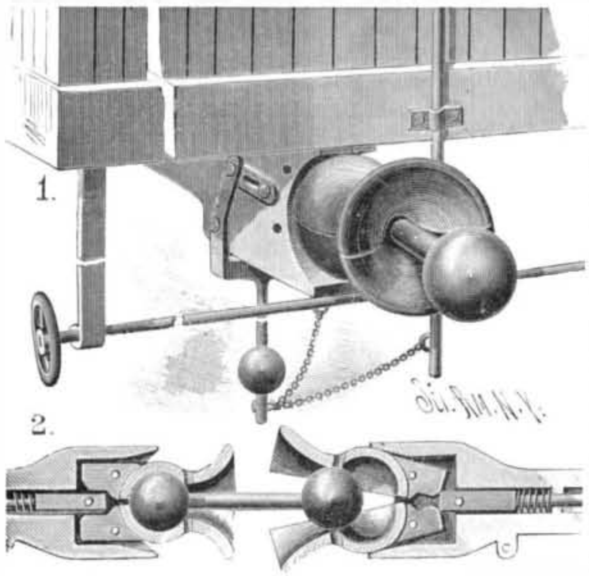
CAR COUPLING.

The recess in the enlarged head of the drawbar is rectangular at its inner end, but is formed with beveled sides as it approaches the mouth of the head. Within this recess there are pivoted two coupling jaws, each formed with a hemispherical recess and a flaring mouth piece formed like one-half of an ordinary bell; between these parts there is a shoulder, as shown in the sectional view. Each jaw is provided with a rear lug formed with a notch, so that when the two jaws are in the



CHAPPELL'S CAR COUPLING.

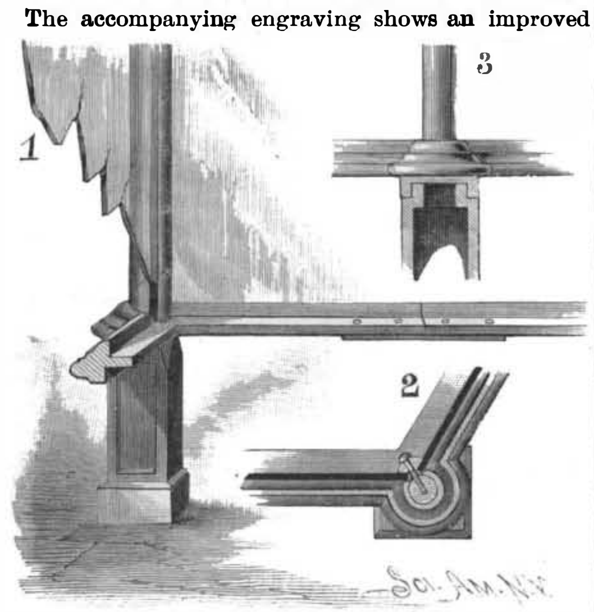
position shown at the left in Fig. 2, there will be a space between the lugs which can be entered by the locking dog, which is held forward and within the recess by a spiral spring. The dog is provided with a cross bar extending through slots in the sides of the drawhead. Links connect the ends of this cross bar with the ends of a U-shaped lever pivoted to a lug upon the under side of the drawhead. A downwardly extending arm of the lever is provided with a weight and is connected by chains which can be wound upon either a horizontal rod extending across the end of the car, or a vertical rod extending to the roof of the car; upon the outer ends of these rods are hand wheels by which the coupling can be operated without going between the cars. Upon each end of the coupling link there is a ball that fits snugly within the spherical recess.

The operation of this coupling is as follows: One end of the link is placed within the recess of one of the couplers, and the locking dog advanced between the lugs to hold the jaws closed. As the cars approach, the outer ball of the link strikes the bell-shaped mouth of the lower jaw of the other coupler, slides up the mouth piece, separates the jaws, and enters the spherical recess; the upper jaw drops to a horizontal position, and the lower jaw is raised by the ball striking the inner face of the recess, when the spring forces the dog between the lugs to lock the jaws. Each jaw is formed with an aperture through which a pin can be passed when it is necessary to use a coupling link of the ordinary construction.

This invention has been patented by Mr. Clifton T. Chappell, of 227 Second Street, Macon, Ga.

