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of Vibration," by which I made all my observations on the submarine boat and on armour-plated ships. In this instrument the needle is 3·2 inches long and 0·17 inch in breadth.

The magnet is suspended on a silk thread and vibrates in a wooden box, on the side of which there are the divisions in degrees to mark the angles formed by the turning-needle; for each observation I counted 700 vibrations. I found that for such a voyage this instrument answers the purpose.

The exact drawing of this instrument you will find in my book on the "Submarine Boat," 1867, Plate VI. Drawings 6 and 8 give half the size of the instrument, and drawing 7 the full size of the needle.

I know that General Sabine and the Royal Society are much interested now in the Northern Magnetic Observations, so I hastened to send the results to you, as I know that they cannot be printed soon in Russian.

I remain, your attached friend,
JOHN BELAVENETZ.

Cronstadt, $\frac{4}{16}$ November, 1870.

March 9, 1871.

General Sir EDWARD SABINE, K.C.B., President, in the Chair.

The following communications were read :—

I. "Results of Seven Years' Observations of the Dip and Horizontal Force at Stonyhurst College Observatory, from April 1863 to March 1870." By the Rev. S. J. PERRY. Communicated by the President. Received January 23, 1871.

(Abstract.)

The object of the present paper is to bring further evidence to bear upon an important question of terrestrial magnetism.

The existence of a sensible semiannual inequality in the earth's magnetic elements, dependent on the position of the sun in the ecliptic, was deduced by General Sir Edward Sabine from a discussion in 1863 of a continuous series of the monthly magnetic observations taken at Kew. A previous reduction of observations made at Hobarton and at Toronto had first suggested the idea, and a new confirmation of the results has lately been obtained by Dr. Balfour Stewart from subjecting a second series of Kew observations to the same tests as before. The observations, which form the basis of the present discussion, extend over the period from March 1863 to February 1870, during which time the same instruments have been in constant use. These are a Jones unifilar and a dip-circle by Barrow, both tested at Kew, and a Frodsham chronometer. Sir Edward Sabine, who made the Stonyhurst Observatory one of his magnetic stations

in the English survey in 1858, greatly encouraged the undertaking of monthly magnetic observations, and the Rev. A. Weld procured in consequence the instruments still in use. Only occasional observations were made with these instruments for some years, and it was only in 1863 that a continuous series of monthly determinations of the magnetic elements was started by the Rev. W. Sidgreaves. He observed regularly until September 1868, when I returned to my former post at the Observatory, and I have continued the same work ever since.

A stone pillar was at first erected for the magnetic instruments in the open garden, and this remained in use from 1858 until the beginning of 1868, when a most convenient hut of glass and wood was built for the instruments in a retired corner of the College garden. This alteration was rendered necessary from the placing of iron rails in the vicinity of the old pillar; and although it introduces into the results a correction for change of station, it has the great advantage of securing immunity from disturbance for the future.

Considering the object in view in drawing up this reduced form of the dip and horizontal-force observations, I have judged it advisable to adhere strictly to the tabular forms in which the matter has been presented in previous discussions of a similar nature. Each element is the subject matter of these tables. In the first are the monthly values of the element, the deduced mean value, and its secular variation. Next in order comes the calculation of the semiannual inequality. The residual errors, and consequent probable weights of the observations and results, compose the third and last Table.

The yearly mean values of the horizontal force are found to vary progressively from 3·5926 to 3·6178 in British units, the mean for Oct. 1st, 1866, being 3·6034, with a secular acceleration of 0·0042. Calculating from the monthly Tables the mean value of the horizontal force for the six months from April to September, and for the semiannual period from October to March, we find the former to be 0·0005 in excess over the latter, showing that this component of the intensity is greater during the summer than during the winter months. Treating the dip observations in a precisely similar way, we obtain 69° 45′ 21″ as the mean value of this element for October 1st, 1866, subject to a secular diminution of 1′ 49″·2; the extreme yearly means being 69° 48′ 47″ and 69° 37′ 52″. The resulting excess of 10″ for the winter months in the computed semiannual means is so small, that the observations tend mainly to show that the effect of the sun's position is not clearly manifested by any decided variation in the dip. Deducing the intensity from the above elements, we obtain for the summer months the value 10·4136, whilst that for the winter months is 10·4128. The intensity of the earth's magnetic force would thus appear to increase with the sun's distance, but the difference is not large enough to have more than a negative weight in the question under discussion. This weight, moreover, is lessened by the slight uncertainty arising from the probable disturbing causes at the first magnetic station.

It is hoped that a second series of observations at the new station will throw greater light on the fact of the sun's influence on terrestrial magnetism, by either confirming the results obtained above, or by adding fresh weight to the conclusions arrived at by the President of the Royal Society.

II. "Preliminary Notice on the Production of the Olefines from Paraffin by Distillation under Pressure." By T. E. THORPE, Ph.D., Professor of Chemistry in Anderson's University, Glasgow, and JOHN YOUNG. Communicated by Professor ROSCOE, F.R.S. Received February 2, 1871.

When paraffin is exposed to a high temperature in a closed vessel, it is almost completely resolved, with the evolution of but little gas, into hydrocarbons which remain liquid at the ordinary temperature.

This reaction will undoubtedly afford the most important insight into the constitution of this body.

Accordingly we have repeated this conversion on a large scale, and from about 3½ kilograms of paraffin melting at 44°·5 C. (prepared from shale) we have obtained nearly four litres of liquid hydrocarbons. This mixture of hydrocarbons commences to boil at about 18° C., but the quantity coming over below 100° C. is comparatively small; by far the greater portion boils between 200° and 300°. A preliminary separation shows that the four litres are made up of hydrocarbons boiling

	litres.
Between 200° and 300°	2·7
„ 100° and 200°	1·0
Below 100°	0·3
	4·0

Up to the present we have principally occupied ourselves with the investigation of the fraction boiling below 100°, and have obtained conclusive evidence that it is mainly composed of *olefines*, the proportion of members of the $C_n H_{2n}+2$ series being but small. By repeated fractionations over sodium we obtained perfectly colourless liquids boiling about 35° and 65°, which were attacked by bromine in the cold with the greatest energy. On adding the bromine slowly and in minute drops, and carefully cooling the hydrocarbon by a mixture of snow and salt, scarcely a trace of hydrobromic acid was produced. The portion boiling at 36° may be either amylhydride or amylene, or a mixture of both; the avidity with which the bromine combines with it shows that the latter body must be present in considerable quantity. As soon as the drops of bromine permanently