THE DISCOVERIES OF 1861.

[Further Extracts from Wells's Annual of Scientific Discoveries.]

GROUND ICE.

Ground ice is the ice found under the surface of the water in rivers. It has engaged the attention of men of science on account of its apparent unnatural position, and also the attention of practical men because of the mischief it may occasion by accidental obstructions, such as a branch of a tree in a mill-course, when the water is charged with icy particles. Mr. Richard Adie has published a paper in the *Journal of the Chemical Society* on this subject. He believes that he was the first to state that ground ice is formed in the coldest part of the stream, and that the small crystals, as soon as formed, are carried along by the current and submerged and entangled by plants, etc. In December and January, 1860-1, he searched for ground ice where he had previously found it; but, although the frost was severer than it had been for sixty years past, he found it only in one locality, viz., on a stone covered over by the water of a rivulet at Duddington, near Edinburgh. Other observations have led him to the opinion that the position of ground ice is one of lodgment merely, in opposition to the notion that the water has frozen in the bed of the river, the current preventing its freezing in its natural place—the surface. In a note on Mr. Adie's paper, the eminent chemist, Dr. E. Falkland, gives his opinion that the formation of ground ice, which takes place only in rapidly-flowing streams, depends upon the fact that ice, like other crystalline bodies, deposits itself more readily on rough surfaces (freezes, in fact, at a higher temperature) when in contact with such surfaces than within the mass of liquid itself. Hence when a rippling stream is cooled to 32° ice crystals attach themselves to the pebbles at the bed of the river and form nuclei for further deposition.

THE FREEZING AND BOILING POINTS OF WATER.

M. L. Dufour has communicated to the French Academy the results of some interesting experiments showing that water and certain other substances may be maintained in the liquid condition at temperatures much beyond the point at which they usually pass into either the solid or vaporous state, by placing them in a fluid menstruum of the same density as themselves, and with which they are not miscible. Globules of water thus suspended in perfect equilibrium retain the fluid condition through a much longer range of temperature than is possible under other circumstances.

The boiling point of liquids is known to vary considerably, and to be particularly affected by the nature of the vessel in which the liquid is contained. With water the boiling point is higher in a glass than in a metallic vessel. When the surface of the glass has been specially cleansed with oil of vitriol the discrepancy becomes still more marked. When placed under the conditions of a water hammer, in which it is entirely free from air, and contained in a glass tube, Donné has shown that it may by careful heating, be raised to 135° Cent. without passing into the vaporous condition. The deviation in such cases is attributed to the force of adhesion existing between the liquid and the surface of the vessel, and the absence of air from solution.

In M. Dufour's experiments, however, the result cannot be attributed to the absence of air, or to the adhesion of the liquid to a solid; on the contrary, contact with a solid produces an instant gush of vapor. His first experiment is as follows:—Some linseed oil is heated in a dish to 105° Cent. or 110° Cent., and a few drops of water dropped in, which sink to the bottom of the vessel. The moment they touch, a sudden formation of vapor takes place, and the globule, a little lessened, is repelled a short distance from the bottom. It again sinks till it touches, when it again boils, and is again repelled. While the globule is floating through the oil no evaporation takes place; it is only on coming into contact with the solid that vapor is formed.

M. Dufour's next experiment consists in using a medium having the same density as water, and in which, consequently, the globules remain in equilibrium, permanently floating in the centre; the medium being capable of bearing a temperature above 100°, and not being miscible with water. Essence of cloves, to which a small quantity of oil has been added, constitutes a fluid answering to these conditions. Water remains floating in round spheres with perfect freedom of motion in the centre of this mixture. Under these circumstances, if heat be carefully applied, a temperature far above 100° Cent. may be obtained without the ebullition of the water ensuing. 120° or 130° Cent. is frequently reached, and spheres of water ten millimetres in diameter have been thus raised to 140° and 150° without changing. Smaller spheres, one to two millims. in diameter, have been raised to 170° and even 175° Cent.: that is to say, a temperature at which steam has a tension equal to eight atmospheres (or one hundred and twelve pounds). The water used had not been prepared; it was neither distilled nor freed from air. At these high temperatures the globules were as calm and transparent as at 10°. When the globules came into contact with a solid, then ebullition instantly ensued. If carried against the side of a vessel or against the bulb of the thermometer, a sudden formation of vapor was the result, and the globule was repelled some distance from the point. By touching the globule when at 115° or 120° with a glass or metal rod, or, better, a point of wood or charcoal, a similar effect was produced; an explosive formation of steam taking place, and the globule being driven away as if the point had exerted some repulsive force.

