tion of pressure determines a proportionately imperfect and complicated transformation of the gun-cotton upon its exposure to heat, the results of which are more or less essentially of an intermediate character, so, conversely, the greater the pressure, beyond the normal limits, under which gun-cotton is exploded—that is to say, the greater the pressure exerted by it, or the resistance presented at the first instant of its ignition, the more simple are the products of decomposition, and the greater are the physical effects attending its explosion, because of the greater energy with which the chemical change is effected.

III. "On Magnesium." By Dr. T. L. Phipson, F.C.S. Communicated by Prof. G. G. Stokes, Sec. R.S. Received March 9, 1864.

(Extract.)

Iodine and Sulphur.—I find that iodine can be distilled off magnesium without attacking the metal in the least. In the same manner I distilled several portions of sulphur off magnesium without the metal being at all attacked.

Decomposition of Silicic Acid.—Heated for some time in a porcelain crucible with excess of anhydrous silica, the metal burns vividly if the air has access; and a certain quantity of amorphous silicium is immediately formed. Magnesium is therefore capable of reducing silicic acid at a high temperature. The reason why potassium and sodium cannot effect this is simply because these metals are highly volatile and fly off before the crucible has attained the proper temperature. Magnesium being much less volatile than the alkaline metals, takes oxygen from silica before volatilizing. If the silicic acid be in excess, a silicate of magnesia is formed at the same time; if the metal is in excess, much siliciuret of magnesium is produced. The presence of the latter is immediately detected by throwing a little of the product into water acidulated with sulphuric acid, when the characteristic phosphoric odour of siliciuretted hydrogen is at once perceived.

Decomposition of Boracic Acid.—With boracic acid the phenomena are rather different; the acid melts and covers the metal, so that it does not inflame even when the crucible is left uncovered. A certain quantity of boron is soon liberated, and the product forms a greenish-black mass, which oxidizes and becomes white in contact with water, and *disengages no odoriferous gas* in acidulated water.

Decomposition of Carbonic Acid.—I thought it would be interesting to try a similar experiment with carbonic acid. Accordingly dry carbonate of soda was heated with a little magnesium in a glass tube over a common spirit-lamp; and before the temperature had arrived at a red heat I observed that carbon was liberated abundantly, and magnesia formed.

Action of Alkalies.—A solution of caustic alkali or ammonia has little or no action upon magnesium in the cold.

Precipitation of Metallic Solutions.—Magnesium precipitates nearly all the metals from their neutral solutions. When these are taken in the form of protosalts, even manganese, iron, and zinc are precipitated as black powders. *Aluminium* and *uranium* (and perhaps chrome) are only precipitated as *oxides.*

Alloys of Magnesium.—I have examined only a few alloys of magnesium. Unlike zinc, magnesium *will not unite with mercury at the ordinary temperature* of the air. With tin 85 parts, and magnesium 15 parts, I formed a very curious alloy of a beautiful *lavender-colour*, very hard and brittle, easily pulverized, and decomposing water with considerable rapidity at ordinary temperatures. If the air has access during the formation of this alloy, the mixture takes fire; and if the crucible be then suddenly withdrawn from the lamp, the flame disappears, but a vivid *phosphorescence* ensues, and the unfused mass remains highly luminous for a considerable time. A white powdery mass, containing stannic acid and magnesia, is the result.

[With platinum, according to Mr. Sonstadt, magnesium forms a fusible alloy; so that platinum crucibles can be easily perforated by heating magnesium in them.]

Sodium and potassium unite with magnesium, and form very malleable alloys, which decompose water at the ordinary temperature.

It is probable that an alloy of copper and magnesium, which I have not yet obtained, would differ from *brass*, not only in lightness, but by decomposing water at the ordinary temperature with more or less rapidity.

Uses.—Magnesium will be found a useful metal whenever tenacity and *lightness* are required and tarnish is of no consequence. The light furnished by combustion of the wire has already been utilized in photography at night. In the laboratory it will be found useful to effect decompositions which sodium and potassium cannot effect on account of their greater volatility.

April 28, 1864.

Dr. W. A. MILLER, Treas. & V.P., in the Chair.

The following communications were read :—

I. "On the Magnetic Elements and their Secular Variations at Berlin," as observed by A. ERMAN. Communicated by General SABINE, P.R.S. Received March 1, 1864.

All observations and results to be mentioned here relate to

Latitude 52° 31′ 55″ North.
Longitude 13° 23′ 20″ E. from Greenwich.

1. *Horizontal Intensity.*

Denoting by $(1800+t)$ the date of observation in tropical years of the