

XVIII. *Observations on the Permanency of the Variation of the Compass at Jamaica. In a Letter from Mr. James Robertson to the Right Hon. Sir Joseph Banks, K. B. P. R. S. &c.*

Read June 12, 1806.

SIR,

As any improvement, or discovery in the arts and sciences, will, I am persuaded, experience your favourable reception, I have the honour of submitting to your consideration a discovery I have made on a subject, the state of which can only be ascertained by observations made from time to time, as it is not regulated by any known law of nature: I mean the variation of the magnetical needle.

This discovery may not only excite others to make, and repeat, observations in different parts of the globe, but, by causing this changeable quality to be better understood, may contribute to the benefit of navigation, and commerce, as well as to the advancement of a more particular knowledge of the subject.

It has hitherto been considered, that the variation of the magnetical needle is not fixed in any particular place, but is constantly varying, in a greater or a less degree, in all parts of the world. I have discovered an exception to this supposed general property of variation; and, as it may be, perhaps, the first that has been made, it will require proportionally strong

proof to establish it. This, I flatter myself, I am able to effect, to the certainty of demonstration itself: but, in doing so, I am under the necessity of being more tedious than I could wish, in order to describe fully the data, on which the inference is founded.

I resided at Jamaica, as a King's Surveyor of Land, upwards of 20 years. Disputes at law about boundaries of lands are there decided by ejectments, in the Supreme Court of Judicature, by the evidence and diagrams of King's surveyors of land. This is different from the practice in England, because the manner in which grants of land from the Crown are made, in the two countries is different. In Jamaica, to every grant of land a diagram thereof is annexed to the patent. This diagram is delineated from an actual survey of the land to be granted, having a meriodional line, according to the magnetical needle, by which the survey was made, laid down in it. No notice is taken of the true meridian. The boundary lines of the land granted are marked on earth, (as it is denominated,) by cutting notches on the trees between which the line is run through the woods. These trees being mostly of hard timber, the notches will be discernible for 30 years, or more. By repeated re-surveys these lines are kept up: and, when the cultivation, on both sides, renders it necessary to fell the marked trees, (which can only be done by mutual consent, it being otherwise death by the law,) logwood fences are planted in the lines dividing the properties thus cultivated: and many of these fences have been regularly repaired, and kept up, to the present time. Lands were granted from the Crown soon after the Restoration, in 1660; and every succeeding year the number of patents increased

The old estates have been often re-surveyed, and plans of them made, and usually annexed to deeds of conveyance, or mortgage, which must be enrolled, within a limited time, in the office of the Secretary of the Island; where, also, all the patents, and diagrams annexed to them, are recorded. In all disputes at law about boundary lines, where the keeping up of the old marked lines on earth has been neglected, surveyors are appointed to make actual re-surveys of all the old marked lines on earth, (preserved in the manner before mentioned,) and to extract from the Secretary of the Island's office, correct copies of all such diagrams annexed to patents, and to deeds of conveyance, or mortgage, of lands in the neighbourhood where the disputed boundary is, as they may think necessary for the investigation thereof. They then compare the lines, and meridians, of these original diagrams with those in their diagrams delineated from their own re-surveys recently made; when it is always expected that the lines, and meridians, of the former will coincide with those of the latter. It is evident that this coincidence could not happen if any variation of the magnetical needle had taken place in the intermediate time elapsed between the making of the first, and of the last, survey. My business being very extensive, I was frequently applied to in disputes at law about boundary lines, and I had, besides, abundance of opportunities, on other surveys, to ascertain this fact satisfactorily. From all which I have discovered that the courses of the lines, and meridians, delineated on the original diagrams annexed to patents, from 1660, downwards to the present time, and of the re-survey diagrams thereof, annexed to deeds, coincide with, and are parallel to, the lines and meridians delineated

on the new diagrams from recent surveys made by the magnetical needle, of the same original marked lines on earth, preserved as before described); so that whatever course is laid down for the line on the diagram annexed to the patent, (and let it be supposed, for example, to be north and south, or east and west,) upon setting the compass in the old marked line on earth, and directing the sights north and south, or east and west, according to the magnetical needle, the said marked line on earth, originally run by the magnetical needle 130 or 140 years ago, has been found by me to be exactly in the line, or direction with that of the compass; consequently no alteration of the variation could have taken place during the whole, or any part, of that period of time in Jamaica.

To this it may not be unacceptable to subjoin a short history of the practice of surveying in Jamaica, from the Restoration to the present time, in order to obviate any doubt that might arise, whether there be not a possibility of the quantity of the magnetical variation having been ascertained, and allowed for, in the first diagrams annexed to patents; and whether the variation of $6\frac{1}{2}$ degrees east, which corresponds with the magnetical needle now, might not then, have agreed with the true meridian.

The variation of the compass was first observed by COLUMBUS, in his first voyage across the Atlantic, in the year 1492; and seemed to threaten that the laws of nature were altered in an unknown ocean. It is evident, however, that COLUMBUS was not able to ascertain the quantity of variation; for if he had ascertained it, the danger he was in would have been diminished, if not entirely removed. His discovery, therefore, must have been, simply, the deflection of the magnetical

needle from the true meridian, without knowing the quantity thereof.

