

TILGHMAN v. MORSE.

{9 Blatchf. 421; 5 Fish. Pat. Cas. 323; 1 O. G. 574;
Merw. Pat. Inv. 122.}¹

Circuit Court, S. D. New York. Feb. 17, 1872.

PATENTS—IMPROVEMENT IN CUTTING
GLASS—DRIVEN SAND—NOVELTY.

1. The letters patent granted to Benjamin C. Tilghman, October 18th. 1870, for an “improvement in cutting and engraving stone, metal, glass, &c.,” are valid.
2. The use, for ornamenting the surface of glass and metal, of the process described in letters patent granted to George F. Morse, November 21st, 1871. for an “improvement in the 1239 ornamentation and dressing of the surfaces of glass and other substances, is an infringement of the first claim of the said patent, to Tilghman, which is, “The cutting, boring, grinding, dressing, engraving, and pulverizing of stone, metal, glass, pottery, wood, and other hard or solid substances, by sand used as a projectile, when the requisite velocity has been artificially given to it by any suitable means.”
3. The word “artificially,” in such claim, and throughout the specification of the Tilghman patent, covers the falling of sand through a vertical tube, high enough to enable the sand to acquire sufficient velocity to do its work. Such claim is a claim for a process or art.
4. The invention of Tilghman consists in the discovery, that a stream of sand, driven with sufficient velocity to cause the grains of sand, through their own velocity and momentum, to act as projectiles against the article to be cut or dressed, will do the work effectually, without any vehicle to carry the sand into contact with the article, and without any contact between anything and the article, except the sand.

{Cited in Andrews v. Carman, Case No. 371.}

5. Such invention was not anticipated by a process in which sand or emery was rubbed against the surface of glass by the wires of a rotating wire brush; or by the use, on a locomotive engine, of a stream of sand, combined with a jet of steam, to drive cows from the track of a railroad.

{This was a bill in equity by Benjamin C. Tilghman against George F. Morse.}

{Motion for provisional injunction. Suit brought upon letters patent [No. 108,408] for an “improvement in cutting and engraving stone, metal, glass,” etc., granted to complainant October 18, 1870.}²

George Harding, for plaintiff.

Charles B. Stoughton, for defendant.

BLATCHFORD, District Judge. This is a motion for a provisional injunction, founded on letters patent granted to the plaintiff October 18th, 1870, for an “improvement in cutting and engraving stone, metal, glass, &c.” The specification says: “My invention consists in cutting, boring, grinding, dressing, pulverizing, and engraving stone, metal, glass, wood, and other hard or solid substances, by means of a stream of sand or grains of quartz, or of other suitable material, artificially driven as projectiles rapidly against them by any suitable method of propulsion. The means of propelling the sand which I prefer is by a rapid jet or current of steam, air, water, or other suitable gaseous or liquid medium; but any direct propelling force may be used, as, for example, the blows of the blades of a rapidly revolving fan, or the centrifugal force of a revolving drum or tube, or any other suitable machine. The greater the pressure of the jet, the higher will be the velocity imparted to the grains of sand, and the more rapid and powerful their cutting effect upon the solid substance. At a high velocity of impact, the grains of sand will cut or wear away substances much harder than themselves. Corundum can thus be cut with quartz sand, and quartz rock can be cut or worn away by small grains or shot of lead. I have sometimes used iron sand, composed of small globules of cast iron. By the term sand, in this specification, I mean small grains or particles of any hard substance, of any degree of fineness, of which common quartz sand is a type. The hardest steel, chilled cast iron, or other metal, can be cut

