Bending Timber.

The following article is taken from *Dickens' Household Words*. The subject is the process of bending timber, the invention of the well-known Thomas Blanchard, Esq., of Boston, Mass. A decided compliment is paid by its author to the practical genius of our people :—

"'You may break, but you cannot bend me,' is a phrase that has hitherto been applied indiscriminately to persons who are very heroic or very obstinate. It has also been applied to certain woods, such as oak and lignum-vitæ. A great deal of braggadocio has been put into the unconscious mouths of trees —if by a figure of speech we may talk of trees having mouths at all—about the stubbornness of heart of oak, and about the monarch of the forest never yielding to the storm, which indeed, he seldom does, unless absolutely torn up by the roots; although Shakespeare, who was not a bad observer, talks of the wind making 'flexible the knees of knotted oaks.'

But in plain truth, setting sentiment aside, the unyielding nature of timber has been one of its disadvantages for many practical and scientific purposes. Give a bar of iron to a smith, or place a mass of material under the gentle persuasion of Nasmyth's steam hammer, and you may have what you will made out of it. You may have it molded like clay by the hand of the potter; may expand it, or contract it, shape it, and reshape it; twist and contort it; bend it into a sword or a plowshare, an anchor or a rifle-barrel, a column for some airy, yet substantial palace, or a girder for a suspension bridge. You may lengthen it into rails for the swift passage of steam, or a Menai tunnel to span an arm of the sea, like some gigantic bracelet. Subject metal to the furnace, and you have a fluid stream whereof you may cast an Iron Duke, or any other shape of man or god you please. Sullen and hard at first sight, this ductile substance is your very slave, in fact, a genie of the mine, who waits your bidding to do wonders—a Proteus, to whom is given the power to change into a thousand forms. Not so has it been with wood. Place a piece of timber under the hammer, and it is shivered into fragments; give it to the furnace, and it is consumed. You may saw and join it; you may carve it into fantastic and beautiful designs; but you have not hitherto been able to use it with that facile manipulation which belongs to metal.

One result of this deficiency has been a great circumscribing of the uses to which timber might be put; another result has been excessive waste of material. When, in building a house or a ship, or in making a piece of furniture, it has been found necessary to employ a bar of wood of a curved shape, there were no means at one time of obtaining this curve, but by searching for a branch which was naturally bent in growing (and which, of course, could be met with only rarely) or by cutting a solid mass of timber into the required form. In the latter process all the outlying parts of the wood, all those portions not included in the curve itself were wasted, or were only available for very trivial purposes; for the curve extending across the block and dividing it, would leave only small fragments of the material, of useless shapes, on each side. In the case of metal, the process is easy and obvious enough; you have merely to take a straight bar, heat it, place it beneath the hammer, and coerce it into the needful convexity. Metal, therefore, has had an immense advantage over timber, on the very important grounds of facility and economy; for, in the one case, you only use precisely what you want, while in the other you use more than you want.

When Mr. Jones, having reached the summit of his earthly desires in obtaining the consent of Miss Smith to marry him, (and also the consent of Mr. Peter Smith, and obey mother Smith,) looks out for tables, chairs, and other et ceteras wherewith to furnish that desirable cottage residence in which the happy couple are to take up their abode in company of love and a young servant, he pays more for these household comforts (meaning thereby, the tables, chairs, &c.) than he otherwise would pay, because of the waste of material necessitated in their construction. The case, however, is not now as it was formerly. In a happy moment some mechanical genius bethought him of a process of bending timber by the application of heat to it.

Like the reform bill, however, it was only a step; and, if any old toryfied engineer, with a dream of finality in his mind, had regarded the success already achieved as the *summum bonum* of such matters, Mr. Jones—not to speak of Mrs. Jones—would have had a right to quarrel with him. For Jones might have called his attention to the fact that the timber had a tendency to a debilitated constitution, very awkward in those articles of furniture whereof the first requisite is strength; that it was weak and fragile, not unfrequently breaking under a moderate pressure, and sometimes absolutely unbending, and returning to primitive straightness, like a young lady's carefully got-up curls on a damp day. All this Mr. Jones might have exhibited out of direful experience; but of the reason—the cause of the effect—he would probably have been ignorant. The explanation, however, is not very abstruse. In the ordinary process of bending, the fibre is strained. Thus, any curved piece of wood is weakest in the sharpest part of the curve. Scientific men, indeed, have argued that, for practical purposes, great curves are impossible, and they have defined their theory thus: To bend a piece of wood, you must extend the outer circumference, and compress the inner. Now, as wood is inexpansible, you cannot bend it without injuring the fibre, and consequently weakening the whole mass.

