TECTORIUM, SUBSTITUTE FOR WINDOW GLASS.

We have already described the manufacture of a sheet glass in which wire gauze is incorporated. For some years, a product of the same nature has been manufactured, in which the glass is replaced by a special insoluble bichromated gelatine as translucent as opal glass and incorporated in the wire gauze. Fig. 1 shows the aspect of it. This product designated as *tectorium*, has, for some little time, been widely used. We believe it of interest to make this curious substitute for window glass known to our readers and to point out its useful qualities.

It has been employed for many years in Austria, Italy, Germany, Switzerland and Russia as a covering for hothouses, marquises, verandas, roofs of stores, windows of factories, etc. It refracts the rays of the sun, and, while possessing the translucency of opal glass, is tough and flexible, bends without breaking, is not injured by frost, and does not dissolve in water. It is a bad conductor of heat, and, when exposed to the air, becomes stronger and stronger.

Upon passing a slight coat of paint of oil color over the tectorium, one obtains an imitation of stained glass difficult to distinguish from the genuine article. It is easily cut with shears and may be given any form that is desired.

To properly utilize tectorium, it is necessary to nail it to the wood of the window like ordinary glass. When it is a question of employing it upon iron, it is necessary to first cover the latter with small laths and fix the tectorium to them with nails (large-headed ones by preference) somewhat distant from the edge of the material.

Tectorium is easily repaired, provided that the damage is not too great. For small holes the wire of the gauze is first put in place, and a special lac prepared for the purpose is then inserted. If, on the contrary, the rent is too large, it is better to cut out the broken part, and, by means of thick lac, fix a piece of tectorium over the hole.

Some manufacturers who employ the material with success assert that it is not only a very curious substitute for glass, but that it may be considered as much cheaper, owing to the long time that it lasts, its resistance to breakage, etc. It is manufactured in pieces 23 feet in length by 4 in width.

Employed for roofing buildings, hothouses, factories, etc., the tectorium, having to withstand rain, snow, etc., must be firmly and carefully fixed to the T irons that generally compose the framework of such coverings. One of the best means of obtaining a good result consists in cutting the squares or strips three-quarters of an inch wider than the frame on every side, and folding the edges upon themselves so as to double them. After piercing the T iron, one puts in place the tectorium, in which apertures are formed opposite those of the frame. Afterward a small strip of wood being applied to the doubled edge, it is fixed by screws or rivets in such a way that the sheet shall be firmly compressed between the wood and the iron (Fig. 2). —*La Nature.*

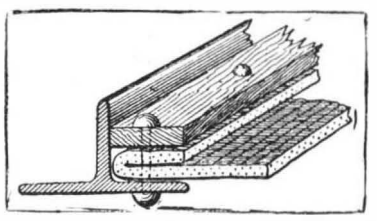


Fig. 2.—MOUNTING OF TECTORIUM.

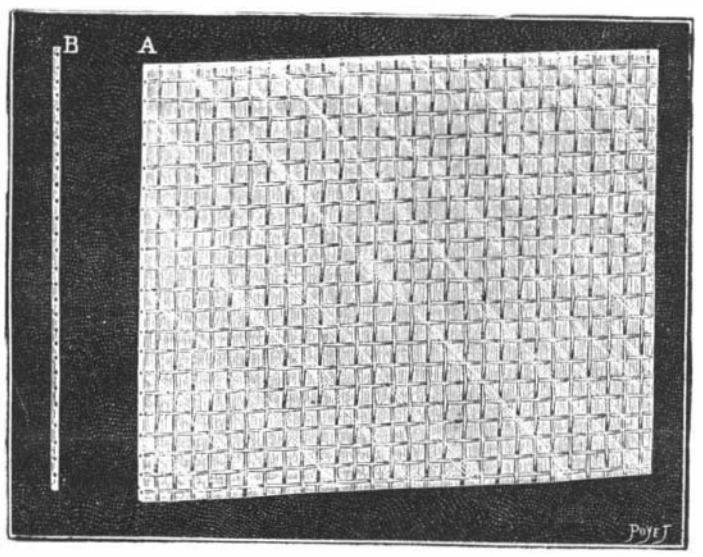


Fig. 1.—SHEET OF TECTORIUM.
A.—Face View. B.—Section.