These phenomena may also be produced with other liquids treated under the same condition. Chloroform may be so heated when floating in a solution of cloride of zinc to a temperature of 90° or 100° Cent.

By means similar to the above, M. Dufour has equally succeeded in retarding the freezing of water. A mixture of chloroform and oil of sweet almonds is made, in which globules of water float in equilibrium. By cooling the mixture, the water scarcely ever freezes at 0° Cent. Its temperature sinks to —6°,—10° before congelation occurs, and globules have even been reduced to—20° Cent. without solidifying. Ultimately the globules either pass into solid grains of ice, or simply freeze on the surface, depending on the size and amount of reduction in temperature. The persistence with which the water retains the liquid state, is, however, remarkable. The mixture containing the globules may be shaken, and foreign bodies introduced, without solidification resulting. By touching the sphere, however, with a lump of ice, congelation is immediately effected. When one globule solidifies, the congelation of others still fluid may be effected by bringing them in contact with the frozen particle. Different effects are thus produced, depending on the temperature and the size of the spheres. Sometimes the spheres touching solidify suddenly, but remain separate; sometimes they combine together, the one joining on or else enveloping the other at the moment of congelation. Irregular spheres formed of concentric layers and other varied shapes are thus produced. The author traces a resemblance between these frozen particles and the shape and structure of hailstones, which he conceives may be formed by a process somewhat analogous.

Other substances beside water present the foregoing phenomenon. Thus M. Dufour has experimented with sulphur, phosphorus and naphthaline. He finds that when melted sulphur is suspended in a solution of chloride of zinc having the same density as itself, the temperature may be reduced to 70° or 50° without solidification taking place. In this instance, the liquid condition possesses remarkable stability.—When the globules of sulphur remain fluid at 50° or 60° below the usual temperature of solidification, their chnage of state continues an interesting object. Globules half a millim. in diameter sometimes remain liquid at 5° Cent. for several days. Solidification is best provoked by contact with a piece of sulphur. Phosphorus in like manner may be reduced far below 44° Cent. without solidifying, and small globules may even be reduced to 5° or 6°. Many other substances would doubtless present the above phenomena. The principal obstacle lies in the difficulty of finding suitable menstrua.

FASTENING OF IRON BARS INTO STONE.

For this purpose lead is almost always employed, which forms a voltaic couple with the iron, by which that metal is rapidly rusted. Zinc, on the contrary, would preserve the iron.—*Dingler's Polytech. Journal.*

METHOD OF DISINFECTING MOLDY CASKS.

The casks are first washed out for about five minutes with an alkaline solution of soda, and then soaked for one or two days with a liquor acidulated with hydrochloric acid.

The committee of the Society for the Encouragement of National Industry report that the process is effective both for wine and beer casks; that it is cheap, and saves great expense.—*Bull. Soc. Encour. l'Indust. Nat., May*, 1860.

The Atlantic Telegraph Again.

Strenuous efforts are now being made in London to to have another Atlantic Telegraph Cable laid, and two companies are already soliciting public favor with reference to it. One is the old Atlantic Telegraph Company, which, nothing daunted by its first tremendous loss and failure, is again endeavoring to restore public confidence, not only in the scientific practicability of the scheme, but in the commercial success that must follow upon its completion. C. W. Field, Esq., who has so long labored with indefatigable zeal in the promotion of this great cause, submitted his propositions to Earl Russell upon the subject, with a view of obtaining a joint guarantee from the American and English governments upon the entire capital required. The gist of the propositions made were to the effect that a capital of $3,500,000 would be required to carry out the scheme in an efficient and permanent manner; that the English and American governments should jointly contribute one-third of the entire amount, leaving the remainder to be taken up in shares on both sides of the Atlantic, in the usual manner, the two governments having certain rights and privileges in return for their money.

