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THE LAWS OF STORMS.

Two laws or modes of operation seem to govern storms. One is the law of progression, according to which every storm travels along a certain track towards the nearest Pole; and the other is the law of rotation, according to which every storm is an aerial eddy, or whirlwind. As a great whirlwind may be revolving so slowly that the wind produced by it will vary from a gentle breeze to a gale, the term *cyclone* has been adopted for it. Some of these cyclones are exceedingly destructive. In July, 1773, one visited France, and destroyed the crops in 1030 parishes. All the storms that have ever been traced in the middle latitudes of the Northern hemisphere travel east-northward. The cyclones of the North Atlantic ocean arise in the Gulf of Mexico, about 10° from the Equator, and travel at first north-westward, throughout the Gulf; then re-curve, sweep along the coasts of the United States, and cross the Atlantic ocean, towards Europe, in a north-easterly direction. All the great West India hurricanes on record, and most of the great Atlantic storms have been carefully examined, and their paths mapped out; and all confirm the two laws enunciated. In the South Pacific Ocean investigations have also been made respecting the character of the storms which prevail there, and these have also been found to be cyclones, but moving in a different direction to those in the northern hemisphere.

These laws were first announced by Colonel Capper, in 1801, in a work on winds and monsoons; but the late W. C. Redfield, of New York, was the first person who fully investigated the question, collected reliable data, and published convincing proofs of his views, in the *American Journal of Science*, in 1831. About this time Major Reid, of the British Army, was also investigating the same subject, while residing in the West Indies; and Mr. Redfield's paper having come to his notice, he said, "it was the first publication he had met with which appeared to convey any just opinion on the subject of hurricanes." Mr. Redfield traced and mapped a cyclone, which, in October 1846, passed through Honduras, Cuba, and extended beyond Newfoundland—a distance of over 3,000 miles. In December of the same year, one was traced from Arkansas, across New Jersey into the Atlantic; and another from Wisconsin, through Lake Ontario, into the Gulf of St. Lawrence. The width of these was usually limited to from a hundred to a hundred and fifty miles; but strange to relate, the places of the beginning and ending of these storms were undetermined. Near the center of cyclones the aerial current sometimes moves with terrific velocity, and they therefore are very dangerous to vessels at sea caught in their whirls. Their approach is indicated by a great fall of the mercury in the barometer; but an inexperienced navigator may be carried around in one as in a whirlpool, for want of knowledge to guide his bark in the safest course. The clipper *Charles Heddle*, cited by Mr. Redfield, sailing from Mauritius to Muscat, was caught by a hurricane and carried round and round in it for 117 hours. Hurricanes occur most frequently on the Atlantic Ocean in the months of August and September; but they are not confined to any month of the year.

The island of Mauritius lies directly in the hurricane track, and being a most favorable situation for observing these, the Government of France has done much for the cause of science in erecting an observatory there. It has been asserted by Mr. Bosquet, of this observatory, that he can predict the approach of a hurricane and determine the course it will take. The barometer, he states, is affected by an advance aerial wave, which causes it to stand higher than usual; and this inequality of atmospheric pressure causes the mercury to oscillate for a period amounting to about 24 hours in advance of the hurricane.

The Gulf cyclones spend much of their force before they reach the Northern States; but they are very dangerous to coasting vessels. Mr. Redfield first suggested that the telegraph should be employed to give notice of their occurrence, and a coast line of telegraph would undoubtedly be valuable to vessels in port, in giving them warning of approaching danger. The cause of such storms is yet a mystery. It has been asserted by some persons who have expressed opinions on this subject, that they are caused by volcanic eruptions, and electricity; but when asked for an explanation of the mode by which these agencies produce them, they have been incapable of giving a satisfactory answer. It is an undoubted fact that the Gulf of Mexico is the great cauldron whence originate most of the storms that visit the United States and British North America. All our thunder-storms appear to come from it, as the result of great solar evaporation. As intense charges of electricity are developed by the escape of steam from a boiler, through a proper frictional orifice, so the moisture generated in the Gulf of Mexico, carried along by the prevailing westerly aerial currents, seems to generate our electrical atmospheric storms, upon precisely the same principles. This is a subject, however, which is still obscure in many of its features, and it presents boundless scope for observation and reflection.

INADEQUATE MEANS OF ESCAPE FROM FIRE.

