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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 258,

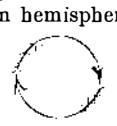
For the Week ending November 6, 1880.

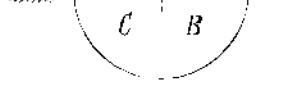
Price 10 cents. For sale by all newsdealers.

THE LAWS OF CYCLONES.

There seems to be no subject of equal importance so little understood as the laws governing the revolving storms of wind known as cyclones. That this should be the case among landsmen who rarely encounter them is not strange; but that sailors and *soi-disant* scientists should fall into gross errors in treating so simple a subject is not only unpardonable, but incomprehensible. The cyclone, as it is called in the northern hemisphere, or the typhoon, by which name it is known in the southern seas, is a revolving storm of wind, having a diameter of from 100 to 800 miles, and a spot of actual calm in the center. This storm revolves at a velocity increasing from the edges toward the center, where it sometimes attains a rate estimated at five miles a minute. The whole disturbance also moves forward at a speed varying between five to forty miles an hour. The great difficulty in understanding the phenomena of the cyclone is due to this double motion—a lateral movement of the whole storm over the face of the earth, and a revolving motion around its axis, or center. The general movement of the storm is confounded with the direction of the wind at any given point, and *vice versa*, so that oftentimes a captain, by putting his ship before the wind, in the idea of running away from the storm, is really steering straight into the track of its most dangerous part, namely, the center. Yet the means of knowing how to avoid this danger are so easily attainable that no captain nor mate ought to be allowed a berth on shipboard unless he is thoroughly acquainted with these simple rules.

Let us examine the conditions of the problem.

In the northern hemisphere the wind rotates "against the sun;" that is, opposite to the direction of the hands of a watch placed face upward, thus,  ; and in the southern hemisphere the motion is reversed, thus,  . Now it is evident that a vessel may come into the range of a cyclone by being overtaken by it—generally the case with sailing ships—or by running into the area of disturbance. In the first case the cyclone center will steadily approach her unless she runs in the right direction, while in the latter case it may be that she will feel the influence of the cyclone less and less as it draws away from her. The vessel must come into its influence in one of the quadrants indicated by the letters A, B, C, and D, in the figure, the direction of the forward motion being shown by the arrow.



So long as a ship was anywhere in either quadrant, A or B, she would feel a constantly increasing power of the wind, and would be in a steadily increasing danger. If a steamer should run into either of these quadrants she ought at once to take such a course as would carry her away from the center; while a sailing ship should do likewise so long as the wind and sea were not too heavy, and then "lie to" on the proper tack. If a steamer entered either C or D quadrants she would be obliged to change her course very little, if at all, and a sailing ship could actually derive a benefit from the cyclone by keeping in its edge as long as the wind and sea permitted her to do so.

Now the great question to be determined is: How can a captain tell which quadrant he is in when he enters a cyclone? First of all, he must always observe the weather and the barometer so closely as to know at the earliest possible moment when a cyclone is coming. Having assured himself that the approach of a cyclone is certain, he should carefully watch the wind and notice in which direction the shifts occur. These gradual changes in the wind's direction constitute the most marked features of the cyclone, since there is only one position in which they will not be immediately observed, namely, if the ship lies exactly in the path of the center of the hurricane in its onward course. When these changes in the direction of the wind have become clearly marked, he should apply the following rule, which is invariable in both hemispheres: When the shifts of wind occur from right to left, that is, say from north to west, west to south, south to east, or east to north, the observer is in quadrant A or quadrant D, that is, on the left hand side of the cyclone's advance facing in the direction in which it is moving; but if the shifts come from north to east, east to south, south to west, or west to north, the observer is in quadrant B or quadrant C, on the right of the storm's track. Knowing on which side the storm center will pass, it is an easy matter to avoid it. The difference between quadrants A and B and quadrants C and D will soon be discovered by the fact that in the first pair the storm will steadily increase, while in the two latter the strength of the wind will diminish. When a sailing ship has run away from the center as long as the wind and sea will permit her to do so, she must invariably follow this rule in "lying to:" If she is on the right hand side of the storm center's track she must "lie to" on the starboard tack, and on the port tack if on the left hand side. She will thus escape the danger of being caught aback by a shift of wind which might result in her sinking stern foremost.

