Restoring Burnt Steel.

At the Nuremberg technical school a series of attempts have been made to restore the original qualities of steel after it has been burnt in the forge. These tests have been carried out with various classes of steel in common use for tools, and with varying degrees of success. Sometimes this accidental burning can be repaired by hammering the piece of steel while hot; but more generally it is only worth returning to the scrap heap. The alteration known as burning is due to a more or less considerable decarburation of the metal. Among the processes that have been devised for restoring burnt steel, the following has given excellent results: The piece of metal is brought to a red heat and suddenly plunged in a mixture composed as follows: Pitch, 2 parts; train oil, 2 parts; tallow, 1 part; with a small addition of common salt. This operation is repeated two or three times.

A Question of Steamship Models.

The speed of the steamer Finance, of the United States and Brazil Steamship Company, which made the trip from St. Thomas to this city in five days, is owing—according to the statement of one of her officers to a *Tribune* reporter—to her model.

"She is nearly flat on the bottom, and has no keel except her two bilge keels, or rolling keels as we call them. This gives her great carrying capacity as well as speed. Her bows have a fine entrance, but the body of the ship is carried well forward under the water-line, so that when she goes into a sea she rises like a duck and does not stagger. I think that American-built ships have a greater carrying capacity and develop more speed with less coal than any others in the world. The swift steamship America is a much larger vessel than the Finance, yet the America only carries about 2,000 tons of cargo to the Finance's 3,166 tons. The America is, of course, the faster ship, but not enough faster to make up for the difference in carrying capacity. The Finance can make 14 knots an hour, and the America 18. The Finance burns from 28 to 30 tons of coal a day, and the America 175.

"There is the ship San Pablo, a typical American ship. She has developed a speed of 16 knots an hour with a consumption of 32 tons of coal. She carries a dead weight of cargo of 4,500 tons. She recently made the fastest passage on record between here (New York) and Gibraltar. She is now running between New Tacoma, on Puget Sound, and San Francisco. The round trip takes 10 days. In 30 days she made three round trips and started on her fourth, and has landed 12,500 tons of coal. In nine months she has cost only $26 for repairs in the engine-room. She is built something on the model of the Finance, but has a keel. The City of Rome burns 320 tons of coal a day and can only carry 1,000 tons of cargo. The great freight ship of the National Line is the England, which carries 3,500 tons of cargo. She makes about 12 knots an hour, and can be pushed to 13.

The England is 437 9 feet long, 42½ feet beam, and 35 feet depth of hold. The Finance is 300 feet long, 38·4 feet beam, and 23·6 depth of hold. The Finance is not, of course, a fast ship, compared with the greyhounds of the sea, but, as you see, attains a respectable speed, has great carrying capacity, and besides that is a passenger ship. And look at the San Pablo with a speed of 16 knots, a carrying capacity of 4,500 tons, and consumption of only 32 tons of coal. It is all in the model. I believe that a ship as large as the Oregon or America and with much less engine power, built on the flat bottom model, would beat their time badly, and have twice or three times their carrying capacity."

Cocaine Hydrochlorate.

The honor of discovery of this new local anæsthetic is due to Dr. Kollar, a young medical student, still engaged in his studies at Vienna. Hydrochlorate of cocaine has been used in this city with success in many cases, especially in ophthalmic surgery. A few drops applied to an injured eye allays the pain, produces immediate insensibility of the parts, and enables the surgeon to operate with success. This discovery forms an important step in the progress of medical knowledge. The hydrochlorate has been used in the opening of felons, for sensitive throat, etc.

THE Pacific coast has nearly doubled its crop of hops this year over that of last, without materially increasing its consumption.

TWO NEW OPTICAL ILLUSIONS.

All optical illusions which have for result the exhibition of an isolated portion of a live human body, such as a head separated from the trunk, a bust without a body, or a body without a head, always surprise and interest the spectator.