Such was the orthodox theory; but in the same way that the knowing ones on the race-course often make the astounding mistakes in their forecastings to their own great pecuniary disadvantage and the edification of a censorious world, so will it frequently occur that professed scientific men, too mindful of abstract theories to make practical innovations, find themselves suddenly confronted with some new application of those theories, or some complete reversal of them. These audacious exhibitions of scientific hetorodoxy have of late years been more common in America than elsewhere. The active, volatile, knowing States' man is as little disposed to submit to antiquated authority in intellectual matters as in political affairs. He will not have an hereditary monarchy, guarded with fictions of divine right in the regions of discovery, any more than in the physical territories which he occupies. He will have an elective President in the Republic of Ideas, and he will reserve to himself entire liberty to set him aside when his time for being useful has gone by. Every man in that republic shall have a vote; and the best candidate shall carry the day. Therefore has it come to pass that Jonathan, disregarding the assertion that wood cannot be bent without weakening the fiber, has set to work to see how he can overcome the difficulty, and has discovered a method, which, to judge from the accounts given by the most eminent engineers, both of America and England, will be of the greatest service in ship-building and domestic architecture, and in the construction of all pieces of furniture in which it is necessary to employ curved timber. It has been already so employed in the United States, where a Roman Catholic cathedral is surmounted by a dome fashioned out of wood bent by the new process. This dome has been found to be lighter, stronger, cheaper, and more elegant than the domes usually formed of metal, brick, and papier mache.

By this invention, which has been patented in America, and is now just introduced into England, the strength of the wood is increased at least 75 per cent. at a point where strength is most required. The curve, moreover, never relaxes. The timber, as in the old process, is first subjected to the influence of steam, which softens the whole mass, and puts it in a fit state for the action of a machine. The principle of bending, as employed in this new application, is based on end-pressure, which, in condensing and turning at the same time, destroys the capillary tubes by forcing them into each other. These tubes are only of use when the tree is growing, and their amalgamation increases the density of the timber, the pressure being so nicely adjusted that the wood is neither flattened nor spread, nor is the outer circumference of the wood expanded, though the inner is contracted. Now, the error of the former process, as expounded by competent judges, has arisen from the disintegrating of the fibre of the wood by expanding the whole mass over a rigid mold. Wood can be more easily compressed than expanded, therefore it is plain that a process which induces a greater closeness in the component parts of the piece under operation—which, as it were, locks up the whole mass by holding the fibre together—must augment the degree of hardness and power of resistance. The wood thus becomes almost impervious to damp and to the depredations of insects, while its increased density renders it less liable to take fire; and the present method of cutting and shaping timber being superseded, a saving of from two to three-fourths of the material is brought about. The action of the machine throws the cross grains into right-angles; the knots are compelled to follow the impulse of the bending; the juices are forced out of the cells of the wood, and the cavities are filled up by the interlacing fibres. In the same way you may sometimes see in the iron of which the barrels of muskets are made, a kind of dark grain, which indicates that the particles of the metal, either in the natural formation or in welding, have been strongly clenched in one another. These specimens are always greatly valued for their extraordinary toughness, as well as for a certain fantastical and mottled beauty.

Another of the good results of this new method is, that the wood is seasoned by the same process as that which effects the bending. The seasoning of the wood is simply the drying of the juices, and the reduction of the mass to its minimum size before it is employed, so that there shall be no future warping. But, as we have already shown, the compression resorted to in the American system at once expels the sap, and a few hours are sufficient to convert green timber into thoroughly seasoned wood. Here is an obvious saving of time, and also of money, for the ordinary mode of seasoning, by causing the wood to lie waste for a considerable period, locks up the capital of the trader, and, of course, enhances the price to the purchaser. Time also will be saved in another way, in searching for pieces of wood of the proper curve for carrying out certain designs. "How delighted," says Mr. Jervis, the United States Inspector of Timber, "will the shipwright be, to get clear of the necessity of searching for crooked pieces of timber! There need no longer be any breaking of bats in the frame, as we have been wont to break them. We shall see numbers one, two, and three futtocks, at least, all in one piece."

