

[For the Scientific American.]

## THE ORIGIN OF COLD SNAPS.

One of Agassiz's oft-repeated expressions was: "Facts are stupid things unless they are made to teach some principle." While true Science consists chiefly in the discovery of laws and principles, these can be gained only by an abundant collation and a careful study of undoubted facts. Whether it was Nature's plan to make us study the laws which govern them, we cannot say; but that a frequent observation of certain facts of meteorology has been forced upon us by the rigors of the past winter, none will deny. And while we are just recovering from the shivering and freezing which these entailed, it may not be uninteresting or unprofitable to consider briefly the meteoric principles upon which cold is produced.

The sun is the cause of all motion, from the wind, the rain fall, and the Niagara cascade to the muscular exertions of beast and man. And anomalous as it may seem, it is also the indirect cause of cold. The very heat that warms us so gratefully during these spring days melts the frozen matter and evaporates the water. Changes from solid to liquid, and from liquid to vapor, require an enormous amount of heat, which, being taken from the sun's rays, leaves the air damp and chilly. Thus the change from cold weather to warm is less sudden and enervating; and by a reversion of the same principle, the cold of fall is more gradual in its approach. Though this principle will produce a greater amount of cold than we are apt to suppose, it will not account for the cold snaps which drive us to the fire and into our furs and wrappings during the winter.

In a recent article in the SCIENTIFIC AMERICAN, on laws of storms, it was shown that our storms are monstrous whirlwinds covering half a continent, in which the wind, blowing from all directions towards a central point, escapes by rushing upwards, and thus diminishes atmospheric pressure. To compensate for this rise of air, there must be a descent somewhere else. As the air rises into the upper regions, it gives off into space the heat it abstracted from the earth, and its increased weight causes its return to the surface. Observations, similar to those mentioned in the article above referred to, have enabled Professor Loomis to show that, in regions of high barometer, the winds blow outwards in all directions. High barometer is often constant for days, and a week or more together, in one locality; and there the thermometer is low for about the same length of time. He attributes this to downward currents, at the center of high barometer, from the cold upper regions, and believes they are made up of air from the upward currents of low barometric centers. From this, he concludes that our sudden and long spells of extreme cold are not due to currents from a northern latitude, but to these downward currents. There seems one difficulty in his theory here. He has shown that the storm center advances at a rate varying from 22½ to 1,200 miles per day; and if air from this came down and produced a region of high barometer, from which the winds diverge in all directions, we would expect the high barometric center to accompany the storm center at about the same velocity; but instead, it sometimes remains stationary for weeks.

The Professor admits that, during the cold spells of December, 1872, and January 1873, northerly winds did prevail; but he considers these as attending high barometer, according to laws already established, and that north winds alone would not be a sufficient cause of the suddenness and magnitude of the thermal depression observed. In substantiation of his views, he cites a storm which came up from the Gulf of Mexico, choosing a southern storm so that he could find observations taken to the north of it. This reached the northern coast of Lake Ontario in three days, and on the last day, in northern Florida, the thermometer was lower than it had been on either of the preceding days at Knoxville, Nashville, Cincinnati, Louisville, and Memphis. This indicates that the cold did not come from the north or northwest, but must have descended from colder regions above. The same phenomenon prevails in the far north, even in the coldest regions ever visited by man. At Melville Island, during a strong wind, the barometer fell to 29.10, and in four days it had risen to 30.75, the highest point reached during the year. During the same time the thermometer fell from -5° to -43°, the lowest temperature observed during the year. At Van Rensselaer Harbor, the same point was illustrated. At Jakutsk, Siberia, latitude 62°, the mean temperature of January is -44° Fah.; but on January 21, 1838, the thermometer fell to -76° Fah. Dove's chart records no place on the earth's surface where the mean temperature of the coldest month is much below that of Jakutsk. And if the temperature suddenly falls 32° below the mean in the coldest part of the earth, the conclusion seems almost inevitable that the cold must come from the upper regions. The distinguished investigator concludes: "If this is the true explanation of periods of unusual cold in Siberia, a similar phenomenon in the United States is doubtless to be explained in like manner."

The suddenness of thermometric changes also points with equal conclusiveness in the same direction. When, in restricted localities, the thermometer falls 18° or 20° in an hour, or, in thunderstorms, 5° or 10° in a few minutes, we are apparently shut up to the conclusion that the cold cannot be borne from the distant north, but must be due to a down rush of cold air.

Professor Loomis makes his conclusions appear quite clear and reasonable; yet at the late meeting of the Academy of Sciences, at Washington, they excited considerable discussion. Professor Ferrel, of the Coast Survey, who is investigating the laws of cyclones, and Dr. Woeikof, of Russia, announced as their opinion, based on recent researches, that descending air would produce heat instead of cold, because

of the increased atmospheric pressure to which it is exposed as it approaches the earth.

