UNITED STATES PATENT OFFICE.

HENRY FEURHAKE, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND WASHINGTON BECK.

IMPROVEMENT IN PROCESSES OF PREPARING GLASS-MOLDS.

Specification forming part of Letters Patent No. **219,240**, dated September 2, 1879; application filed February 1, 1879.

To all whom it may concern:

Be it known that I, HENRY FEURHAKE, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Ornamentation of Glassware and Molds therefor, of which the following specification is a full, clear, and exact description.

My invention relates, first, to that class of glassware, whether blown or pressed, wherein the ornamentation is produced in the mold; and under this head consists in an article of glassware ornamented either over its entire surface or by a raised or depressed design or figure formed thereon, the distinguishing characteristic of which is a fine granular surface, which partially obscures and partially refracts the light, whereby a new and peculiar effect is produced.

In the ornamentation of glassware of that class wherein portions are left clear and other portions obscured several general methods have been adopted—as, for instance, a stop-out varnish or acid-resistant has been applied to portions of the article, and the unprotected portions have been etched by hydrofluoric acid, either in a gaseous or liquid state; or the design has been formed on the glass in raised or sunken figures, or by means of fine lines, and the raised portions of the glass subsequently obscured either by the brush or wheel; or in some instances where the article had a uniformly plain surface limited portions thereof have been subjected to the wheel for the purposes of ornamentation. These several methods all produce good and useful results, but to a greater or less extent demand the employment of skilled labor, necessitate the treatment of the article after it leaves the mold, and multiplies the labor and expense of manufacture.

The object of the first part of my invention is, therefore, to produce the ornamentation of the article by the mold and reduce the labor and cost of manufacture.

The second part of my invention relates to the method or manner of producing the molds, whereby the surface of the mold or portions thereof will be left in a condition adapted to obscure the surface of the glass or portions thereof; and under this head consists in etching the mold or portions thereof by a suitable acid, or in engraving the mold by a sand-blast, or like means, which will leave the surface of the metal uniformly roughened with minute indentations, or granular, and adapted to minutely indent or roughen the glass formed in the mold.

Heretofore in the production of a glass-mold, the casting therefor having been properly dressed and polished upon its interior, the design or pattern to be produced in or on the glass has been cut or engraved on the interior of the mold by tools and hand labor in the usual manner of engraving metals. This procedure involved the employment of skilled mechanics, and the interior surface of the finished mold has been left in a smooth and finished condition, so that the glass formed therein would have a uniformly polished surface imparted to it by the mold.

So far as I am aware no known tools used or method heretofore practiced by glass-mold makers would enable them to give the face of the mold the uniform fine granular finish required; certainly not except at the cost of much time and labor.

The object, therefore, of the second part of my invention is to simplify, cheapen, and expedite the production of molds for manufacture of ornamental glassware of the class specified.

The third part of my invention relates to the manner of applying the protective coating to those portions of the mold which are to be protected against the action of the acids used in etching the designs upon the mold; and the fourth part of my invention relates to the acid, or compound acid, preferably employed, all of which will be hereinafter more specifically set forth.

I will now proceed to describe my invention, so that others skilled in the art to which it appertains may apply the same.

If the object in view is to produce an article of glassware the entire surface of which is to present the granular or ornamental appearance, the bottom of the mold is closed; and if the mold is a partible mold the joints are protected by any of the well-known acid-resisting substances used as a stop-out in etching metals, after which the mold is filled with an

acid or equivalent substance which will attack the metal. The acid may be drawn off from time to time and the interior surface of the mold examined. When the surface of the mold has been sufficiently etched or roughened by the acid the mold can be washed, the stop-out removed from the joints and bottom, and it will be ready for use; but in general it will be found most desirable to ornament the glassware by either raised or depressed designs, in which case certain portions only of the mold will be acted upon by the acid. If the figure or design upon the article of glassware is to have a raised granular surface, then all of the mold except the design or figure is protected by the stop-out; and, on the contrary, if the design or figure upon the glassware is to be depressed and clear, and the surrounding surface is to be raised and granular, then the design or figure alone is protected by the stop-out, and the remainder of the interior surface of the mold is exposed to the action of the acid.

