flower is of a greenish white, and forms axillary spikes. The fruit, which is a pod, when full grown measures from ten to twelve inches, and is about half an inch in diameter. The commercial vanilla (from the Spanish, *vainilla*, diminutive of *vaina*, a pod) is generally produced from the plant *Vanilla plainifolia* (Andrews), a native of Eastern Mexico. It is also extensively cultivated in Réunion, the Seychelles, and Java, but the Mexican vanilla is thought to be the best. The quality of a vanilla pod can always be determined by the presence or the non-presence of a crystalline efflorescence called *givre*, and also by the colour of the pod, which in the best varieties is of a dark chocolate brown. But it is the crystalline efflorescence which contains the substance to which the fragrance of vanilla is due. This substance is called *vanillin*, and is chemically known by the formula $C_8H_8O_3$. The pods contain also vanilla acid, oily matter, soft resin, sugar, gum, and oxalate of lime. The choleraic effects that sometimes occur through eating ices flavoured with vanilla may not be due to the vanilla, but to putrefactive changes in the milk; but it is known that the vanilla plantations are subject to the attack of a little pest known as *Bacterium putredinis*, and it is quite likely that the poisonous effects from ice-eating can be accounted for by the presence of some microscopic fungi in the vanilla.

In the plantations the vanilla plant is generally fertilised by hand, but, like other orchids, there is no doubt its fertilisation is promoted by insects when in its natural state. The wild plant yields a smaller fruit, and is distinguished in Mexico as *Baynilla cimarona*, while the cultivated vanilla they call *Baynilla corriente*.—A. J. F., in *Knowledge*.

A SUGGESTED NEW USE OF PHOTOGRAPHY.

Prof. John Trowbridge, in the May *Scribner's*, calls attention to the importance, from an engineering point of view, of making careful photographs of steel and timber at the point of rupture under a breaking load, suggested that in this way we may learn something important on the much vexed question of elasticity.

This is a suggestion worthy the attention of our metallurgists, some of whom have made a critical study of the behaviour of iron and steel under strains.

A FAR-SIGHT MACHINE.

Mr. Edison is reported, in a conversation with an interviewer who solicited his ideas on the subject of the projected World's Fair in New York (says *Iron*), as saying that he would take an acre of space in such a fair and completely cover it with his inventions, of which he has no less than 70 now under way. "One of the most peculiar, and now promising good results," said Mr. Edison, "is what I may call a far-sight machine." By means of this extraordinary invention he hopes to be able to increase the range of vision by hundreds of miles, so that, for instance, "a man in New York could see the features of his friend in Boston with as much ease as he could see a performance on the stage. That," he added, "would be an invention worthy a prominent place in the World's Fair, and I hope to have it perfected long before 1892."

The saw is largely used now instead of the axe in bringing down the giant redwoods in California. The tree is sawed partly through, and then is forced over by wedges.

EXPERIMENTS ON THE INEXPANSIBILITY OF WATER AND CONTRACTION OF ICE.

BY T. O'CONOR SLOANE, PH.D.

When ice melts, the water produced is of considerably less volume than was the original ice. This is obvious from the fact that ice floats upon water. The reverse is a fact but too well known to housekeepers, who trace many broken vessels and fractured water pipes to the expansion of freezing water. The change in volume is a sudden one for the most part. At 39·2° F. water attains its greatest density. If the temperature is lowered it expands slightly, until 32° F. is reached, when it freezes, if there are no causes to prevent. In freezing it suddenly expands about one-eleventh of its bulk with almost irresistible power. A pressure as high as 28,000 pounds to the square inch has been estimated as having been exerted by it.

Many other substances in solidifying experience the same change. Thus solid cast iron floats on melted iron as ice does on water, and for the same reason.

This sudden expansion is the more impressive in the case of water, because it is ordinarily of comparatively constant volume. Its change of bulk by alterations of temperature or pressure is but slight. It resists compressive or expansive strains, yielding but little to very high pressures.

Both of these phenomena—the reduction in volume experienced by melting ice and the slight expansibility of water—are illustrated by the simple experiments shown in the cuts. Nothing in the way of apparatus is required to perform them, unless a couple of wineglasses or goblets and an India rubber band can be termed such.

The simplest one may be first described, the illustration of the slight expansibility of water. If two empty wineglasses are placed mouth to mouth, and a rather wide India rubber band is sprung around the junction, they will resist separation with some force. The glasses in separating slide, like the members of a telescope, through the band, and in doing so cause the air within to be slightly rarefied. A partial vacuum is produced, and some exertion is required to separate them. When they part, a slight report is produced by the inrush of the outer air. It is evident that if the glasses were filled with a non-expansible substance, they would adhere much more strongly. For air, therefore, water may be substituted.

The glasses are immersed in a vessel of water large enough to hold them mouth to mouth. The band is sprung over them and is worked up as near the lip of one of them as possible. It is important that it should be wet, to facilitate its sliding. The glasses, immersed so as to be filled with water, are next brought mouth to mouth beneath the surface. The band is adjusted by sliding so as to cover the junction as evenly as possible. Care must be taken to exclude all bubbles of air. The glasses are then removed from the water, when they will be found to adhere loosely yet strongly. They can be worked from side to side, but will resist a direct pull with great force. A very heavy weight can be sustained before they come apart. The water contained within them is practically inexpansible, and permits no telescoping of the band and glasses.

The second experiment may now be tried. The glasses are separated and emptied, and the band is sprung around one of the glasses and is brought down below the edge, so that only half of its width surrounds the body. The other half will now spring inward and form a horizontal diaphragm through which a large aperture extends. It represents a flat perforated washer. The glasses are again immersed in water and filled. A lump