in the plate, which portion is hardened while therein, substantially as specified.” “(28) The within described process of making sheets of plastic composition, which consists—*First*, in forming and causing the adhesion of a slab of the composition to a plate; *second*, subjecting such slab to the operation of a plane, to reduce it to sheets; and, *third*, drying the sheets thus produced in a frame, substantially as set forth.” “(30) A slab of plastic composition, fixed upon a bed or plate, by the means substantially as herein specified, for the purpose of enabling the division or planing of the slab, substantially as set forth. (31.) A plate carrying a slab of plastic composition, affixed thereon by means of heat and pressure, substantially as set forth, and for the purpose specified.”

The other facts of the case, so far as they are necessary to the understanding of the decision, are stated in the opinion.

*William D. Shipman, Frederick H. Betts, Rowland Cox, and Warner & Brandeis*, for plaintiff.

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

Before GRAY, Justice, and COLT, J.

GRAY, Justice. Pyroxyline, otherwise called nitro-cellulose, or gun-cotton, is made by subjecting a fibrous material, such as paper or cotton rags, to the action of nitric and sulphuric acids. Celluloid, or zylonite, is made by combining pyroxyline with a solvent of camphor and alcohol, and passing the compound through heated rollers into the form of rough sheets or slabs. The evidence clearly establishes that, in the state of science and knowledge before the experiments and discovery of Hyatt, no one had been able to form a massive rectangular slab or block of celluloid; and that the attempt to form such a slab or block was attended with very great danger, on account of the explosive Character of the material.

The improvement of Hyatt, as described in his specification, consists in piling a number of rough sheets of celluloid upon a grooved plate in a chase or mould; subjecting the celluloid to heat and great pressure, by which it is solidified into a single, compact, rectangular slab, and portions of it are forced into the grooves; then cooling it, so that it shrinks, and those, portions operate as clutches to hold the slab firmly in place; then planing the slabs into sheets; and finally stretching these sheets upon a frame to prevent their wrinkling or warping while drying.



Notwithstanding some phrases, which, taken by themselves, might admit of a broader construction, it is quite clear, upon a view of the whole specification, that the apparatus and process patented are limited to the manufacture of celluloid and those kindred compositions, the base of which is, pyroxyline; which under the influence of heat become

plastic, and can be pressed into new shapes, without being reduced to 3, liquid; which shrink in cooling; and which can be planed into sheets, but which are with difficulty held in place to be planed. A few quotations from the specification will put this beyond doubt. The specification begins with the statement that "the invention relates to an improved apparatus and process for the manufacture of sheets of plastic composition, and in the present instance is applied to the material known as celluloid." It presently afterwards declares that "the objects of the invention are accomplished by causing the union in a single, slab, of a number of sheets or pieces of celluloid." It emphasizes the fact that "unseasoned celluloid, when heated above 150 deg. Fahrenheit, becomes plastic, and can easily be manipulated so long as it is warm, but becoming cool it hardens, and, while losing its caloric, has a slight tendency to shrink;" In describing the operation, the specification states; that, in the first place, "the requisite number of sheets of celluloid are superposed, one above the other;" that, on applying the heat from below, "the lower stratum of the celluloid" is first heated and solidified, and "the lower surface of the celluloid "becomes plastic; that "the celluloid," upon afterwards applying the heat from above, "becomes plastic; and under the pressure is solidified into a single compact slab;" that the subsequent cooling "chills the celluloid, whereupon it hardens in place;" and that on being exposed to the air, "the celluloid shrinks somewhat." It further states that the operation of planing is effected by securing "the plate carrying the slab of celluloid" upon the bed-plate, and causing the latter to move so as to bring "the material secured upon the plate "against the edge of, the plane; and, lastly, that "the sheet of celluloid" is placed upon the drying-frame. And each of the claims, although it does not mention celluloid by name, but uses the general term "material" or "plastic composition," yet, by the words "substantially as set forth," or "for the purpose specified," refers to the description in the specification, and is limited accordingly.