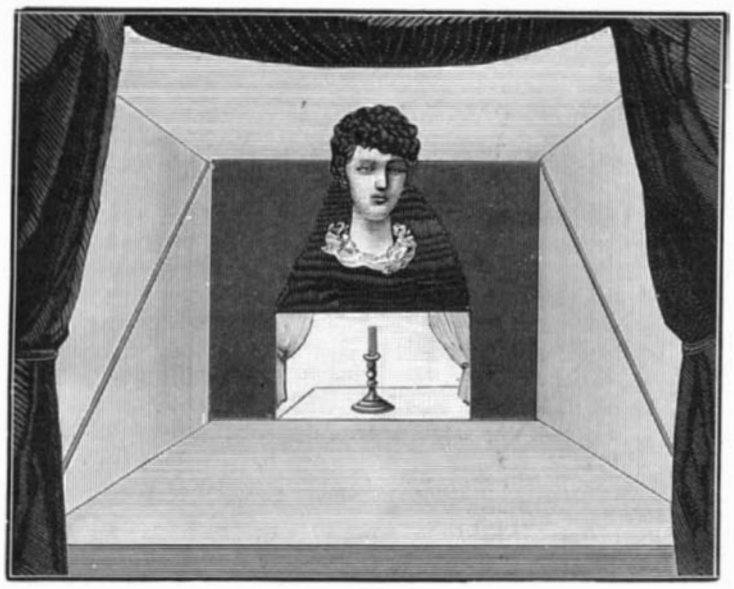

Fig. 1.—AN ISOLATED HEAD IN THE CENTER OF A STAGE.

We learned in early childhood that life is impossible under such circumstances, and yet, if the experiment be well presented, we distinctly see the reality of what our judgment and experience are in accord in declaring impossible. We are tempted then to doubt the evidence of our eyes, notwithstanding our daily confidence in those organs.

This sort of contest between the senses and reason lasts a longer or a shorter time, according to the spectator. It is quick in some, and slower in others; but it may be said that in almost all, this kind of spectacle strongly excites the curiosity. For this reason, ever since the first exhibition of the decapitated talker by Colonel Stodare at London, prestidigitators and physicists have been exerting their ingenuity in order to obtain analogous effects by varied processes; and so there has appeared a large number of decapitated talkers, living busts, half-women, persons with two or three heads, men cut in pieces, and decapitated bodies of all sorts. As an example of the apparent realization of several of these physiological impossibilities, we may cite a singular exhibition that is now being held at London, in Egyptian Hall. A physician and his patient are upon the stage, and engage in a very animated conversation; the sick man seats himself in an arm chair, and the physician cuts off his head and lays it upon a table. The head speaks, and threatens the physician with the vengeance of heaven, and then the headless body rises, and, by expressive mimicry, joins its reproaches to that of the head. Then it takes the latter upon its arm, and the dialogue goes on—the head always talking, and the body gesticulating.

After seeing this sort of spectacle a certain number of persons go away indifferent to the processes by means of which such effects are obtained, while others, on the contrary, are interested therein. It is for the latter that we shall describe in this article two new tricks, that have recently been shown in Paris, at the theater Folies Bergeres, under the names of *Stella*, and *The Mystery of Dr. Lynn*.

Stella.—The spectator, upon entering, sees in front of him a large panel in which there is an aperture about 5 feet square closed by a silk curtain. When the latter is drawn aside, there is seen a small and elegantly decorated stage, whose sides may be perfectly distinguished. In the center of this stage, suspended in space, there is a young girl's head, the neck of which starts from a satin collar (Fig. 1). This head is well isolated on every side; one sees the rear of the stage, the sides, the top, and the bottom, and the light leaves no portion in shadow. The head is living; it speaks and smiles, the eyes move, and the exhibitor further proves it by presenting to it a lighted candle, which it extinguishes by blowing it out. The exhibitor then disappears behind the side scenes along with the candle. He now, as it seems, draws out a panel in the back of the stage, and through the aperture thus formed, the spectator very distinctly sees the top of a table, and, upon it, the candle that the head has just extinguished. Now this aperture is directly under the head, but much farther off, and is in the direction that the body would occupy if the head possessed one. The absence of the body is therefore well demonstrated, and the curtain drops.

