The Scientific American.

MUNN & COMPANY, Editors and Proprietors,

PUBLISHED WEEKLY

At No. 37 Park Row (Park Building), New York.

O. D. MUNN, S. H. WALES, A. E. BEACH.

TERMS—Three Dollars per annum—One Dollar in advance, for our months.
Single copies of the paper are on sale at the office of publication, and at all periodical stores in the United States and Canada.
Sampson Low, Son & Co., the American Booksellers, No. 47 Ludgate Hill, London, England, are the British Agents to receive subscriptions for the SCIENTIFIC AMERICAN.
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VOL. IX, NO. 10...[NEW SERIES.].....*Nineteenth Year.*

NEW YORK, SATURDAY, SEPTEMBER 5, 1863.

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 northwestward, throughout the Gulf; then re-curve, sweep along the coasts of the United States, and cross the Atlantic ocean, towards Europe, in a northeasterly 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 thunderstorms 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

wood would be effected ; and, if iron were used, the saving would be 5 tuns.

OUR MARITIME DEFENSES.

We paid a visit to the Novelty Iron Works recently, and found a large force of men busily engaged upon the various contracts now under way at that establishment. Some of these engagements are for engines for the Revenue service, the vessels for which are laying at the large dock below. The engines will be of the oscillating class, with cylinders of 40 inches diameter and 40-inch stroke ; fitted with all the recent improvements in modern engineering—including surface condensers, instruments of all kinds for observing the condition of the engine, testing its duty, &c. They are also to have large boiler power, and it is thought that these ships will prove very fast. The Italian frigate, *Re D'Italia*, recently launched from Mr. W. H. Webb's yard, presents an imposing appearance, moored at the wharf alongside the large derrick. She is "top lofty," in sea phrase ; and has all her masts and much of the rigging already set up. The iron mail upon her sides is now in place, and nearly fastened ; though some portions of it (the upper streaks) will only be put on the ship when she arrives in France. The prow is ornamented with a full length figure of Victor Emanuel, who has a sufficiently imposing moustache, and wears a most determined aspect, as though he intended to defy Neptune, and ride over him, as he does over his countrymen—to be not only King of Italy, but King of the Sea.

The engines and machinery of the *Re D'Italia* are first-class, and consist of two 80-inch cylinders, the pistons of which have four feet stroke. They are to have large slide valves, worked by a very simple and elegant arrangement of arms aud levers ; in addition to which there are "tail valves" to each cylinder ; these are merely small slides that enable the engineers to move the large machines with the greatest ease when the eccentrics are thrown out of gear. Two engines of this class are being made at the Morgan Iron Works for a sister ship, also building by Mr. Webb.

The *Dictator*—the large ocean monitor at the Delamater Iron Works—is rapidly approaching a finished state. We are informed that she will be launched some time during the autumn. A strong force of men is at work, although they are not visible in masses, the vessel being so large that they are lost in her. The ship carpenters are busily engaged in putting on the timber backing of the side armor ; it consists of oak logs, about 12 inches square, laid in sections ; in all about five feet, as we are informed : outside of this there will be ten and a half inches of iron, also put on in sections. The engines and turret machinery are well along, and progressing favorably.

The character of the engines is the same as those on all the monitors, with the exception that the cylinders and all reciprocating parts are vertical ; a desirable feature in engines of this size—namely cylinders 100 inches in diameter by 4 feet stroke of piston.

In the state they now are no adequate description can be given of the general arrangement, except to say that the cylinders are set amidship, and the air-pumps aft of them ; that the steam chests are on the outboard side of the cylinders, where the bonnets can be readily removed, and that expansion valves are provided.

We were told by the workmen that one of the cylinders fell down a distance of five feet, while suspended from the shears, which ruined it so that it had to be replaced by one cast for the *Puritan*, consort, now building, at Greenpoint, by Thomas F. Rowland. The cause of the disaster was the breaking of the guy ropes which stayed the shears ; fortunately, no lives were lost. The company incur a heavy expense by this unavoidable accident, which we regret very much ; the completion of the ship will not be delayed by the casualty. The overhang of the armor shelves on the sides of the *Dictator*, is much less than in the monitors, being only some two feet ; while the projection forward and aft is also less than the same parts in the smaller batteries ; we notice that the armor shelves are strengthened by the addition of iron-plate sponsons.

The *Dictator* has an immense screw propeller, of 21 feet 6 inches diameter, and 32 feet pitch ; there is no outboard bearing for the shaft. The boilers are six in number, three on each side, and are of the return tubular pattern. The ship herself is 320 feet in length, 50 feet in width, and 20 feet deep ; there will be two turrets, whose walls are 15 inches thick ; outside diameter to us unknown.

The *Dunderberg*—a wooden vessel, immensely thick and strong in the hull—is assuming shape and form as rapidly as human hands can do the work. Mr. W. H. Webb is her builder, and the singular appearance of the hull, as well as the monstrous projecting ram forward, attracts much attention, and provokes criticism from every one, whether competent to pass judgment or not. The whole ship is solid throughout, frames, floor and bulwarks ; and with solid casemates, solid plating, guns, engines, commander and crew, she will doubtless prove a valuable addition to our national defenses.

There are numbers of other iron-clads in various parts of the city and suburbs, which we have not had time to visit, but which we hope to inspect at an early day.

THE DIGNITY OF LABOR.

