silicious compound be not thoroughly saturated with silica. The vessel which I use for the said preparing operation is a strong cylindrical steam boiler; the silica is kept from the bottom of the boiler by means of a diaphragm of perforated sheet iron, and by using silex or pieces of common gun flint, such as they are found in chalk formations, the calcareous matter adhering to the same having previously been got rod of by washing with dilute muriatic acid, it will be found that the solution is effected without any sediment settling at the bottom of the boiler. When sand is used it will be advisable to employ some mechanical means of stirring or agitating, but I generally prefer using gun flint, either in its native state, or else after having disintegrated the same by chilling it in cold water when red hot. However, all silicious matters may be used and yield solutions that are more or less colorless. The solutions thus obtained are sufficiently thick or dense to be used at once, and it is even necessary to weaken them for very siccative or fast-drying paints or colors; on the contrary, when it is desired to produce a varnish, the solution is still further concentrated. The silicate may also be prepared in the dry process. The operation in this case is carried on in a reverberatory furnace by using one and one-third, or two parts of silica to one part of carbonate of potash, and I heat the whole during six or seven hours till a complete fusion is obtained. This modus operandi may be objected to when used for making solutions for painting, on account of certain sulphurets remaining present, which causes several colors to grow black or dark, but this may be obviated by melting the compound in a crucible, and adding a small portion of nitrate of potash to the mixture of silica and potash.

The solutions of alkaline silicate which form the base of my new or improved paints, are reduced to the proper liquid consistency for being used with the brush, by mixing said solutions with the greater part of mineral colors or pigments, either natural or artificial, that are at present in use; excepting of course those that are altered by the presence of the alkali, as Prussian blue, for instance. Some colors of the same kind are difficult to apply, and require precautions, being rather strongly attacked by the solution of silicate of potash, and by partially combining with silica for instance white lead, chromate of lead, etc. These latter kind of colors must therefore be used with weaker solutions or else in conjunction with substances having a less affinity for silica. It may also be observed that even the more insoluble kind of colors are attacked a little by the silicate; among these we have the artificial or natural sulphate of barytes, which form an exceedingly white and cheap base, and agrees very well with the silicate by thoroughly uniting with it. Although this white base does not cover quite so well as white lead, yet it is preferable on account of the low price at which it can be obtained.

When the improved paints are used, the surface or object to which the paint is applied must sometimes be filled up or cemented, the same as when oil, turpentine, gelatine, starch, etc., is used.

For this purpose I form a cement or mastic from the same solution, which is concentrated for the purpose. and compounded with fast-drying substances, such as white lead, artificial carbonate of barytes, phosphate of lime, chalk, ocher, oxyd of manganese, oxyd of iron, etc., the mixture being applied to the joints.

The silicate colors above described may be rubbed over or smoothed down with pumice stone, they can also be laid on in several layers and covered with a varnish that is made with a dilute solution of the same silicate as has been used for making the paint itself. The silicious paints may not only be applied to stone and wood, but also to metals, glass, and porcelain.

These colors sticking very satisfactorily to metallic substances, ochre and oxyd of manganese, or oxyd of iron and silicate, may be used to preserve the iron from rust, instead of minium (red lead) and linseed oil; also, by applying successive layers of a mixture of silicate and artificial sulphate of barytes, upon brightened surface of cast-iron, a very durable and hard kind of enamel is obtained, that can be vitrified by heat if required. Oxyd of manganese may be used in the same way, and gives a black enamel of a superior description. The silicate colors produce remarkably fine results when applied to glass painting; and the pigments which I chiefly make use of for that purpose, are transparent or opaque enamels, which are reduced to fine powder; all the other colors, and also ordinary gum-lac colors, are equally applicable, but these latter are liable to get changed by the presence of free alkali, and are less solid than mineral colors. I also sometimes form an imitation of dull-ground glass, by applying artificial or natural sulphate of barytes and the soluble silicates on glass, either cold, or vitrifying the same by heat, so as to produce white enamel.

The processes above-described for glass-paintings, are equally applicable to porcelain, which may be ornamented with the varied and elegant colors, either when it is enameled or not, (viscotto); the painting in the latter case, being coated over with silicated varnish or enamel.

In any of the applications above set forth, the varnish or enamel after some time becomes insoluble in water, even if it be boiling; this insolubility may be still further insured by the addition of the coloring oxyds, or of a small quantity of artificial carbonate of barytes, which is dissolved in it at a gentle heat. In some cases when the colors are not very siccative, they may be rendered more insoluble by washing the painting after it has hardened, with a dilute solution of hydro-fluo silicic acid, which fixes the potash—however, this means need but very seldom be resorted to.