Artificial Diamonds

To obtain the pressure which he judged requisite to the formation of the diamond, M. Moissan conceived the idea of utilizing the property that certain bodies possess of increasing their volume when cooling from a liquid to a solid state. He placed silver and charcoal of sugar in an electric furnace and fused the metal to a state of ebullition; a certain quantity of carbon was thus absorbed by the metal. The mass was then thrown into water, and at once formed a shell of solid silver. When this was withdrawn from the water and allowed to cool slowly, the pressure of the kernel of molten silver contained in the exterior shell, which expanded in the process of cooling, precipitated the carbon in the form of microscopic black diamonds.

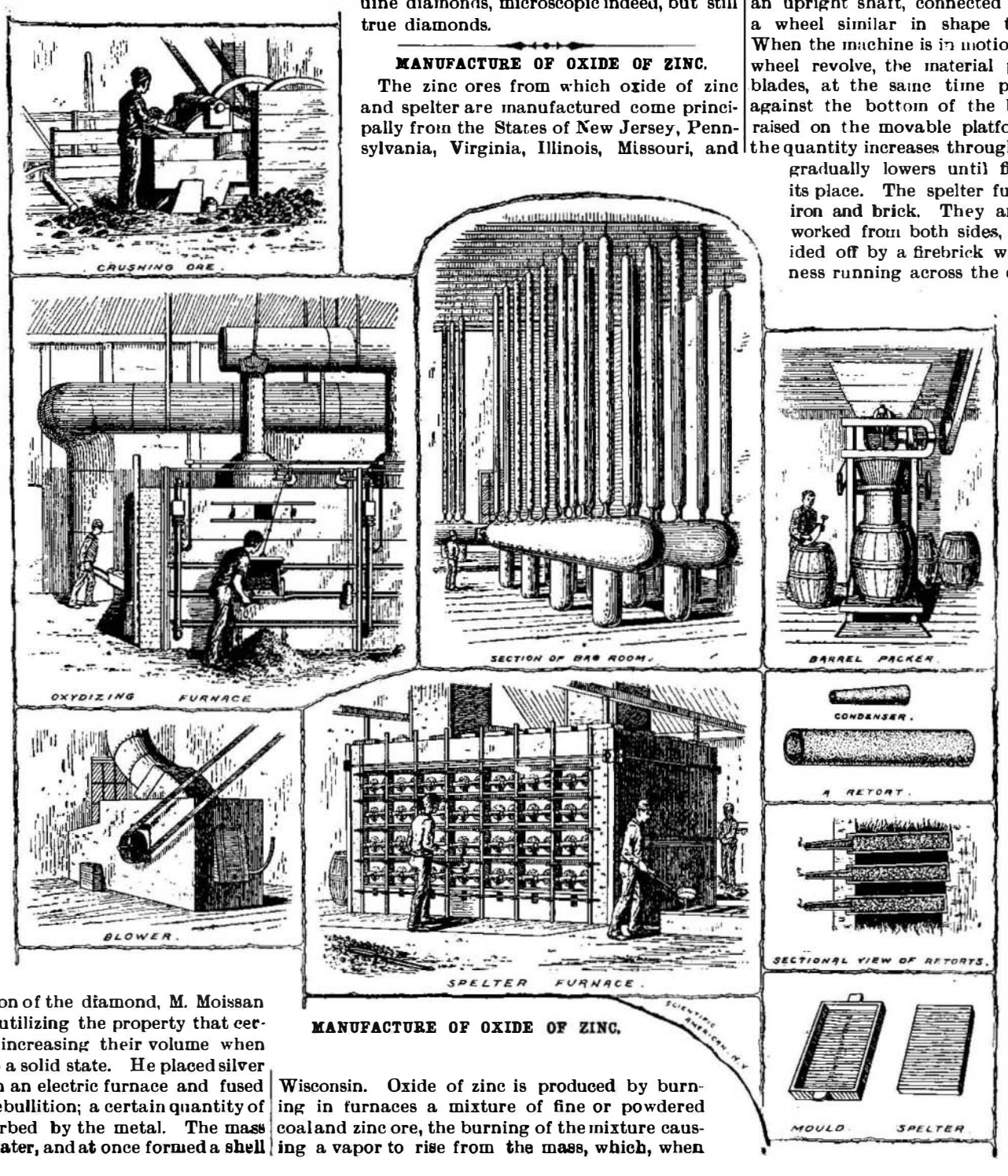
Following this experiment, M. Moissan inclosed in a cylinder of soft iron a certain quantity of charcoal of sugar, and plunged it into a bath of liquid iron, placed in an electric furnace. Withdrawing the crucible from the furnace, he plunged it in water and allowed the mass, as soon as the exterior shell was formed, to cool gradually. The result was the production of genuine diamonds, microscopic indeed, but still true diamonds.