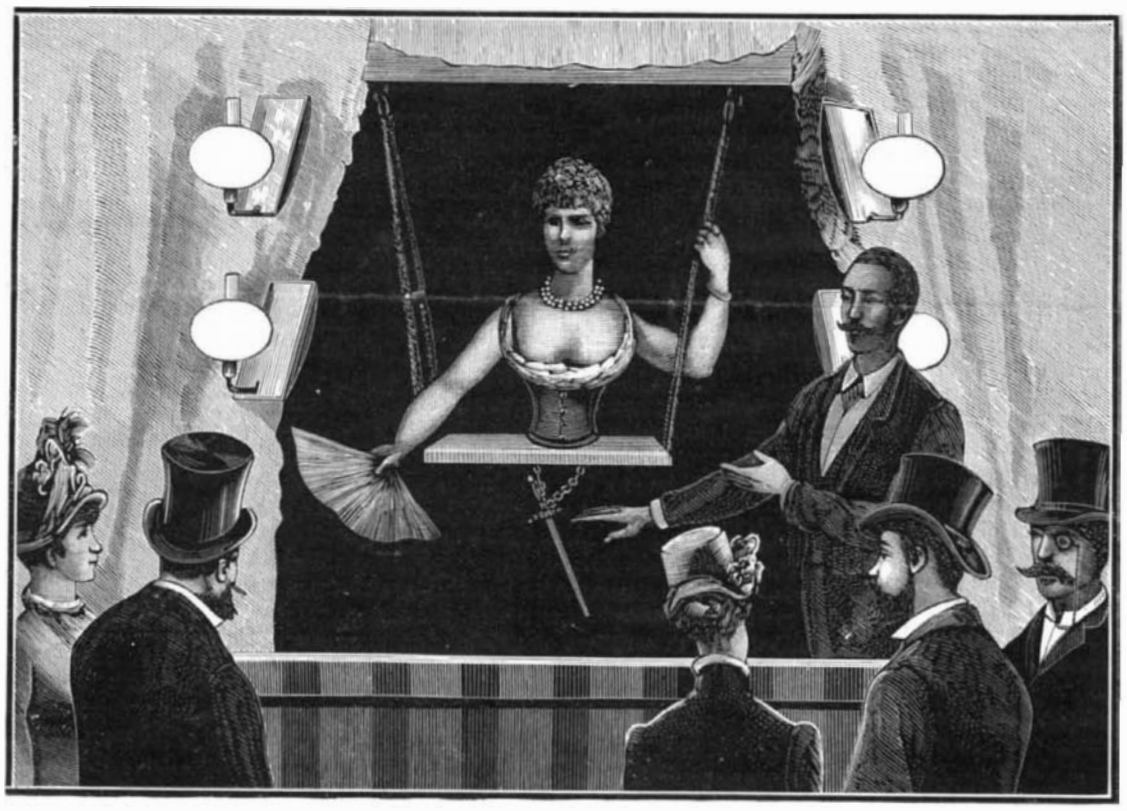

Fig. 2.—THE WOMAN WITHOUT A BODY.

Such was the evidence of the eyes, but the reality was entirely different. The head was indeed real, and was seen directly, and the same was the case with the top and a part of the sides of the stage, but aside from this the rest was only an illusion. The stage had no back, no floor, no sides, and the aperture seen in the rear was not in that place.