or ground by a rapidly-projected stream of quartz sand. Articles of cast or wrought metal may have their surfaces thus smoothed and cleaned from slag, scale, or other incrustation. The surfaces of wrought stone in buildings or elsewhere can thus be cleaned and refreshed. By means of stencil plates, screens, or suitable covering substances, letters or designs can thus be cut or engraved upon hard substances. By varying the shape, number, and direction of the projected streams of sand, and by giving to them and to the articles treated suitable movements by means of lathes, planing, or drilling machines, or other known mechanical devices, cuts or holes may be made of any shape or size. When sand of a brittle nature, such as quartz or emery, is very rapidly projected against a hard material, the grains are broken by the shock into fine powder, and the process may thus be used as a method of pulverization. Where a jet of water under heavy pressure is used, as in hydraulic mining, the addition of sand will cause it to cut away hard and close-grained substances, upon which the water alone would have little or no effect. Pebbles or stones of size and weight as great as can be rapidly projected by the jet of water used will have a battering, penetrating, and dislocating effect, which will assist the disintegrating and scouring action of the water. Heretofore, when sand has been used as a grinding or cutting material, it has been applied between solid substances, moved over each other under heavy pressure, so as to make a series of scratches, as in the ordinary cutting of stone and glass, or else in a solidified form, as in a grindstone or sandpaper, or sometimes in a semi-fluid state, as when a body is rubbed or moved in a mass of sand. The peculiar feature of my invention, which distinguishes it from other methods of cutting and grinding, is, that each grain of sand acts, by its own velocity and momentum, like a bullet or projectile, and pulverizes, cuts, or indents the object it strikes.

From this peculiarity of action, it results, that some substances, which, though comparatively soft, are also tough, or malleable, or elastic, and not pulverizable by a blow, such as copper, lead, paper, wood, or caoutchouc, for example, are less rapidly cut and ground by the sand blast, particularly at moderate velocities, than some much harder substances which are brittle or pulverizable, such as stone, glass, or porcelain. Another peculiarity of the sand blast is, that the grinding or cutting action takes place upon irregular surfaces, cavities, corners, and recesses hardly 1240 accessible to ordinary methods. I believe that steam will generally be found the most convenient impelling jet, particularly for high velocities, but, in some localities, air or water may be cheaper.”

The specification then describes, with references to a drawing annexed, a method of carrying the invention into effect, for cutting stone by means of quartz sand projected by a jet of steam. It then proceeds: “For purposes where only a small quantity of material is to be cut or ground away from the surface of a hard substance, and where only a moderate velocity of the sand is required, I have found the current of air produced by the ordinary rotary fan to be convenient. I have used this method for grinding or de-polishing glass, china, or pottery, either on entire surfaces, or on surfaces partially covered and protected, so as to produce an engraving of letters, ornaments, or designs. In engraving designs, air is more convenient than steam as an impelling jet, in this respect, that the sand keeps dry and rebounds, leaving the pattern clear, while with steam the sand becomes damp, and is apt to adhere to and clog the fine lines and corners. The sand, being fed into the fan, is carried along, by the currents of air, in a tube or close trunk, and strikes upon the glass, which is held or moved opposite the mouth of the trunk, and cuts, grinds, or stars its surface. One arrangement, which I have found convenient for flat

glass, is, to cause the air current from the fan to descend in a narrow vertical tube of a cross section about three feet long by one inch wide, into the top of which the sand is evenly introduced by numerous small pipes, at the rate of about twenty cubic inches per minute for each square inch of cross section. A travelling apron carries the sheets of glass gradually and regularly beneath the sand blast, at about one inch distance. The finer the sand used, and the less the pressure of the blast, the finer is the grain of the depolished surface. Also, the finer the sand used, the more weak and delicate may be the texture of the covering substance used to produce the design. Good results have been obtained with designs cut in a layer of wax, and with paper or lace pressed close to the glass, and using sand which passed through a sieve of fifty wires per inch, and an air blast of the pressure of about one inch of water. With sand reduced to very fine powder, and an air blast of a pressure of eight or ten inches of water, a very delicate depolishing of the surface of glass has been produced. Numerous processes are known and used in the arts for producing, painting, or transferring designs on surfaces. Any of these processes by which a design can be produced or transferred in a sufficiently tough and resistant medium, may be used to prepare a surface for being engraved by the sand blast. Many natural objects, such as plants, leaves, insects, &c., which can be fastened flat upon a surface, have sufficient strength and resistance to a blast of fine sand to admit of their outline being thus engraved. Glass colored by a thin stratum of colored glass on one surface, may be ornamented by designs cut or ground through its colored stratum. Designs engraved by the sand blast to a sufficient depth, either in relief or intaglio, on a smooth surface, slate or glass, for example, can be reproduced by known processes of printing. When the sand blast, at moderate velocities,

