

ART. XVII.—*The present annual effect of the secular change of the Magnetic Declination in the Eastern part of the United States, accompanied by a Chart*; by CHARLES A. SCHOTT, Assistant U. S. Coast Survey.

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IN a preceding number of this Journal (vol. xxix, May, 1860), I have given a special discussion of the secular variation to which the magnetic declination in the eastern portion of the United States appears to be subject: in the present communication will be found some additional material, since collected, with a chart of isomagnetic curves of the *annual change* of the declination. As a first attempt, this chart can claim but very moderate accuracy; it has been supposed, however, that enough information had accumulated to attempt its construction.

The curves unite places of equal annual change and by their distribution furnish us with ready means to refer any observed magnetic declination (within their limits) taken within the past decade, to the present value or to an epoch a few years in advance. These lines themselves change in the course of time, as is sufficiently plain from the discussion above referred to, but they may be taken to answer for about a decade either way from date, without passing beyond the limit of uncertainty to which they are subject themselves. The year 1860 may be taken for their average epoch.

The curves marked thus: II, III, IV, V, indicate the localities where the *annual* increase of west declination amounted, on the average, to as many minutes, between the years 1850 and 1860.

The change at Eastport, Me.,  $+1'6$  appears singularly small, but monthly observations, continued between 1860 and 1864, and a verification of last summer, will not admit of any other

value. For the greater part of our Atlantic coast the annual change is confined between  $+2'$  and  $+3'$ , less on the southern coast, the careful observations at Key West between 1860 and 1865 give the comparatively large value  $+2'9$ . Proceeding westward, on the Gulf coast the annual change becomes less, and at the Mississippi delta it is but a fraction of a minute. The Coast Survey report of 1861, pp. 252 and 256, contains the numerical quantities for our southern coast.

If we start from the extreme northeast, in a southwesterly direction, we shall find the annual change as follows: along the St. Lawrence river between the Saguenay river and Quebec  $+6'$ ; between Quebec and Montreal about  $+5'$ ; between Montreal and Kingston about  $+4'$ ; at Portland, Me.  $+3'2$  (from the most recent observations); along Lake Ontario  $+4'$ ; at Toronto  $+3'1$  (from a table of absolute value published by G. T. Kingston, director of the observatory); at Buffalo  $+3'6$ ; at Dunkirk  $+4'3$ ; at Lake St. Clair  $+2'9$ . The average value for Pennsylvania is about  $+2'7$  (see record and results of a magnetic survey of Pennsylvania, etc. etc., by A. D. Bache, LL.D., Smithsonian Contributions to Knowledge, Oct. 1863). At Parkersburg, Western Va.  $+3'2$ ; at Cairo, Ill.  $+2'0$ , apparently a reliable value; at Florence, Ala.  $+2'3$  a very reliable value; the value  $+0'8$  for Chicago, Ill. seems too small, though it is certain that the secular change must pass through zero and increase the eastern declinations along our Pacific coast.

Taking a glance at the West Indies and Central American regions, we find at Havana, Cuba, and in Jamaica the *easterly* declination still on the *decrease*, and the dividing region between stations of decreasing and increasing easterly declination, appears to lie somewhere between Panama and Vera Cruz. At the city of Mexico the east declination *increases* about  $1'$  a year, and at San Blas, Mexico, about  $3'$ ; for California, Oregon and Washington, the value formerly assumed by me (in the Coast Survey reports for 1856 and 1859) appears now too small though we possess as yet no precise information. According to Col. Ransom's paper (vol. ii, of the Proceedings of the California Academy of Natural Sciences, 1858-62, San Francisco, 1863) the annual increase of easterly declination for the epoch 1855 is between  $2\frac{1}{2}'$  and  $4'$ , though  $7'$  is said to have been observed in Alameda Co. I feel inclined to assume now an annual increase of  $2\frac{1}{2}'$  along our western coast,  $3'$  may be taken under the forty-ninth parallel and west of the Rocky Mountains. Higher north, at Sitka, Russian America, the east declination increases about  $4'7$  per annum.

It is in contemplation to have special observations made on the Texan and Western Coast for the purpose of a precise determination of the annual change in those localities.