MANUFACTURE OF OXIDE OF ZINC.

The zinc ores from which oxide of zinc and spelter are manufactured come principally from the States of New Jersey, Pennsylvania, Virginia, Illinois, Missouri, and Wisconsin. Oxide of zinc is produced by burning in furnaces a mixture of fine or powdered coal and zinc ore, the burning of the mixture causing a vapor to rise from the mass, which, when coming in contact with the air, forms itself into a white powder.

Spelter is produced by burning the mixture in air-tight retorts, the material in which vaporizes and forms itself into liquid zinc. The oxidizing furnaces are made of iron and brick, the inside of which is lined with fire brick. The burning spaces are about 6 feet in length, 4 feet in height, and about 4 feet in width. A charge—of which there are six daily—consists of about 400 lb. of fine coal and about 550 lb. of zinc ore crushed, which is moistened with water. When the furnace is ready to receive the charge, the mixture is put into the oven. After burning about one-half hour, an upper door of the furnace is thrown open to let the gas escape and prevent explosion. As the heat from the burning mass increases, a vapor from the heated ore arises, which is carried off through an 18 inch pipe or chimney, by means of a blast underneath the bottom of the furnace. This blast admits the oxygen, which, coming in contact with the vapor, causes it to form itself into a white powder. Running horizontally and attached to the pipe at the top of the furnace is a 4 foot pipe, which connects itself by an underground passage to a blower, which carries or forces the powder up into what is called the bag room. The pipes from the blowers run across the center of the room, connected to which every few feet apart, on each side, are a number of muslin bags ranging in diameter from 1 to 4 feet. The small bags are suspended to the rafters 50 feet above and are connected at the bottom to the large 4 foot bags, which run horizontally each way across the room, underneath the bottom of which are a number of 2 foot teats. The oxide of zinc is blown from the pipes into these bags. After a quantity is collected, the blower is stopped and the bags collapse and are shaken by the attendant, causing the material to settle down into the teats, where they are emptied in common bags and then screened and bolted. After being bolted the material passes to the barrel packer. The material passes down through a hopper and into a metal cylinder about the length and the diameter of the top of the barrel. Running down through the center of this cylinder is an upright shaft, connected to the end of which is a wheel similar in shape to that of a propeller. When the machine is in motion the upright shaft and wheel revolve, the material passes out through the blades, at the same time pressing and packing it against the bottom of the barrel, which has been raised on the movable platform of the machine. As the quantity increases through the blades, the barrel gradually lowers until filled and another takes its place. The spelter furnaces are also made of iron and brick. They are square in shape and worked from both sides, the furnaces being divided off by a firebrick wall about 1 foot in thickness running across the center. The distillation is carried on in cylindrical fire clay retorts. These retorts are about 5 feet in length and about 1 foot in diameter and 1⅛ inches in thickness. There are 56 of these retorts on each side, placed in rows, so that they can be encircled by the fire and heat, the inner ends resting on projecting shelves in the center wall and placed so that the inner ends are a little higher than the other.