The second competitor for the honor of accomplishing this great enterprise is the North Atlantic Telegraph Company, a company formed to effect telegraphic communication with America by such a route as would avoid the danger of a long stretch of sea way between Valentia and Newfoundland, and, above all, the difficulty of working through such an unbroken length of wire. To accomplish these important objects it was decided to lay the line in four distinct sections—the first from the north of England to the Faroe Islands, and the second from the Faroe Islands to the easternmost point of Iceland. Iceland itself is to be crossed by a short length of land line to Reikiavik, the capital. From Reikiavik the cable is again to be taken under the sea to Julianshaab, the capital of Greenland, and thence across the entrance to Davis's Strait to the southernmost point of Labrador. The advantages of this route are that its greatest stretch of submarine wire is only between 700 and 800 miles—not more, allowing for slack, than about one-third of the distance by the old deep sea line to Newfoundland; while, on the other hand, the sections could be easily replaced or repaired, and it is in the highest degree improbable, almost impossible, in fact, that all four sections would get out of order at once, and so totally interrupt the communication. The British government were applied to about two years ago to allow a series of deep sea soundings to be taken along the proposed line, and they at onceacquiesced, and Sir Leopold M'Clintock was dispatched to make the survey. The result of this showed that the greatest depth of water between the north of England and the Faroe Islands to Iceland did not exceed 600 fathoms, and was generally very much lower, averaging about 250 throughout. From Iceland to Greenland the water is much deeper, though not any where exceeding 1,500 fathoms; while from Greenland to Labrador the greatest depth is 2,000 fathoms. The author of this scheme is Col. Tal. P. Shaffner, of Kentucky, who made the first survey of the route. We hope that both companies will be successful in obtaining funds to lay cables. It is only by practical experience that the best route for an Atlantic telegraph can be determined. We have no doubt but the telegraphic business between Europe and America would be more than sufficient to keep two lines busy.

A FIRM in Glasgow builds marine engines with double cylinders. The steam is admitted into the small one at a very high pressure; it is cut off at half stroke and is then expanded into the large cylinder, the expansion amounting to eight times the original volume of steam. A saving of 50 per cent of fuel is said to be effected by them.

THE Great Western Railway Company of Canada has two locomotives provided with steel boilers and fireboxes.

Improved Coasting Sled.

The improvement in boys' sleds, here illustrated, is shown so clearly in the engraving that any description is scarcely needed. All who have in boyhood participated in the fun of sliding down hill will remember the exceedingly disagreeable feeling caused by the snow flying up the legs of the pantaloons whenever the heel was forced upon the surface to guide the sled; while in going "belly bump," or, as the boys in this city term it, "belly gutters," the toe of the boot was very quickly worn through in the operation of steering. The rising generation of boys, among the innumerable advantages which they enjoy over their predecessors, are not to be subjected to these annoyances. Every boy may now slide down the steep sides of the hills sitting comfortably in an upright position, legs and feet all aboard, and guiding his vehicle by rains, as if he were driving a mettled steed.

BROWN'S COASTING SLED.

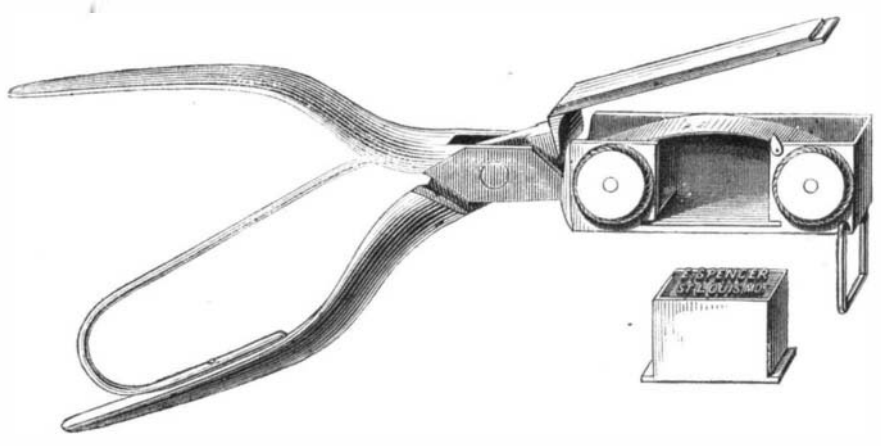
It will be seen by glancing at the engraving how this is accomplished by a new invention, which consists in attaching a guiding runner to the front part of the sled. A strip of board is fastened to the middle of the front part of the seat, and extends forward of the runners. To the lower side of this board the guiding runner is attached by a pivot pin, and a cross bar is secured rigidly to the runner at right angles. Upon this cross bar the feet of the rider are placed, and he can thus turn the runner in either direction, which guides the sled. A cord may also be attached to both ends of the cross bar to aid the operation, and support the rider in his seat.

The engraving illustrates clearly the various modes of using this steering device, as well as the danger of sliding the old kind, such as we used when a boy.

The patent for this invention was granted through the Scientific American Patent Agency, April 8, 1862, and further information in relation to it may be obtained by addressing the inventor, Isaac N. Brown, No. 2 Beekman street, New York City.