IMPROVED WINDOW SASH.

The accompanying engraving shows an improved



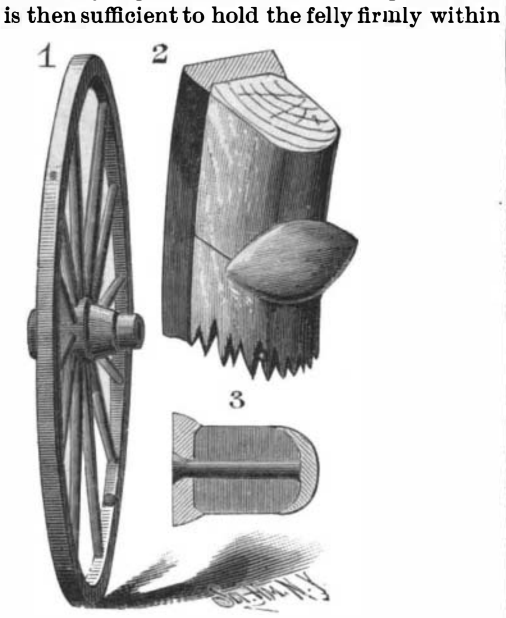
BROSNAN'S IMPROVED WINDOW SASH.

construction of the frames and sashes for store windows. The vertical post sustaining the edge or edges of the glass is formed of a pipe provided with a longitudinal slot at its inner side. This post is filled with wood, and the edges of the glass are held by a fillet secured against the margins of the glass by screws, as shown in the sectional plan view, Fig. 2. The lower end of the post rests in a socket formed in the upper end of a metal standard. In the case here shown, this socket is formed by the continuation of the fillet that extends along the top surface of the metal sash bar, and forms, with the horizontal inwardly projecting flange of the bar, the rabbet in which the lower edge of the glass is held. This flange also forms the support for the boards composing the flooring of the window. In the case of a window having a single post at the meeting edges of the glass, the sash bars are extended in both directions and their free ends are supported in the walls or columns of the building. In a window having two or more posts the adjacent ends of the sash bars are bolted to a connecting plate, as shown at the right in Fig. 1. By making the bars and support for the post in one piece, the relative movement of the parts is prevented. The standard may be made in two parts, as shown in Fig. 3. By using a metal frame for supporting the glass, there is no liability of the shrinking, warping, or giving away by decay, so as to allow the glass to settle, as is liable to occur in the construction of these parts commonly used. The metal sash bar, by occupying only a small part of the opening beneath the window, gives a much larger space for lighting the lower room than could heretofore be obtained.

This invention has been patented by Mr. P. J. Brosnan, of 200 Milwaukee Avenue, Chicago, Ill.

SIMPLE MEANS OF FASTENING WAGON TIRES.

The illustration herewith represents a means of securely fastening the tires of wagon and carriage wheels, so that it is almost impossible for them to spring from their position, while only two bolts are used, those being at the joints where the fellies come together. Fig. 2 is an enlarged and Fig. 3 a sectional view of the bolt and tire, showing how the joint is made. The tire is made with flanges to fit over the outside edges of the felly, so that it requires a full heat in being put on to give the necessary expansion, but the subsequent contraction is then sufficient to hold the felly firmly within



HITT'S TIRE AND TIRE BOLT.

the flanges of the tire. The bolt is then driven through the felly and tire, and riveted in a countersunk hole in the face of the latter, the head of the bolt being drawn over the felly on the inside, as shown in Fig. 3. The whole operation can be completed in far less time than it takes to put on a tire of the ordinary style, and the wheel has a neat and substantial finish. In this tire, also, the face is wider than the felly, and thus protects that and the spokes from injury from rock and dirt, while the flanges likewise help to stiffen the tire and help it to better keep its shape with hard usage.

