## HOW GOLD LEAF IS MANUFACTURED.

No one who has handled gold leaf can forget the feeling of wonder or surprise which its remarkable thinness produced at first.

Familiarity takes away the surprise to a certain extent, but the results of the lightest breath of air usually give occular demonstrations of the fact that there was good reason for wonder.

The extreme malleability of gold has made it a prominent metal in the useful as well as in the fine arts. It has been calculated that from $1,000,000 to $3,000,000 worth of this precious metal is annually used on ornaments, in gilding, in lettering, edging of books, in sign and ornamental painting and in dentistry. Of course, the greater proportion of this is for the first-named purpose, although there appears to be a great amount used in the other industries. A comparatively small amount, however, is necessary to cover a great deal of space. A cubic inch can be hammered so as to cover a space 35 feet wide and 100 feet long, and 20 of our $20 gold pieces can be drawn into a wire that would reach round the globe.

The gold-leaf beater's art is one of the most surprising when the result is considered. The minute films are so thin as hardly to retard the light, and yet possesses all the brilliancy of color of the solid block of gold. Gold leaf is manufactured from gold of about 22 carats. It is first cast into a bar 8 inches long, 1 inch wide and ½ inch thick, the weight being about 35 ounces. It is then rolled out until it is about as thick as the finger nail. The "ribbon" as it is called, is then weighed into packages, or "beatings," of 2½ ounces each. These beatings are what the men first start to work on. A man will cut one of these beatings (of 2½ ounces) into 180 pieces, making the pieces about an inch square. He then puts them into a "kutch," which is made of prepared paper, the size being 2½ inches square. He lays these 180 pieces of gold between these papers—first a paper, then a piece of gold. He will then beat on the "kutch" with an iron hammer weighing about 48 pounds, until the gold is the size of the "kutch." These pieces are then cut into quarters and then filled into a "shoder," which is made of gold-beater's skin, the size being 4 inches square, and holding all the pieces, numbering 750. The gold beater's skin is made from a preparation of a small portion of the large intestines of an ox, and the prepared paper is, or may be parchment from calf-skin, rendered clear and white by a peculiar operation that gives it the appearance of writing paper, for which purpose it is used to some extent. The pieces are then beaten out in the "shoder" with a hammer weighing about 13 pounds, making them all 4 inches square. These pieces of "shoder leaves" (as they are now called) are cut into quarters making them 2 inches square, and in all 2,880 pieces or quarters of "shoder leaves." These are then filled into three molds, each mold is made of the same material as the "shoder;" the molds are 5 inches square and hold 900 pieces or quarters of "shoder leaves" each.

The molds are then beaten out separately with a hammer weighing about eight pounds, until the gold inside is very nearly square with the edge of the molds. They are then sent to the girls for booking. Each girl will then take a mold full of gold taking each leaf out separately and trimming the edges of the leaf off, making them 3½ inches square and as the leaves are cut, they are put into a paper book holding 25 leaves. The gold is then ready for sale; it is sold by the single book or by the pack, 20 books making a pack.

To make gold leaf easier to handle, a Yankee inventor has found a method of fastening the leaf in a temporary manner upon a piece of of very soft tissue paper, just a little larger than the leaf itself. Gold leaf thus prepared can be cut and lifted into place upon work with very little trouble and much less annoyance than leaf unmounted. As soon as the gold touches the gold-size upon the surface to which it is applied, the paper can be pulled and the gold left in the desired position. We presume practical gilders would laugh at such an invention, but it is certainly a great convenience to those who have only a little gilding to do, and consequently are not always in practice. Gold put up this way we think is less liable to get damaged in the book from handling than the plain leaf.

## FIXED WATER COLOURS.

A new and important discovery is claimed to have been made by M. Mery, a Frenchman, which, if it prove to be true, will be valuable to the painting arts and trades. He has been experimenting a great many years, and he claims now to have hit upon the means of making and applying imperishable water colours. He does not explain what he uses as a vehicle for his pigments, but it is something which, while it will mix with water, is not soluble in it. Whatever it is, it renders the colours unalterable, and, as it becomes after a time as hard as cement or stone, they may be said to be indestructible. It can be applied to any surface suitable for ordinary oil or water painting, such as wood, paper, glass, stone, canvas, &c., and can be prepared so as to dry in a few minutes or remain moist for an indefinite length of time. It is suggested that possibly M. Mery has re-discovered the long-lost art of encaustic painting, which is supposed to have been applied and fixed by means of heat. It seems almost incredible that a paint can be applied by means of water, and yet not be affected by it afterward, but our authority is excellent for saying that such is really the case.

