Scientific American.

NEW YORK, APRIL 25, 1857.

Ivory—A Substitute Wanted.

Ivory is formed of the large upper teeth of the elephant. Those of the greatest size are obtained from Africa; but the tusks of the Ceylon elephant produce ivory which is not so liable to become yellow, hence they are generally preferred. Africa, however, is the great source of the ivory trade; and marvellous are the quantities of this material which have been obtained from that quarter of the globe. Until within a few years, France imported about 200,000 pounds annually, England 12,000,000 pounds, and our own country about 200,000 pounds. The most of the ivory imported into the United States comes from the port of Zanzibar, in Africa, and the trade is almost monopolized by the good people of Salem, Mass, in which place, only two weeks since, a cargo of it arrived valued at $90,000. Ivory is of the same composition as bone, but yet it is very dissimilar from bone; and although other animals than the elephant have large tusks, still none of them produce the genuine article. The teeth of the *sea unicorn* and *morse*, and the hippopotamus are also used for the same purposes as the tusks of the elephant, but they are not so valuable, although some of them are very hard, and sustain a fine polish. Some elephants' tusks have been obtained which measured ten feet in length, and weighed 300 pounds, but the average weight of them is about 100 pounds. Its price varies from 75 cents to $2 per pound, according to its quality. The demand for ivory has been increasing, hence its price has been advancing, with the extension of the decorative arts, such as fine cabinet work, pianofortes, &c., but the supply of it has not been augmented in proportion. This, we are told, is the reason why it now appears to be so scarce in the market—not that the quantity imported annually has decreased.

Fears have been entertained that elephants were disappearing as rapidly in Africa as the buffalo in our own country; but Dr. Livingston, in his recent wonderful travels, relates that the immense herds of elephants which he saw filled him with astonishment, and it therefore seems that these animals are still very plentiful. The difficulty, however, of obtaining a sufficient supply of ivory at present, and the great increase in its price within a few years, suggests the propriety and possibility of manufacturing a cheap substitute. Many attempts, we know, have been made to manufacture an article in place of it from white porcelain, but all such efforts have hitherto proved abortive. It is easy to make hard white porcelain articles of similar forms to those made commonly from ivory, but this is not all that is wanted. Ivory is fibrous and elastic, and can be sawn and cut into any form to fit for the most exquisite inlaid, carved or veneered cabinet work. It is not so with articles of porcelain. But is there no other substance from which we may hope to see a good substitute for ivory manufactured? India rubber compounds are now made to imitate black horn and ebony; can they not be made to resemble ivory? We have never seen any India rubber compound of a pure white color; but we believe it may be bleached and made snowy white, and then compounded with some equally suitable white material to harden it. Ivory has to be bleached itself, by exposure to the sun and frequent sprinklings with water, in the same manner that linen is bleached on the green fields. And why may not India rubber or gutta percha be bleached equally as well by some other process, and then compounded to produce a white material that can be worked by tools, like that from which India rubber combs are made?

Various articles are now manufactured from ivory nuts, a peculiar vegetable production of South Africa; but although hard and white, they are very brittle, and soon become yellow in color. Needle boxes, infants' rings, and various other small fancy articles are now made of these nuts, but they are neither ivory in their nature or quality, and are no substitute for it. That substitute has yet to be discovered.

Car Wheels.

For some of the uses to which cast iron is subjected, great strength is the only requisite; for others, hardness is a quality of great importance; and for others again, as in some of the minor parts of light machinery, the opposite, and a consequent facility for perfect finishing is paramount. There is probably no example in which a combination of great strength at all temperatures—elasticity to resist the effect of continued concussion, and extreme hardness and ability to resist wear in certain parts—is required to so great a degree as in the wheels of ordinary railroad cars. Economy of power impels us to the employment of wheels of large size, so that the number of revolutions, and the consequent friction on the axis in traveling a given distance may be as little as possible; but every increase of size involves not only an increased weight of useless load to be moved with each car, but a necessity for greater strength in all the parts of the wheel itself, and also exposes the track to a greater percussive strain, as the wheel rolls over it. Under these conflicting influences, wheels are manufactured of every size, from twenty-four inches diameter to thirty-six, the smallest being employed in the trucks of some locomotives, and the largest under passenger cars, for rapid traveling, but in every case great efforts are made to combine strength with lightness.