From this period down to the year 1700, when Dr. HALLEY published his "Theory of the Variation of the Compass," no observations, ascertaining the quantity of variation, in the West Indies, were, I believe, published. He was the first that made any in South America, and these were chiefly applicable to the coast of Brasil. With his theory was published "A new and correct Chart of the whole World, shewing the Variations of the Compass, &c. as they were found in 1700, by Direction of Capt. EDM. HALLEY." By this chart the variation, at Jamaica, appears to have been the same as it is at present. His theory could have been known but to few; nor do any observations, in the West Indies, appear to have been made for many years after its publication. Indeed I know of none till very lately, and these only in a few charts. But, however extensive its publicity might have been, it could have had no influence in directing the surveys, in Jamaica, that preceded it by 30 or 40 years.

The ascertaining of the true meridian, and, consequently, of the magnetical variation from it, requires more scientific, as well as practical, knowledge, than is often to be met with even at this time; but, 130 or 140 years back, it was entirely confined to a very few individuals. The magnetical needle was then the only guide and rule to go by, both at sea and at land, and, generally, without any reference being had to the true meridian.

Had the first surveyors ascertained the quantity of variation, and allowed for it, in delineating their diagrams that were annexed to the earliest patents in Jamaica, they would

have mentioned the same in such diagrams; otherwise it could only tend to mislead, not to direct. The same system of surveying would, and must, by law, have been continued; for, (as was stated above,) the number of grants has been annually increased; and the uninterrupted practice of surveying, which was always daily increasing in proportion to the extending cultivation and settlement of the island, could not admit of any change, without a new law having been made by the legislature for that purpose: and then such a change must have been recorded with the laws of the island, and with those that regulated the conduct of surveyors. No surveyor, nor other person, could have been ignorant of such a change having taken place. Since even the difference of one degree in running a line is very considerable; but that of six would have totally changed all property, deranged all boundaries, thrown woodlands into plantations, and *vice versâ*: and, consequently, would have been so palpable and injurious as to have demanded legislative interference and correction. But no such change has ever happened, nor has the most remote idea of it ever been entertained. On the contrary, the magnetical meridian, in all disputes at law about boundary lines, is and always has been the only criterion by which the surveyors, the court, and the jury, decide.

From the year 1700, when Dr. HALLEY's theory was published, it is very easy to trace down the practice of surveying in Jamaica, as well as up to its commencement. When I arrived in that island, upwards of 25 years since, I became acquainted with the oldest surveyors there, who had practised from 30 to 40 years. They had the original papers, field notes, and diagrams of their predecessors, up to the

dates of the first surveys. Many of these original papers, field notes, and diagrams are now in my possession; from which the practice of surveying, taking field notes, and delineating them on diagrams, is clearly shown.

Jamaica was early divided into counties and parishes, the boundary lines whereof were defined by the legislature, and the lines of many marked on earth. In the county of Surrey, the line, dividing the parishes of Portland and St. George, is a north and south line, by law, and was marked on earth according to the magnetical needle. It continues in the same direction. In the county of Cornwall, the dividing line between the parishes of St. James and Trelawney continues a north and south line, on earth, as it was first run by the magnetical needle. This will be evident on the inspection of my maps of Jamaica, lately published. It became necessary, in giving the island its true position on the globe, to ascertain its latitude and longitude; and also the true meridian, with the quantity of the variation of the magnetical meridian from it. But I have applied these meridians differently in the maps of the counties, and in that of the island. In the former, in which the situation on the globe is not given, the magnetical is laid down as the principal meridian; because all surveys of every other description, as well as those of the boundary lines of counties and parishes, are regulated by it; and the true meridian is introduced only to show the variation; but, in the latter, in which its place on the globe is fixed, as to latitude and longitude, the true meridian becomes the principal one; and the magnetical meridian shows the quantity of variation from it, and regulates the surveys, and the relative situation of places, as in the county maps.

When Sir HENRY MOORE, (who was considered a great surveyor,) was governor of Jamaica, about the year 1760, maps of that island were constructed, under his immediate direction, by Mr. CRASKELL, the island engineer, and Mr. SIMPSON, both eminent surveyors. But, in these maps, the magnetical meridian only is represented. Neither the magnetical variation nor the true meridian is mentioned: the island's place on the globe, as to latitude and longitude, is not given. In short, the true meridian has never been noticed, nor the quantity of variation ascertained, nor the variation even mentioned, nor the latitude and longitude, observed by any *surveyor or engineer* in Jamaica, but myself.

Although the discovery of the variation's not varying, in Jamaica, is established on the clearest evidence without the aid of other data, yet it is highly gratifying to find Dr. HALLEY, as it were, confirming it to the minutest accuracy, as will appear from the recital of the following observations of Mr. LONG, in his History of Jamaica.

“ The variations of the magnetical needle were observed
“ by Dr. HALLEY to be very small, near the equator. I have
“ seen no account of them for this island, that can be relied
“ upon; but, if observations should be faithfully made here,
“ they would probably confirm his opinion. According to
“ MOUNTAIN'S chart, constructed in the year 1700, from Dr.
“ HALLEY'S tables, the variation at Port Royal then was about
“ $6\frac{1}{2}$ degrees east. But, as in most parts of the world it is
“ found to be continually either increasing or decreasing, so
“ we may reasonably conclude, that it may have altered in
“ both respects very much during this long interval that has
“ passed since the constructing of the chart.”

The magnetical variation, ascertained by me, and laid down in my maps of Jamaica, is $6\frac{1}{2}$ degrees east.

I leave to others, better qualified than I am, to enquire, and to point out, what improvements natural philosophy may derive from this discovery; which I hope may be an acquisition to science.

I am afraid I have been too prolix. But the importance of the subject, and my desire to remove even the shadow of any doubt that might be suggested, will, I trust, be admitted as my apology.

I have the honour to be, &c.

JAMES ROBERTSON.