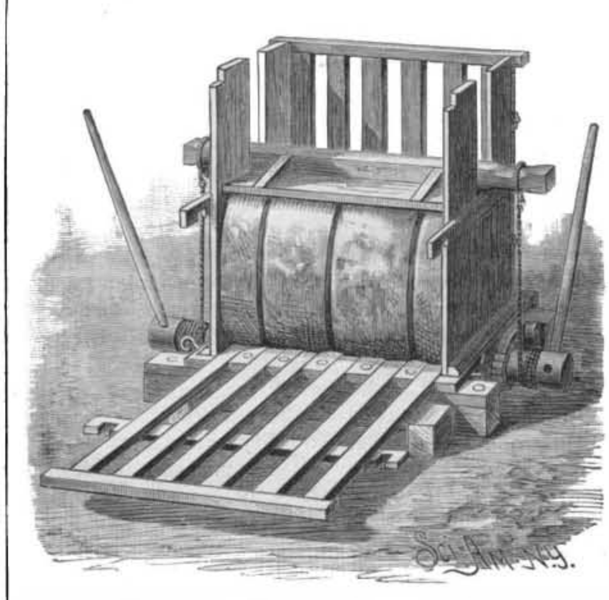
This invention has been patented by Mr. Lewis L. Hitt, No. 924 Market Street, Chattanooga, Tenn.

Test for Leather Belts.

Herr Eitner proposes the following method for testing the efficiency of belts: A small strip is cut off and placed in a jar filled with common vinegar. If the belt was well tanned and good quality, it may remain in the vinegar many months without being injuriously affected, it growing only a little darker in color. If, on the contrary, the belt was of an inferior make, its fibers begin soon to swell, and after a short time are transformed into a gelatinous mass.

HAY AND COTTON PRESS.

This press for baling hay and cotton is constructed in independent detachable sections, so as to be quickly set up for use and taken apart and compactly packed for storage or shipment. Upon the base are mounted the four sides composing the box. Two sides are made up of upright strips, between the spaces at the lower ends of which are the ends of similar strips forming the bottom. The upright strips are united by top and middle rails. The lower parts of the ends, each of which is made in one piece, are held from spreading by strips secured to the base. The upper ends of the four side pieces are held together by cross bars, which are halved into the extended ends of the middle rails. The lower ends of the two sides are pivoted to the frame by removable rods, which form hinges upon which either side can be turned down to form a platform upon which to receive the bale from the press. The follower is provided with a central cross beam extending through vertical openings in the ends; to the extended ends are secured ropes wound around a windlass turning in bearings in the base, by which the follower is drawn down to compress the bale. The windlass is



HANSEN'S HAY AND COTTON PRESS.

operated by a lever, and is prevented from turning backward by a pawl. That side of the box not to be used as a door may be connected to the ends by bolts and staples. To prevent the end pieces from rising off the base, they are notched beneath the top side rails.

This invention has been patented by Mr. H. G. Hansen, and further particulars can be had from Mr. Fred. Mackensie, of Calumet, Mich.

A SMOKE CONSUMING FURNACE.

The simple construction herewith illustrated, for promoting a more perfect combustion, and making a furnace which is in reality a smoke consumer, adapted for locomotive, marine, and stationary boilers, will be understood at a glance. Its most essential feature is in the arch located in the front of the combustion chamber, between the fire on the grate and the boiler, and dividing the combustion chamber so as to form a coking oven in its front half. Here the fuel is first fed, and after being there coked is forced back upon the rear of the stationary grate, where the process of combustion is completed. The arch is inclined toward the rear, so as to narrow the throat between the coking oven and the rest of the combustion chamber, so confining all the volatile products of combustion as to insure their most thorough utilization, that no smoke or soot may pass the bridge wall. The arch also prevents cold air from coming in contact with the boiler when the door is opened for the admission of fuel or otherwise. There is a dumping grate in the rear of the stationary grate, just in front of the bridge wall, which is provided with an operating bar, shown at the side of the ashpit door; as the clinkers are crowded to the rear end of the furnace in the

THE BACKUS BOILER FURNACE.

regular order of firing, they may thus be readily removed without disturbing the operation of the furnace or impairing its even and perfect combustion of fuel.

This invention has been patented in the United States and in several foreign countries by Mr. Absalom Backus, Jr., and these furnaces are manufactured by The Backus Company, of 505 Fort Street West, Detroit, Mich.

Shellac.*

BY J. BOSISTO, EXAMINER IN MATERIA MEDICA AT THE VICTORIA COLLEGE OF PHARMACY.

