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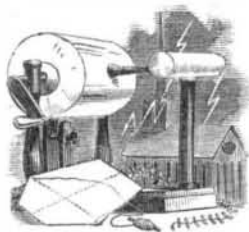
O. D. MUNN, S. H. WALES, A. E. BEACH.

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ELECTRICAL CONDUCTORS.



HERE is something very fascinating in the study of electrical phenomena. This is doubtless owing to its mysterious nature—its imponderable character, irresistible power, and peculiar modes of operation. Most persons

are deeply interested in it when it comes in the condition of atmospheric electricity, accompanying the rolling thunder, illuminating the darkness of night with its flashes, and sometimes shivering noble structures into fragments in an instant. As the season has now arrived when its destructive effects are frequently experienced in injury done to life and property, we take this opportunity of saying a few seasonable words on the subject, our attention having been principally directed to it by the letter of Judge Caton, published on another page. It is certainly a very desirable object to be enabled to obviate the dangers of lightning during those storms which are beyond man's control. We believe that Franklin made a discovery in the simple lightning-rod which can accomplish this object. There are many hundreds of instances on record which prove that these simple agencies, when carefully erected and of sufficient capacity, are perfect protectors against disruptive electric strokes. We cannot tell why it is that lightning prefers to travel quietly by one medium, such as metal conductors, and refuses to do so by others; we only know that such is the fact. It is by providing such conductors to carry atmospheric electricity from a charged thunder-cloud to the ground, that disruptive discharges which cause damage to buildings are prevented. The best conductor is silver, but copper is very nearly as good, and as it is much cheaper, it is very extensively used, especially on ships. In regard to the size of such conductors, it has been found that a rod of copper three-quarters of an inch in diameter or an equal quantity of copper under any form is capable of resisting the heating effects of any discharge of lightning yet recorded. Most of the common conductors, however, are made of iron, and these answer very well; but care should be exercised that they be of greater diameter for high than low structures, so as to lessen the resistance. A rod of iron three-fourths of an inch in diameter and perfectly united from top to bottom, is considered of sufficient capacity for any house from fifty to sixty feet in height. If it rises ten feet above the roof, it is held to be sufficient for protecting an area extending forty feet from it in every direction. This point, however, is not fully settled. A lightning conductor should be carried down into the moist earth or a drain or well in every case, and be terminated with a plate of iron or copper, according to the metal employed. All the masses of metal near the conductor in a house should be united to it, so as to have a perfect connection of all the conducting agents. Some houses which have had lightning-rods secured to them have been shattered, but it is believed that there had been some imperfection in the metallic connections in all such cases.

Many persons have erroneously supposed that lightning rods attract the electric fluid, and that they are pointed for this object. We corrected this idea on pages 305 and 367, Vol. I. (new series) of the SCIENTIFIC AMERICAN, and in answer to these remarks we received a vast number of communications disputing our position.

Since that period, an article in the *North British Review* (for last November), by Sir David Brewster, contains the following sentences:—"It will scarcely be credited that so late as 1838 the East India Company, on representation made to them by some of their officers, removed the lightning conductors from their powder magazines and other public buildings, on the ground that buildings with conductors were more frequently struck than those which had no such protection. Sir William Harris justly observes, in reference to this subject that 'conductors can no more be said to attract or invite a discharge of lightning than a water-course can be said to attract the water which flows through it at the time of heavy rain.'"

This is very high authority, and those who doubt the utility of such agents for protecting houses and ships from the destructive effects of lightning would do well to pay attention to one of the facts which Sir David Brewster adduces. He states that all the vessels in the British navy are now furnished with lightning conductors, and that during the past few years, while one hundred merchant ships have either been totally destroyed or severely injured by lightning, not a single ship of war has been materially damaged. As quite a number of our merchant vessels are either set on fire or otherwise injured by lightning every year, we hope our shipping merchants may now be induced from such evidence to furnish all their vessels with good conductors. The idea held by most persons that these agents attracted lightning has tended to prevent their more general application. Let all prejudices be banished from the minds of an intelligent people, and let science and correct observation exercise their just influence in the community.

INTERESTING FROM WASHINGTON - PATENT LAW DISCUSSION.

On Friday, the 14th inst., on motion of Mr. Bigler, the Senate took up the discussion of the Patent Bill, which was resumed on the following Monday, when several amendments were suggested. We think the bill would have passed but for want of a *quorum* of senators, many of whom were out of the chamber, attending to political matters. If our readers will turn to page 146 of the present volume, they will notice that the last clause of the second section of the Patent Bill provides that "hereafter no appeal shall be allowed from the decision of the Commissioner of Patents, except in cases pending prior to the passage of this act." In the discussion which took place on the bill, Mr. Bigler explained very clearly its principal features, and advocated their importance. Mr. Hale objected to the second section, and was unwilling to confine the inventors of the country to the Patent Office, as the only tribunal to which they could resort for the protection of the vast interests which come before the Commissioner, in reference to the granting of patents and the renewal or extension of the same. Senator Hale does not seem to understand that the applicant for the renewal of a patent has never had the right of appeal from the decision of the Commissioner of Patents; that officer is the sole arbiter in such cases, and his decision is final. Mr. Hale is also misinformed when he says that the Chief Justice was one of the board to whom such cases originally were referred. The board was originally composed of the Secretary of State, Solicitor of the Treasury and the Commissioner of Patents; but by the act of May 27, 1848, the whole jurisdiction in such cases was conferred upon the Commissioner, which jurisdiction had reference only to the power to extend patents. The Chief Justice had power to reverse the decisions of the Commissioner of Patents, and order a patent to be granted, upon appeals to him in all cases where the original application was rejected; also, to review and overrule the Office in cases of interference.

