

# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN PROCESSES OF PRODUCING DESIGNS UPON HARD SURFACES.

Specification forming part of Letters Patent No. **174,167**, dated February 29, 1876; application filed  
July 3, 1875.

*To all whom it may concern:*

Be it known that we, BENJAMIN C. TILGHMAN and RICHARD A. TILGHMAN, both of Philadelphia, Pennsylvania, have invented a certain Process for Producing Designs on Surfaces by the Sand-Blast, of which the following is a specification:

In cutting designs on hard surfaces by the sand-blast it is the general method to protect certain parts by a substance capable of resisting the action of the sand while other parts are left bare.

When a number of articles are to have the same design cut on them, it is desirable to make the designs by some process of reproduction like printing or stenciling. As the surfaces suitable to be cut by the sand-blast, such as glass, stone, metal, &c., are generally non-absorbent, and sometimes curved or irregular, it is difficult to print designs directly upon them; also, to resist the cutting action of the sand, it is necessary that the protecting substance should be of a thickness proportioned to the depth of cut required. Known transfer processes, whereby the design is printed with a suitable resisting-ink upon prepared paper, and applied to the glass, &c., and the paper afterward peeled off, leaving the design sticking to the glass, answer in certain cases, but are found to be troublesome in practice, and uncertain in result.

Our invention consists in using a very pulverizable paper, or other thin tissue easily destructible by the sand-blast, as the material upon which the design is made or marked, by printing or otherwise, with a suitable resisting ink or material not easily destructible by the sand-blast, and then sticking this marked paper upon the surface to be cut, so that when it is subjected to the sand-blast the paper or the unmarked parts of it are first cut away by the sand, and then the parts of the surface beneath are cut, while the parts of the surface covered by the resistant design are protected by it from the cutting action of the sand. The function of the paper is to act as the medium by which the design is applied to the surface to be cut; but the essential feature of our invention is that, instead of the paper being removed or peeled off by hand, like the paper

in the ordinary transfer processes, in our process the paper is left sticking to the surface when the sand-blast is applied, and is only removed by the cutting action of the sand itself.

We do not confine ourselves to any special method of putting the resistant design upon the pulverizable paper. Any suitable known process of common or lithographic printing or stenciling, or drawing or painting, may be used, as found convenient, and the design may be either positive or negative.

The following is a method of carrying our invention into effect, taking, for example, the case of a design indented or engraved to a suitable depth on a metallic plate, and which is to be cut upon flashed glass by the sand-blast.

The paper which we prefer as possessing the requisite pulverizable and other properties is known in trade as "French lithographic transfer-paper;" but we have sometimes used other thin paper, which, if unsized, should be first thinly varnished, so as to make it non-absorbent, and also more pulverizable and easily cut by the sand-blast, and we have found a solution of Dammar resin in spirits of turpentine to be suitable for such varnish. The ink or resist substance which we have found to answer (but we do not confine ourselves thereto) is made by dissolving six parts, by weight, of good glue in fifteen parts of water, and adding six parts of glycerine, specific gravity 1.25, three parts of molasses, and two parts of carbonate of magnesia, and a little india-ink to "sighten" it. These ingredients are melted together at a gentle heat, well mixed, and used at the lowest temperature of fluidity. We use preferably the ordinary lithographic press. A plate-press will answer. The indented plate is first thoroughly, but lightly, greased with coal-oil or lard, and then the ink or resist, which is kept just warm enough to flow easily, is poured in excess, so as to form a puddle entirely across that end of the plate from which the pressure is to be given. The paper is at once laid in position, so as to cover the plate and rest on the puddle of ink. The pressure of the "scraper" is then given as in ordinary lithographic press-work, by which the ink or resist is driven forward in a broad



thick mass between the plate and the paper, filling all the indentations of the plate, but being expelled by the pressure from all other parts of it, and the large excess of the ink is squeezed out at the end of the plate. The pressure being still kept on, the motion of the carriage is reversed, so as to squeeze down the paper on the plate a second time in the opposite direction. By this reversed action a more sharp and clean impression is produced.

As soon as the ink or resist has solidified by cooling, the paper is carefully stripped from the plate and is hung up to dry. A good result is shown by the ink being spread of even thickness over the proper parts of the design, and the paper between the impressions being clear and clean from it, or with only an extremely thin film capable of being quickly cut through by the sand-blast.

To control the rate of cooling and solidification of the warm fluid ink or resist during the pressing, it is desirable to be able to regulate the temperature of the engraved plate. One method of doing this is to have said plate to rest upon a hollow metallic bed-plate through which water of proper temperature may be made to circulate.

To use the design-marked paper it is pasted on the surface to be cut by the sand-blast. The printed side is generally placed outward, but sometimes it is more convenient to have the unprinted side outward. The surface to be cut is evenly covered with a thin film of the paste, (the less the better, provided good adhesion is produced,) the paper is laid smoothly upon it, and pressed or rubbed closely down, avoiding wrinkles. An elastic roller with a thick cloth between it and the paper is convenient for this purpose. A moist atmosphere is favorable to this operation, as it prevents too rapid drying and gives time for adjustment.

When the design is to be applied to curved or irregular surfaces—bottles or glass globes, for example—the paper may have suitable gores cut in it so as to lie smoothly on the curves.

When dry, the paste should be of a brittle and easily pulverizable nature. We have found a solution of dextrine in water, with a little ammonia added, to be a suitable paste for this purpose. When the paste is thoroughly dry the article is subjected to the sand-blast, which first pulverizes and blows away all the unprotected parts of the paper and then cuts into the surface beneath, while the printed resist protects whatever is beneath it from

the cutting action of the sand for a time proportioned to its thickness. When the cutting is finished the resistant design is removed by soaking and washing in water.

We have also printed negative designs from types, or electrotypes, or stereotypes, as when letters, &c., are to be cut in intaglio by the sand-blast on a protected ground. In this case the warm gelatinous ink is spread thinly on the pulverizable paper, and the oiled type is pressed down upon it by a steady motion, so that the ink is squeezed out wherever the face of the type comes in contact with the paper. When the ink has set the type is removed, and the paper is dried and used, as before described.

As the above-mentioned kind of paper and ink are both of them capable of being softened and obliterated by steam or water, it is evident that no such agent should be used to impel the sand, but some of the other methods described in the Patent No. 108,408, granted to said B. C. Tilghman, October 18, 1870, should be employed, and we prefer to use a current of air for this purpose. If it is desired to use steam or water as the impelling agent, the paper, ink, and paste used must be capable of resisting such agent, but they must also possess the requisite property with regard to the cutting action of the sand itself—that is, the paper must be easily pulverizable by it, and the ink capable of resisting it.

What we claim as our invention, and desire to secure by Letters Patent, is—

The process of producing designs upon hard surfaces with the sand-blast by means of pulverizable paper or other tissue readily destroyed by the cutting action of the sand, and carrying a design made or marked with an ink or other suitable material capable of resisting such cutting action—said paper being applied and made to adhere to the surface to be engraved, and then exposed to the sand-blast, substantially as described, whereby the unprotected parts of the paper will be first pulverized and removed, and then the corresponding parts of the hard substance or surface laid bare will be cut, while those parts of such surface beneath the resistant ink and composing the design will be protected from corrosion, as set forth.

B. C. TILGHMAN.  
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Witnesses:  
JOHN URIAN,  
W. R. KEAN.