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JOSEPH HENRY.

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ON THE UTILIZATION OF ATMOSPHERIC CURRENTS IN AERONAUTICS.*

(From the Smithsonian Annual Report for 1860, pp. 118, 119.)

March 11, 1861.

DEAR SIR: In reply to your letter of February 25, 1861, requesting that I would give you my views in regard to the currents of the atmosphere and the possibility of an application of a knowledge of them to aerial navigation, I present you with the following statement to be used as you may think fit.

I have never had faith in any of the plans proposed for navigating the atmosphere by artificial propulsion, or for steering a balloon in a direction different from that of the current in which the vehicle is floating.

The resistance to a current of air offered by several thousand feet of surface is far too great to be overcome by any motive power at present known which can be applied by machinery of sufficient lightness.

The only method of aerial navigation which in the present state of knowledge appears to afford any possibility of practical application is that of sailing with the currents of the atmosphere. The question therefore occurs as to whether the aerial currents over the earth are of such a character that they can be rendered subservient to aerial locomotion.

In answering this question I think I hazard little in asserting that the great currents of the atmosphere have been sufficiently studied to enable us to say with certainty that they follow definite courses, and that they may be rendered subservient to aerial navigation provided the balloon itself can be so improved as to render it a safe means of locomotion.

It has been established by observations now extending over two hundred years, that at the surface of the earth

*[A letter addressed to Mr. T. S. C. Lowe, the Aeronaut, dated Washington, D. C., March 11, 1861.]

within the tropics, there is a belt along which the wind constantly blows from an easterly direction; and from the combined meteorological observations made in different parts of the world within the last few years, that north of this belt, between the latitudes of 30° and 60° around the whole earth, the resultant wind is from a westerly direction.

The primary motive power which gives rise to these currents is the constant heating of the air in the equatorial, and the cooling of it in and toward the polar regions; the eastern and western deflections of these currents being due to the rotation of the earth on its axis.

The easterly currents in the equatorial regions are always at the surface and have long been known as the trade winds, while the currents from the west are constantly flowing in the upper portion of the atmosphere, and only reach the surface of the earth at intervals,—generally after the occurrence of a storm.

Although the wind (at the surface) over the United States and around the whole earth between the same parallels, appears to be exceedingly fitful, yet when the average movement is accurately recorded for a number of years, it is found that there remains a large resultant of a westerly current. This is well established by the fact that on an average of many years packet ships sailing between New York and Great Britain occupy nearly double the time in returning that they do in going.

It has been fully established by continuous observations for ten years collected at this Institution from every part of the United States, that as a general rule all the meteorological phenomena advance from west to east, and that the higher clouds always move eastwardly. We are therefore from abundant observations as well as from theoretical considerations, enabled to state with confidence that on a given day, whatever may be the direction of the wind at the surface of the earth, a balloon elevated sufficiently high would be carried eastwardly by the prevailing current in the upper or rather middle region of the atmosphere.

I do not hesitate therefore to say that provided a bal-

loon can be constructed of sufficient size and of sufficient impermeability to gas to maintain a high elevation for a sufficient length of time, it would be wafted across the Atlantic. I would not however advise that the experiment of this character be made across the ocean, but that the feasibility of the project should be thoroughly tested and experience accumulated by voyages over the interior of our continent. It is true that more eclat might be given to the enterprise and more interest excited in the public mind generally by the immediate attempt of a passage to Europe; but I do not think the sober sense of the more intelligent part of the community would be in favor of this plan; on the contrary, it would be considered a premature and fool-hardy risk of life.

It is not in human sagacity to foresee prior to experience what simple occurrence, or what neglect in an arrangement, may interfere with the result of an experiment; and therefore I think it will be impossible for you to secure the full confidence of those who are best able to render you assistance, except by a practical demonstration in the form of successful voyages from some of the interior cities of the continent to the seaboard.