be produced is traced on a leaf of paper, which is then reversed, and has repeated upon the opposite side of it the outlines and other features of the design in a mixture of varnish and vermillion, softened over a mild fire. This side of the paper is then applied to the lacquer to be decorated, and the paper is rubbed and pressed upon it by means of a small spatula of bamboo.

The transfer of the pattern from the paper to the lacquered surface is further assisted by gently beating the paper down with a small silken bag containing powdered stone. The paper is then peeled off, and can be used again if desired. The slight relief of the pattern so produced upon the lacquer is rubbed down with carbon polish, and the design, and that alone, is then lightly covered with a thin layer of quickly drying varnish. Gold, in powder, is then applied to the moist surface by means of a camel hair pencil, if the gold pencil be fine, and by means of a small tube if it be comparatively coarse and heavy. The article is then dried for a day in a warm closet, such as is used for drying the ordinary lacquer varnish. The design is next lightly coated with a very thin layer of varnish, applied by means of paper steeped in it and passed very delicately over the object, which is then re-dried in the closet. The object receives further extremely light coatings of varnish and subsequent polishings before it is complete. Silver is applied in powder in the same manner. When gold or silver is applied to designs in relief the details of the process vary considerably, but the application of the metals is effected in substantially the same manner. When gold and silver are applied in leaf, they are laid upon the varnished surface prepared for them, and dealt with in the usual manner, the varnish acting as a "size" for the metallic leaf. When mother of-pearl is used as an incrustation for lacquer, it is laid on during the varnishing processes, earlier if it be thick than if it be thin, and the final polishing is proceeded with until the pearl is brought to the surface.—*Oil and Colourman's Journal.*

HOW TO TELL GOOD FROM BAD GILDING.

It may be ascertained whether gilding is genuine or not by the fact that on the latter a weak solution of protochloride of copper produces a black precipitate, which it does not on the former. In the case of gilt paper, the simplest method consists in slowly burning the paper in a bright flame that gives out no smoke; in the incinerated remains of good gilt paper there are traces of the gold left behind, which are quite perceptible to the naked eye, in the shape of glittering spots while base metal on paper oxidizes in burning, and leaves nothing but a lot of red spots behind. This method, however, is scarcely accurate enough; a very much safer test is to be found in the use of mercury, either in metallic shape or in solution of salts of mercury. The former test is performed by putting a few drops of pure quicksilver on the gilt article, and either rubbing it in or slighly heating it. If the gilding be genuine, though ever so thin, the mercury combines itself with it, producing white spots on the surface. This does not occur in the case of sham gilding, and in rubbing mercury in no change of color whatever can be noticed. Another test consists in the application of a watery solution of nitrate of mercury. In this case the exact opposite takes place as in the former, for genuine gilding remains intact, while a "duffer" at once takes a white color when brought in contact with the precipitate of mercury.

Miscellaneous.

LIFE OF STEEL RAILS.—An engineer of the Rhenish railway, which has had the longest experience in steel rails, has made a calculation according to which the average duration of steel rails, when 24 trains pass over them every day, is 30 years, while that of iron rails, with a traffic of 17 trains, is 11 years. Steel rails, according to this calculation, last four times as long as iron rails, although they are but one-third more expensive.

TO PREVENT WOOD FROM SHRINKING.—Carefully conducted experiments have shown that wood, well saturated with oil, when put together, will not shrink in the driest weather. Wheels have been known to run for many years, even to wearing out the tires. Very many dollars might be saved annually if this practice was adopted. Boiled linseed oil is the best for general use, although it is now known that crude petroleum, on even old wheels, is of great benefit.

VARNISH FOR IMITATING GILDING.—A very perfect imitation of gilding on brass and bronze articles, it is said, may be made by means of a varnish composed of 160 grains of gum-lac, 40 grains of dragon's blood, 10 grains of turmeric and 3320 grains of alcohol. The metal should be brushed with the varnish in all directions, by means of a sponge, and then immediately warmed over a gentle charcoal fire. The surface at first will appear dead, but will soon resemble the finest gilding. The varnish should be kept in well corked bottles.

A BALLOON ascent was recently made by MM. Duté, Poitevin, and Du Hauvel, at the instance of the French Society of Aërial Navigation, with the special object of studying the conditions of formation of clouds. The observations made verified the following provisions.—(1) Clouds are formed in the zone of mixture of two layers of air saturated with moisture; (2) these clouds arise in the warm layer while they are dissolved in the cold layer which shares in the mixture; (3) their direction is that of the zone of air whose temperature is the higher; (4) the winds observed on the surface of the ground, which are merely reaction-effects of the principal wind, may measure several hundred metres in height, and have a different direction in neighboring localities, while the upper current has great regularity of direction and intensity.

THE TENSILE STRENGTH OF GLASS.—Traulionie gives the tensile strength of glass at from 2,500 to 9,000 lbs. per square inch, according to kind; crushing strength 6,000 to 10,000 lbs. per square inch; transversely, by his own trials, Millville (N. J.), flooring glass, one inch square, and one foot between the end supports, breaks under a certain load of about 170 lbs. consequently it is considerably stronger than granite, except as regards crushing, in which the two are about equal. It is suggested that glass will shortly be used for many purposes where other and much inferior materials are exclusively employed. Glass may be used as water conduits to better advantage than cast iron or terra cotta, as it is impervious to moisture and proof against corrosion or chemical action. It is already considerbly in use for flooring, and it has lately been successfully experimented with for railway sleepers under exceptionally severe conditions.

IN a recent comprehensive paper to the Hanover Society of Engineers and Architects, Herr Schering makes a comparison of various kinds of glass roofing that have been constructed, and their cost of maintenance. The results of experience prove that there is less risk of injury from hail for such roofs than has generally been supposed, and that by far the greatest amount of fracture has occurred, not through hail, but through dead-weight, or casualities. Accordingly, in determining dimensions, dead-weight is primarily to be considered. Against hail, a glass-thickness of 5mm. to 6mm. (1 5 in. to 1 4 in.), with the usual construction, may be considered quite safe; with thicknesses over 3mm. ($\frac{1}{8}$ in.) no considerable damage from hail is on record. It appears, on the other hand, that the thickness should not be carried beyond 10mm. to 12mm. say $\frac{1}{2}$ in.), else (probably on account of imperfect cooling) the glass is apt to break.

The oxyhydrogen or limelight has not been much heard of lately, in presence of the electric light. If its excellent illuminating power has not found much industrial or domestic application, this is probably due to the high price of oxygen and the quick destruction of the matter which is made incandescent. A Russian naval officer, M. de Khotinsky, has been lately trying to improve the system. He has devised a lamp in which the refractory substance proves much more durable. A thin pyramidal crayon of lime or magnesia is supported (adjustably) in a vertical position, with its thinner end facing the orifice of the burner below, which surmounts two tubes, for coal-gas and oxygen, both controlled by one stopcock. The two gases only mix at the mouth of the burner. The crayon, immersed in the flame, is successively heated from below, without any sudden difference of temperature occurring in its different parts. The same crayon will last fifteen days, with daily use. The burner consumes about 0·014 cub. m. of oxygen per hour, and as much coal-gas, giving a light equal to about 1·5 Carcel burner. M. de Khotinsky proposes to prepare oxygen from permenganate of potash (the Tessié de Motay process), or by another method he is working out, and to convey it to houses in a compressed state, each subscriber having a reservoir for storage. M. Tissandier, who reports on the system in *La Nature*, is unable to speak of it from an economical point of view, but he was highly satisfied with the light.