is directed upon a metallic surface, it removes but little of the metal, but the grains of sand make innumerable small indentations of the surface, and produce a frosted, dull mat or dead appearance. By using suitable stencil plates, or covering substances, designs or devices can thus be engraved on metallic surfaces. If desired, the sand may be propelled by a current of air produced by suction, or a partial vacuum made in any convenient manner, as by a fan or steam jet, or any other known machine; or the sand may be impelled by a mixed current of steam and air, produced by a steam jet in the ordinary manner. I have produced some cutting and grinding effects by sand impelled by the force of gravity. A stream of sand fed into the top of a high vertical tube, at first falls slowly, but, after the air in the tube is set in motion, the sand gradually falls more rapidly, and can finally acquire velocity sufficient to grind or depolish glass. I have described above several arrangements for projecting the same with the requisite velocity, but I do not mean to confine myself thereto. Any method or arrangement may be used by which sufficient velocity can be artificially given to the sand to enable it to cut or grind the object." The claims of the patent are seven in number. The first claim is the only one which it is proposed to consider in this case, and is as follows: "The cutting, boring, grinding, dressing, engraving, and pulverizing of stone, metal, glass, pottery, wood, and other hard or solid substances, by sand used as a projectile, when the requisite velocity has been artificially given to it by any suitable means."

The defendant is using, for ornamenting the surfaces of glass and metal, the process described in letters patent [No. 121,119] granted to him November 21st, 1871 for an "improvement in the ornamentation and dressing of the surfaces of glass and other substances." The specification of that patent states, that "the surfaces of the glass or other substances to

be ornamented or dressed, which surfaces may be of plain, curved or other form, are subjected to the action of a falling or gravitating mass of corundum and emery, which compound constitutes the dressing material, substantially in the manner hereinafter described. The mechanism which I employ consists substantially of one or more hoppers or receptacles for receiving the dressing material, 1241 and one or more tubes connecting with the receptacles, for conveniently directing the said material, during its gravitation, upon the glass or other substance to be dressed." The specification then describes, with references to a drawing annexed, the machine to be used. A longitudinal box is divided, by means of partitions, into a series of hoppers, into each of which a mass of the dressing material is placed. Pendent from the centre of each of the hoppers is a small tube about eight feet in length, through which the dressing material descends by gravitation, until it is discharged through the lower end of the tube. The upper extremity of each tube is provided with a slide valve, by which the quantity of dressing material which falls through the tube may be regulated or wholly shut off. A shallow tray under each tube receives the dressing material as it is discharged. In each tray is a cushion on which the workman rests the glass plate or other substance to be dressed. The dressing material is a compound of corundum in powder and emery in powder. These substances, having been intimately mixed, are placed in the hoppers, the glass plates, or other substances, to be ornamented or dressed, are then held beneath the lower extremities of the tubes, and the slide valves are opened so as to allow the dressing material to descend by gravitation and fall upon the surface of the glass or other substance. The specification says: "The effect of this dressing material is to cut the surface of the glass or other substance, giving it a grained appearance of beautiful hues, even texture, very ornamental and

desirable. In order to produce designs of any desired pattern upon the glass or other substance, I place upon the surface thereof a pattern, cut out either in paper, cloth, textile material, metal, paper gelatine, parchment, rubber, gutta percha, or collodion film, or any other film or suitable substance having such a nature that it will throw off or resist the action of the dressing material, and, when the aforesaid patterns are applied to the glass or other substance, and subjected to the action of the dressing material in the manner described, the glass or substance will be dressed or cut only in the open parts or interstices of the pattern, while the parts of the glass or substance that are protected by the pattern will not be cut or acted upon by the dressing material, and thus some portions of the glass or substance will be cut or dressed, and the other portions left in their original condition, and the contrasts thus produced will form an ornamental configuration or dressing upon the surface of the glass or other substance. By continuing the action of the dressing material upon the surface of the glass or other substance for a sufficient length of time, in connection with patterns of suitable nature, as described, I form raised patterns having almost any desired degree of relief. In the same manner, I also produce intaglio patterns or depressions to almost any desired degree, in the surface of the glass or other substance. The dressing material, as fast as it is discharged from the hoppers, is to be replaced in them again, either by attendants or by suitable mechanism. * * * I am aware of the patent granted to B. C. Tilghman, October 18, 1870, for cutting or dressing with sand projected against the object which is to be dressed or ornamented, and desire to disclaim all that is therein shown and described." The specification states that Morse's invention consists in the machine and in the compound described in the specification and pointed out in the claims. The claims are to, first, one or

more hoppers and tubes, combined, as described, with a suitable receptacle thereunder for the article to be dressed or ornamented, as and for the purpose set forth; and, second, a compound formed of coarse particles of corundum and emery intimately mixed and applied, as and for the purpose set forth.

