1884 was elected to membership in the National Academy of Sciences.

Besides frequent memoirs on mineralogical and kindred subjects contributed to scientific journals in the United States and Europe, he has published "Appendix II." (1875) and "Appendix III." (1883) of Dana's "System of Mineralogy" (New York); "Text-Book of Mineralogy" (1877, and revised edition 1883); and "Text-Book of Mechanics" (1881).

The Retirement of Professor Tyndall.

Prof. Tyndall has presented his resignation to the managers of the Royal Institution, and it has been accepted with expressions of sincere regret. His age hardly furnishes a justification, as he is only sixty-seven years old. In his letter of resignation he assigned the uncertainty of his health as the cause of his retirement, stating that it would be unjust to permit the fortunes of the Institution to depend on the caprices of his health. He stated that he was so fully prepared to go on with his work that he had made arrangements to go to Paris and purchase apparatus, when he was suddenly seized with an attack of intense sleeplessness. While anticipating full and complete recovery, he felt it his duty to resign. In June, 1853, he received his appointment as professor of natural philosophy in the Institution, and in 1867, a year after the death of Michael Faraday, he succeeded him as its superintendent. His work has taken largely the direction of the popularization of science. His original investigations, while of interest and value, were not as extensive relatively as was his work in other fields. Thus his books on science have had almost phenomenal success, while as a lecturer he was, as regards his audiences, almost without a rival. His lecture tour in this country in 1872 will be remembered by many, and his generous donation of its results, $13,000, to the establishment of a fund for promotion of the study of the natural sciences in America, will ever entitle him to the regard of our people. He acted frequently as the assistant of Faraday. The latter in 1813 had been appointed assistant to Sir Humphry Davy, then professor of chemistry in the recently founded Royal Institution. This was Faraday's first connection with the Institution, over which he ultimately presided. Thus Tyndall forms the last link in the unbroken chain. His successor will do well if he can sustain the reputation of the chair hitherto so ably filled.

As a mountain climber, Prof. Tyndall won renown also, his ascent of the Matterhorn in 1868, preceded by his ascent of the Weisshorn seven years earlier, being achievements of high merit. For many years he annually visited the Alps. He became connected with the Trinity House in 1866, and has done some excellent work in the investigations demanded by lighthouse service, such as the "transparency" of the atmosphere, foggy and clear, to different sounds, such as bells and the steam siren. On retiring he has refused to accept any pension. The directors have requested him to sit for a marble bust to be preserved in the halls of the Institution, have appointed him honorary professor, a title previously borne by Sir Humphry Davy and Prof. Brande, and have decided that one of the annual course of lectures shall be termed the Tyndall course in his honor. Lord Rayleigh was nominated as his successor, the election to take place on May 9. His appointment to the chair will confer on it additional luster, as this eminent physicist may be safely ranked with two or three others as the foremost of the profession.

Plates for Wimshurst's Machine.

My method of piercing these machines is as follows: A disk of iron, 3 in. diam. and ¼ in. thick, with a hole in the center, of the size required in the plates, is cemented to the center of a circular glass plate by softened glass pitch (ordinary pitch with a little turpentine added while warm), the glass and the iron disk being previously warmed. When quite cold, the plate, with the disk attached, is immersed in water to prevent vibration, while the center is broken through, first by driving the tang end of a file through in several places, and afterward by nibbling the glass away with a small hammer until the hole is of the right size. This hole can then be smoothed by a file or a piece of grindstone. The iron disk is now to be detached by a gentle heat to soften the pitch, and the glass cleaned with a little turpentine on a piece of rag. I can do five plates in one hour by this process, and recommend amateurs to try it.—*C. A. Lowe, in English Mechanic.*

A COMMON trouble with us all is that we fail in our business because we think little of it. No man truly succeeds in any calling who has a poor opinion of it. No man has a good opinion of his business who uses it only to make money out of it. No man can have the best conception of his business who does not esteem it for its usefulness. And the higher we go—if "higher" and "lower" are proper terms to use in considering the different honorable and useful walks of life—the more clearly will it appear that he who only esteems his business for the living or money that is in it must, if judged by any high standard, be a failure.—*Dr. Hapgood.*

SCIENCE IN TOYS.

X.