If the weather and the barometer both clearly indicate a cyclone, but there are no shifts of wind, the captain may consider it certain that he is exactly in the path of the hurricane; and during the first few hours of the storm there is a direct relation between the rapidity with which the wind changes its direction and the proximity of the vessel to the cyclone's track: the slower that the shifts occur the nearer the vessel is to the path of the center, especially if the increase in the wind's strength is great; but if the shifts occur rapidly and steadily without a very great increase in force, the center will not pass very near. A careful seaman, consulting his experience and his barometer to discover the approach of a cyclone, observing carefully the foregoing rules to determine on which side of and how near him it is going to pass, and using a prudent discretion in avoiding its center, ought never to lose his ship.

THE CULTIVATION OF THE SUMAC.

There are thousands of people who wander through the woods in autumn picking the beautiful scarlet and yellow leaves of the sumac bush to decorate their rooms, without knowing that there is any other use for the plant. Yet the importation of the sumac into this country this year will amount to about 11,000 tons, costing about $1,100,000. The leaves of the sumac, dried and ground, are largely used in tanning and dyeing, and in Sicily and other parts of Italy the plant is carefully cultivated and treated. In view of the fact that the American sumac contains from 6 to 8 per cent more tannic acid than the Italian, and remembering that the plant grows wild in profusion throughout this country, it seems reasonable to believe that it might be made a very profitable crop. At the present time the amount of native sumac brought into market does not exceed about 8,000 tons yearly, and its market price is only $50 per ton, just half the price of the Italian product. This large difference in the market value of the foreign and the domestic article is due to the fact that the American sumac, as at present prepared, is not suitable for making the finer white leathers so much used for gloves and fancy shoes, owing to its giving a disagreeable yellow or dirty color. The many attempts that have been made to avoid this difficulty by care in collecting and grinding the leaves have not resulted in success, and it has long been supposed that this objectionable quality was inherent in the American plant; but Mr. Wm. McMurtrie, in a report to the United States Commissioner of Agriculture, shows that this difficulty can be surmounted and the American product made even superior to the foreign.

Mr. McMurtrie made a number of tests to learn the relative amounts of tannic acid found in the leaves at different periods of their development, and while the amount was found to be greatest in the leaves gathered in July, he found that those gathered in full development in June were even then more than equal to the best foreign leaves in this respect. But further, he found that the deleterious coloring matter (due to the presence of quercitrin and quercetin) was not yet developed, and that therefore the American leaves gathered in June were superior to the Italian for all purposes. The importance of this discovery may be seen by the fact that the cultivation of the plant may be carried on most profitably in this country as soon as manufacturers and dealers recognize the improvement thus obtained in the domestic article, and by classifying it according to its percentage of tannic acid and its relative freedom from coloring matter, advance the price of that which is early picked and carefully treated.

In Italy the sumac is planted in shoots in the spring in rows, and is cultivated in the same way and to about the same extent as corn. It gives a crop the second year after setting out, and regularly thereafter. The sumac gathered in this country is taken mostly from wild plants growing on waste land, but there is no reason why it should not be utilized and cultivated on land not valuable for other crops.

THE COLOR OF OZONE.

A paper recently read before the French Academy of Sciences contains some interesting facts relative to the liquefaction of ozone. A reservoir containing oxygen, at a temperature of 9·4° below zero (Fah.), is charged with ozone, and pressure applied by a column of mercury acted upon by a hydraulic press. Immediately the gas begins to turn to an azure blue color, deepening the shade as the pressure increases. The liquefaction of ozone was obtained by applying a pressure to the ozonized oxygen of 75 atmospheres, while 300 atmospheres of pressure would have been required for pure oxygen. The fact was also established that ozone is an explosive gas, since, unless compressed slowly and at a low temperature, it exploded with a yellow flame. Its heavenly blue color was rendered manifest not only under heavy pressure, but under all circumstances.

UNTIMELY SNOWS.

The retreating winter of the southern hemisphere goes out like a lion, while the first showings of our coming winter are by no means lamb-like.

A dispatch from Buenos Ayres says that a terrific snow storm occurred in that province September 18, causing the death, it was estimated, of 700,000 cattle, 500,000 sheep, and 250,000 horses.

On the 15th of October a furious storm fell upon Western Iowa, attended by a heavy fall of snow, which drifted seriously during the following day. On several railroads trains were blockaded by drifts from five to seven feet deep. The snow fell heavily in Southern Minnesota, causing great interruption of travel and telegraphic communication. The storm moved eastward slowly, raging with greatest fury over Lake Michigan, wrecking a number of vessels and causing a

serious loss of life. Even as far east as Western New York the snowfall was from twelve to fifteen inches, and badly drifted. Between Buffalo and Rochester several freight trains were stalled, and the passenger trains of the morning of October 18 had to be abandoned. So early and so severe a snowfall is quite unusual.

