logy with the diamond, inasmuch as in the divers experiments which, with the aid of the microscope, I have made upon these laminæ, and of which the number was about 160, the general results were as follows: 1. The hydrate of potassa in fusion has no action upon them at a temperature in which this alkali acts briskly upon silica. 2. They are sufficiently hard to scratch glass. 3. They entirely disappear when brought to a red heat in the open air.

These scales were produced in the two experiments of which I have given the details in a memoir which I have this day had the honor to submit to the Academy.

Ibid.

The Difference which Exists between Gilding by Mercury and Electro-Gilding. By M. BARRAL.

The author of this paper says that he has been frequently called upon to solve the following question, viz. :—"By what means had a certain article of copper or silver been gilded?" This could not possibly be ascertained with certainty by mere inspection, even by the most experienced eye. M. Barral has, however, discovered a certain means of ascertaining the fact by chemical reaction. He has found that by attacking the articles to be tested with dilute nitric acid, either warm or cold, pellicles of gold are obtained, of the exact form of the article; provided the acid be not allowed to act too energetically. These pellicles are of a yellow gold color on both sides, when obtained from articles gilt by simple immersion in an alkaline solution of gold, or by means of the galvanic current decomposing certain solutions. On the contrary, the pellicles produced on the surfaces of articles gilt by mercury are of a reddish-brown color on the side next the surface of the articles gilt.

In order to explain this difference in the appearance of the pellicles of gold, M. Barral first had certain articles gilt by the mercury process with certain quantities of gold. The articles thus gilt, on being acted upon by dilute nitric acid, furnished pellicles of gold of a deep brown color on their inner faces, and heavier than the gold originally employed in the gilding process. The pellicles not dissolved by the acid were therefore not pure gold.—They were proved by direct analysis to contain about three per cent. of copper or silver, according to which of these two substances the gilt article was formed.

M. Barral therefore considers it evident that when the amalgam of gold is applied to the surface of an article, a double amalgam of gold and copper or silver is formed. If the article be then submitted to heat, the mercury will be volatilized, and an alloy will be formed, thereby uniting the precious metal and the metal of which the article is formed. If the article gilt be then acted upon by nitric acid, the metal of which it is formed will be completely dissolved, and the acid will act upon the alloy, and carry off the copper or silver near the inner surface, where the gold is in small quantity. But, as the proportion of gold increases near the outer surface, it will preserve the other

metal from dissolution, as is well known to be the case with all alloys in which gold predominates.

It will therefore be understood, that the pellicles detached from articles gilt with mercury must be covered on their inner surface, after being acted on by the nitric acid, with a very thin layer of gold, which gives it a brown color; this will also explain the reason why nitric acid leaves the gold in an impure state after the destruction of the base metal of the articles.

When an article to be tested has been gilt by electro-chemical means, it will be found that the pellicle of gold covers the copper or silver, without amalgamating therewith; and therefore the nitric acid will not act upon the layer of gold.

The foregoing explanation proves the new methods of gilding to be less solid than the old ones; for it is evident that a layer merely laid on like a coat of paint, cannot adhere so tenaciously as when the metals are to a certain extent incorporated. Experience has proved, however, that the processes of electro-gilding and gilding by simple immersion possess certain advantages over the old methods. The pellicle obtained from the gilding by mercury, when held up to the light, presents an appearance of being perforated with numerous fine holes; this effect is produced by the passage of the mercury through the gilding when driven off by evaporation. Layers of gold deposited by a battery or by immersion are, however, perfect coatings; and, consequently, for domestic purposes—especially for vessels intended to come in contact with acids—copper articles, gilt by the mercury process, possess disadvantages which are obviated by the new processes.—

Comptes Rendus.

Lon. Jour. of Arts & Sci.

On the Steam Jet. By Mr. FARADAY.

In Mr. Faraday's former discourse on Mr. Barry's method of warming and ventilating the new House of Lords, he mentioned that a part of the means employed for securing a current of air sufficiently abundant to insure the required object was the use of a jet of high-pressure steam in the ventilating shaft of that building. The present evening Mr. Faraday devoted to a consideration of the physical conditions of such a steam-jet, and to the relations of the vapor discharged from it to the surrounding air. More than forty years ago, Dr. Young (*Nat. Phil.*, vol. ii., p. 534) had shown that, wherever any elastic fluid was forced from a jet with but small velocity, the steam proceeded for some inches without observable dilatation, and then diverged into a cone; but that when the pressure on this vapor was increased, the apex of the cone approached the orifice of the jet; but whatever might be the amount of this pressure, the form of the cone continued the same. Mr. Faraday proceeded to notice the lines of motion of the particles constituting this cone of vapor. The rings of smoke produced by the combustion of bubbles of phosphuretted hydrogen on the surface of water were exhibited. The revolution of each of these hollow rings on the axis of the cylinder which forms it was pointed out, as was