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CAUTION.

It has become necessary for us to state very distinctly that the Scientific American Patent Agency Offices are at No 37 PARK ROW, and not at No 39.

LIGHTNING CONDUCTORS.

A lightning conductor is always made of metal, and of the metals which are available the choice lies between iron and copper. Iron has the advantage of less cost per pound; in all other respects copper is better. Copper is the better conductor, is easier wrought into form, and is less liable to rust. The conducting power lies in the surface; a tube is as efficient as a solid rod of the same diameter, and a strip or ribbon which presents the same amount of surface is equal in power.

The ribbon form of conductor is evidently the most economical in the amount of metal and it has beside other evident advantages. It is more compact for transportation, joints are more easily and perfectly made in it, it can be put up with less labor and more securely than a solid rod, and when erected it is less in the way and so less liable to injury. As so little metal is required in the form of a ribbon we can afford to use copper. For these reasons we prefer a copper ribbon conductor to anything else which is in use.

As to insulating the conductor from the building, the question is of little importance. Good insulation, if it were desirable, is wholly impracticable. Those who make a great ado about glass insulators, ought to try a few experiments with an ordinary electrical machine, and better understand the nature of lightning. A lightning conductor if properly constructed and put up, will furnish the most direct road for all the electricity which can get into it at its pointed end.

The most important point to be attended to in setting up a conductor is its connection with the ground. Unless a proper connection is made, the conductor is worse than useless. There are many cases on record where there was insufficient provision for the escape of the lightning and it struck the houses, doing great damage. In cities the conductor should terminate on the gas and water pipes, care being taken that the joint has as much surface as the conductor. Where there are no water or gas pipes the next best thing is to lead the conductor to a stream of water or to a well which is supplied by a spring. Ordinary cisterns are not sufficient, as the wood or cement of which they are made might not allow the electricity to pass through them fast enough. When there is no body of water near at hand the lower end of the conductor may be attached to a plate of metal of several square feet of surface or to rods or strips a few feet long, laid horizontally in the nearest moist earth.

The conductor should present the same amount of surface at all parts of its length; if any part of it be narrower, which often happens with old-fashioned rods at the joints, it is but little better than if it were at every other part of the contracted size.

If a building be in length two or three times its width it should have at least two conductors, for reasons which are sufficiently obvious. There are cases on record of churches which have been struck at the rear end while the spire was provided with an efficient conductor.

THE PUBLIC RAILWAY SYSTEM.

Evidences multiply daily, that the principle of public property in all highways and parts of highways, as advocated in and widely quoted from the SCIENTIFIC AMERICAN, commends itself to the general sentiment of the public and is to prove one of the practical and governing ideas of the age. Among others, the latest we have observed is the southern movement for a public railroad system from the coast of North Carolina, to the Mississippi river, from Atlanta to Savannah, and from the Ohio to Mobile. These three will make six schemes of the kind now pending (when formally presented) by bill, before Congress. Each of these recognises, in the manner of turnpike roads and canals, the right of every one who chooses to run his vehicle on the proposed highway, for a proper payment of tolls. This principle established as the ruling principle in the construction of future railroads will tend gradually to bring all the old roads under its operation. The same principle will ultimately prove to have been to railroads what it has been to turnpikes, the entering wedge to separate them from private ownership and make them at last free to the public, and the property of the public, on the same terms with common highways.

Another principle embodied in the North Carolina scheme, is that proposed in a memorial to Congress by Mr. Lorenzo Sherwood, establishing a uniform and moderate speed for trains, and thus enabling them to follow each other in constant and regular succession, up to the whole capacity of the line, around the circuit formed by the two tracks. There is no doubt in the minds of practical men, we believe, that the freight end of the business is the right end to begin at, postponing rapid travel to the greater question of cheap transportation, rather than, as hitherto, the reverse. Eventually, no rail will be used alternately for freight and express trains, but each description of traffic will have a track of its own, with great advantage and economy to both. The devotion of a double track to steady freight traffic, is the one thing needful to render railroad freighting as cheap and universal as it is expeditious.