THE CAPE COD CANAL.

From time to time, for the past two hundred years, the merchants and shipmasters of Boston and New York have agitated the question of severing, by a ship canal, the narrow neck of land between Buzzard's Bay and Barnstable Bay (the inner portion of Cape Cod Bay), and thus saving the dangerous passage around Nantucket and Cape Cod. More than a century ago a committee, favored by Washington, examined and reported upon the feasibility of the project, and recommended its execution on commercial and military grounds. The need of such a channel of inshore communication was severely felt during the war of 1812, and in the years immediately succeeding the war the project was often brought up for public consideration. Between 1818 and 1824 the route of the proposed canal was re-examined by order of the State authorities of Massachusetts, and in 1825 a careful survey was made by Major Perault, U. S. Engineer, under the direction of the President of the United States.

The results of the survey, with plans, estimates, etc., were laid before Congress in 1826. Two years later the Board of Internal Improvement adopted a route for the canal, and there was every promise of its early execution. But a change of administration occurred, and with it a reversal of the policy of the general government touching the question of internal improvements, and the affair was dropped for thirty years or more.

In 1860 the State authorities of Massachusetts revived the project, obtained the assistance of the Coast Survey, and got together much information directly bearing upon the feasibility and probable benefit to flow from the work.

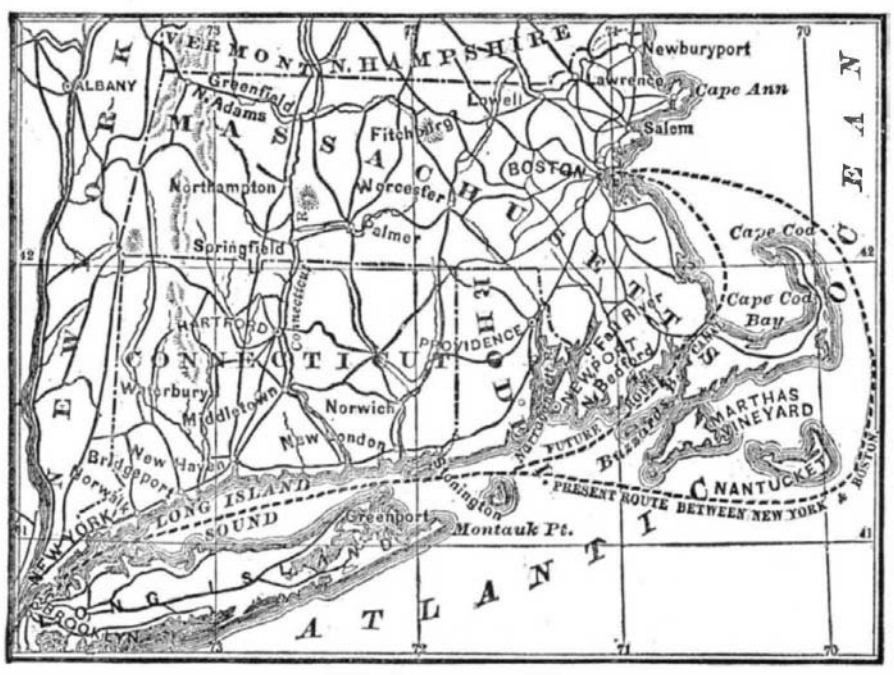
The exigencies of the war, however, prevented the carrying out of their plans at that time, and the years immediately following the war were not favorable for such enterprises. So the matter rested until a few months ago, when a merchant and shipbroker of this city took up the scheme, enlisted a number of New York capitalists in the enterprise, purchased, under an unexpired charter, a strip of ground a thousand feet wide across the neck of land to be severed, and set to work to dig the canal. The contract was given to Adam Driesbach and John Cameron, of New Jersey, and Mr. Geo. H. Titcomb was placed in charge as engineer.