ARTIFICIAL GLUE.—A glue which can be well utilised for paper-making or finishing of textile fabrics has been lately introduced in Germany. The starch possesses the property of swelling considerably if it is treated with a hot solution of caustic salts, and a gluey mass is obtained which is moderately transparent and elastic, but insoluble in cold and slightly soluble in hot water. This process, which has been known some years, had to be abandoned. According to the *Papier Zeitung*, Herr A. Abadie prepares by means of alkaline or neutral chloride, like chloride of calcium, an artificial glue which is thick and more or less hard and easily dissolved in water. He can also obtain a hard mass, which is elastic, transparent, and insoluble in hot water. In this process magnesium chloride is used, to which a certain quantity of boiling water is added; the solution is left alone for some time, the liquor is drawn off, and a small quantity of sulphuric acid is added. It is necessary to use pure water for the operation. To the solution thus prepared starch is added, and the whole brought to the boiling-point, and kept for one hour at 90 deg. C. (194° Fah.) To the now clear liquor clear lime-water is added till all the acid is neutralised; the boiling is repeated, and a good artificial glue is obtained. After it has been left to cool, it can be removed in the solid state. For treatment of 100lb. starch, 100 lb. magnesium chloride and 1 lb. muriatic acid are taken along with the necessary quantity of water for the complete solution.

PRINTING GOLD AND SILVER COLOURS ON CARPETING AND OTHER TEXTILES.—Gold and silver designs for carpeting and oilcloths have been hitherto prepared in the following manner: The gold on silver were put in leaves or bronze powder on the designs, which were printed with a varnish of linseed oil or similar adhesive. The bronze thus attached did not possess much firmness, and the method was necessarily expensive. The method recently adopted by Wohlforth is as follows: The bronze powder is united at once to printing material. The liquid silicate of potash, or of oxide of sodium, answers this purpose. One part, by weight gold, silver, or bronze powder, along with two parts of the silicate, will give a prime colour, is easily transferable by rollers to paper, oilcloth, and woods and metals. The bronze thus printed dries very rapidly, and cannot be taken off by oil or water unless they are boiling. It bears light and heat equally well and especially sulphuretted hydrogen, which has such a destructive effect on bronzes put on in the form of powder. It is recommended to thin the mass by an addition of warm water, 10 to 20 per cent., so as to keep it from becoming too hard during the process of printing. An addition of glycerine or syrup, of 5 to 10 per cent., will be even preferable. The bronze color remaining on the printing forms can be taken off by warm water.

THE RELATIVE COST OF MOTIVE-POWER.—Mr. Bissinger, M.E., at Carlsruhe, Germany, gives the following results as obtained in his examination of the several motors in regard to the relative cost per horse-power for each hour. It will be observed that the examination pertained principally to small motors. The relative cost per effective horse-power per hour is as follows:

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| 100 | h.-p. | steam engine | 7.6 |
| 2 | " | " | 44·3 |
| 2 | " | Lehman's caloric engine | 26·5 |
| 2 | " | Hock's motor | 40·0 |
| 2 | " | Otto gas-engine | 26·4 |
| 2 | " | Otto Lang gas engine | 26·4 |
| 2 | " | Schmidth's hydraulic motor, supplied with water from the city waterworks | 95·00 |
| 2 | " | obtained by horses and a gin | 45·00 |
| 2 | " | obtained by manual labor | 200.00 |

A NOVEL HORSESHOE.—A manufacturer in Berlin, Germany, is turning out a novel horseshoe made of malleable iron. It is not made solid. but has a deep and wide groove, into which tarred hemp rope is so firmly wedged that it cannot be withdrawn. It is so thick that it protrudes considerably beyond the rim of the malleable shoe. It is stated that the lightness of this horseshoe has gained for it considerable favor in Berlin.