An English engineer (Mr. Charles Mayhew) remaks that one of the advantages of the American method is that, "in its application to all circular, wreathed, or twisted work, it not only preserves the continuous grain of the wood, which is now usually and laboriously done by narrow slips of veneer glued on cores cut across the grain, with many unsightly joints, ill-concealed at best; but it will materially reduce the cost of all curved work, which now varies according to the quickness of the sweep, and will give the artist greater freedom in his design, by allowing him to introduce lines which are now cautiously avoided, in order to prevent the cost of their execution." Dr. Hooker, Mr. Fairbairn, Mr. Rennie, Mr. Galloway, civil engineer, and other eminent scientific men, confirm these judgments. A specimen of bent oak now lies before us, and exhibits a beautiful continuity in the sweep of the fibres.

Timber-bending has reached a new stage of development, and it is not too much to anticipate that it will have considerable influence on the industrial arts."

The Task of Inventors.

The following is an extract from a lecture recently delivered in Newark, Ohio, by Joseph E. Holmes, Esq., an intelligent engineer and mechanic :—

"Inventors, yours is the task to deal with Nature, and her laws; and a wondering world, amazed at what you have already evolved from that mysterious book, are looking on your efforts; not like those who persecuted Gallileo; no longer like those who called the immortal Fitch, Watt, and Fulton madmen, but full of faith and hope that the workings of the mighty laboratory may yet be understood in all its departments, and made to subserve the varied wants of man. Step by step has the shrewd observer of nature worked among the elements—the winds, the waters, the vapors, the lightnings, and heat—and they have become his willing servants, and by their aid he has wrought metals, and mines, and woods, and stones, and yet knows little compared with that which shall yet be revealed. A vast field is before the inventor, but every new discovery adds new light to his pathway, enabling him still more clearly to see and prepare for the use of our common humanity things now hidden and unknown."

To Observe Jupiter's Satellites.

MESSRS. EDITORS—There are thousands of the readers of the SCIENTIFIC AMERICAN who would gladly avail themselves of an opportunity of seeing the satellites of the planet Jupiter, provided they had the means.

Every person can witness them by reflection, using a looking-glass for this purpose. On a clear night take a good looking-glass, and—either at the window or out-doors—so position it as to receive the impression of this planet. By a close examination of the planet as reflected in the glass, all its satellites will also be observed, provided none of them are eclipsed. It is rather remarkable, however, that although these satellites can thus be seen, while they cannot be noticed with the naked eye, that neither Venus nor the Moon can be seen so distinctly by reflecting them in the glass, as they can by observing them with the naked eye. VULCAN.

Cambridge, Mass.

The Adulteration of Gold.

It had been stated in the columns of the *Tribune*, that certain parties in this city, possessed the secret of amalgamating with gold a cheaper metal, the presence of which could not be detected at the Mint or the Assay Office. The Director of the Mint has publicly denied this, in a card, and S. F. Butterworth, the Superintendant of the Assay Office has also made a similar denial on the part of the Assay Office. He says :—

"I beg leave to state, therefore, that not a particle of evidence exists at this Office, or has been presented to it, that the alleged experiment has ever been made. The whole matter rests only upon the *ipse dixit* of 'a modern chemist.'

"It is proper to add, that gold exists in a variety of forms, some of them possessing not the slightest resemblance to gold; and that a 'modern chemist' might easily practice a deception even upon intelligent witnesses. If gold in one of these disguised forms be melted up with a given quantity of gold coins, an apparent increase of gold will be the result This solution of the mystery best accords with the facts that have transpired."

To this the *Tribune* answers :—

"Mr. Butterworth states, positively, that not a particle of evidence exists at the Assay Office that the alleged experiment has ever been made. We would respectfully suggest that the Assay Office is not precisely the place to look for evidence in such a case as this. If the Assay Office had any such evidence, the experiment could, of course, never have been successfully performed. The full record of the transaction is, however, on the Assay Office books, where we have seen it."

This answer is rather cloudy, and requires explanation. The meaning of the language is, that the experiment referred to is unknown in the Assay Office, and yet it is recorded in the books of the Office. We believe that there is not sufficient evidence on record, that gold can be amalgamated in any manner with any cheaper metal, so as to escape detection by a chemist.

Fatal Effect of the Breaking of a Circular Saw.

Recent news from San Francisco relate that a person was killed in that city by the breaking of a circular saw. The person killed was standing near to it while it was running at a high velocity, when it broke in pieces, and a part of it passed through his skull.