The paintings may be made still more insoluble by washing them with a solution of muriate of ammonia. My new black colors, or pigments, which are made with lamp black, are as homogeneous or mix as well as the others. In these colors there is no danger of a double silicate forming; it will also be found useful to increase the drying powers of the silicate, by adding a little artificial carbonate of barytes. The same precautions may be taken with respect to other colors, that are not very liable to be attacked by the alkaline silicate. These black colors may also be used as printer's ink, giving a very fine and durable letter press. As the silicated ink, however, is liable to get thick soon under the roller, a little treacle may be mixed with it, to facilitate the work. Instead of black colors, any others may equally be applied to paper; also, by printing a colorless and concentrated solution on the paper, I prepare the same for gilding or silvering, or the silicious solution may be used for fixing on paper and other surfaces, thin leaves of metal, which are previously rendered adhesive, merely by slightly damping them with saliva or some other gummy liquid. The processes described with regard to letter-press printing, are also applicable with regard to the manufacture of papers for hanging rooms, etc. The same means and processes may also be applied to fixing on fabrics, certain adjective colors, such as ultra-marine, and for printing on fabrics any lac-colors of organic origin, which give tolerably solid designs. The colors may be fixed by using, in suitable proportions, any of the above substances employed for rendering the silicated *paintin* insoluble, or any salt that decomposes the silicate, that is still soluble, answers the same purpose. The silicious solutions can be also employed as the base of a most unalterable writing ink. For this purpose, I prepare a liquid of a brownish-black, by boiling pieces of old leather with a solution of caustic soda or potash, and this alkaline solution is then saturated with silica that is in a state of jelly, and if a deeper black is to be given to the ink, the carbonaceous ingredients of Indian ink must be added.'

Recent Foreign Inventions.

Reworking Waste Fiber of Cloth.—S. C. Lister, of York, Eng., has secured a patent for reducing hard waste fiber with a twist in it, like cord, or woven cloth of cotton, silk, &c., to be worked over again. The waste is first cut in a machine into short lengths, then it is put into a machine having revolving arms, like a rotary flail, and beat for some time. This loosens the several strands in the same manner that plasterers loosen the hair used to mix with their first coat for walls.—After this beating it is placed in a chamber and exposed to the action of steam, then taken out, dried, and submitted to the action of the common carding engine of a cotton factory. This process is stated to be a great improvement in the way of treating shoddy, or waste cotton twists, to be reworked and put into new fabrics.

New Lubricating Compound.—H. Hyde, of Nova Scotia, patentee. Take 100 gallons of clear coal oil, and 7 lbs. of india rubber; heat to a temperature of 150° Fah., and agitate them from time to time for several days, until the india rubber is dissolved. The liquid is then passed through a fine seive into a vessel, where it is suffered to remain several days, when it becomes perfectly clear, and is fit for use. For most purposes this will make a good lubricating oil; but it has been used for many years in various parts of the United States.

Hollow Iron Spikes.—C. May and P. Prince, Eng., patentees.—This invention consists in the manufacture of hollow iron spikes or tree-nails. The portion of the spike at the head is made thicker than the point; the point is stated to be made in the shape of a quill, to be driven into wood without a hole being bored for the purpose.

New Glass.—In making common transparent glass, some potash and soda are generally employed as fluxes for the silica, but L. I. F. Margueritte, of Paris, has obtained a patent for dispensing with these in making transparent glass, by the use of silica, lime and albumen alone. By calcining a mixture of silica 65·47 parts, lime 25·80, and albumen 8·73 parts, a perfectly transparent glass, is stated, can be manufactured.

If these ingredients produce a good transparent glass the discovery is a valuable one.

Hydrogen Gas for Locomotives.—H. Wickens, of London, has secured a patent for improvements in locomotives, one of which consists in placing retorts in the furnace in such a position that they can be easily fed, with iron filings, and as easily emptied. A pipe in connection with the boiler admits steam to these retorts, and as the iron filings are kept red hot, they will decompose the steam by depriving it of its oxygen, setting its hydrogen free (water is composed of hydrogen and oxygen.) Another pipe allows the hydrogen to pass into the furnace where it is ignited and mixes with the products of combustion to produce an intense heat. Although hydrogen gas produces but a feeble light, it gives out a most intense heat when ignited; still, it appears to us that, as much heat must be absorbed in the furnace by decomposing the steam to produce the hydrogen, as will be gained in the liberating of hydrogen in the furnace. This, however, is a question to be determined by experiment alone. Steam has been introduced into furnaces for the purpose of producing a greater degree of heat, by resolving it into its elementary gases, and the great objections to its use has been stated to be a rapid oxydation of the grate bars and sides of the furnaces; the plan of Mr. Wickens removes this objection or evil, but not at less cost, we presume, taking into consideration the wear and tear of the retorts, &c.