The illusion was obtained by means of a simple mirror, which, starting from the upper part of the back of the stage, descended obliquely to the front. In the center of this there was an opening which was concealed by the satin collar of which we have just spoken, and through this the young girl passed her head. The inclination of the mirror was very easy to determine; it was in fact indicated by a gold rod designed to hide the line of junction of the mirror and side. Through their reflection in this mirror the anterior part of the top seemed to be the bottom, and the posterior part of the same produced the back of the stage. The sides, of which only the upper portion was seen, seemed to be prolonged and join the bottom. As for the aperture through which the table was seen, that was in reality at the top; the table was vertical, and the candle, which was firmly fixed to it, was horizontal. The farce of blowing out the candle and carrying it behind the scenes was only designed to make the spectators believe that it was the same candle that was seen at the rear of the stage, while it was only a duplicate.

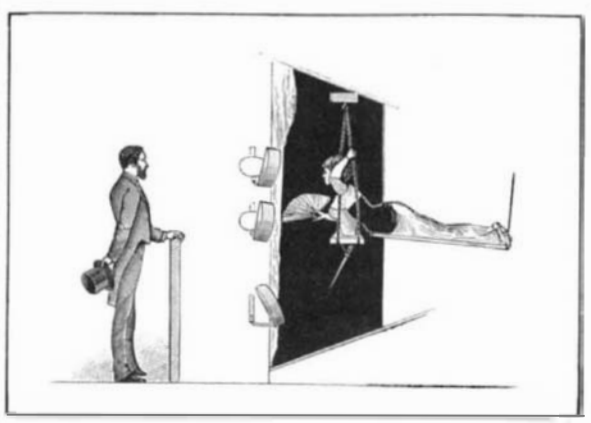

Fig. 3.—EXPLANATION OF THE PHENOMENON.

The arrangement of the top and sides with respect to the mirror may be perfectly ascertained by means of a very simple experiment. Take a small, square mirror and incline it at an angle of about 35° or 40°, while it rests upon a book; then place above it a piece of cardboard, or anything else, and it will be found by experiment what inclination should be given it in order to obtain, through reflection, the semblance of a vertical back.

Upon bringing the same cardboard near to the sides of the mirror, the part that will be above the latter will seem to be prolonged beneath. If one wishes to take the trouble to fix several pieces of cardboard in these different positions with pins, he may produce the semblance of a space which is apparently completely empty, while it is cut into two by an inclined mirror. It would be easy thereby to get an idea

of the process used for producing the illusion given by *Stella.*

The Mystery of Dr. Lynn.—In this new illusion, now being presented at the Folies Bergeres, the stage is larger than for Stella. It starts from the floor; and it is nearly in front, at a very slight distance from the spectator, that we observe the bust of a woman cut off at the thighs and resting upon a small swing shelf. This woman is alive. Moreover, under a thrust from the showman the shelf moves laterally. At a certain moment the woman seizes the cords, the exhibitor removes the shelf, and the body is then seen suspended for a few minutes. The showman passes a rod beneath the bust, and around it, and shows that it is completely isolated.

Where is the body? Such is the question that every visitor asks. In Stella and in several analogous tricks shown by English and French prestidigitators, completely isolated, but immovable, busts or heads were shown to the public, and the majority of these illusions was obtained by means of mirrors. Even with these latter it would be possible to move a bust and swing a shelf, but we believe that *The Mystery of Dr. Lynn* is obtained by a much simpler process—by a simple effect of illumination.

All painters know that in a too strongly lighted picture the whites and bright colors stand out at the expense of the half tones and dark colors, and this effect is the more pernicious in proportion as the light is brighter. Hence the complaints that are heard at exhibitions of paintings, where the light never suits the exhibitor. This same effect is seen in two objects placed alongside of each other; if a white object be placed alongside of one of somber color, it will prevent the details of the latter being distinguished as well as if it were alone. The visibility of objects is relative, then, and depends more or less upon the brilliancy of that which surrounds them. A thing that attracts the eye is seen at the expense of what is placed alongside of it.