In the central provinces of India, especially in the thick jungles, the Coccus lacca insects may be seen dwelling together in thick set groups on the branches and twigs of *Zizyphus jujuba*, *Ficus religiosa*, *Butea frondosa*, besides other trees and shrubs belonging chiefly to the Leguminosæ order. Each insect incrusts itself over with a resinous substance, forming within a cell containing larvæ and a deep coloring matter, the dead body of the parent being itself the cell. Hundreds of these are piled together, adhering to a twig, and in this condition it is termed stick lac, and contains about 70 per cent of resin, 10 per cent of coloring matter, and the rest debris.

The collecting of stick lac and the making of shellac, button lac, sheet lac, and lac dye, is an industry carried on by the Hindoos in the districts of the central provinces. In order to obtain the largest quantity both of resin and coloring matter, the stick lac is collected before the larvæ emerge from the cells, else, with their flight, they carry away the greater part of the dye coloring.

Since the advent of the anilin dyes, lac dye is but little in demand. The larvæ are allowed to mature, as they do not interfere with the quality or quantity of the resin portion. It is chiefly this circumstance that keeps down the price of shellac, there being, consequently, more insect workers than formerly.

The process of dealing with stick lac for the making of shellac and lac dye was witnessed by the writer when in India, and is as follows: The first part of the process is to separate the lac from the twigs. This is done by two women—one turning and the other feeding a primitive-shaped wooden mill. When a heap is formed (about a bushel in quantity), it is winnowed in a rustic-looking winnower, the lighter debris separating; the remainder is then hand picked. The process of grinding and winnowing is repeated until the whole is reduced to small, orange colored nodules. When in this condition, it is termed seed lac; the bright, garnet-colored pieces, being few in number, are now picked out and set aside for native ornaments. The seed lac is then placed in a large earthenware pan, and with it some water. A woman steps into the pan, steadying herself against the mud wall with her hands, then turning violently to the right and left, in order to keep the lac in a continual state of motion against her feet and the sides of the pan for some time, the other woman occasionally adding more water, until the vessel is full of a dark colored liquid. After settlement, the dye water is removed into another earthenware pan, and the lac again washed until the water runs away clear.

Lac Dye.—The treatment of the colored water for the purpose of obtaining from it the lac dye is very simple. After straining, lime water is added, which precipitates the dye. The water is then drawn off, and the dye drained through cotton cloth; from this it is transferred to compressible frames, containing strong iron plates, and reduced by a native screw press to solid sheets of dark purple dye about a quarter of an inch thick; these are cut up into cakes and stored till dry enough for packing, and then forwarded to Calcutta for sale in the bazars. The utilitarian value of lac dye over cochineal in a humid climate, especially in dyeing the scarlet cloth of the soldiers' coats, lies in its power to resist the action of human perspiration.

Shellac.—The manufacture of shellac is an entirely distinct process. The seed lac at the bottom of the pan is removed, dried, and sifted. The finer dust, which is highly inflammable, is removed. The lac workers of India make it up into bracelets and ornaments of various kinds.

The coarse lac which is to be made into shell is put into long sausage-shaped bags of about two inches diameter, made of cloth like American drill. Under a shed is a charcoal fire about two feet long and six inches wide; alongside of the fireplace is a bamboo pole, about three feet long and four inches in diameter, filled with warm sand, inclining at a slight angle to the ground. On each side of the fireplace is sitting a man, or more generally a woman, each holding an end of the sausage-roll-looking bag about twelve inches high over the clear charcoal fire, turning the roll or bag briskly until the lac begins to ooze through the interstices of the cloth; the bag is still kept twisted until a coating of soft lac covers the outside. It is then removed from the fire, and a small disk of lac is placed here and there over the surface of the bamboo by a rapid turn of the wrist. A third woman is sitting at one end of the bamboo, holding in both hands a strip of aloe leaf, resembling very much a thin magic wand; this she pushes forward over the soft lac, repeating the motion three or four times, when a thin film of the lac covers over the round surface of the bamboo, which is immediately transferred into an open basket. The lac drying rapidly cracks up into many pieces; this is shellac.

Button lac is simply shellac without spreading.