The increase of pressure would diminish the air's capacity for heat, and this would be given off to the surrounding air at the rate of one degree for every 325 feet of descent. This objection seems hardly conclusive, for we have no adequate means of measuring the temperature of the air in the regions from which it descends. It may lose one degree of heat for every 325 feet of descent, and still be much colder than air at the earth's surface. Dr. Woeikof gives the height of thermometer at several places of different elevations, which goes to show that low places are as cold as high ones. Later, he says, cold may be generated on the spot by simple radiation. This statement seems to weaken the force of his previous observations; for evidently the greatest radiation would occur in the highest regions, for there is less to obstruct it, and of course this would make the elevated regions coldest, as Loomis claims. The Russian scientist denies that cold snaps are caused—except in a few cases of special local conditions, or in thunderstorms—by cold air descending, but rather by winds from the vicinity of the meteoric poles. He attributes the sudden low temperature to which the Atlantic coast is subjected to the fact that the Appalachian Mountains are not high enough to break off the currents from the meteoric pole to the northwest of these mountains.

If this theory is correct, we may conclude that the cold air from the meteoric pole, somewhere to the west of Hudson's Bay, sweeping across the unobstructing lakes and prairies, is the cause of the notoriously variable temperature of Chicago.

As doctors in the same line of scientific investigation so widely disagree, our only resource is to await future developments for a satisfactory settlement of the question.

S. H. T.

## New Snow Spectacles.

Mr. William White Cooper, oculist, London, has devised a new kind of spectacles to prevent snow blindness. It is well known that a long exposure to the glare of the intense white of the snow in the polar regions is most harmful to the sight; to meet this difficulty, spectacles of green tinted glass, surrounded by gauze, have been proposed. These will, however, fail in practice, as the glass part of the spectacles is liable to get dim and cloudy, while the gauze and the wire, by means of which the spectacles are fastened behind the ears, will in an arctic climate become so cold that to the human skin they will have the sensation of being made of red-hot wire. Mr. Cooper's snow spectacles have neither glass nor iron in their composition, for they are made of ebonite, and are tied on to the head by a velvet cord. They resemble somewhat two half walnut shells fastened over the eyes. Their great peculiarity, however, is that the wearer sees through a simple slit in front of the pupil of the eye. The sides of each eye box are perforated with minute holes, in order that the wearer can get a side view of objects. These glasses will also prove useful to travelers by railway, inasmuch as they keep out the glare of the sun, and prevent the admission of dust into the eye. To engine drivers, therefore, they would be invaluable, especially when exposed during sleet, snowstorms, or very windy weather. They are also very agreeable when reading at night by lamp or gas light.

## A New Lifeboat.

There has just been exhibited to the brethren of the Hull Trinity House, and to the principal ship owners of the port, a new patent lifeboat, patented by Messrs. Anderson and Burkinshaw, of Burlington Quay, and it is by them termed the "Reversible Lifeboat." As its name implies, it is top and bottom both alike; and if in launching, before it touches the water, it should, by the rolling of the vessel or any other cause, turn over, there are thwarts and seats running around the side just the same as there would have been had the boat gone in the other way up. Whichever side the lifeboat takes the water, when she is once afloat, a couple of flaps running the whole length will close and form the bottom of the boat, and there is provision for drawing a further flooring out, which will rest upon strong beams. The boat receives its buoyancy from a massive belt of cork, which is encased in canvas, and runs from stem to stern on each side, and forty separate airtight tanks, ten on each side of both the upper and lower parts of the boat. Still further buoyancy is obtained by large tanks at each end of the boat, but it is intended to use these latter compartments as storerooms for provisions, spirits, medicines, etc., the whole supply being protected from damage by either rain or sea water. On each side of the belt of cork outside the boat there are numerous life lines, which will hang in the water, so that any one falling overboard on leaving a vessel may readily gain the boat and hoist themselves on board.

## Burning Iron.

A Berlin experimenter has demonstrated the combustibility of iron in a peculiar manner. He takes a straight bar magnet of some power, and sprinkles iron filings on one of its poles. These filings arrange themselves in accordance with the lines of magnetic force; and however closely they may appear to be placed, of course no two of the metallic filaments are parallel, and consequently, a certain amount of air is enclosed as in a metallic sponge. The flame of any ordinary spirit lamp or gas burner readily ignites the finely divided iron, and it continues to burn brilliantly for some time, the combustion being, apparently, as natural and easy as that of any ordinary substance. If the experimenter with this operation stands on a slight elevation and waves the magnet to and fro while burning, a magnificent rain of fire is said to be produced.

## DECISIONS OF THE COURTS.

## United States Circuit Court—District of Massachusetts.

PATENT CAR WHEEL.—CHANDLER NEEBHAM vs. NATHAN WASHBURN *et al*. [In equity.—Before Clifford and Lowell, J. J.—Decided October, 1874.] Opinion of the Court by Mr. Justice Clifford.

