

## Science & Mechanics.

### SNOW CRYSTALS.

"Fire, and Hail; snow and vapours; stormy wind fulfilling His Word."

Living as most of our readers do in a country and climate where ice and snow predominate for a third of the year, it may not be inapt to give to the non-scientific portion of them a familiar exposition of the formation of ice and snow.

Water freezes at a temperature of 32° Fahrenheit or at 0 centigrade, but the first processes of its change may not be generally known. As seen on the surface of ponds during periods of frost in winter, the first congelation is attended with the almost simultaneous appearance of long needles, radiating for the most part from the sides of the bank, within the margin of the water; these increase in length, sometimes appearing divergent and sometimes parallel. Those at the sides are generally the first to make their appearance, but, by degrees, others similar in form gradually form at intervals on the surface, transversely, and in all directions, until the very smallest interstices are filled. The needles are laminated, as may be distinctly seen on the surface of thin and newly-formed ice. But the freezing of water is not always so accomplished; it frequently happens that the needles on the surface, generally those towards the surface of the pond, group themselves into stars of three or six radii, feathered on either side with fine spicules, which quickly form a crystalline encrustation of serrated outline, giving to each radial arm or pinnule the appearance of a frond of fern. If the frost continues, in the course of a few hours as the ice thickens these beautiful markings become obliterated.

The crystallization of water or vapour in the upper regions of the air is a still more interesting field of enquiry, and leads us to the consideration of snow. Very little is as yet known respecting the formation of snow, excepting that it is water congelated in the higher regions, and can only be formed at or below a temperature of 32°. It falls for the most part in flakes of such density, that about ten inches of snow produce water to the depth of an inch; but it is not always that snow assumes the form of flakes, it occasionally falls in clusters of small needles or spicules, sometimes broken in their descent into the finest possible fragments, while at other times it descends in minute and highly crystallized stellar particles, designated by ancient writers as Polar snow, and generally supposed to be common to the more northern latitudes; its density in our Canadian winters, when the temperature of the air is at or near zero, is more than when it falls in flakes, and may be estimated that about eight inches are required to produce an inch of water. To use popular language, blowing snow, or snow that falls in large flakes, and snow that falls in spicules, hold the following proportions—the first requiring a fall of ten inches, the second a fall of eight inches to produce an equivalent of rain water an inch deep.

The simple or elementary crystals of snow, formed at or near the freezing-point (32°), bear considerable analogy to those on the surface of the water already referred to. Water crystallizes at an angle of 60 degrees; in accordance with which law the snow crystals are compounded of hexagons, and their component parts respectively arranged at an angle of 60 degrees. The great variety observable in the conformation of snow crystals is remarkable, and adds not a little to the complexity of the problem, respecting the conditions and circumstances attending their crystallization. It is generally supposed by scientific meteorologists that the crystallization of snow is intimately connected with the electrical and chemical condition of the air. Sir Edward Becher in his work on the Arctic Seas, has devoted many pages to the subject and has divided them into three classes—

1. "Stars and garters—from their resemblance to the order of knighthood and perfection of crystal, or such as might result from temporary currents of electricity suddenly forming and condensing vapour, as compared to fine, light, passing showers between bright gleams of sun."

2. "Rain-heavy flocculent snow, cohering, and into which the travellers and sledge sank deeply, warning the intelligent officer that he had better pitch his tent."

3. "Bad-omened—fine, specular snow, the result of No. 1 broken by the wind into fine particles."

The study is a very interesting one—the snow crystals are beautiful microscopic objects, and by collecting them as they fall on a piece of glass, having its under side blackened, they can be examined by either a simple or compound microscope in a room whose temperature is below 32°. Those who have not a microscope may use a single lens of about a quarter of an inch focus, which may be obtained for about fifty cents from any optician. Those who do not care to be exposed to a temperature below 32° may obtain the Report of the British Meteorological Society for 1855 in which Mr. James Glaisher, Director of the Meteorological Department of Greenwich Observatory, has treated at length on these interesting snow crystals, and appended illustrations of more than 150 varieties—some of the designs or forms are of great beauty, so much so that in the *Art Journal* for March and April, 1857, there appeared an article on the "Application of Snow Crystals for the purpose of Design."

It is our intent to treat, week by week, on

various things in such a popular manner that interesting and valuable facts may be imparted to our juvenile readers so as to lead them insensibly to further inquiries in the physical sciences, literature and the arts, and to communicate knowledge which is best adapted to the wants of the day and in a form which is best suited for the generality of readers.