Sheet lac is made in a similar manner to shellac, only the sheets are much thicker, and the woman removing it from the bamboo in a supple condition and with both hands stretches it over the fire in order to remove the wave-like furrows which are impressed on it by the fibrous surface of the aloe leaf. While doing this, it is not uncommon to see the woman—who performs her work intelligently—lift the hot sheet to her mouth and bite out any foreign substance, such as dirt or sand, filling in the hole so made by a rapid movement of her hand over the sheet. The average rate of wages is an anna and a quarter (1⅜ of a penny) per day.

* *Australasian Journal of Pharmacy.*

Report by M. Pasteur.

At the last meeting of the Academy of Sciences, Paris, M. Pasteur read the following report of the results of his antirabic treatment at his laboratory in the Rue d'Ulm: "The number of persons so treated amounted, up to the 12th April, to 726, including those who are still undergoing treatment. Of this number, there were 688 who were bitten by mad dogs and thirty-eight by wolves, the latter being all Russians. The patients belonging to the first category are, with the exception of the little girl Pelletier, who, it will be remembered, died after a few inoculations, all doing well. More than half of that number have passed the dangerous period. Of the thirty-eight Russians who have been treated and are still undergoing treatment, three have died rabic; the others are doing well, but it is impossible to foresee what may happen to them, as there exists a profound difference between the bites of dogs and those of wolves, the proportion of deaths caused by rabid wolves being at least 82 per cent." M. Pasteur then concluded his report in the following terms: "The above facts demonstrate (1) that the duration of incubation of human rabies caused by the bite of a rabid wolf is often very short, very much shorter than rabies after the bite of a mad dog; (2) that the mortality after the bites of rabid wolves is considerable, if we compare it with the effects from the bites of dogs. These two propositions may be sufficiently explained by the number, the depth, and the seat of the bites caused by the wolf, which so savagely attacks his victim, the attack being often on the head and face. The necropsy of the three Russians who died at the Hotel Dieu, and the inoculation of rabbits, guinea pigs, and dogs with the medulla oblongata of the first of the patients who died, prove that the virus of the wolf and that of the dog are sensibly of the same degree of virulence, and that the difference of the rabies of the wolf and that of the dog depends on the number and nature of the bites. These facts induced me to inquire whether, in the case of bites from rabid wolves, the method could not be usefully modified by inoculations in greater number and within a shorter time. The results will be eventually reported to the Academy. In any case, for the wolf in particular, it is good to submit the patient to the preventive treatment as soon as possible. The Russians of Smolensk were six days on their journey to Paris, and presented themselves at the laboratory fourteen or fifteen days after having been bitten. They might therefore have commenced the treatment eight days earlier, and one cannot say what might have been the influence of this modification for the three patients who have succumbed."

Swedish Iron Mountain.

It cannot be said that our iron mining companies have latterly had any very profitable times, for they have had to pay ruinous mineral royalties at a time when trade is very depressed and prices almost unprecedentedly low, and the amount of competition existing not only between home, but from Spanish, Swedish, and other foreign sources, is very great. It has become a common occurrence, in fact, for imported ores to undersell ours, even in places contiguous to the mines. An enterprise, however, is now being undertaken which, when completed, will have a considerable effect on the iron ore market of both this country and the Continent, and will lead to still further competition in this direction. We allude to the opening up of what are perhaps the largest deposits of iron ore to be found in the world, large hills being almost entirely composed of this material of an extremely rich and valuable nature. The deposits in question are situated in the extreme north of Sweden, verging on Lapland, and a railway is now being constructed for the purpose of bringing the metal to market. The Northern Europe railway, said to be the most northern in the world, commences at the port of Lulea, at the northwest end of the Gulf of Bothnia, a town of about 4,000 inhabitants, having a very large timber trade, and possessing a good harbor, which vessels of large tonnage can easily enter, and runs across the Scandinavian peninsula to Ofoton Fjord on the Atlantic coast of Norway. The line follows the Lulea River valley for the first twenty-five miles, then, turning north, crosses the Arctic Circle and proceeds to Gellivara, 140 miles from Lulea. This section of the line, in which the work of construction is light, passing principally through valleys of sand and gravel, is now on the point of completion.