Damages are claimed by the complainant for an alleged infringement by the respondents of certain letters patent granted to him, January 8, 1871, in which it is recited that the complainant is the original and first inventor of a certain new and useful improvement in casting car wheels, as more fully described in the specification of the letters patent.

The principal defenses upon the merits are as follows: 1. That the alleged improvement is not new in the sense of the patent law, because the patentee was not the original and first inventor of it, and because the process was well known and in public use long before the date of the supposed invention. 2. Because the respondents have never infringed the patent as alleged.

Both of these defenses make it necessary to ascertain what the invention is when the patent which secures it is properly construed. Enough may be learned from the description given by the patentee in the specification of the process which he pursues to manufacture the patented car wheel, when weighed in connection with the claim of the patent, to furnish a satisfactory answer to the inquiry as to the true nature and scope of the alleged improvement.

His first step, as pointed out in the specification, is to cast a suitable quantity of steel to form the tyre of the wheel into an annular ingot, about fifteen inches in diameter, with an opening at the center of the diameter, of four inches. He then hammers the ingot upon an anvil by means of a steam hammer, by which its diameter is extended to eighteen inches; and he gives a description of the anvil which he uses, and of the manner of conducting the hammering. The next steps are the following: The ingot is enlarged to the proper size and shape to form the tyre of the wheel. Having formed the tyre, he then places it in a heated furnace and heats it to a bright cherry red, when it is taken from the furnace, and, having removed every foreign substance from its surface, he places it within the mold in which the body of the car wheel is to be cast, said mold having previously been formed and prepared for the purpose. Care, it is said, should be taken that the heated tyre should be properly adjusted in the mold; and when that is accomplished the operation that the flask shall be immediately closed, and the molten iron be poured into the mold, which, as it comes in contact with the highly heated steel, fuses the surface of the latter, there by forming a perfect union between the two, and, as the metal cools, the body of the wheel and the tyre are welded into one solid mass. Extended remarks upon that part of the described process are unnecessary, as nothing there described is embraced in the claim of the patent; and if it had been, it would not have been a material objection, as the respondent admits that there described is substantially the same as that set forth in the patent granted to Zadoc Washburn, which was introduced in evidence, and is of prior date.

Two matters are then introduced into the specification of the patent in question, which, it is insisted, distinguish it from the invention of Zadoc Washburn, which, it is admitted, is the older of the two: 1. That the molten iron is introduced into the mold through a series of openings at the center of the wheel, just inside the tyre, and that it flows thence to the center, carrying away from the inner surface of the steel tyre all dirt and dust, if any, which might otherwise prevent the welding of the parts. 2. Nothing is expressly set forth under the second head as a matter pertaining to the described improvement, but the patentee points out what he represents as a defect in the process of the other patent, which is that the cast iron, instead of lying still in the mold and forming a perfect union, is agitated and caused to bubble by the gas generated by the molten iron as it comes in contact with the flux used in the process, whereby, as he states, the perfect and desired union of the iron and steel is prevented. Everything described in the patent to Zadoc Washburn is disclaimed by him in express terms. What he claims is the described method of introducing the molten cast iron into the mold, through a series of holes, directly upon the inner unfluxed surface of the cast steel tyre, by which a perfect union and weld of the metal are produced.

Car wheels manufactured by first forming a rim of cast steel, and then heating and placing it in a mold previously prepared for the purpose, and by pouring molten cast iron into the mold to complete the manufacture of the wheel, by the union or weld between the two, into one solid mass, are certainly old. Nor is that proposition denied. Nothing, therefore, but a new and useful improvement in the method or process of such a manufacture can be regarded as the proper subject of a patent. Doubtless it may be true that the molten iron formerly poured into the mold at the center of the mold, and it may be that it is better to construct the openings in the mold for the purpose—whether they are called by that name or are called "sprues" or conduits—just inside the inner surface of the heated rim when placed in the mold; but the court is not satisfied from an examination of the product, or from any evidence in the case, that such a change, without more (even if new, which is not admitted), is the proper subject of a patent, as it is scarcely to be regarded as a new and useful improvement to make it. Changes of the kind are nothing more than common knowledge and experience would suggest, and every workman, whether skilled in the art or not, would know how to apply the suggestion. Nor can it make any difference that the patentee uses a series of such openings or holes in his method or process, as the proofs are full and satisfactory that a series of holes has been used in making such castings at a much earlier period than the date of the complainant's invention, and on several occasions, as appears by the testimony of an unimpeached witness.