Very much has been said, at different periods of the world's history, about the dignity of labor ; and orators and politicians have turned many pretty periods, and rounded sentences with sonorous allusions to the "bone and sinew of the land." The admiration and adulation of these gentry is partly true and partly false, and too often their sentiments are uttered for sinister purposes. In either event, whether the after-dinner speakers mean what they say or not, no lover of his race can withhold his hearty admiration for the sturdy, law-abiding, hard-working mechanic, who toils with the sun, and wrests from his trade a modest but certain support. The little picture of his home, beautified by the taste of his equally frugal wife ; the children who share his hearth and cot : these have been held up to public view, and have been admired and dwelt upon with pleasure, as they should be. This is one aspect of the mechanic's social position ; and another is that one in which, by the universal consent and vote of his fellow-citizens, the artisan aspires and is elected to an honorable office, in which neither political wire-pulling nor trickery are of any value. The dignity of labor is then realized in the reward of industry and honesty, and the preferment which naturally follows in the wake of integrity when manifested in any sphere of life.

But there is no dignity to be found in those laborers who fritter away their time, and reduce their families to want, by hanging around pot-houses, or in loafing about places where idlers resort. There is no moral worth or value in those individuals who lounge about workshops, and condole with their fellows upon the small amount of wages they receive : who endeavor to incite strikes, thereby bringing beggary and ruin upon themselves ; who deprecate and ridicule the efforts of apprentices to improve their spare hours with study ; and who, in brief, embarrass every good and noble movement by sneering and declaiming against it, or by manifesting spite and opposition to moral and physical advancement of every kind. There is no dignity in the laborers who represent this class let them belong to whatever handicraft they may. They stand metaphorically in the position of Samson of old ; with either arm around the columns of the social temple, they topple the whole fabric to its fall, careless that they also are involved in its destruction. If there were any good workmen among those misguided individuals who lately defied the law in this city, they must have been there through terrorism and compulsion, and not from choice ; for the respectable artisan flies from such scenes of chaos, as from an epidemic, and knows only too well the stigma which attaches to a mobocrat.

TREMENDOUS FORCE OF RIFLED PROJECTILES.—During the furious assault upon Fort Sumter, the first shot fired from the 200-pound Parrott rifle penetrated nine feet into the wall facing Sullivan's Island, after first passing through the gorge wall of the fort ; it knocked over a pile of brick upon a steamer outside of the wall, demolished its smoke stack, and caused the boiler to burst, by which casualty four negroes were killed.

UNINFLAMMABLE FABRICS.

A report has been presented to the French Academy of Sciences by M. M. Payen, Valpeau & Rayer, on treating muslin fabrics to render them uninflammable. Therein it is stated that only three salts have hitherto been found which may be successfully employed in preparing ladies' muslin dresses, &c., to prevent them from taking fire. These are the phosphate and sulphate of ammonia, and the tungstate of soda. To apply them, the phosphate of ammonia is mixed with half its weight of the hydro-chlorate of ammonia, and 20 per cent. of this mixture is dissolved in water, in which the muslin is to be immersed. A solution of 7 per cent. of the sulphate of ammonia produces a similar result, and it is the most economical salt that can be employed for the purpose. But the best solution for dresses, &c., which require to be finished with a hot flat-iron, is that of the tungstate of soda : about 20 per cent. of which should be used in the solution. To obtain the best effects, these solutions should be applied to the dresses after they are starched and dried. Acid tungstates, borax and alum, although they render muslins uninflammable, tend to injure the strength of the material. The sulphate and phosphate of ammonia should be employed on cotton and linen fabrics that do not require to be ironed ; the tungstate of soda for those that are to be ironed. The latter is therefore the safest substance for use in families.

STEAM ON CITY RAILROADS

The whole of this city is being girdled and intersected throughout by lines of railway, that, when complete, will afford the utmost convenience for reaching every street and avenue in its confines. The Third Avenue Railroad is worked exclusively by horses, as are all the other lines. The first-named corporation employs nearly 1200 horses ; and, as a matter of course, has to feed and care for that number ; attendants have to be provided, hostlers, drivers, horse-shoers and others. Large buildings are required, covering an immense space, on which the rate of insurance is necessarily high, from the inflammable nature of the contents : in short the maintenance and support of such a vast number of horses requires an immense outlay of capital, and entails enormous expense to keep the concern at work. These details will all be repeated in the "Gridiron" railroad, and the number of animals required for the several routes must be very great. In view of these facts, does it not seem a little strange that, while the ingenuity of man is capable of furnishing an efficient and economical substitute for the use of horses on city railroads, the managers of these should refuse to avail themselves of such an improvement, and humbly jog along in the same way that other old fogies have for years.

In the small space afforded by the platform of the ordinary city car, steam engines might be placed which would do the work of three teams, without a tenth part of the fuss, dirt, labor, and loss of time involved by the use of animal power. The engine wants no stable, comfortably arranged and fitted, to preserve its health, and the oats it demands are not greater in quantity, considering the amount of work it performs, than the rations of the horse ; it is not exposed to the weather, and seldom gets sick, unless badly made and managed, and there is no more danger from its use than there is in the boilers full of water placed beside the kitchen ranges in houses all through the city. The same care and oversight required in one case will answer for the other.

The prejudices of property holders regarding the use of steam, should not be suffered to stand in the way of a great public convenience, for such it would certainly be. The cars could be run much more quickly, with greater certainty of making time without abusing the horse, they would take less room on the track (a consideration of no small importance), and the whole working expenses of the road would be reduced materially : this is we fancy the most interesting part of the matter to stockholders. Why should we not have steam on our city railroads? Now, if ever, is the time to introduce it, when the whole city is to be turned into a line of railway.

A PHILADELPHIA paper notices that one effect of the draft in that city has been to drive away all the organ-grinders.