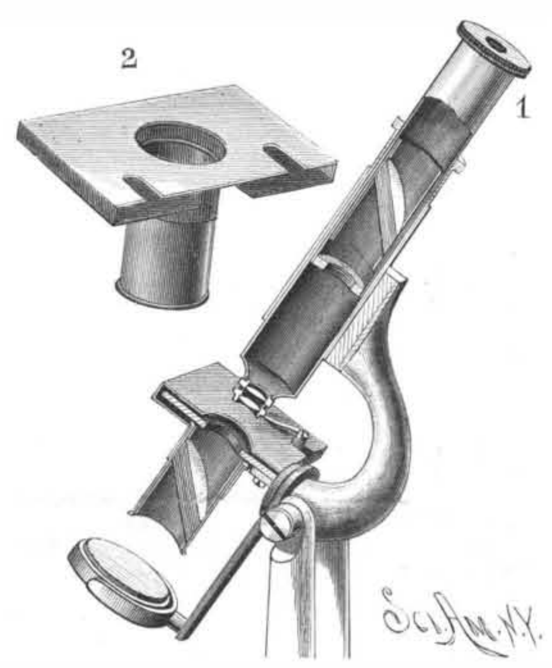
SIMPLE POLARISCOPE FOR THE TOY MICROSCOPE.

The possessor of an inexpensive microscope like that shown and described on page 246 of the current volume of the SCIENTIFIC AMERICAN, or, in fact, of any other microscope not provided with a polariscope, will feel well repaid for his labor if he will construct and apply to his instrument a polariscope like that shown in the annexed engraving. The cash outlay for the material is 25 or 30 cents, and only an hour or so of time is required to complete the attachment.

To the draw tube of the microscope is fitted a paper tube, which is readily made by gumming writing paper and winding it around a cylindrical stick of the proper size. To the paper tube is fitted a second tube, and this last tube is cut diagonally through the center at an angle of 35° 25'. One of these pieces is inserted in the first tube, and sixteen or eighteen elliptical glass covers, such as are used for covering mounted microscopic objects, are placed on the diagonally cut end of the inner tube.

The glasses should be thoroughly cleaned, and when in position in the tube they are held by the remainder of the diagonally cut tube. The sectional view of the instrument clearly shows the position of these glasses in the draw tube.

The tube which goes under the stage is made in precisely the same way, and is supported in position for



SIMPLE POLARISCOPE FOR THE MICROSCOPE.

use by a short paper tube secured to a cardboard casing adapted to slide over the stage of the microscope, as shown in the engraving. Notches are formed in the rear edge of the upper part of the casing to allow it to slip by the slide-holding clips, as shown in Fig. 1. The lower tube must be capable of turning in the short fixed tube, and it may be prevented from falling out by gluing a cardboard band or a piece of small cord around its upper end, forming a sort of flange. The hole in the upper part of the casing is made larger than the movable tube, to admit of inserting the tube from the top of the casing. The part of the attachment below the stage is the polarizer. The part in the draw tube is the analyzer.

By turning the polarizer, the light being thrown directly up the tube by the mirror, the field of the microscope will appear alternately light and dark, showing the partial extinguishment of the polarized beam twice during each revolution of the polarizer.

When the field is darkest, a piece of mica of the proper thickness inserted between the stage and objective renders the field light, and it may produce a color effect, in addition to its depolarizing effect. The colors depend on the thickness of the film or upon its position in the instrument.

There are various chemical salts and animal and vegetable substances which produce brilliant color effects in the polarized beam. Salicine is a favorite. Santonine is good. Tartaric acid, boracic acid, and cane sugar are easily prepared by allowing their solutions to crystallize on the glass slip. Some of these substances, salicine for example, may be fused upon the slip and recrystallized.

The colors may be heightened by placing a film of mica behind the object during examination. Different colors will be produced by different thicknesses of mica.

Among animal substances to be examined in this way are fish scales, parings of the finger nails and of horses' hoofs, parings of corns and of horn.

Among vegetable substances, the sections of some woods, the cuticle of plants, the rush for example, form good polariscope objects.

Many minerals show well in polarized light, but they are generally difficult of preparation. Selenite is an exception. It may be readily reduced to the proper thickness to secure brilliant effects.