There can be no doubt of the great merit and utility of the plaintiff's invention. It has been extensively applied to practical use. The defendant, in his patent, disclaims having been the inventor of any thing shown and described in the plaintiff's patent, and confines his claims to the mechanical arrangement of a hopper, a tube and a cushion in combination, and to the use of the mixed compound of corundum and emery.

It is set up, in defence, that it has, for many years, been customary to deaden or roughen parts of the surface of articles of smooth glass, by covering over certain portions with thin sheets of metal, or other material, cut out into such shapes as to form or leave patterns or designs, and then subjecting the exposed surface of the glass to the frictional action of some suitable material, produced by such material striking against the exposed portion of the glass. It is not alleged that, prior to the invention of the plaintiff, a simple stream of falling sand or granulated substance was used to wear away or roughen the exposed portions of glass, but it is alleged that it was always known that any solid or liquid material, falling continually on any surface, would wear away the latter, such as a water drip, or jets of falling water, perforating stone. There is nothing in all this that touches the plaintiff's invention. His invention consists in the discovery that a stream of sand, driven with sufficient velocity to cause the grains of sand, through their own velocity and momentum, to act as projectiles against the article to be cut or dressed, will do the work effectually, without any vehicle to carry the sand into

contact with 1242 the article, and without any contact between anything and the article, except the sand.

This view disposes of the apparatus or process described in the provisional specification of John Robinson, in England, of December 13th, 1866, for "improvements in ornamenting glass," so as to produce a bright pattern or design on a rough or dead ground on the surface of the glass, or a dead pattern or design on a bright ground, and thus ornament globes or glasses for lamps, and dishes, decanters, and articles of glass in general, and flat or curved sheets or plates of glass. Robinson says, that, in ornamenting the glass, he applies, and secures to the glass, plates of metal having the form of that portion of the design which it is intended shall be bright, and then subjects the surface of the glass "to the action of a rotating wire brush fed with emery or sand and water, or other material capable of roughening or deadening the surface of the glass," and that the surface of the glass is thereby roughened or deadened, except at the parts protected by the metal plates, "the said parts being unoperated upon by the wire brush," and being left bright. He states, that if the protecting plates have a pattern cut out of them, a roughened or deadened ornament or pattern on a bright ground is produced. It is urged, that this process of Robinson produces an action and effect very similar to that produced by the defendant in the use of a concentrated stream of granulated material falling or poured upon the article to be operated upon, at about right angles to its surface, where there is a greater or less accumulation of the material all the time, and where, during the displacement of the particles, a continuous friction and rubbing on the surface being operated upon is kept up; that the action and effect so produced by the defendant are not similar to what occurs in projecting, at a high velocity, a very small stream of sand against a surface obliquely; and that the process of Robinson is not a

grinding process, but is one in which, by the action of the wires of the brush, the exposed surfaces are deadened or roughened, just as they are deadened or roughened, and not ground away, in the defendant's process. Whether the process of Robinson was practically of any use is not shown, and is left to conjecture. But, even if useful, in its employment, the surface of the glass was subjected "to the action" of the wire brush, and the parts roughened or deadened were put in that condition by being operated upon by the wire brush, as Robinson expressly states. It is true, that the brush was "fed with emery or sand and water." What part the emery or sand fulfilled is not stated—whether it, by means of the water, was held to the points of the wires in the brush, and was brought into contact with the surface of the glass, as such points revolved, or whether it formed a bed, kept fed, on the surface of the glass, such surface being maintained as horizontally as possible, and the particles of emery or sand were rubbed by the revolving points of the wire brush against the glass. Robinson states that the emery or sand is capable of roughening or deadening the surface of the glass. But his process, so far as it can be understood, is to rub the emery or sand against the surface of the glass, by means of the rotating wire brush. There is no suggestion that the work is done by using the grains of emery or sand as projectiles, through the velocity and momentum imparted to them. If the rotation of the wire brush would make projectiles of the grains of emery or sand, by a velocity of rotation sufficient to overcome their adhesion, through the water, to the wires of the brush, it would be a pure matter of accident whether those projectiles would strike the glass. It seems probable that the sand and water were fed to the surface of the glass, and that the wire brush was used to scratch the grains of sand against the glass. The description is very vague. Whatever the

process was, it would suggest to no one the plaintiff's invention, or the process used by the defendant.