The hubs and rims differ little in all the most approved varieties, but in the form and arrangement of the intervening parts, an almost infinite variation in form is allowable. Scores of patents have been granted in this country for car wheels, and principally for varieties in this part alone. The policy of the Patent Office has been to protect every new form, without inquiring very closely into principles or effects, the subject being one difficult of close and positive analysis in this respect. This course has been very properly adopted as one which would give a fair chance to all, and be likely, in the end, to develop the best possible disposition of the material. Straight spokes, as in the common coach or wagon wheel, have been long since abandoned, as, whatever may be the theories adopted in explanation, the *fact* is sufficiently evident that, with a given weight of metal, they are more liable to break.

Plates, in some form, have come to be considered as a necessity; and it has been attempted, in most of the patents, to so dispose the metal as to allow proper shrinkage and expansion, and provide an ample degree of elasticity, and yet secure just the proper amount of strength, proportional to its strain, at every point diminishing from the center to the circumference.

On some of the New Jersey roads, and to a considerable extent in Great Britain, wood has been employed with very good effect as a filling up between the hub and rim, both of which latter parts are necessarily of metal. Red cedar is the favorite for this purpose in our country, and is applied in blocks properly tapered and thoroughly seasoned, put together and secured by rings, so bolted as to make the whole perfectly solid. These wheels, are light, something lighter, probably, than the majority of plate wheels of the same size, and are considered, in some points, more desirable; but the cost has forbidden their very extensive introduction.

In some foreign countries wrought wheels have been tried, and elaborate and powerful machinery has been devised for properly forging such wheels in one piece; but with us, cast iron alone has been, and will probably continue to be, the popular material. The face, or tread, which rolls on the rail, requires to be of the hardest and most uniform texture, to resist wear. In wrought wheels this may be of steel; but cast wheels are hardened nearly as intensely, though not so tenaciously and uniformly, by the familiar process of "chilling," or rapid cooling, by contact with a good conductor of caloric. This is readily accomplished with proper iron.

We were not aware, until a few days since, of the existence of the "Union Car Wheel and Tire Works," at Jersey City; but while waiting for the cars recently, we spent an hour there very profitably, and will briefly describe the process of wheel-making:—

The work resembles that of an ordinary foundry, except in the provision for chilling and annealing. The tread or exterior of the rim is cast in contact with a heavy ring of iron, previously turned smooth. The metal employed in these works is hot blast iron, from Connecticut. Nos. 3 and 4 are preferred, and small quantities of white iron are added whenever the metal proves not sufficiently inclined to chill. The depth to which the hardening is effected on the rim should be about half an inch, and this may be very readily ascertained if the casting be broken across at that part. In order to afford means for thus ascertaining the depth of the hardened metal, small projections termed "trials" are cast on the side, which trials are broken off by a hammer after the wheel is cold, and readily show by the color and highly crystaline appearance of the fracture, the precise depth of the chill. The mold—constructed in the ordinary manner, except for the insertion of the chill—is broken up as soon as practicable after the metal has been poured. Eight minutes was the time allowed in the instance which we timed; and the wheels, still bright red-hot, are at once transferred to "annealing pots," where they are covered deeply with dry sand, and allowed to remain three days gradually cooling. From experiments made in the Crane Foundry in England, in 1849, it appears that iron chilled and subsequently annealed is considerably stronger than common castings; but it is not probable that the annealing employed in the car wheel manufacture has any such effect, as it is not sufficient to soften the tread, but only to equalize the shrinkage of the metal in cooling, and avoid a tendency to fracture. It would probably be necessary, in order to produce extra strong castings by such means, to allow the chilled metal to cool, and subsequently to heat it nearly to the melting point before placing it in the annealing pots.

The interior cavities, of course, are produced by coring, the cores being sustained by slender iron rods, which remain in the perfected casting as part of the same. The material of the cores is disintegrated and removed in the usual manner, by stirring it with rods inserted through holes of quite moderate size, left for the purpose in the side plates.