The polariscope above described, although not as desirable as one provided with a pair of Nicol prisms, is nevertheless worth having, and will give its possessor a great deal of satisfaction. G. M. H.

The Value of Water Gas in Heating and Smelting Operations.

In a recent number of *Dingler's Polytechnisches Journal* are given the results of some interesting experiments carried out at Frankfort-on-the-Main with the object of testing the value of water gas for heating and smelting purposes. It was found that this gas, made in a Wilson generator, and having the following percentage composition: Carbonic oxide, 18; hydrogen, 10; nitrogen, 68; carbonic acid, 4; was serviceable for the heating of boilers, but unfit for smelting purposes. The melting temperature of silver could hardly be reached, the gas having lost its generating temperature of 400° C. by the transit from the generator to the furnace. By utilizing this temperature and heating the air of combustion, the ordinary smelting operations could be performed; nevertheless, the use of the Wilson generator was discontinued, because the gas was not cheaper than other fuel for boiler heating.

Since 1885 the refining works at Frankfort have used water gas, furnished by the neighboring gas works at 6 pfennige per cubic meter, or about 1s. 8d. per 1,000 cubic feet. It is not stated by what process the gas is manufactured; but in composition it is identical with the Lowe gas. It is still too expensive for all crude purposes, so that it is only used in melting gold, silver, and their alloys, fluxes, and pigments for the decoration of china, and all purely laboratory work. It was compared with the rich illuminating gas obtained from the Frankfort works, and the poorer gas supplied in the city, the burners used being identical. A copper vessel, filled with water, was heated from 15° to 100° C., under similar conditions. It took 10 cubic meters of water gas against 4 cubic meters of Frankfort rich gas, and 5 cubic meters of the poorer gas. Equal weights of two kinds of flux for enameling colors were melted under identical conditions, in a Perot furnace. The cost of the gas in each operation was 4·60 and 6·50 marks for water gas, ag inst 19·6 and 26·8 marks for the rich Frankfort gas.

Equal quantities of fine silver and copper were melted with the two gases in the same furnace. It required of water gas 4·30 and 5·70 marks' worth, and of rich illuminating gas 16·7 and 21·7 marks' worth. By using water gas, therefore, all boiling, heating, or evaporating operations can be accomplished for half the money, and all melting for about a quarter the money, as compared with illuminating gas. It will be seen that this is only the result of the difference in the price of the two gases; for from the first experiment it follows that the pyrometric value of the coal gas is 2·5 times as high as that of the water gas.

A Chemical Entertainment.

A correspondent of the *Chemist and Druggist* says he "was asked to entertain a number of school children with chemical amusements, and chose out of the list such as were most suitable for public exhibition. Others were suggested by what I read. It may save some of your readers time and trouble, when looking up similar work, if I give a list of what were found feasible and successful in my own case:

The Magician's Kettle, which supplied twelve liquors of different color. Of course, the coloring agents were in the glasses—aqua pura in the kettle.

Witch's Caldron.—S. v. meth. with boric acid; stront. nit., etc., in suitable vessels.

Blazing Ice.—Potassium and ice.

Lighting a Candle with Ice.—Put a piece of potassium in the wick.

Fire under Water.—Phosphorus, pot. chlor., and acid sulph.

Dancing Fire Ball.—Charcoal ball on pot. chlor., fused in test tube.

Lightning.—Lycopodium blown into a flame by insect powder bellows.

Ice Creams.—Silicate of soda and chloride of calcium.

Sunlight.—Magnesium ribbon burning in oxygen.

Moonlight.—Phosphorus in oxygen.

Will-o'-the-Wisp.—Phosphorized ether in hot water.

Turning Steel into Copper.—Dipping boy's knife into sol. cup. sulph.

Volcanoes.—Pot. chlor. and sugar, inflamed with ac. sulph.

In addition to these experiments, a gas factory was in work, by making hydrogen, passing it through benzine, and igniting. A lead tree was "planted," and grew. But the most captivating of all was the *Magic Likeness Taker.* Comic figures were drawn on white paper with gallic acid and mucilage. The sheets, apparently clean and untouched, were hung up, and the pictures developed by spraying on them a solution of iron sulphate.

All these may be carried out by any chemist at very little expense."