NAPHTHALIZING GAS.

Illuminating gas gives the greatest quantity of light when it is just on the point of smoking, and still burns clear. Such gas is said to be rich, and the richness of gas or other hydrocarbon increases with the carbon it contains. The gas which the companies supply is very seldom of an excellent quality: if it had as much carbon as it ought to contain, it would generally give about twice as much light.

There is a very simple way of introducing more carbon into gas. Coal tar naphtha is a substance which has a very large excess of carbon; so that it cannot be burned alone without giving out an intolerable smoke. Gas has the property of taking up or dissolving a large quantity of this naphtha, and the mixture becomes thorough and is permanent at ordinary temperatures. It will be seen that the excess of carbon of the naphtha can be made to nicely balance the deficiency of the gas. Naphtha is cheap, and the amount of it needed to naphthalize a thousand feet of gas is very little. Moreover the practical difficulties in carrying on the process are by no means formidable. It is only necessary to make the gas pass over the surface of naphtha or to cause it to bubble through the naphtha, always taking care that the naphtha be so handled that it shall not set the house on fire.

The process of naphthalizing gas was first used by a Mr. Lowe in England twenty or thirty years ago. Since that time it has constantly been in use. Gas companies and insurance companies however throw cold water on it, and it has consequently never been so popular as it deserved. About six years ago a company was organized in London to carry on the process on a large scale, and succeeded in getting their naphthalizers or carburetors attached to the public lights. After a year or two, however, the company came into great disfavor and the carburetors were abandoned. What part the inefficiency of the naphthalizing company or the hostility of the gas companies had in the failure is not very clear. At all events the process must still be regarded as meritorious and practicable.

THE BROADWAY BRIDGE.

It may be hardly safe to speak of the bridge over Broadway, at the corner of Fulton street, as nearly completed, yet from appearances it is nearly so. It is partially painted, and the structure itself is not only *in situ* but built. When it will be opened for the use of the thronging crowds of pedestrians we cannot tell. The addition of the paint of light shades, so far as applied, greatly improves its appearance, but, after all, there is an appearance of heaviness, not to say clumsiness, about the structure anything but gratifying to the eye and wholly unsuited to its position and object. Public opinion is somewhat divided as to its utility and beauty; but the prevailing opinion in regard to the latter quality is that the bridge *appears* unnecessarily heavy. We must confess that we share in this opinion.

In regard to its utility there can be no dispute between those who have been compelled, several times a day, to pass down and cross Broadway during the past winter. Repeatedly, to reach Cortlandt street from the east side of Broadway, coming from Park Row, we have been obliged to walk down below Trinity Church before we could cross, and then crossed at the peril of limb if not of life. To the business portion of our people, citizens and strangers, it will be a boon, especially in the winter months. The trash published in some of our papers and made a subject of illustration in comic periodicals in regard to the reluctance of women to ascend the stairs that serve as approaches on account of the exposure to which it will subject them, is nonsensical when one considers the fashion of dress, women deliberately adopted and wore for many months, and which is not yet entirely discarded. The bridge stairs are no more provocative of other stares than tilting hoops.

The appearance of the bridge is massive rather than elegant, and yet it is not so heavy as it appears. The immense moldings of hollow castings suggest heaviness altogether out of proportion to the supports at either end. The engraving which we gave in No. 9, current volume, taken from the drawings of Messrs. Ritch & Griffiths, the designers, is of a much lighter and more elegant construction. The departure from this design is hardly creditable to those who directed and authorized it.

In such a structure as a single-span elevated foot-bridge, apparent lightness combined with the requisite strength should be the rule, and not, as in this case, adequate strength with apparent heaviness. No doubt, however, this bridge will serve its utilitarian purpose, but it can never be considered a model of beauty.