When the retorts are all in position they are filled with a mixture of fine coal and ore, the attendants putting the material in by means of semi-cylindrical shovels, the operation taking about 3 hours, each retort holding about 125 pounds. After the retorts have been filled conical-shaped tubes or pipes of fire clay are plastered in the mouths of the retorts and the fires started. These conical tubes or condensers are about 18



MANUFACTURE OF OXIDE OF ZINC.

inches in length, about 5 inches in diameter at the base and taper down to about 3 inches at the mouth. As the temperature increases, small jets of flame of different colors issue from the mouth of the condensers; when it becomes a dazzling white it shows that the material is vaporizing and forming into liquid zinc, which begins running into the condensers. The condensers are drawn every 24 hours, the attendants emptying them by means of long iron rods ladle-shaped on the ends. These are drawn back and forth drawing out the liquid zinc which runs into iron receptacles held by the attendants. They are then taken away and moulded into 40 pound cakes of spelter. The retorts last from 2 to 6 weeks, the upper ones lasting the longest on account of their not being close to the fire. The production of spelter in net tons amounts to about 40,000 tons yearly. The sketches were taken from the manufactory of the Passaic Zinc Company, Jersey City, N. J.

Law Governing Sales of Merchandise.

Mutual Assent.—The parties must agree to the same thing at the same time to make a valid sale or contract.

Assent need not be in writing, but may be verbal, by signs or by the conduct of the parties. Even silence often gives consent, as where a man takes up another man's goods and walks off with them. In such case, he agrees to buy the goods and pay their marked value in cash, when demanded.

The fall of the auctioneer's hammer implies consent of both seller and buyer to the bid.

Performance of an offer or proposed agreement constitutes assent.

A mere offer or proposal does not constitute a sale; but if it be accepted, the sale is complete.

(1.) *Offers* must be complete and definite, leaving nothing to be settled by future arrangements, otherwise they are mere proposals to enter into an agreement to sell.

Naming the price of goods and nothing more does not constitute an offer to sell, to the person inquiring, at that price. A letter, stating that the senders were "authorized to offer" goods on certain terms, if accepted, will not bind the seller for any amount the buyer might see fit to order.

An order is usually an acceptance of a previous offer, but often it is merely an offer from the buyer, and if the order is accepted and filled by the seller, the sale is complete.

An offer, unless limited to a certain time, will continue good for a reasonable length of time, according to the circumstances and usages of the trade. If not accepted within a reasonable time, the offer is considered recalled.

An offer can be recalled at any time before it is accepted, and is revoked by the death or insanity of him who makes it.

(2.) Acceptance of an offer must correspond with the offer in its terms. If it does and the offer has not been recalled, the minds of the traders have met, there is an agreement, either to a present sale or to a future one.

If the offer is accepted a moment before it is recalled, the trade is binding. An offer cannot be recalled or accepted unless the acceptance or revocation be communicated to the other party in some manner. The one party may, in his mind, have decided to rescind his offer or to accept an offer; but mere intention is not sufficient to bind the other party. The intention must be followed up by action.

According to the decision of our courts, however, an acceptance to be binding does not have to come entirely to the party making the offer. *The acceptance is binding as soon as it is deposited in the post office properly or given to the telegraph operator.* And this is true, although the letter or telegram never reaches the party to whom it is sent. If the acceptance is mailed or telegram started before the withdrawal of the offer reaches the acceptor, although the withdrawal might have been mailed or telegraphed before the acceptance, the contract or sale is made and both parties will be bound.

The acceptance, if sent by letter, must be actually deposited in the post office. The fact that it was placed among other letters to be posted will not suffice.

An acceptance can be withdrawn at any time before or simultaneously with its receipt, by the party making the offer.

If the offer specifies when it will expire, or when acceptance must be made, or the manner of acceptance, the acceptance must be within the time and in the manner specified. If it is not, the offer is considered rejected.

An acceptance that varies the terms of the offer in any respect amounts to a complete rejection of the offer, and the party making the offer can consider his offer rejected.

If A offers to sell for 10 cents and B says he will accept the offer, price payable at 60 days, the offer is rejected, for unless it be customary in such dealings to give credit for 60 days, the offer is for 10 cents cash down.