This difference in visibility, which makes itself seen when the illumination of two objects is the same, will naturally be still greater if the white object is in the full light and the somber one in darkness. Now it is upon this principle that the Doctor Lynn trick appears to be based.

If we take a book bound in black or very dark cloth, and place it outside of the cone of light produced by a lamp shade, we shall be able to see it more or less distinctly; but if in the same direction we place a sheet of white paper so that it shall be well lighted by the lamp, the visibility of the book will be null or nearly so, and we will see it anew if we take away the paper. It is for the same reason that a person who at night holds a lamp having a reflector becomes completely invisible to other people toward whom he turns the light, while he might be seen were the lamp turned in another direction.

Another small experiment will directly explain to us the Doctor Lynn trick. Let us suppose that in the evening a person dressed in black leans upon a table, his head inclined between two lamps provided with reflectors, which latter may be merely white cardboard, or a few sheets of paper; or the lamps may be replaced by two candles, each shaded by an open book. Under such circumstances the spectator seated upon the other side of the table will distinctly perceive the face of the person placed in front of him, the white parts of the costume, the neck, sleeves, and fore portions of the shoulders and arms, which are well lighted. But if there is no reflection from the ceiling or wainscoting, all the rest of the body placed in darkness will be invisible.

Let us suppose that all the precautions are taken to make the experiment successful, just as if it concerned a public exhibition, and we shall be able to have in this way a decapitated talker, a living bust, or to repeat the mystery of Doctor Lynn.

As regards this last named trick, a glance at the explanatory figure (Fig. 3) will show how the illusion may be obtained. The lower part of the bust seen is a dummy, upon which the upper part of the woman's body rests, the remainder of her body being extended nearly horizontally upon an apparatus that is capable of swinging and following the motion of the shelf. All this portion is hidden by opaque black drapery so arranged as not to attract the light to any point.

The bust and shelf receive a very intense light; then immediately behind there is seen intense darkness—an absolutely black background. This latter is rendered still darker by the brilliant cords of the shelf, a metallic chain, a sword suspended beneath it, and a white handkerchief that seems to have been dropped upon the front of the stage by accident. If we add to this, six gas burners with powerful reflectors turned toward the spectators, it will be seen that the latter are, in a manner, dazzled by everything that strikes their eye in the foreground, and that beyond this they see absolutely nothing but a black background.

Such is the explanation that may be given of the mystery of Dr. Lynn—an illusion that rests upon a curious principle in physics.—*G. Kerbs, in La Nature.*

Trade Marks in Japan.

By imperial decree dated June 7, 1884, a trade mark law has been promulgated in Japan, the law going into force on the first of October. Persons who counterfeit registered trade marks and employ them will be punished by imprisonment with hard labor for a term of not less than thirty days and not more than one year, in addition to a fine. A trade mark in Japan runs for 15 years. Nearly all classes of goods manufactured are included under this new act.

Correspondence.

The Smartest Old Man in the Country.

Under this heading we chronicled in our paper of Nov. 1, an account of the walk of seventeen miles by Seth Cook, of Rathboneville, a gentleman 103 years old. The following curious particulars will be read with interest:

To the Editor of the Scientific American:

Allow me to add a little to the history of "The Smartest Old Man in the Country." I was his family physician for twenty-five years, commencing during the year 1847. He had the appearance of quite an old man when I first knew him.

During that time he lived in constant violation of nearly every sanitary law. His constant drink was *pure alcohol,* of which he drank large quantities, buying it by the gallon and keeping it in the house. I think he rarely ever drank at a bar. I often remonstrated with him for drinking it, telling him it would eat up the coats of his stomach. He constantly affirmed it agreed with him and did him *good.* I do not remember that he was ever sick during the time. He kept himself what might be termed *full,* but never saw him drunk.

S. MITCHELL, M.D.

Hornellsville, Nov. 1, 1884.

Steam for Extinguishing Fire in Vessels at Sea.