Grave reference is made, on the question of novelty, to patents granted for projecting a stream of sand combined with a jet of steam, from a locomotive engine, for the purpose of driving cows from the track of a railroad, and the learned expert who makes an affidavit on the subject says, with great truth, that the only difference between such use, in combination, of a jet of steam and a stream of sand, and the use by the plaintiff of the combination of a jet of steam with a stream of sand, is, that, in the former case, the sand, after having had velocity imparted to it, came in contact with cows, while, in the latter case, it comes in contact with glass, stone, &c. This is the only difference, but in this difference lies the distinction between the two. No one, from observing the temporary operation of the process on the animal, would infer that he could, by the same means, produce the results which the plaintiff describes. Nor is there any resemblance in kind between those results and the result produced on the animal.

It is urged that the plaintiff, in his first claim, claims the cutting, &c., of stone, &c., by sand used as a projectile, only when the requisite velocity is "artificially" given to the sand; that this confines him to a mode of propelling the sand such as he describes, or equivalent means; that, notwithstanding what is said in the specification about "the force of gravity," the first claim does not allude to or cover the natural velocity acquired by the falling of a body; that such claim covers only velocity artificially given; that, in the defendant's process, the requisite 1243 velocity is not artificially given to the sand; and that, therefore, the defendant does not infringe the first claim of the plaintiff's patent. The plaintiff, in his specification, not only states that he has produced some cutting and grinding effects by sand impelled by the force

of gravity, and that a stream of sand fed into the top of a high vertical tube at first falls slowly, but, after the air in the tube is set in motion, the sand gradually falls more rapidly, and can finally acquire velocity sufficient to grind or depolish glass, but he speaks of causing an air current, created by a fan, to descend in a vertical tube into the top of which sand is fed, against flat glass held about one inch below the bottom of the tube. The process used by the defendant is fully described in the plaintiff's specification. The word "artificially," in the first claim of the plaintiff's patent, and throughout the specification, covers the falling of sand through a vertical tube high enough to enable the sand to acquire sufficient velocity to do its work. The work is done because the sand falls through a tube. It would not be done if the sand fell unconfined and unguided by a tube, not only because the tube concentrates the sand and makes a stream of it, which can be directed effectively against a given space on an object, but because, as the plaintiff's specification states, the falling of the sand in the tube, which is at first slow, sets the air in the tube in motion, and then the sand gradually falls more rapidly until it finally acquires sufficient velocity to do the work. There is thus produced an artificial current of air. The air would have no current, if not set in motion by the falling of the sand through the high vertical tube. This current of air gives an artificial velocity to the falling sand, greater than the natural velocity which, as a falling body, it would have outside of the tube. Such artificial velocity grows to be the requisite velocity. The requisite velocity is thus artificially given to the sand. The artifice is the confinement of the falling sand in a high vertical tube, into the top of which it is fed, with free access of air to the tube.

The first claim of the plaintiff's patent is for a process or art, and is valid. It is infringed by the defendant. There is no doubt as to the novelty and

utility of such process. The fact that the plaintiff has extensively applied it to practical use, and has been, and but for the infringement committed by the defendant would still be, in the undisturbed possession, use and enjoyment of the exclusive privileges secured by the patent, and in receipt of the profits of the same, as averred in the bill, is not contradicted. An injunction must, therefore, issue, as prayed for.

[For other cases involving this patent, see Cases Nos. 14,039 and 14,040; *Hartell v. Tilghman*, 99 U. S. 547.]

¹ [Reported by Hon. Samuel Blatchford, District Judge, and by Samuel S. Fisher, Esq., and here reprinted by permission. The syllabus and opinion are from 9 Blatchf. 421. and the statement is from 5 Fish. Pat. Cas. 323. Merw. Pat Inv. 122. contains only a partial report]

² [From 5 Fish. Pat. Cas. 323.]

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