Vast forest of pine are here met with, extending over hundreds of square miles, and timber will now be able to be readily brought to the port of shipment. At Gellivara stands the mountain of that name, entirely composed of rich iron ore, hundreds of feet thick, and covering many square miles. The ore requires no mining, being close to the surface, and can be quarried and put into railway wagons direct, the railway passing round the mountain for that purpose. A small portion of this ore already reaches Lulea, being carted the whole distance during the winter months. After leaving Gellivara, the line passes Lake Tjantjas and Panki, to the great iron mountain of Kirunavara, whose peak of solid metal is visible at a distance of forty miles. This mountain is several miles long and 850 feet above the level of Panki Lake. It is composed of about 98¼ per cent of peroxide of iron, very rich in quality, and is estimated to contain about 280,000,000 tons of metal above the waters of the lake. It is estimated this ore can be quarried and put into trucks for two shillings per ton. It will have to be carried eighty-five miles by rail to the proposed Atlantic harbor. A sister iron mountain, Luosavara, stands four miles to the northwest of Kirunavara, being about the same height, and also containing gigantic deposits of equally rich ore. The two mountains are separated by a valley, through which the railway will pass on its way to the Norwegian frontier, running by the Great Torne Lake, fifty miles long, and through forests of fir trees, until the frontier is passed on a tableland 1,600 feet above the sea level. The descent from the Kjolen mountains to the terminus, a distance of 28 miles, is circuitous, and will necessitate some severe gradients and expensive works during construction, which is being undertaken by English contractors under the supervision of English engineers.—*Mechanical World.*

Using One's Eyes.

How many of us go through life without ever realizing that our eyes have to be educated to see as well as our tongues to speak, and that only the barest outlines of the complex and ever-changing images focused on the retina ordinarily impress themselves upon the brain? That the education of the eye may be brought to a high state of perfection is shown in numerous ways.

There are many delicate processes of manufacture which depend for their practical success upon the nice visual perception of the skilled artisan, who almost unconsciously detects variations of temperature, color, density, etc., of his materials which are inappreciable to the ordinary eye.

The hunter, the mariner, the artist, the scientist, each needs to educate the eye to quick action in his special field of research before he can hope to become expert in it.

The following story from the *Penn Monthly*, which is quite *apropos*, is related of Agassiz, and it is sufficiently characteristic of this remarkably accurate observer to have the merit of probability. We are told that once upon a time the Professor had occasion to select an assistant from one of his classes. There were a number of candidates for the post of honor, and finding himself in a quandary as to which one he should choose, the happy thought occurred to him of subjecting three of the more promising students in turn to the simple test of describing the view from his laboratory window, which overlooked the side yard of the college. One said that he saw merely a board fence and a brick pavement; another added a stream of soapy water; a third detected the color of the paint on the fence, noted a green mould or fungus on the bricks, and evidences of "bluing" in the water, besides other details. It is needless to tell to which candidate was awarded the coveted position.

Houdin, the celebrated prestidigitator, attributed his success in his profession mainly to his quickness of perception, which, he tells us in his entertaining autobiography, he acquired by educating his eye to detect a large number of objects at a single glance. His simple plan was to select a shop window full of a miscellaneous assortment of articles, and walk rapidly past it a number of times every day, writing down each object which impressed itself on his mind. In this way he was able, after a time, to detect instantaneously all of the articles in the window, even though they might be numbered by scores.

SPEAKING on the "Corrosion of Iron and Steel," Mr. T. H. Davis, F.I.C., formerly assistant at the Royal College of Chemistry and School of Mines, London, says if the air or water which surrounds iron contains carbonic acid or any free acid in minute quantity, the corrosion increases rapidly; but if a caustic alkali, such as potash, soda, or lime be present, the corrosion ceases altogether while any causticity remains, because oxygen and carbonic acid have greater affinities for these alkalies than for iron. He also points out that a perfect paint for the protection and preservation of iron and steel should be one which has a high mechanical adhesive property, and composed of such materials as are related electro-negatively to iron, mixed with some tenacious fluid vehicle containing little or no oxygen, and not capable of being decomposed by the iron beneath it. This would exclude most oily paints.