Any well-known way of applying the stop-out and the design to the surface of the mold may be adopted—as, for instance, the design or figure may be traced on tracing-paper and then transferred to the mold by the use of duplicating-paper, or the design may be drawn directly on the surface of the mold. Those portions of the mold which are to be protected against the action of the acid or acids may then be covered or painted over with asphaltum-varnish; or, in some instances, the whole interior surface of the mold may be first uniformly coated with asphaltum-varnish or equivalent stop-out, and then the varnish removed by suitable instruments to expose such portions of the mold as are to be eaten away by the acid to form the figure or design. The method preferred by me, however, especially where the design or figure is very fine or intricate, is as follows: First, the design or figure is cut in intaglio on boxwood, steel, copper, or lithographic stone. The stone or its equivalent is then inked without dampening it, and the design is printed upon dry French-folio or onion-skin paper. The paper having the design upon it is then applied to the surface of the mold and carefully pressed thereon to cause the ink to adhere to the surface of the mold. As soon as the ink is firmly attached to the surface of the mold the paper is slightly dampened, when it can be readily removed without detaching the ink. By this means the design or figure will be transferred to the mold-surface. The ink so transferred is then dusted over with a mixture of one (1) part rosin and one (1) part gum-asphaltum, which should be gently rubbed in with the fingers, so as to fill the ink and increase its density. The mold should then be slightly warmed, care being taken not to heat it to such a degree as to melt the rosin, and again dusted with the composition of rosin and asphaltum, the warming of the mold and dusting the design with the powder being repeated until a solid body for the design is obtained. The joints and such other portions of the mold (besides the design) as are to be protected against the action of the acids are then coated with asphaltum-varnish. The bottom of the mold is then closed, and rendered water-tight and acid-proof by a coating of bees-wax or asphaltum. The portions of the mold surrounding the design will, of course, be left unprotected for the action of the acid. The mold having been prepared as specified, the acid is introduced into the mold and allowed to remain fifteen or twenty minutes, and is then removed and the action of the acid noted. If the surface of the mold is not sufficiently etched or cut deep enough, the acid is replaced and allowed to remain for a short time and again removed. This application of the acid is repeated until the metal of the mold is cut to such a depth that it will properly imprint the figure on the glassware. The varnish and bottom plug are then removed. The mold is thoroughly washed to remove all traces of the acid, and is then ready for use.

The transfer-ink used for printing upon the French folio paper is, preferably, an ink composed of beef-tallow, one (1) part; bees-wax, one (1) part; rosin, two (2) parts; asphaltum, one (1) part; lamp-black, one-half ($\frac{1}{2}$) part, all of which are boiled together and intimately mixed.

The French folio or onion-skin paper may be made by coating paper with the following composition: starch, one (1) pound; glycerine, one (1) ounce. Boil the starch, then add the glycerine, and stir the two together while boiling.

The acid composition preferred by me for etching the metal is composed as follows: pyroligneous acid, five (5) parts; alcohol, one (1) part; nitric acid, one (1) part. The pyroligneous acid and alcohol should first be mixed together, after which the nitric acid is added.

Throughout the body of the description I have spoken of acid as the agent for etching the mold, for the reason that the same is sufficiently cheap and very manageable; but in lieu thereof any agent adapted to attack the metal may be employed, or the well-known sand-blast may be used after the mold has been properly prepared with the design, as before specified.

It will be readily understood that if the design or figure is cut in the stone, or its equivalent, in intaglio, it will be the same on the mold, and the figure will be in bas-relief on the glassware; or, in other words, the design, having been formed in that portion of the mold which was exposed to the action of the acid, will be rough or granular and raised, while the body of the article, having been formed in that portion of the mold which was protected from the acid, will be clear and polished.

It is, of course, evident that in molds for pressing glass the plunger may be prepared in like maner as the mold; and it is here proper to say that it will be observed, in pressing

glass, that the design imprinted by the plunger upon the article will, in all cases, be much sharper, clearer, and more accurate than that imparted by the mold. This is due to the fact that when the glass is cut into the mold it is slightly chilled where it first comes in contact with the mold, and loses some of its plasticity at that place before the forming-pressure is applied, for which reason, wherever practicable, I prefer, in practicing my invention, to reverse the usual practice—that is, to form the design upon the plunger or its equivalent, (pressing upside down,) as the more plastic the glass at the time the design is imprinted thereon the better will be the results.

In some instances it may be desirable to form the outline or other portions of the figure coarsely granular, and the body or other certain portions of finer granular character, in which case the coarser granular condition of the mold may be produced by the action of one acid—as, for instance, the compound acid hereinbefore specified, and the finer granular condition produced by another acid—as, for instance, a compound acid composed of nitric and fluoric acids, in which case I prefer to form the fine granular surface first, and then protect the same by a varnish or stop-out during the action of the acid which forms the coarser granulation.

Any suitable metal may be used for forming the molds; but I prefer homogeneous steel, cast-steel, chilled cast-iron, phosphor-bronze, carbon-bronze, or brass.

In addition to the obtaining of a new and highly ornamental finish for glassware, another great advantage of my invention is the fact that drop-molds can be readily and cheaply cut so as to produce ornamental ware, which it has hitherto been impossible to do except at great expense.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An article of glassware ornamented in whole or in part by a granular surface which partially obscures and partially refracts the light, substantially as and for the purpose specified.

2. A mold for the manufacture of glassware the forming face or faces of which, in whole or in part, has the fine granular or unfinished condition such as is produced by the action upon metal of acids or a sand-blast, substantially as and for the purpose specified.

3. As an improvement in the manufacture of glass-molds for producing ornamental glassware, first, printing the design upon paper; secondly, transferring the design to the surface of the mold to be etched; thirdly, increasing the density of the transferred ink by the application of an acid-resisting powder; fourthly, protecting the joints and like portions of the mold by a suitable stop-out or acid-resisting substance; and, finally, applying an acid to the unprotected surface of the mold, in order to etch the same, substantially as specified.

4. A composition acid for etching molds, consisting of pyroligneous acid, alcohol, and nitric acid, substantially as specified.

In testimony whereof I, the said HENRY FEURHAKE, have hereunto set my hand.

HENRY FEURHAKE.

Witnesses:
F. W. RITTER, Jr.,
WASHINGTON BECK.