Conductor's Ticket Stamp.

Among the plans resorted to by railroad conductors to enable them to make sure of collecting their fares from all passengers, one device is to punch holes through a certain portion of the tickets when they are presented for the first time by the passenger; and many conductors carry little hand punches in their pockets for this purpose. Edward Spencer, of St. Louis, has invented a stamp to be used in place of a punch, so arranged that the conductor's name with the date, and the name of the station, may all be printed upon the ticket in place of the little hole made by a punch; thus affording a much more perfect check. This stamp is represented in the annexed engraving.



SPENCER'S HAND STAMP.

In the box upon one of the jaws an inking ribbon is wound upon one roller with the end attached to another roller, so that it may be wound from one roller to the other by simply turning the milled head. A box of type, shown below, is slipped into the jaw just below the ribbon, when by laying the end of the ticket between the jaws and pressing them together the letters of the type are printed on the ticket. The type are made moveable so that any words may be made which it is desired to print upon the ticket. A loop at the end of the jaws is provided for fastening them together when the stamp is to be placed in the pocket.

The ribbon is so prepared as to last a long time, is moved at pleasure by means of the brass button or collar, and conductors will be put to no unnecessary inconvenience or trouble in using the stamp. Its size is only one-third larger than the cut above, so that it is quite convenient to be carried.

To Railroad Companies desiring a correct record of their tickets, this stamp is specially recommended; and it will be found valuable for printing cards, dates, or stations on envelopes, bills, letters, &c. It is proposed to make a variety of sizes of the stamp, for General and Station Ticket Offices, and to that for conductor's use the usual punch can be applied at a small additional cost, whenever ordered.

For terms, &c., address E. Spencer, patentee, P. O. box, 1408, St. Louis, Mo.

A New Alloy.

An alloy, as a substitute for silver, is proposed by M. Trabuc, of Nismes; it consists of banca tin 375 parts, nickel 55, regulus of antimony 50, bismuth 20. One-third of the tin is placed at the bottom of a crucible of suitable dimensions, together with the nickel, antimony, and bismuth; upon this first layer a second third of the tin is deposited and covered with charcoal to the depth of 1½-inches; the crucible being covered up, it is heated to a white heat, then with the aid of an iron rod, also heated, we ascertain if the nickel be melted and the antimony be reduced, in that case the remaining portion of tin is passed through the charcoal, and the whole stirred until a perfect mixture of the different metals is obtained, it is then cast into ignots or other forms. The color of this alloy is silver white, and it resists the action of vinegar and other vegetable acids.

It is known that a saturated solution of salt in water boils at 228° Fah., while pure water boils at 212, but Rudberg says that the vapors of saline solutions under the ordinary pressure of the atmosphere, have only the temperature that they would possess if they were disengaged from pure water under the same pressure.

Glossing Linen.

Inquiry is frequently made respecting the mode of putting a gloss on linen collars and shirt bosoms like that on new linen.—This gloss, or enamel as it is sometimes called, is produced mainly by friction with a warm iron, and may be put on linen by almost any person. The linen to be glazed receives as much strong starch as it is possible to charge it with, then it is dried. To each pound of starch a piece of sperm, paraffine, or white wax, about the size of a walnut, is usually added. When ready to be ironed the linen is laid upon the table and moistened very slightly on the surface with a clean wet cloth. It is then ironed in the usual way with a flatiron, and is ready for the glossing operation. For this purpose a peculiar heavy flatiron, rounded at the bottom and polished as bright as a mirror, is used. It is pressed firmly upon the linen and rubbed with much force, and this frictional action puts on the gloss. "Elbow grease" is the principal secret connected with the art of glossing linen.

New Patent Law in England for Artists.

A bill has been introduced into the British Parliament to afford protection to the authors of original paintings, photographs and drawings. It provides that for a small sum original paintings, drawings and photographs may be registered, and protection from piracy given during the life of the patentee. It is stated in the bill, however, that when any painting or drawing, or the negative of any photograph, shall be for the first time sold or disposed of, the person so disposing of the same shall not retain the copyright, unless it be expressly reserved to him by agreement in writing. This bill is designed more particularly to protect artists from free trade in their productions through the agency of photography. Sir Hugh Cairns has moved in the House of Commons for a special committee to inquire into the patent laws. It is believed that these laws will be remodelled, and perhaps the American system will be adopted for Great Britain. It is advocated by one of our London cotemporaries.

About 6,000 bales of Surat cotton have been imported into the United States within the past six months.