GREAT INVENTORS---THEIR SUFFERING AND SUCCESS

Once or twice in a generation it happens that a great patent, like the sewing machine, meets with a success and yields a return prompt enough to enrich the inventor himself. More usually it happens that the inventor perishes in if not of the poverty to which his self-devotion consigns him, leaving to lucky rather than worthy purchasers the lucrative product of his genius and of his sufferings. Posthumous gratitude and honor may then be his reward; but if fortunate enough on the other hand to enjoy a small percentage of the pecuniary benefit he has conferred upon his own generation alone, men too commonly think him greatly overpaid without any acknowledgement as a public benefactor, and rather make it a point to embitter his too good fortune with envy, detraction, and plenty of litigation for his rights.

In this grudge that some men feel, they wholly forget the life cost of great invention. There are a few lottery prizes in life; but most men have to pay for all they get, and inventors are not exceptions to the rule. The life of Charles Goodyear is one of the most pathetic histories under the sun, and now that the reality and wisdom of his work have redeemed it from the contempt that was long its bitterest ingredient, appears one of the most heroic and admirable.

Great power is required for great work, in men just as rigorously as in steam engines; and Charles Goodyear and Elias Howe, judged by their histories and works, have the same title to our admiration as great men, and by the same rule, as General Grant.

The last-named inventor (Howe) has a history somewhat resembling that of Goodyear, in its desperate (though less protracted) struggle, but happily contrasted with it in its sequel and reward. It is well to look back upon the price of his fortune while looking at its amount. The story is well told in the last *Atlantic Monthly* by that lively biographer, Mr. Parton, and is worth recalling in its main features here.

Elias Howe was born in 1819, the son of a Massachusetts farmer and miller, whom he assisted in both capacities from a very small beginning until the age of 16, when he went to Lowell and began life on his own account in a machine shop. At the age of 20, then a journeyman machinist in Boston, the conception of the sewing machine first presented itself to his mind, and three or four years later he applied himself in earnest to realize in a machine the plan which had been gradually wrought out in his imagination.

Here the rare faculty by which he had been ordained an inventor exhibited itself triumphantly. It is a faculty possessed by the fewest of men, where the visual image in the brain is so true to reality as to require only an embodiment to work successfully in the very form foreshown. Within five months, commencing in December, 1844, the sewing machine was an accomplished fact, made two suits of clothes, sewing at the rate of 250 stitches a minute, and was patented. That first machine is still preserved in the Howe Company's Office on Broadway, and doubtless will be preserved to all time as one of the most interesting mementos connected with material progress. It is said to have recently proved its capacity, making 300 stitches a minute, and making them as well as any of its successors; a fact among the most remarkable, even if a little exaggerated, in the annals of invention.

Singularly indeed, the trials of the inventor were but commenced with the completion of his machine. Nine long and distressful years were consumed in unavailing efforts to start the manufacture and sale, before the business began to yield a modest support to his family. At the end of the first two years not a machine had been sold. Two years more were spent in extreme poverty and trial in England, during which time his straits sometimes bordered on starvation. Against the opposition and through the difficulties which he encountered, few men would ever have persevered, or persevering would have succeeded. The present generation owes as much to the invincible determination of the patentee as to the ingenuity of the inventor. Great as his success has at last been, it is one of those prizes which are only for the wise and valiant who "endure unto the end."

OFF TO EUROPE.

On Saturday, May 4th, Mr. S. H. WALES, one of the proprietors and editors of the SCIENTIFIC AMERICAN, with his family, sailed on the steamer *Pereire* for France. A large number of his friends were on the wharf to take their last farewells, and wish him and his family a pleasant voyage and safe return. Mr. Wales intends to visit all the principal points of interest on the continent and in Great Britain. He will spend considerable time in Paris during the holding of the Exposition, and our readers may hear from him occasionally through the columns of this paper.

A SCIENTIFIC party from New Haven, Conn., under the command of Clarence King, a graduate of the Yale Scientific School, has just set out on an exploring tour of the 40th parallel of this continent.