in all its force and peculiarities. Over and over again this little experiment was performed without variation in its results, until, finally, satisfied, I moved my head off my arm and stretched my arm out of its cramped position, and felt no more this *bête noir* of earlier days, now again returned, bringing with it emphatic and unmistakable explanation of its cause.

G. V. D.

## *ASTRONOMICAL NOTES.*

### A NEW SATELLITE OF SATURN.

A NEW satellite of the planet Saturn has been discovered by Professor William H. Pickering at the Harvard College Observatory. This satellite is three and a half times as distant from Saturn as Iapetus, the outermost satellite hitherto known. The period is about seventeen months, and the magnitude fifteen and a half. The satellite appears upon four plates taken at the Arequipa Station with the Bruce Photographic Telescope. The last discovery among the satellites of Saturn was made half a century ago, in September, 1848, by Professor George P. Bond, at that time Director of the Harvard College Observatory.

EDWARD C. PICKERING.
HARVARD COLLEGE OBSERVATORY,
CAMBRIDGE, MASS., March 17, 1899.

## *NOTES ON PHYSICS.*

### THE NERNST LAMP.

THE electric lamp recently invented by Nernst, as has been stated in this JOURNAL, consists of a small rod of magnesia which is heated to brilliant incandescence by an electric current which is pushed through it by an electromotive force of several hundreds of volts. The rod must be heated nearly to a red heat by a blowpipe or other independent means before it passes sufficient current to operate.

A number of these lamps have been made in the Physical Laboratory at Bethlehem, Pa. It has been found that a rod of pure magnesia can scarcely be started even with 1,000 volts and a good blow pipe. The surrounding air becomes electrically too weak to withstand the high electromotive force at a temperature lower than that required to make the rod a sufficiently good conductor. This is true even when the rod has been heated to softness beforehand in a temporary mounting.

The conductivity of the rod may be completely controlled by mixing with the magnesia varying amounts of silica and of fusible silicates. A satisfactory lamp is made as follows: Pure calcined magnesia (heavy) is thoroughly mixed with two or three per cent. of powdered silica, one or two per cent. of magnesium sulphate, and one per cent. or less of sodium or potassium silicate (water glass). The mixture is dried until it is just moist enough to pack under pressure. A small piece of brass tubing is lined with a roll of several thicknesses of stiff writing paper, and the mixture is tamped into this tube. The tube is then baked until the paper is burned, when the rod of magnesia may be removed. This rod is then laid upon a bed of magnesia (powdered lime would, perhaps, answer) and by means of carbon terminals an alternating current is passed through the rod, heating it first to redness by a blow pipe. With some care a very hard and compact rod of magnesia is thus formed which is then ground to a thin rod with large grooved ends. Platinum wire is wound on these grooved ends and, if desired, cement made of water glass and powdered magnesia may be used to cover the platinum. The two platinum wire terminals may then be bound to the sides of a small glass tube as a support. A lamp made in this way may be started easily, although its resistance rises slowly with continued use, owing, perhaps, to the volatilization of the potassium or sodium silicate. Calcium silicate would, perhaps, be more satisfactory in this respect.

A very striking experiment may be performed with a piece of glass tubing several inches long wound with copper terminals at its ends. The tube begins to pass considerable current at a low red heat, with a few hundreds of volts, and is quickly melted by the current. A thin-walled tube half an inch or more in diameter is best, and it should be heated along one side only so that the cool portion of the tube may for a short time serve as a support for the hot conductive portion.

W. S. F.