If A offers at 10 o'clock to sell for 10 cents, and at 12 o'clock B tells him that he will accept the offer, but at the same time A says he will not sell for less than 12 cents, there is no sale. They failed to assent to the same thing at the same time.

(3.) Fraud in sales makes them voidable at the option of the party who is defrauded. If he chooses, he can hold the defrauding party to his contract. Such a sale is voidable because the parties failed to agree to the same thing. A offered damaged goods while B accepted an offer of sound goods.

(4.) *Mistake* as to the existence, indentity, species, or kind of goods, or as to the price to be paid, if it be material, will render the sale void. In such case they do not assent to the same thing.

In case such mistake occurred, the party mistaken or injured must rescind the sale by notice, or otherwise, as soon as the error has been discovered. If he delays beyond a reasonable time, his silence will be equivalent to confirmation of the sale.

Property that has ceased to exist cannot be sold, nor can property not yet in existence, or not yet owned by proposed vendor, but there may be an agreement to sell such property, that will bind the parties.

(5.) Valuable consideration.

To make a sale binding on the parties, there must be money paid down, or agreed to be paid for the goods. If goods are exchanged for goods, there is an exchange or barter, but it is not, strictly speaking, a sale.

When the parties deal honestly, the amount of the price has no effect on the validity of a sale, provided it be some amount, however small. But where there is a charge of fraud, a small price is evidence tending to prove fraud.

In a contract of any kind, a valuable and binding consideration is any benefit to the party promising, or to a third person at his request; or any injury, loss, charge, or inconvenience, or the risk of it to the party promised.—*Milling.*

The Function of Clothing.

DR. ROBSON ROOSE IN THE "FORTNIGHTLY REVIEW."

Wind carries off the layers of air in contact with the body, replaces them by colder air, and promotes evaporation, whereby the temperature is lowered to an almost indefinite extent. Every one knows the sensation caused by wind blowing on damp clothes or on the wet skin, and the intense cold thus experienced. To obviate this effect the wind must be prevented from reaching the surface of the body, and for this purpose skins and furs are the most efficient coverings. These constitute extremely warm clothing, and cannot be dispensed with in many parts of the world. It is perhaps well to repeat that these articles possess no warmth in themselves. When worn they prevent the natural heat of the body from being rapidly dissipated and neutralized by the external cold air. Next to these come thick, coarse, woolen fabrics which entangle and retain large volumes of air. These are especially suitable whenever great fluctuations of temperature have to be encountered. Besides the properties already mentioned, there is another peculiarity connected with wool which enhances its value as an article of clothing, viz., its power of absorbing water, which penetrates into the fibers themselves and causes them to swell, and also occupies the spaces between them. This property is a very important one as regards health. The normal skin gives off nearly a pint of water, in the form of perspiration, during twenty-four hours, and this fluid disappears by evaporation. The passage of liquid into vapor causes heat to become latent, and the bodily temperature is thus lowered, as may be clearly observed some little time after exertion. If dry woolen clothing be put on immediately after exercise, the vapor from the surface of the body is condensed in and upon the wool, and the heat which had become latent in the process of evaporation is again given off. Flannel clothes, therefore, put on during perspiration always feel warm, whereas cotton and linen articles allow the perspiration to pass through them, so that the evaporation and cooling processes are unchecked. There is, therefore, an obvious reason for selecting flannel clothing for wearing after active exertion. An individual who is perspiring freely is far less likely to take cold when clad in flannel than when clad in linen or cotton. Dr. Poore thinks that cotton might be made to acquire properties similar to those of wool by adopting a looser method of weaving the material. If linen or cotton be woven "in a loose, porous fashion, these fabrics then become, as heat retainers, scarcely inferior to wool." Woolen fabrics cause a sensation of warmth in virtue of another peculiarity which they possess. They often present a rough surface, which, coming into contact with the skin, causes friction, and therefore more or less warmth. The irritation thus produced is intolerable to some persons, but if it can be borne for a short time, the skin often gets accustomed to the sensation.

