

**THE CAUSES WHICH PRODUCE
THE GREAT PREVAILING WINDS
AND OCEAN CURRENTS, AND
THEIR EFFECTS ON CLIMATE**

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The Causes which Produce the Great Prevailing Winds and Ocean Currents, and their Effects on Climate by C. A. M. Taber

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C. A. M. TABER

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Author of "The Causes of the Great Prevailing Winds and Ocean Currents, and their Effects on Climate."
BY *C. A. M. Taber*
C. A. M. TABER.

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P R E F A C E .

THE explanations contained in this pamphlet proceed from many years' experience on the several oceans of the globe. Still, however large such unnoted experience may have been, I am well aware of the presumptuous position assumed while drawing from such a source to advance new explanations of natural causes which have been long studied and repeatedly expounded by learned writers. But it is well to consider that such writers have never yet been able to explain satisfactorily the causes which produce the great prevailing movements of the atmosphere and ocean. And for this reason dissatisfaction is frequently expressed at our imperfect insight into phenomena so varying and contradictory to the explanations they have given. Therefore after a long familiarity with the working of the great prevailing winds and ocean currents, I am led to draw different conclusions in regard to their tendency, and the manner in which they are produced, than has yet been published. It is now generally known that the great prevailing winds and ocean currents do greatly influence the climate of the high latitudes, consequently their operations are shaping the future climatic condition of a large portion of the civilized world. Hence, I am led to point out what I conceive to be the tendency of such operations, and wherein they differ from current theories which leave

out of consideration the gradual change of climate which is now progressing in the high northern latitudes. In fact, so comparatively rapid is this climatic change in many northern countries we even find it verified in modern history.

It will be seen that a portion of the facts brought forward to maintain my assertions are taken from well known authors. But this summary is necessarily far too limited to admit full explanations, or even to note many important facts which would greatly strengthen the conclusions I have drawn.

C. A. M. TABER,
Wakefield, Mass., U. S. A.

THE CAUSES WHICH PRODUCE THE GREAT PREVAILING WINDS.

For many years extensive observations have been made to obtain information respecting the changes which are taking place in the atmosphere on different parts of the globe, and through this means much knowledge has been gained regarding the true extent, direction, and velocity of the great prevailing winds.

But with increased knowledge confidence is not proportionally strengthened as it should be in the theories hitherto advanced for explaining their cause.

The theory now taught in our schools is founded on Halley's explanations given nearly two centuries ago; which was long before the general direction of the great aerial currents was known. Yet because of its seeming plausibility for explaining the cause of such prevailing winds as had then been reported by navigators it was generally accepted, and has ever since served to mislead persons striving for information in that direction. Such inquirers supposing the generally accepted theory to be true, have usually been disposed to disregard or undervalue the constantly increasing observations which are in direct conflict with its teachings. The author of this paper commenced with the supposition that Halley's theory explained the true causes which produced the great prevailing winds; but was induced, after many years experience with the winds of the several oceans of the world, to abandon it, even while the barrenness and inadequacy of other theories afforded still less reasonable explanations. Yet wishing to find a consistent explanation for the great aerial circulation of the globe, the natural ef-

facts that should be produced through the diurnal heat of the sun were brought under consideration, and found to harmonize with the great prevailing movements of the air; besides being adequate to perform the world-wide work which is so constantly carried on in the atmosphere.

The object of this paper is to show in a summary manner how the author conceives such work is accomplished, and to point out some of the principal defects of Halley's theory.