A new blue, approaching in beauty of colour that of ultramarine, has been introduced. Metastall antimony is dissolved in commercial nitric acid, and the solution filtered through powdered glass; to this is added a weak solution of the yellow prussiate of potash. The precipitated colour is then washed and dried.

It has been decided to pierce the tunnel of St. Gothard, in Switzerland, by means of lithofracteur; 25 tons of this explosive body have just been purchased by the engineers in charge of the work. Some idea of the extent of the undertaking and the exceptional hardness of the rock to be traversed may be formed from the fact that at least 1,500 tons of lithofracteur will be the total amount required.

Professor Boissigault, in the *Annales de Chimie et de Physique*, for August records a series of experiments, founded on the old experiment of the Florentine Academicians of bursting an iron vessel by the freezing of water, which fully prove that if the vessel in which the water is enclosed be strong enough to resist the expansive force of the water in the act of congelation, the water will remain fluid at the lowest temperature to which it may be exposed.

The scientific expedients which have been recently put forward for mitigating the evils of the Channel passage are about to be anticipated by a practical experiment on the part of the South Eastern, the London, Chatham, and Dover, and the Northern of France Railway Companies. The managers of these three companies have made an arrangement for jointly guaranteeing interest upon money to be expended in deepening and otherwise improving the harbours at Dover and Boulogne. Four large steamers similar to those which run between Holyhead and Kingstown are to be built, at a cost of £10,000 each, so constructed as to carry 600 passengers and accomplish a speed of seventeen knots an hour. The existing steamers accommodate only 200 persons, and make about fourteen knots an hour. The changes will no doubt do much towards increasing the comfort of passengers crossing the Channel, but the difficulties in the way of perfecting them are so great that nearly two years will elapse before the scheme comes into full operation.

A writer in *Land and Water* thinks he observes a relation between the presence of jelly-fish, or medusae, on the British coast and the potato blight. According to his account, the jelly-fish has been excessively abundant on the coasts of Scotland and Ireland during the past season; so much so, indeed, as to carry away or to clog up the salmon and herring nets so as to render them unfit for use. For a time they were closely packed along the entire coast, extending seaward forty miles, or even more, and the air was affected by the clear emitted by their decomposition. They are considered so excessively poisonous to man and animals that the touch of their streamers on the hand or on the face produces a most intolerable itching and inflammation. The writer of the article referred to thinks that either the solid particles from the dried-up jelly-fish, or the emanations from their decomposing bodies, being carried inland from the sea, strike the potato vines and produce the disease.

Some time ago a paper was read before the French Academy of Sciences, in which the evil consequences of using cast iron stoves were forcibly dealt with. Little, however, was the interest excited in the matter at the time, but the subject has been more recently brought forward with better success. Dr. Carrel, one of the physicians to the Hotel Dieu in Chambery, plainly denounces cast iron stoves as an absolute source of danger to those who use them, and he claims to base his denunciations upon positive facts. It appears that during an epidemic which prevailed in Savoy Dr. Carrel observed that all the inhabitants who were affected by it used cast iron stoves which had recently been imported into the country. On the other hand, he observed that all those who used other kinds of stoves, or adopted other modes of firing, escaped the disease. Another circumstance bearing on the same interesting question occurred in the Lyceum of Chambery, where an epidemic of typhoid fever broke out. This outbreak is regarded by Dr. Carrel as having been influenced or superinduced by a large cast iron stove in the dormitory of that establishment.

A letter has recently appeared in the *Manchester Examiner* from a smoker who "has read with interest the various letters that have appeared in that journal on the tobacco question." This gentleman, it seems, never knew a day's health until he took to smoking. Up to the age of twenty he never smoked, but he was always sickly, and during the winter months was much troubled with affections of the chest. Fortunately for him, at that age, on the recommendation, he alleges, of no less an authority than Prof. Huxley, he began the use of mild tobacco; and from that day forward he has enjoyed good health. He is no longer troubled with colds in winter, nor, although he is of delicate constitution has his memory or sight been in any way impaired. A short time ago he foolishly gave up the habit of smoking, for the sake of experiment, and denied himself the use of tobacco for two or three weeks. The consequences were most serious. All his old symptoms returned, and his cough became again so exceedingly violent that it nearly turned him into a phlegm. He accordingly now smokes from a sense of duty, and, happily, as a precaution. This painful story is calculated to throw additional difficulties in the path of the anti-tobaccoists.