To the Editor of the Scientific American:

In view of the loss by burning at sea of the steamship Maasdam, on the 24th of October last, I suggest the use of steam as an incomparably more effective agent than water in the extinguishment of fire in vessels at sea, or in any confined situation of limited extent. In all vessels driven by steam power, let it be considered a primary necessity that conducting pipes for steam be laid, and so connected with the boilers for generating steam for power, as to make it possible to deliver it at any and every part of the vessel liable to take fire from accidental circumstances, as in the case above referred to; from lightning, not a very infrequent cause; or from the spontaneous combustion of the cargo in remote and practically inaccessible parts of laden vessels.

From the latter cause we quite often hear of the occurrence of fire in the holds of vessels, and particularly those laden with cotton, in which fire has been known, with closed hatches, to smoulder for days and even for weeks before the final catastrophe of its breaking out was reached. In such cases, no amount of water that could be supplied short of sinking the vessel would, with certainty, accomplish the object, because it would inevitably descend to the floor of the vessel and away from the fire. With steam as the active agent, this would be entirely different. The moment it was ascertained in what compartment, or place in a vessel, fire was located, steam could, by the opening of a valve at or near the boilers, be instantly delivered there, through the open ends of pipes, and would with almost absolute certainty reach and extinguish it.

That the supply of steam for the purpose be assured in all stages and localities of a fire, it would be necessary to have main valves for controlling its distribution situated at a convenient place on deck; also, to have one or more small extra boilers, like those for driving steam fire engines, located there, *as reserves,* to be used in connection with the same system of conducting pipes as those above named. It may be added, also, that boilers of this kind could be supplied and used for this purpose on any and all sailing vessels, carrying large and valuable cargoes, thus practically insuring that class of vessels also against destruction by fire. Of course, the use of steam boilers for such purpose would necessitate the employment and presence of one or more men among the officers or crews of sailing vessels qualified to use them.

In such cases the arrangements for distributing steam to every part of a sailing vessel would be the same as in the other.

The advantages in the use of steam for extinguishing fire are that by aid of its pressure in the boilers it can be forced into and through every compartment or subdivision of a vessel, and by many branch pipes, near the extremities, with open ends, into every *crevice,* even, of the cargo. Thus, by its dampening effect on all surfaces with which it would come in contact, the tendency to ignite and burn will be greatly lessened, while its extinguishing power results from the exclusion, by its pressure, of a large part of the air necessary to support it, and by the reduction in the temperature in what remains below the point of combustion, thus ending the danger.

If by the use of arrangements for the purpose, so simple, inexpensive, and efficient, the owners of vessels can secure their comparative safety against fire, why should not passengers, officers, and crews have protection against danger from one of the most remorseless of all destructive agencies known to man?

H. A. BUTTOLPH.

Morris Plains, N. J., Nov. 4, 1884.

Sulphuret of Carbon as a Disinfectant.

M. Peligot has presented a "Note" to the *Comptes Rendus* on some newly discovered properties of sulphuret of carbon. Contrary to the teaching of the text-books, sulphuret of carbon is soluble in water, in the proportion of 2 to 3 milligrammes per liter. The compound stops fermentation, and kills microbes. The manipulation of the liquid is perfectly harmless, and it is erroneous to say that work people, employed in factories where it is used, are poisoned in consequence. No such ill effects as are supposed to emanate from this cause have been detected by M. Peligot in workmen continually living in the midst of sulpho-carbonaceous vapors. The respiration of the vapor of sulphuret of carbon occasions, after a few minutes, a state of anæsthesia similar to etherization, which speedily disappears. The aqueous solution has a sweet taste, and produces a sensation of heat in the mouth and stomach. The author thinks that this solution will be useful as a perfect and harmless antiseptic. In cases where the spread of an epidemic through contamination of the water supply is to be feared, he proposes that the supply should be passed through apparatus whereby it may be impregnated with sulphuret of carbon.