The color of the materials has some influence on the warmth of clothing. Black and blue absorb heat freely from without, but white and light shades of yellow, etc., are far less absorbent. This difference can be demonstrated by experiment; the same material, when dyed with different colors, will absorb different amounts of heat. In hot countries white coverings are universally worn, and sailors and others wear white clothing in hot weather. With regard, however, to heat given off from the body, the color of the materials used as clothing makes little, if any, difference. Red flannel is popularly supposed to be warm, though it is no better in this respect than similar materials of equal substance, but white or gray in color. Dark clothing is best for cold weather, because it more freely absorbs any heat that is obtainable. Waterproof clothing is very valuable under certain conditions. It protects against cold, rain and wind; but it is an exceedingly hot dress, for it prevents evaporation and condenses and retains the perspiration. Save for very short periods, it should never be worn by persons taking active exercise. For those, however, who are not exercising their limbs to any great extent, but are exposed to wet and cold, waterproof materials are an excellent protection. Woolen clothing should be worn underneath in order to absorb perspiration, and the waterproof should be taken off as soon as the necessity for it has passed away. Ventilating waterproofs are sometimes offered, but a real combination of this kind is an impossibility. If a garment let out air and perspiration, it will let in wind and wet. If thoroughly waterproof, it will not admit of any true ventilation.

With regard to woolen clothing as a protection against wet, it must be remembered that fabrics of this kind, especially if loosely woven, absorb an enormous amount of water. A man clad in thick woolen clothes, and walking in rain for some hours without other protection, is conscious of great weight and inconvenience. Under similar conditions cotton and linen garments are speedily saturated, and the wearer soon becomes chilled. Garments made of pure silk are exceedingly comfortable, but very expensive. Thin silk, worn under flannel, adds greatly to the protection afforded by the latter against chills, and likewise prevents the unpleasant sensation of friction. Thin flannel socks, worn under merino or woolen ones, form a good remedy for cold feet.

The principal conclusions to be drawn from the foregoing paragraphs may be thus briefly stated:

1. As a protection against cold, woolen garments of equal thicknesses are much superior to either linen or cotton, and should always be worn for underclothing. Furs and leather are serviceable against great cold, and especially against severe wind. Waterproof clothing should be reserved for very wet weather, and generally for persons who are not taking exercise when exposed to it.

2. The value of several layers of clothing as compared with a single warm garment should be borne in mind. An extra layer even of thin material next the skin is often very valuable.

3. As a protector against cold, a garment should not fit closely to the body, but should be comparatively loose and easy, so that a layer of air is interposed between it and the skin. A loosely woven material is warmer than one of an opposite character.

4. For wearing at night, woolen clothing is not generally desirable; cotton or linen is far better. The blankets constitute the woolen covering, and ought to protect the body sufficiently.

5. Lastly, it must always be remembered that the source of heat is within the body itself, and not in the clothes. Proper food, coupled with a due amount of exercise, will produce heat; the function of clothing is to retain the heat thus generated.

Effect of Temperature on Iron.

An official statement of tests made at the Massachusetts arsenal to ascertain the effect of temperature on the strength of iron has been published. The specimens were heated by rows of Bunsen burners, which were arranged in a muffle, and the temperatnres of the test specimens were judged by their observed expansions. Each piece was heated to the temperature of the test before being strained, and its expansion determined by a micrometer, and the coefficient of expansion of each grade of metal having been determined before the tests began, the temperature could be inferred with considerable precision. An abstract of five of these tests—the temperatures being all on the Fahrenheit scale—is in evidence that the strength of steel is greater at about 500 deg. than it is at 70. These five series of tests were made with five different qualities of steel containing respectively 0·09, 0·20, 0·31, 0·37, 0·51 per cent of carbon, and the percentage of strength was obtained by dividing the tensile strengh of a sample of steel at the given temperature by the strength of the same quality of steel at 70 degrees. The result presents the interesting fact that the specimens in question were all stronger in the neighborhood of zero than they were at ordinary temperatures—all of them, in fact, showing a minimum of strength at 210 deg. or thereabout, and a maximum of strength at about 550 deg.

ROCK emery millstones are said to be rapidly coming into use. It is claimed that they are wonderful grinders, and it seems quite natural that blocks of rock emery should cut faster and last longer than anything else.