Mr. Trumbull (who is on the Patent Committee) replied, in answer to the objections of Mr. Hale, that inventors complained of too much *machinery* in the matter of issuing patents. He said:—"There must be an end to litigation somewhere; and it seems to me that these Primary Examiners first deciding, then the Examiners-in-chief, and then the Commissioner, give an applicant as many chances as the public good require he should have. I think it right to cut off the appeal to the courts. You can now appeal from three bodies of men—the Primary Examiners, the Examiners-in-chief and the Commissioner—to a court which cannot be expected to un-

derstand these matters as well as persons who devote their whole time and attention to them." In reference to this matter, Senator Trumbull's argument would be sound if the bill provided for a distinction between the decision of the Primary Examiner and the Commissioner. The decision of the former is technically the decision of the latter; for the Commissioner signs all the letters and decisions of the Examiners, and it looks odd, to say the least, to see an applicant paying to the Patent Office a fee of \$20 to get the Commissioner to review and reverse his own decisions! During the past year, cases have come under our observation where the whole power of the Patent Office was exhausted in behalf of the applicant, and he was obliged to seek the aid of an outside appellate tribunal before he could overcome the obstinacy of the Patent Office. There is great force in Mr. Trumbull's suggestion that the advantages of three impartial tribunals ought to secure the rights of every inventor, and is as much as the public good requires that he should have. We incline, however, to stick to the practice now prevailing in such cases, and leave open to all applicants the right to carry their claims out of the Patent Office for final adjudication, in case there are proper grounds for an appeal. The bill is generally right, and the reforms which it proposes are much needed; we hope, therefore, that the honorable senators will not kill it with amendments.

SMOKE!

The London *Engineer* administers to us the following lesson:—

"The SCIENTIFIC AMERICAN replies, in answer to a correspondent, 'Smoke consists principally of carbon. The plan of burning it by passing it into a hot furnace has been in operation for several years; it is extensively practiced in England. An escape flue is necessary.' Although smoke is rendered visible by the presence of carbon, in the most inconceivably minute state of subdivision, we had supposed that smoke consisted principally of carbonic acid, nitrogen and steam; and whatever plans may be in operation in England, or elsewhere, it may be taken as settled that smoke was never yet burnt by passing it into a hot furnace, nor can true smoke, once formed, be burnt at all. The carbo-hydrogenous brown vapor which is distilled from coal just thrown upon a fire, is very different from smoke, but not even this vapor can be burnt by passing it merely into a hot furnace."

Among all our exchanges, there is none for which we have a higher respect, and the coming of which is more heartily welcomed, than the *Engineer*. It is conducted and edited with marked enterprise and ability, and, as our readers are aware, we have enriched our pages by many valuable articles from its columns. We have derived satisfaction and profit from its teachings; but the above lesson, which is given expressly for our benefit, is contradicted by so many weighty authorities that we hesitate to accept it, even from the *Engineer*. We are told that smoke consists of carbonic acid, nitrogen and steam, but that it is rendered visible by carbon. That carbon may reflect light, and thus be visible itself, we have long since been taught; but the mode in which it makes another substance visible is a fact in optics which we should be pleased to have explained. If smoke consists of the substances named, it is certainly true that it "cannot be burnt at all," either by merely passing it into a furnace or by any other process known to science or art. It would be literally as impossible to consume it as it would to set the Thames river on fire. But we respectfully submit to our cotemporary that a definition of smoke which would render it absolutely incombustible, would prove that the learned, able and elaborate disquisitions of the subject of burning it, by the British people and Parliament, and in the columns of the scientific press—including the *Engineer*—were all conducted under an entire misapprehension of the nature of the substance.

The position that smoke cannot be consumed by *merely* passing it into a furnace is, in strict and literal meaning of the language, well taken. But as we not long since minutely discussed the phenomena of combustion, our readers are generally aware that it consists in the chemical combination of two separate substances, and that one cannot be burned merely by putting it into a furnace, or anywhere else, without bringing it in contact with another. The remark of the *Engineer* is just as true applied to cannel coal as to smoke; either of them can be burned only by receiving a proper supply of atmospheric air, or of oxygen in some form; but we do not deem it necessary to re-explain this matter whenever we allude to the subject in our condensed answers to correspondents.