Timber and Tools.

It is a fact well known to millmen that it is not always the harder woods, in the ordinary acceptation of the term, that are the most wearing to the saws. Many practical persons marvel at this, and wonder to themselves why a piece of timber showing small crushing, tension, and other strengths, requires more power to work into lumber, and at the same time wears out the saws and cutting tools faster, than other varieties of timber, the strength of which, in most respects, is greater.

According to the *Lumber Trade Journal,* a log of black walnut and one of burr oak of the same size worked into the same sized stuff will show widely different results on both saws and machinery. If we attempt to rive or split these logs, the walnut will work much easier than the oak, and so far as the various strengths are concerned the oak is superior by far, but when worked or cut into tools of any description the walnut presents much greater resistance than the oak, and the same is true as regards many other varieties of hard and soft timber.

If we take a longitudinal section of these comparatively soft timbers which are so hard on cutting edges, we will find the minute pores or interstices filled with minute glistening particles or crystals; and subjected to chemical analysis we will find them composed of silica, one of the very hardest minerals known, while with the hard, easy working woods they will be found nearly or quite absent by both the microscope and analysis. These little particles, so finely divided as to be insusceptible of ordinary touch, are really a better grit than ordinary sand, and are the means of cutting off the fine edge of cutting tools, as saw teeth, plane irons, and the like.

Two plane irons, made of a fine quality of steel, as near alike as it was possible to make by an accurate, skilled mechanic, were each hardened in our laboratory by means of mercury, then finely sharpened, that the edges of each presented precisely the same appearance beneath the magnifier.

These were each inserted in an ordinary plane, and one placed on oak, the other on a piece of walnut, both pieces of wood having been previously dressed. At the rate of one hundred pounds pressure, each iron was crowded forward four inches. On the oak stick, the pressure from the rear indicated 809·5 pounds, while with the walnut the indicator showed a pressure of over one thousand pounds. The irons were both now withdrawn, and first placed beneath the microscope; the one used on the oak presented a general upset appearance, the edge of the iron showing a slight tendency to turn downward, there being sufficient heat generated by the friction to partially draw the temper along the minute edge, which, however, would not extend back sufficient to materially affect the wearing and cutting properties of the iron if in constant use.

The iron used on the piece of walnut showed a scratched, notched appearance all along the minute edge, and by the aid of the most accurate means of measurement at hand, these notches were all of the same depth, but different distances apart, proving conclusively that the particles of grit or crystals which caused them, by being harder than the best mercury hardened steel, were all of the same size, and evenly distributed, as far as regards depth of deposit in the grain of the wood. The small spaces of the iron edge between these notches or scratches were found nearly as the entire edge appeared originally, showing again that the cellular tissue of walnut, outside its mineral deposits, was really softer than that of oak; hence, were it not for these deposits, the timber would cut much easier. Of course, if the iron had been been drawn back, and again shoved through, the notches would have been more apparent and general, increasing each time, and the distance showed until the entire cutting edge had been of itself cut off.

Consulting the laws governing plant or vegetable growth, we are told that all food before becoming fit for assimilation must be reduced to its gaseous state. If this be so, the question arises. How or by what methods of plant growth and assimilation is it possible for silica to appear in its original crystalline state among the tissues of the growing or matured tree, while it is universally known that this variety of wood grows only where this mineral is abundant in some of its modified forms? This, however, is not of great interest to manufacturers just how it gets there, but that it is present is shown conclusively. To get rid of it, even were it possible, would destroy the beauty and general characteristics of walnut, and to overcome its action on tools, rapid motion and softer iron is the best, safest, and most efficacious method.

LUMINOUS key hole trimmings and door knobs are said to be in great favor with the bibulous inclined person, and convenient for others. They are made of glass, and the back is covered with luminous paint, giving forth a light which may be seen considerable of a distance, on the darkest nights.