The position of the proposed canal is shown in the accompanying map. The neck of land to be cut through is a little short of eight miles across. Two small rivers, the Monumet and the Scusset, make a shallow water way about seven-eighths of the distance, the narrow dividing ridge, five miles from Buzzard's Bay, rising only thirty-five feet above the average level of the bays on either side at low water. The earth to be removed consists mostly of gravel and is easy of excavation. The canal will be without locks, and owing to the difference in the times of high and low water in the two bays it is expected that a current of two miles or more an hour will traverse the canal four times a day. In width and depth the proposed canal compares with other ship canals as follows:

Canal.	Width at mean level. Feet.	Width at bottom. Feet.	Depth at mean level. Feet.
Cape Cod Canal	225	66	25
Caledonia Canal	110	50	20
North Holland Canal	123	31	20½
New Amsterdam Canal	191	87	23
Suez Canal	190	72	26

The direct advantages of the canal are the saving of ninety miles of distance and at least eight hours of time on the trip from New York to Boston. The incidental advantages are the avoidance of delays through fogs and rough weather while rounding Cape Cod; escape from the serious dangers attending the navigation of that dangerous coast, the present average loss by shipwreck on Cape Cod being something like 6,000 tons of vessel property a year, and from twenty to forty lives. In addition, the safe inshore route which the canal will provide will enable the popular Sound steamers, which cannot endure the outside passage, to run the entire distance to Boston. By this route steamers for freight and passengers will be able to leave New York in the evening and reach Boston early the next morning, making between the two cities one of the most inviting excursion routes imaginable. For general freight traffic between these ports—indeed for a large part of the coasting trade—the canal cannot fail to prove economical. It is estimated that not less than 40,000 vessels round the cape every year, carrying cargoes valued at $600,000,000. The friends of the canal expect that fully 4,000,000 tons of shipping will use the canal the first year. The saving in insurance, time, crew's expenses, etc., is estimated at $1,500,000.

The subscribed capital of the company formed for digging the canal is reported at $8,000,000, of which it is said that $1,500,000 have been paid in. The work is to be completed in two years, if the plans of the company are carried out.



THE CAPE COD CANAL.

A Five Hundred Dollar Comet.

To the Editor of the Scientific American:

I hasten to say to the astronomical readers of the SCIENTIFIC AMERICAN that on the evening of the 10th instant, just before midnight, I discovered a new comet in about right ascension 21 hours 30 minutes, declination north 17° 30′, or in the constellation Pegasus. It was very large, and its apparent motion so slow, and I have been so troubled to see it in the evening by moonlight and in the morning by haze and clouds, that I am yet uncertain regarding its direction and rate of motion. I can say, however, it is moving very slow, and probably west of north. Its slow apparent motion indicates that it is either moving nearly toward or from the earth.

It is so nearly in opposition to the sun (the earth being nearly between the two bodies) that its distance from the sun must be equal to the earth's distance (ninety-two and a half million miles) with the comet's distance from the earth added, whatever that may be, so that its distance from the sun must be very great.

It is, or was when discovered, apparently on the border land between brightness and faintness as applied to a telescopic comet. Its great apparent magnitude may be owing to proximity to the earth, but if, as is probable, it is at a very great distance from us, its real magnitude must be enormous.

As soon as the moon withdraws, observations of a reliable character will be made by such astronomers as have a clear sky, when the elements of its orbit will be approximately determined, and its magnitude, distance from both earth and sun, and many other interesting facts ascertained.

It is greatly to be hoped that it prove a bright one, that it may be satisfactorily subjected to spectroscopic analysis, for no large and bright comet has appeared since the invention of the spectroscope.

Whether science will be benefited or not, my pocket has been, for Mr. Warner, who is building for my use the "Warner Observatory," probably the finest private observatory in the world, has just handed me a check for $500 for discovering it. This munificent gift, together with the gold medal I shall get from the Imperial Academy of Sciences of Vienna, makes it a comet which has some remunerative qualities about it which can be seen with the naked eye. During the whole history of astronomy, I think this is the highest price ever paid for a comet.

LEWIS SWIFT.

Rochester, N. Y., October 16, 1880.

Importance of Scientific Research.

The Philadelphia *Ledger* thinks that the scientists employed by the government have generally given a full return for the money expended upon them and their labors, and if Professor Riley has really found a means of putting an end to the ravages of the cotton worm, the editor adds, he will have paid in a single season for a whole decade of accumulated salary. So many scientists of our day turn speculative philosophers, and confound the public mind at least as to what is known and what is simply guessed at, that science, so far as they may represent it, is brought into disrepute, but the labors of real observers and experimentalists continue to be of immeasurable value to workers everywhere and in all kinds of occupations. The economic work of topographical and geological surveyors, of entomologists and meteorologists cannot be done effectively by private institutions or by individuals. The government must look to it "for the general welfare," and there is no danger that too much of it will be done. The discovery of a means of stopping the ravages of a single pest like the grasshopper, or the army or cotton worm, or the potato bug, is worth more than has been expended by the government on purely scientific labors since the foundation of the government.