The recent terrible disaster at Cohoes, N. Y., where some twenty unfortunate females were burned to death, or suffered such injuries that they died in consequence, awakens public interest anew to the condition of factories generally, as regards the means of escape from fire they afford. If we reflect upon the subject, we shall find that, in nearly all cases, the factories most liable to accidents of this kind are worked by women—the most helpless of beings in time of danger. Cotton mills, shops where cartridges are made, and fireworks of all descriptions: these are the occupations which females seek, as best adapted to their strength and capacity. In the latter class of employments no fire-escape can avail when an explosion takes place; but in the cotton factories of the several States, North, East and West, there are at this moment thousands of precious human lives at the mercy of the first flame that accident or design may spring upon them. It does seem as though some extraordinary provision should be made to meet the necessities of the case. We are aware that lengths of hose are kept stretched in the most extensive works, and that pumps are at hand which would ordinarily flood the building; but these are not all that is required; for while the fires are being subdued, hundreds may perish; and a suitable regard for life and limb should induce corporate bodies to consider whether some additional precaution is not required for the safety of their employes. Let them construct staircases outside of the building, as is done in the large factories abroad, so that the flight or exit of a struggling, panic-stricken crowd of women would not be impeded, or their retreat cut off by a loss of the usual mode of egress. As the case now stands, their safety depends very much upon contingencies, whether the pumps work or not, and whether those imperilled retain presence of mind enough to move orderly and quietly. The exhibition of this latter trait of character is an extremely rare one, and no reliance can be placed upon its manifestation.

While the above remarks are true of factories, they are none the less so of other buildings. Churches, school-houses, public halls, theaters, &c., all require to be remodelled. Perhaps once in ten years there occurs a holocaust of human life, wherein numbers of individuals are burned alive and others trampled to death. The fact is that we build large public edifices like fly traps, very easy to get into, but impossible to get out of, should occasion demand the utmost expedition. Every day large public buildings are being erected all over the land; but we cannot observe, among the glowing descriptions of their architectural beauty, that extraordinary provision is made against fire. This feature is at least of as much importance as any other point, ventilation not excepted; and public interest and private weal demand that a radical change be made in this respect.

CONGRESS OF MECHANICAL ENGINEERS—IRON SHIPS.

The Annual Congress of British Mechanical Engineers was held at Liverpool, during the first week of August, and was attended by a large number of distinguished mechanics—the chair being occupied by Mr. William Clay, in the absence of the president, Robert Napier, of Glasgow. The first paper read was by John Vernon, of Liverpool, on the construction of iron ships. As iron is now employed so extensively in the new steamers which are being built for our navy, and as it will yet take the place of timber to a large extent in our merchant steamers, every item of information obtained from a practical iron ship-builder—like Mr. Vernon—is of importance. The following is a brief abstract of his paper :—

The first consideration is the main points of superiority in iron over wood. These consist in its greater strength and durability, and in the greater carrying capacity of iron vessels over those of wood. Iron affords facilities for obtaining the necessary strength in the keel, stern, stern-posts and screw-port frames, by the introduction of large forgings. Of this, as well as of the power of iron ships to resist damage in case of stranding, the *Great Britain* steamship was an instance. She lay stranded in Dundrum Bay for nearly twelve months without suffering material damage. The best built wooden ship would have been ruined under the same circumstances. Statements had lately gone forth that punched holes in iron plates were very injurious to their strength in ship-building, and drilled holes were recommended in preference. His experience did not seem to warrant much superiority in the drilled over the punched plates. Undoubtedly the metal was subjected to greater strain in punching than in drilling; but when the operation was performed with care, the difference was not great between the two methods. Within two years past, steel had been used, to some extent, in place of iron, in shipbuilding; and, as this metal is twice as strong as iron, so much lighter vessels can be built with it. In using steel plates, it is the practice to allow one-third less weight compared with iron, which is a great advantage as regards the floatage of a vessel. But the price of steel is so much higher than of iron, that even with the reduction of about one-third in weight, the cost of a steel steamer would be about a fourth greater than one of iron. If good steel, however, could be obtained at greatly reduced prices, it should and would be preferred to any other material for building ships.

According to the results of experience, the only objection to the use of iron was the liability of the bottoms of iron ships to become foul, and the derangement of the compass, by the local attraction of iron in the hull. The former, principally occurring in vessels going long voyages, would be remedied by the discovery of better compositions. The second was to be met, with difficulty, by fixing permanent magnets in suitable positions, so as to neutralize the attraction. By the adaptation of iron to the construction of rigging, in the place of hemp, a saving of three tuns in weight would be effected in a ship of 1,200 tuns; with steel the saving would be about 6½ tuns in weight, and about the same saving of cost as in the case of iron. Greater durability and less liability to injury from moisture was gained by galvanizing, as well as, in some instances, by covering the iron with hemp. In the construction of masts and yards, in a 1,200 tun ship, a saving of 26 tuns in weight would be effected by making the three lower masts and the bowsprit of iron; and the proportion would be thus—iron, 25 tuns; steel, 19 tuns, wood, 32 tuns. If the whole of the masts and yards were constructed of steel, a saving of 17 tuns over

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