This widely accepted theory as now explained is declared to consist in "a great system of surface-currents continually streaming out of bands of high atmospheric pressure, towards a belt of low-pressure around the equator on one side, and towards the poles on the other, and of upper air-currents continually flowing away from the low-pressure areas,—a system set in motion by the greater warming of the equatorial regions by the sun and consequent low-pressure of the atmosphere there than in the regions on either side. It might be that those assumed currents with an uninterrupted circulation should have a direct north and south course; but owing to the diurnal rotation of the earth an object at the equator is carried along with far higher speed than an object nearer the pole. Hence when a current of air travels away from the equator northward or southward it moves in a region of less velocity, yet at the same time carries with it part of its equatorial rapidity of rotation. Now as the earth rotates from west to east, a current of air flowing from the tropics, north or south across the high latitudes, would be forced towards the east, thus causing a south-westerly wind in north latitude, and a north-westerly wind in south latitude. On the other hand, the air which travels from the higher latitudes towards the equator is always getting into regions where the speed of rotation increases; therefore it lags behind, causing a north-east trade-wind north of the equator, and on the south side a south-east trade-wind, the two winds meeting at the equator, where their vapors are collected, thus producing a calm belt of rain clouds encircling the earth."

However correct this theory may appear on certain portions of the globe, it fails to coincide with observations made

on extensive parts of tropical oceans far removed from land, the very places where they should be proved. Such off-shore waters, according to the experience of persons cruising over them, have no regular north-east and south-east trade-winds separated by a calm-belt, but rather, a prevailing easterly wind veering a few degrees north and south of east. Such is the direction of the prevailing winds of the tropical Pacific Ocean where removed from the influence of the American continent. The fact is the equator or latitudes near it do not possess a decided space of rarefied air sufficient to attract the atmosphere of other portions of the torrid zone lying parallel with such latitudes, except in the vicinity of heated lands. The ocean currents from the north and south meeting near the equator prevents a continuous band of heat from being maintained throughout the central portion of the torrid zone. Therefore the north-east and south-east trade-winds prevail only on parts of the ocean lying to the west of continents where the air-currents which move toward the equator are mainly governed by the attraction of heated tropical lands. And when we look for winds streaming out of bands of high atmospheric pressure towards the equator, they are only to be found on parts of the ocean corresponding to the calm rainy regions in the vicinity of continents.

On sailing over the North Atlantic in latitudes bordering the tropic from the longitude of 35° west to the American shores, air-currents are not found to be flowing towards the equator; their general movement ranging from the eastward, and more frequently from the equatorial regions than toward them. And this is the prevalent course of winds on the borders of the torrid zone on the central and western portions of all oceans. Judging from these facts there is lack of proof to show that the easterly winds of the tropics are caused by the air being left behind while on its way from the high latitudes to the equator, through the rotation of the earth, as described in Halley's theory.

The principal differences in atmospheric pressure being caused by temperature, the daily passage of solar heat over wide lands and seas, appears sufficient to give a prevailing

westerly motion to the surface winds of the tropical latitudes. For when we consider the daily passage of the heat of the mid-day sun over the earth's surface it appears that the air on the places passed over must be constantly cooling until the next rising of the sun; while the quicker heating of the air is performed in front of the sun, from sun-rise until the most heated part of the day. This diurnal heating and cooling of the lower atmosphere of the tropical zone causes an uneven atmospheric pressure towards the east and west. For it has been found from numerous observations made within the tropics, that the lowest barometric pressure is during the hour of greatest heat. So the heaviest atmosphere is found in the morning after the nocturnal absence of the sun. But between these extremes of atmospheric pressure barometric oscillations take place; which are supposed to be caused by watery vapor. Yet they are not sufficient to change the general effect produced by the greater extremes of atmospheric pressure caused by temperature. Therefore, the rarefied atmosphere caused by a vertical sun is the attractive point for the cooler air of the east and west. Thus it may seem that the attraction in front of the sun is equal to the attraction in its rear. But we should consider that the attraction following the sun has double the time to act than the opposing force in front of the tropical noon; therefore the last-named force moves the air back a less distance than it is carried forward by the longer attraction, because the more hurried air meets with greater resistance from friction while passing over the earth's surface, besides the greater lessening of pressure in its rear to be overcome with an increased rate of speed.

There is not a more important truth in physics than this: for the difference in favor of the most enduring air-current constantly creates powerful agents to increase its strength; for the prevailing wind not only carries the vapors along with it to be condensed on the western shores of tropical oceans, thus constantly setting free vast stores of heat and thereby greatly adding to its power; also, during such operations, the surface waters of the sea gain a higher tempera-