2. Suppose that is so, still it is insisted by the complainant that his method or process is new and useful, because he does not use flux in making the described weld; which, as he insists, distinguishes his method or process from the invention described in the Zadoc Washburn patent, and from all others known at the date of his invention. Much reason exists for holding that the absence of flux from the process is a new and useful improvement, as the description of the method or process used by the complainant, as required by the act of Congress; but inasmuch as the alleged invention consists merely in omitting an ingredient often employed in welding steel and iron, or two pieces of iron, the court is not inclined to rest the decision entirely upon that ground. Nor is it at all necessary to do so, as the court, in view of the facts and circumstances of the case, is of the opinion that it is matter of common knowledge, that iron, or iron and steel, may be successfully welded with or without the use of flux, and that such iron and steel has existed among mechanics accustomed to work at the ordinary forge, for a very long period, whereof the memory of man runneth not to the contrary. Axes, scythes, hoes, and other farming utensils were formerly made on the common anvil; and it is believed that mechanics formerly engaged in manufacturing such articles know full well that flux was often omitted in effecting a weld of iron, or iron and steel. Horseshoes were made in the same manner, and many larger articles, such as plowshares and many cranks. Differences of opinion, it is known, have at times existed among mechanics of that class upon the subject; some maintaining that flux was useful and even necessary, and others maintaining the opposite opinion with equal earnestness and confidence. All of these suggestions, it is believed, are supported by common experience and knowledge, but it is not necessary to go out of the record to find convincing proof to the same effect.

Even the complainant, in his deposition filed in the present case, testified in his cross examination that he was aware that iron and steel had been welded, and, when asked if he knew as matter of fact that iron and steel had for a long time been welded with and without flux, stated that it was said to have been so welded for a long time. Support to that view is also derived from one of the respondent's witnesses, in which he says that, in making four or five car wheels, they used four sprue holes and that some of them were made with flux, and some without; which statement is also confirmed by the testimony of other witnesses.

Having come to the conclusion that the alleged improvement is not new or patentable, it is not necessary to examine the question of infringement. Bill of complainant dismissed with costs.

[James B. Robb for complainant, A. K. P. Joy for defendants.]

## United States Circuit Court, Eastern District of Pennsylvania.

PATENT PAPER COLLAR.—THE UNION PAPER COLLAR COMPANY vs. HENRY J. WHITE.

[In equity.—Before McKenna, Cir. J.—Decided April, 1875.]

McKenna, Circuit J.:

The complainants are the owners, by several mesne assignments, of a patent granted to Walter Hunt, on the 25th of July, 1854, for a new article of manufacture, consisting of a collar made out of paper and muslin, so constructed and adapted to use as to keep it from becoming soiled, and which was duly extended for seven years from the date of its expiration, and was reissued on the 22d of October, 1872, No. 5,109. The validity and infringement of this reissued patent are the subjects of this contention.

I do not think the legal presumption that Hunt was the first and original inventor of the article of manufacture for which he obtained a patent is at all shaken by the proofs in the case. It is true that paper and muslin or other materials were used before and had been adapted to use as collars, but this was not analogous to the use to which Hunt adapted them, nor was it in any wise suggestive of his invention. He was the first to discover the adaptability of this material to a use not cognate to any to which it had before been applied, and, by appropriate manipulation, to give it a useful and practical form. He thus not only supplied the public with a new article of manufacture, but he demonstrated unknown susceptibilities of the material out of which it was made. This is a method more suggestive of the application of an old thing to a new purpose. It is the production of a new device by giving a new form to an old substance, and, by suitable manipulation, making its peculiar properties available for a use to which it had not before been applied, thereby distinguishing it from all other fabrics of the class to which it belongs. This seems to me to involve an exercise of the inventive faculty, and, in view of the great practical benefits resulting from it, to invest the product with a patentable character.

The patent in controversy is the seventh reissue of Hunt's original patent. This multiplication of reissues is, of itself, suggestive of a purpose to cover intervening improvements, and some phrases in the specification of the last reissue may, not without semblance of reason, be treated as having that significance. It is difficult to suppose that so many reissues, with considerable intervals of time between them, were necessary to correct accidental or inadvertent mistakes in the specification and claims of the original patent. And yet the correction of these is the proper legitimate purpose of a reissue. This practice has been strongly disapproved by the Supreme Court on more than one occasion.

In *Carlton vs. Boker*, 17 Wall., 471, Mr. Justice Bradley remarks: "We think it proper to reiterate our disapprobation of these reissues, attempts to expand a simple invention of a distinct device into an all-embracing claim, calculated by its wide generalizations and ambiguous language to discourage further invention in the same department of industry, and to cover antecedent inventions." Whatever reason there may be to suspect that the motive of the patentee was to give undue elasticity to his patent, still the law presumes that the reissue was granted to correct an inadvertent omission in the original, because it commits to the Commissioner of Patents the conclusive determination of that question, and the only test of the validity of his action is whether he has allowed a reissue for a different invention from that covered by the original patent, or for what was not therein described, claimed, or indicated.