Epidemics.—Yellow Fever.—Its Cause.

The discovery of the cause of any epidemic would be of vast importance, for "a pestilence that flyeth by night and walketh at noonday" is a terrible visitation to any community. Although volumes have been written on epidemics, their causes are still veiled in much doubt and obscurity.

Some of our Philadelphia cotemporaries, especially the *United States Gazette*, have recently published some good articles on the causes of cholera and yellow fever, still, they contain too much that is indefinite.

Of late years the cholera and the yellow fever have been the most appalling epidemics with which our country has been visited. The latter is a fever which appears to have its origin in the West Indies, South America, and in some parts of our Southern States, and is chiefly confined to those regions. Local causes no doubt, give it the peculiar character for which it is distinguished. If these were known, the question arises, can they be removed.

The *U. S. Gazette* says:—"The localities of yellow fever have been described, and the features which they possess in common have been noted. There are, in a great many places, a mixture of sea and land air, maritime exposure, a hot and moist air, low ground, marshes, swamps, vegetable and animal remains in a state of decomposition, and a mixture of this product with the human or vegetable mold, forming made ground, with scattered materials on the surface directly exposed to the operation of the sun and air at a high temperature. This is a description of the localities also of those fevers, intermittent and remittent, with which we are so familiar, and which are sometimes designated by the title of marsh or paludal, after their ordinary locality, also of periodical or intermittent, and, finally, miasmatic or malarious, from their presumed origin in miasma, generated in the soil by the action of hot and moist air."

This paragraph is somewhat confused, bu it points to one cause of yellow fever distinctly, viz., exposure of upturned new soil, and this apparently has some foundation in fact.

Dr. Barton has stated that from 1796 to the present date there has been no great epidemic of yellow fever in New Orleans without an extensive breaking up of the soil, such as digging canals and basins, or excavating the streets. Dr. Levert, of Mobile, traces epidemic yellow fever in that city to similar disturbances of the soil, and in Charlestown, S. C., such works are forbidden during hot weather. In 1795, during the yellow fever in New York, it prevailed most extensively (as stated by Dr. Bayley,) and was most fatal in situations where the ground was *new made.* There can be no doubt, we think, but that new made ground exposed in hot weather tends to cause fevers. In all the new countries West, intermittent fevers and fever and ague are most prevalent during the season succeeding the first breaking up of extensive tracks of new soil in spring. A useful lesson to be derived from these facts is, that the plowing up of extensive tracts of new land should always be performed in the fall season, and that extensive excavations and exposure of much fresh soil should never be permitted in cities during very hot and moist weather.

The breaking up of new land or excavations, however, will not account for all epidemic yellow fever, for its prevails, more or less, every season, in some part of the intertropical regions of our continent. It is a disease which is asserted to be infectious by some, and denied to be so by others. It will visit a place one season, then after a certain period disappear, and perhaps not return again for a number of years, and perhaps never. It prevailed fatally and extensively in Norfolk and Portsmouth, Va., in 1855, when there were no ex tensive excavations carried on, while this summer these cities have been comparatively healthy. Some persons asserted that the yellow fever as an epidemic traveled in circuits, and that from New Orleans it was traveling around the cities of our Atlantic coast, and would visit Philadelphia and New York this summer; but these predictions have not been verified by facts, for the city of New York—although it never experienced a hotter summer—never was healthier; no epidemic in any form has yet visited it. Some cases have occurred at the Quarantine Hospital at Staten Island, brought in by ships from Havana, and some such occur in the same place almost every summer, but no epidemic has made its appearance.

Fire-Engine Playing.

The Adrian (Mich.) *Watch Tower* states that "Albert" engine, No. 1, of that place, threw a stream out of a 7-8 inch nozzle on the 1st of August, to the distance of 238 feet 2 inches horizontally. In all accounts of horizontal playing with fire-engines, the hight at which the pipe was held should be given. The nozzle should be laid on a board perfectly true, as the elevation of it a single inch makes quite a difference in the measured length to which the stream is thrown.