## Courrier des Dames.

### THE DOMESTIC DIFFICULTY.

The following paper by Gail Hamilton, which appeared in the last number of *Wood's Household Magazine*, is worthy of the consideration of Canadian housekeepers:

"The relations of mistress and maid are as much subject to the laws of supply and demand as are those of mason and employer, or of merchant and customer. Both are moreover human beings, actuated by the self-same motives, impossible by the same signet, curbed or encouraged by the same influences. Neither mistress nor maid may be aware of these facts, but they are just as much controlled by them as if they intelligently recognized them. Kathleen never heard a word of political economy in her life. She knows nothing whatever of trade laws. She never analyzed her mind or its workings. But she charges twenty cents an hour for her scrubbing, while other women charge twelve and fifteen cents. And she gets it. She lives in a country village, where she is the only floating woman-of-all-work, and she is not quite equal to the demand. Consequently she is always in demand, and can dictate terms. If you choose not to pay her twenty cents an hour, you can let her alone; but there is no one else to whom you can have recourse, and the chances are that you would rather pay her price than do her work. In larger villages and in cities there is more competition. If one woman will not work for fifteen cents, another will. Some grumble because women pay so low a price to women; but neither man nor woman is bound to pay more than its market price for anything. Philanthropy may—must—found its operation on natural laws. If it attempts to interfere with them, or to subvert them, it is on the wrong track. Some grumble because Kathleen charges high rates, but Kathleen has a thorough right, is thoroughly business-like and sagacious in availing herself of her monopoly. If she becomes unreasonably, her vaunting ambition will overstep itself, and the too much enduring public will bring in a rival—but that is for Kathleen to decide, and she is wholly right in making hay while the sun shines. She is practically a logician, as unerring and as conclusive as Adam Smith. If she could pass a competitive examination in the 'Wealth of Nations,' she could not shape her course any more in accordance with right reason. Christianity is a good thing, and philanthropy is a good thing, but logic is inexorable.

"When American housewives complain of the incompetence of their servants, they complain not without cause. Poor servants are the rule, and good servants are the exception. And so long as our system of house-service remains as it is, so long will this be the case. Our servants are poor because we do not insist upon it that they be good. Our whole domestic management is framed and fitted to make incompetent servants, or at least to keep them incompetent. If women would determine that they would have none but good servants, they would very soon have good servants. Even one woman could do something in this matter, but all women could do everything. As things are, a woman who wants a servant takes the best she can get, and puts up with her as long as she can. Then her neighbour takes her and does the same thing. Both pay the girl the same wages which a third neighbour pays to an efficient and excellent servant. We have no positive requirements, no routine of re-education, no tariff of prices. The servants, ignorant and earnest, combine and amonage. The mistresses, intelligent but inert, complain and submit.

"Servants ought to be good, because goodness is great gain; but so long as we, their superiors, need all sorts of influences besides the excellence of virtue to make us virtuous, why should we think it strange that these weaker brethren should need them too? If we so regulate our suffer to be regulated—our houses that a servant shall be just as well off in doing it and unkindness and untruthfulness as in their opposites, we are singularly credulous if we believe they will be anything but untidy and unfaithful. It takes twice as long to polish a spoon or goblet as it does to dry it; and most servants need some further incentive than the mere delight of doing it.

"Suppose now women could be brought to the point of agreeing once for all that they will no longer retain poor servants. Methinks I hear the cry of dismay going up from a thousand households, in expectation already dismantled. How can the mother of many children dispense even with the partial help which, small as it is, keeps her from sinking under her burden. But are women utterly incapable of effecting organization? One woman can accomplish little, because, if she dismisses her maid, a neighbour immediately takes her. But suppose the women of a city should organize, who could stand against them? The men organize for political and other purposes, and with tremendous power. Why cannot a city be thoroughly canvassed, by districts, by wards, by streets as may be? Why cannot all the women who hire assistance be assembled and addressed and enlisted? The women who sell assistance might be similarly or simultaneously assembled. There is no natural hostility between the two. They ought to be friendly and sympathetic. If they are not so, they should be made so. They should be informed of their relations and their duties. Surely some of our female writers could arouse their interest and secure their attention. I think the mistresses should be first addressed. They should be enlightened as to the importance of requiring skill, tidiness, efficiency, and should be pledged to secure it. There are but general terms, and perhaps there is a difficulty in determining whether a dinner-service be

washed clean, whether a steak or a loaf be properly cooked, or a room thoroughly swept. They know whether a servant is respectful or impertinent. If then the mistress hires a chambermaid, a cook, a waiter, it is not so very hard for her to learn whether the person hired is fit for her situation. If she is not, instead of enduring her unfitness, or attempting to train her into fitness, the mistress should dismiss her at once. Let servants know of a surety that no pretence will avail them, and they will relinquish pretence and become what they assume to be. In this they are precisely like ourselves. Very few of us will take pains to be thorough for thoroughness' sake. If the shoemaker gets plenty of employment and the highest wages for mean shoes, it is fearfully improbable that he will be so gratuitously satisfied as to make good shoes. A servant can get high wages and good situations for lazy, rough, careless half-service, what more could she get for real work? What inducement has she to be effective?