The Keeley Run Colliery Fire.

The failure of the attempt to stop the fire in the Keeley Run Colliery, Pennsylvania, by flooding the mine, was noticed some months ago. The attempt to suppress the fire by means of carbonic acid gas and nitrogen has been equally unsuccessful. That part of the mine in which the fire is has been closed up, and is estimated to have a capacity of 12,000,000 cubic feet. It is claimed that 6,000,000 cubic feet of gas has been forced into the mine daily for some weeks, but it has had no effect upon the fire.

Cresolene for Epizooty.

The following experiment in the treatment of a case of epizooty is reported to the *Tribune* by George Shepard Page, of Stanley, N. J. An ordinary stall containing a sick horse was lined and inclosed with sheets of carbolized paper. A vaporizer was set in operation, evaporating chemically pure cresolene ($O_6H_5CH_3O$). The horse had been coughing very frequently, the offensive discharge from the nostrils was profuse, and the eyes were dull and sunken. In ten minutes the inclosed space was charged with the vapor. In half an hour a copious discharge of mucus took place. The animal exhibited evident relief, holding its nose over the grating through which the vapor was issuing, the vaporizer being placed in the iron feed box, over which a perforated grating was arranged. He remained in the inclosure for six hours. The effect produced was marvelous. The cough ceased, the discharge from the nostrils was entirely checked, and the eyes regained their normal condition of brightness.

INCENDIARY SILKS.

Our readers will recall the interest that was awakened some months ago with regard to the spontaneous combustion of certain silks on shipboard and in warehouses in this city. The burning of the storage warehouse in Leroy street, apparently from this cause, led to the appointment of a committee of investigation by the New York Board of Fire Underwriters. They have now completed their inquiries and issued their report, which conclusively establishes the fact that the fire in question and other fires in the same warehouse and elsewhere must have been caused by the spontaneous combustion of black silk yarn, thread, or twist, a class of fabrics often so loaded with dangerous dye-stuffs as to be at all times liable to burn of themselves. Five fires—four in this city and one in Philadelphia—are proved to have this origin, involving heavy losses and the peril of property valued at hundreds of thousands of dollars.

The evidence collected includes chemical analyses and the opinions of scientific experts, as well as the direct testimony of witnesses to the effect that in many if not all the cases examined the fires originated *within* the packages of incendiary silk. The committee refer also to fires occurring while packages of weighted silk were being transported by rail or water—for example, that of the Mosel in mid-ocean a year ago, which fire began in and was confined to cases of heavy sewing silk so stored that fire could not have taken from without.

All this merely confirms the information long since brought out abroad in consequence of fires unmistakably traced to weighted silks. It was found that certain European silk manufacturers were able to "load" silk in dyeing to such an extent that the product would yield by analysis three or four pounds of chemicals for every pound of pure silk; and yet the thread would show no visible signs of adulteration. The animal, vegetable, and mineral substances thus united with the silk fiber forms a very unstable compound, liable to rapid oxidation with a consequent heating, which under favorable conditions results in active combustion or fire. Such goods have been known to smoulder and take fire not only while closely packed in cases, but also when lying in piles upon shelves freely exposed to the air; and so dangerous are they that certain European railways have been compelled to forbid their being carried as freight. Reporting upon the fire in the Leroy street warehouse, Fire Marshal Sheldon had no hesitation in pronouncing it due to spontaneous combustion of the silk twist therein stored, and he frankly suggested that the Board of Underwriters should take steps to prevent the storage of such materials in bonded warehouses within the city limits. The matter is evidently one that importers and dealers in silks will do well to consider carefully. The profits on weighted silks may be very large, but they will hardly justify the handling of them at the risk of burning one's entire establishment.

It would seem that nations prefer not their own thermometers, but other people's. It was Germany that invented the Fahrenheit scale, which we have appropriated, the Fatherland itself preferring to employ that of a Frenchman, Réaumur; while France will have none of Réaumur, but uses the Celsius or Centigrade, whose introduction is due to a Swede.