It is equally clear that the specification and claims are limited to an apparatus and process in which the plate, on which the slab of celluloid rests, has grooves or depressions into which portions of the celluloid may be forced, and which may thereby aid in holding down the slab, as it shrinks in cooling, and while it is subjected to the action of the plane. The specification, at the outset, states that a principal object of the invention is "to hold the slab of material firmly upon the surface sustaining it, pending the operation of shaving or planing it into strips;" and that this object is accomplished "by causing the union in a single slab of a number of sheets or pieces of celluloid, this being effected by means of pressure and heat, which contemporaneously amalgamate the sheets into a slab, and also force portions of the under side thereof into channels or inclined grooves, in the surface upon which the slab rests, which grooves are so arranged that, upon the hardening and shrinking of the material, the portions thereof in the grooves operate as a

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series of hooks or crutches to retain the slab in place.” It first describes an apparatus for doing this, in which the middle of the upper surface of the plate is

a slightly raised boss, wholly covered with grooves and intermediate ridges or elevations, and the grooves on either side of the central, vertical, longitudinal plane of which incline inward and downward towards that plane; and it afterwards, near the end of the descriptive part, adds that "the purpose of retaining the slab in position may be effected, also, by vertical apertures in the plate, or, in fact, apertures or elevations of any order, in or upon or about which the plastic composition can be forced, and there permitted to harden, the essence of this element of the invention being to affix a plate [slab?] of plastic composition upon a plate immovably, by combined heat and pressure and subsequent cooling." The claims are equally limited, either by express mention of the grooves, depressions, or apertures in the plate, or by reference to the previous description.

The patent, so construed, sets forth a new and useful invention. It describes a process by which a mass of crude celluloid may be held down firmly upon a plate, taking advantage of the tendency of the mass to shrink, while cooling, to assist in holding it down; then heated gradually and under great pressure, so as to expel all air and gas, and afterwards cooled, and, before it has become quite cold and hard, planed or cut into sheets: and those sheets then stretched upon a frame so that they may dry smoothly. All processes previously known were not only attended with great danger, but left the material more or less spongy and porous, and therefore not fit to be used for so many purposes. Hyatt, by the process described in his patent, was the first to produce a large, hard, tough, compact, homogeneous slab, more durable, susceptible of a better polish, and capable of a greater variety of uses. The result is a new product, differing from any known before, not merely in 'degree of usefulness and excellence,' but in kind, having new properties and uses; and, according to all the authorities, a process producing such a result is the proper subject of a patent, although some or even all of the parts of the machinery or apparatus used are not new. *Corning v. Burden* 15 How. 252, 267; *Smith v. Dental Vulcanite Co.*, 93 U. S. 486, 494; *Cochrane v. Deener*, 94 U. S. 780, 788; *Tilghman v. Proctor*, 102 P. 8. 707, 722-726; *Railroad v. Truck Co.*, 110 U. S. 490, 494, 495, 4 Sup. Ct. Rep. 220; *Fermentation Co. v. Maus*, 122 U. S. 413, 428, 7 Sup. Ct. Rep. 1304; *Cannington v. Nuttall*, L. R. 5 H. L. 205; *Smith v. Goldie*, 9 Can. Sup. Ct. 46.

The holding the crude mass of celluloid down firmly upon a grooved, indented, or perforated plate, the heating and cooling it under pressure, the cutting it, while still war in and plastic, into sheets, and the stretching of those sheets on a frame so as to dry smoothly, are successive steps in one process, the purpose-and effect of which are to produce-sheets of celluloid of a size and quality not before obtainable. The case is thus distinguished from *Manufacturing Co. v. Manufacturing Co.*, 114 U. S. 523, 5 Sup. Ct. Rep. 1007, cited for the defendants, and the cases there referred to.

Hyatt's patent being for a process, the modifications in some particulars of the apparatus used by the defendants are unimportant. Although

the defendants have not made such grooves in the iron plate on which the slab of celluloid rests, as are specifically described in the patent of Hyatt, they have used an iron plate perforated by holes with screw threads, with plugs of zylonite screwed into those holes, and depressions left around the heads of those plugs, into which portions of the slab Of celluloid are pressed. The pressure not only welds the slab of celluloid to the celluloid plugs, but it forces portions of it into the apertures around the heads of the plugs. The evidence leaves no doubt but that the de fendants intended and expected by this con- trivance to take advantage of the tension of the celluloid while cooling and shrinking, and that they accomplished that result.

The facts that the defendants apply the heat first from above and afterwards from be- low, while the plaintiff applies the heat first from below and afterwards from above, and that the sides of the defendants' chase or mould are not, like those of the plaintiff's, made hollow for the purpose of containing steam, do not constitute any substantial difference in the process used by both parties. The case in this respect falls within the principle of the decisions of the supreme court in *Tilghman v. Proctor*, 102 U. S. 707, 780, and of this court in *Machine Co. v. Teague*, 15 Fed. Rep. 390.

Decree for the plaintiff.