"But how can a woman dismiss her servant until she can secure another? There may perhaps be a few cases in which it cannot be done, but they are very few. It needs, more than anything else, resolution. If women will in good faith resolve to do it, they will scarcely need to do it. But generally they can do it, and do it easily, by fording their skulls. Agreement and principle would take the sting out of the act. A good servant—or we curtail the table, we eat in the kitchen; the clothes that we cannot iron, we wear rough dry. It is an heroic remedy, but let us be heroes in a worthy cause. It is only for a little while. It is only until servants are convinced that we will do this rather than endure their ignorance and indifference; that if we are to be shabbily served, we will serve ourselves shabbily rather than pay them three dollars a week for doing it.

## Art and Literature.

Archbishop Manning is about to publish a work on Papal infallibility.

The Victoria Medal for 1873 of the Royal Geographical Society has been awarded to Mr. Stanley.

Verdi and Offenbach, it is said, are coming to America. Mr. Charles Hickok, Jr., says that the late announcement of his intention to visit the United States is unfounded.

The wedding of Wagner with Madame von Bayou, Liszt's daughter, has recently been celebrated, and the pair are passing their honeymoon in a tour through Germany, looking up recruits for the Bayreuth Theatre.

Mr. Ruskin recently made the following criticism upon himself: "I was obliged to write too young, when I knew only half-truths, and was eager to set them forth by what I thought fine words. People used to call me a good writer then; now they say I can't write at all; because, for instance, if I think any body's house is on fire I only say, 'Sir, your house is on fire,' whereas formerly I used to say, 'Sir, the whole in which you probably passed the delightful days of your youth is in a state of inflammation,' and everybody used to like the effect of the two 'S's' in 'probably passed,' and of the two 'd's' in 'delightful days.'"

Some of the most accomplished linguists in Europe are sons of kings and emperors. The Crown Prince Rudolph, of Austria, speaks six languages, and understands three more. The eldest son of the Crown Prince of Prussia, Frederick William, who some day hopes to be Emperor of Germany, fluently speaks German, Polish, Danish, French, and English. Crown Prince Humbert, of Italy, boasts of being familiar with all the numerous dialects spoken in Italy. The Crown Prince Frederick, of Denmark, speaks Danish, Swedish, German, French and Russian; and the eldest son of the Emperor Alexander II, of Russia, can converse with you in Russian, Polish, German, French, Danish, and English.

Many of the prominent literary men of England hold positions under the Government. Sir Arthur Helps is Clerk of the Privy Council, an office from which he derives \$8,500 a year. Sir Henry Taylor, the author of "Philip von Arctevold," has \$5,000 a year as one of the senior clerks at the Colonial Office; and Mr. J. W. Kaye, who began his literary life as the editor of an Indian journal issued in London, and whose works on Indian history are so highly valued, is the political and secret secretary at the Indian Office. Mr. Dunsen, formerly sub-editor of the *Times*, a writer of novels and translations from the Norse, is the Second Civil Service Commissioner, at a salary of \$8,000; while Mr. William Michael Rossetti, the poet and critic, has \$1,000 a year as an assistant-secretary at the Inland Revenue Office. Mr. W. Rathbone Greg, who succeeded McCulloch, the political economist, as the head official at the Stationery Office, enjoys \$7,500 a year; while Mr. Herman Merivale, has \$10,000 as permanent under-secretary at the Indian Office. Mr. Galton is a director of works at Whitehall; Mr. Frank Buckland has \$6,000 a year as an inspector of salmon fisheries, and Mr. Lionel Brough \$3,000 as an inspector of coal mines; Mr. F. T. Polgrave is an examiner at the Educational Council Office, and Mr. Matthew Arnold holds the post of inspector of schools; Mr. C. Pennell, the piscatorial writer, gets \$2,500 as the inspector of oyster fisheries, while Mr. J. Glaisher and Mr. Edwin Dunkin do not get more between them for inspecting the stars; Mr. Henry Reeve, editor of the *Edinburgh Review*, has a very good post, while a less one is also enjoyed by Mr. J. R. Planché, Mr. T. Dallas Hardy, Mr. T. Walker, Mr. G. Scott, and other writers, whose names are less familiar to the general public.