A car wheel of any approved variety may be contemplated as one of the most elaborate and successful efforts of man to produce a casting which shall be hard as flint to resist wear, light to diminish the destructive effect on the track, and sufficiently strong to sustain immense loads under circumstances where a sudden break would be fatal to a large number of individuals.

Proportions of Machinery.

That "a machine is no stronger than the weakest part," is an adage familiar to every well-informed mechanic, and one the truth of which will be self-evident even to the most stolid, with a little reflection. All the superabundant strength and consequent increased weight in any of the parts over and above that necessary to make them conform in strength to the other parts, is not only useless, but positively injurious—in many cases seriously so. In all very quick moving machinery—rapidly vibrating levers for example—or parts exposed to jerks and percussive strains, a surplus of weight in the moving part is a serious evil, and, in general terms, it may be said to be the highest effort of the designer to proportion the strength of every part to the strains so nicely that the whole machinery, and every part of every individual detail thereof, may be just as likely to break in one point as in any other. This is perfect proportioning; and although it is, from variations and uncertainties in the quality of all materials, impossible ever, except by chance, to attain perfectly to such a condition, every effort at proportioning should tend in that direction.

So far, we have referred entirely to what may be termed perfect or finished machinery, but there are many cases where, in experimenting merely—a business in which inventors are always supposed to be more or less engaged—the parts are exposed to unknown and unmeasurable strains; and we commenced this article solely to make one suggestion with regard to such operations, and that is, that some detail of little importance should, in such cases, always be made lighter and weaker than the rest, so that if the machine breaks anywhere, it will break at that point, and be very easily repaired. The thought may, perhaps, have occurred naturally to many, but we believe it has not been heretofore known to the majority. A good place to introduce such weakness is in some part secured by a single bolt or pin—for example, in a knuckle joint. The design is simply to make the fracture occur, if at all, at some point most easy of repair; and it is difficult to imagine anything simpler, on an elaborate machine than a simple bolt or pin.

It must be understood that this is but a temporary expedient, one adopted on first starting a new and untried device, as a prudent precaution against accidents which it is impossible to foresee. After having the advantages once pointed out in this manner, we think few mechanics will venture on starting a costly and untried machine under full power without adopting it Whether the machine be a saw-mill or a dredger, a punching, shearing, or pressing machine, or any other device involving considerable strains, there is no predicting, with absolute certainty, what parts may jam and become displaced, and what extraordinary and unheard-of strains will come upon the mechanism, which a little practice in both fitting up and operating will effectually avoid. Make a perfect novice "chief engineer" in attending even a fully perfected machine of any elaborate and delicate character, and there is a strong probability that it will break down in an hour, from some cause or other; yet even the inventor is almost as great a novice when he first starts a machine, on the bare construction of which he may even have wrought with great care for months.

Machine for Splitting Logs.

We have received a letter from Mr. John C. Gore, of Monterey, Cal., in which he inquires for a machine to split logs, asking whether such a machine has ever been invented, and if so, where it can be purchased. He says:—"It is impossible to split many of our logs by hand; and such a machine is much wanted here."

We believe there is no such machine in use. No doubt logs can be split on the very same principle as blocks from which staves and shingles are split; but then it would require immense and powerful machines and engines to do the work.

Death of Dr. Scoresby.

Rev. Dr. William Scoresby, F. R. S., formerly a navigator of distinction, and later a clergyman, author and savan, in which latter capacity his name is familiar to our readers, died on the 21st of March. He was a native of Whitby, in Yorkshire, England.

Sardines.

We annually import great quantities of this delicious fish from Europe, for which we pay extravagant prices, and yet they are found in great abundance on our coasts?

California Raisins.

We learn from our California exchanges that some boxes of raisins have been produced in Sacramento by M. Smith, of that place. They are the first raisin product of the Golden State.

A Good Throw.

The Adrian (Mich.) *Watch Tower* states fire engine No. 1 of that place, recently threw a stream of water out of the open *butt* through fifty feet of hose, a distance of 72 feet. It was built by Jeffers & Co., Pawtucket, R. I., and manned by 38 men.

The gold fields of Australia are said to be yielding at the rate of nearly one hundred million dollars per annum; the produce of the first three months of 1856 was nearly seven hundred thousand ounces.