

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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VOL. XLII, No. 8, [NEW SERIES.] Thirty-fifth Year.

NEW YORK, SATURDAY, AUGUST 23, 1879.

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A SUBJECT FOR INVESTIGATION.

In another column we reprint a remarkably suggestive article from the London Engineer on the mysterious in boiler explosions.

In spite of conviction of the great majority of boiler inspectors, that boilers explode from inherent defects, weakness, or gross misusage, our learned and practical contemporary deems it beyond question that there is yet an element of mystery attending some of the catastrophes of the sort. While ninety-nine in every hundred explosions may be clearly traceable to faults in material or construction, defects due to age or abuse, ignorance, carelessness, or neglect in management, or some other preventable cause, the Engineer believes, and is not alone in believing, that in the hundredth case the boiler may suddenly fly to pieces in the absence of all known conditions tending thereto.

The strength or weakness of this position hinges on the circumstance that when a new and strong boiler explodes "mysteriously" it is rarely possible to determine what the immediately antecedent conditions were. The engineer in attendance is usually killed; and there is no means of telling exactly what was the condition of the boiler, or what was going on in it, the moment before the explosion occurred. The recklessness, ignorance, or misconduct of the engineer may have brought about the disaster; but it is not safe to assume his fault in all cases, as the only alternative to indeterminable conditions.

In the Coltness case referred to, for example, "when six boilers out of ten flew away at once like a covey of birds," the boilers are described as strong enough to stand a pressure of 300 pounds, and it is not easy to see how such a pressure of steam could have been produced through any fault of the engineer or otherwise.

In a recent attempt to explain why boilers explode a Philadelphia paper says:

"If we could get down to the bottom facts of every boiler explosion it would probably be found, in nine cases out of ten, that the engineer in charge had permitted the water to get below the flues, and that, upon ascertaining the fact, he had, in his fright, turned cold water in upon the hot iron. No boiler that was ever made can withstand the tremendous pressure applied by the sudden conversion of a large volume of water into steam, and the reason why it cannot may easily be comprehended when it is remembered that one cubic foot of water will make seventeen hundred cubic feet of steam."

This theory is, and has been, widely accepted; and is a very plausible one for throwing the blame on the dead, who cannot contradict the charge. The circumstance, however, that to convert the cubic foot of water into steam would use up the spare heat of something over a quarter of a ton of red hot iron, makes the sudden conversion of a large volume of water into steam, in any ordinary boiler, altogether doubtful. As the Engineer pertinently remarks, it has never yet been shown how enough red hot iron could be present in any boiler to cause a development of steam with which the safety valves could not deal.

The electrical theory of explosion, the theory that under certain unknown conditions the decomposition and recombination of water may take place explosively, and similar guesses, are equally unsatisfactory when brought to critical test of fact and experiments. The circumstance that many explosions take place just when an engine is started suggests the possibility that the sudden reduction of pressure may cause a part of the water to flash into steam; and it is supposed that somehow, by some physical law not yet discovered, the flashing process may be self-continuing in spite of the restoration of the pressure. This, however, is sheer hypothesis, and involves conditions as mysterious as the mystery to be explained. And after all, what is wanted at this time is not a plausible explanation of an unavoidable disaster, but a critical investigation of the behavior of water and steam under all conceivable conditions likely to obtain in boilers. As soon as investigation has determined absolutely all the circumstances under which water explodes, the inventor will lose no time in furnishing a boiler which will not explode under intelligent management. Thanks to what has already been determined the range of mystery in boiler explosions has been narrowed, numerically speaking, to a fractional percentage. To remove the remaining mystery is a task that may well engage any ambitious student of physics, who wishes to gain an honorable fame by benefiting his kind.

STILLE ON YELLOW FEVER.

At this time, when public attention is so forcibly drawn to the plague that prevails at Memphis and Havana, and threatens every commercial city of the country, our readers cannot fail to be interested in the critical review of the natural and clinical history of yellow fever, by Dr. Alfred Stille, in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT.

There is probably no man living whose competence to discuss the subject is more widely recognized; and now that the newspapers are so full of speculation and error in respect to the origin and propagation of the disease, the profession as well as the public will be glad to know from him what he holds to be positively known about it.

Dr. Stille traces the origin of yellow fever to the West Indies. There it was first discovered; and from West India ports it has, in all instances, spread. It has never originated elsewhere, however favorable the conditions may have been for its rapid extension when once introduced. A high temperature is essential to its propagation; salt water and un-

sanitary conditions favor it; but the morbid poison must be imported in ships and fomites. A strict quarantine is always efficient in preventing the dissemination of the disease. It is not contagious. Its essential cause has never been isolated or defined, but is assumed to be a specific poison, distinct from all other fever poisons. It is spread by infection. In the system it acts primarily in two ways: by disintegrating the blood and by inflaming the stomach; secondarily, it tends to impair the eliminating function of the kidneys.

The evidence upon which these conclusions are founded, with much exact and timely information as to the character and behavior of the disease, and the effects of different modes of treatment, will be found in Dr. Stille's lecture, reported specially for the SUPPLEMENT.

A NEW METHOD OF LOCATING LIGHTNING RODS.

The Brockton (Mass.) Weekly Gazette contains a long account of a so-called wonderful discovery which has been made by Messrs. George S. and A. R. Prescott, of Merrimac, Mass. These gentlemen have ascertained that "lightning never strikes the earth except in localities directly over what may perhaps be best described as electrical currents on or below its surface, with which currents the electrical discharge invariably communicates. This has been determined by a multitude of tests made in localities widely separated. It follows, therefore, that in places where these currents are not found to exist, no danger need be apprehended, as in upward of four thousand instances, where tests have been made during the past three years, no record can be found of any exception to this universal rule."

This is certainly a wonderful discovery and merits careful attention. The subject is in the domain of science, and it can be reasonably presumed that the Messrs. Prescott have some knowledge of electricity, especially of earth currents, since their work is claimed to be in the detection of such currents. Moreover, these gentlemen must have made use of scientific methods, which past experience has shown to be indispensable, or they must have created a new method which rests on a scientific basis and is not dependent upon the freaks of the observer.

On careful inquiry we have ascertained that the Messrs. Prescott lay no claim to a knowledge of science. They are farmers, and have gained their knowledge of agricultural operations from actual practice in this pursuit, and not from mere theories. Whatever success they have obtained in farming has been due to the experience which has been handed down to them and by a lifetime of labor in their chosen pursuit. Without any knowledge whatever of electricity, they have suddenly made a discovery which puts to the blush the labors of scientific men in meteorology; have curbed, so to speak, the thunderbolts of Jove; have within their reach an immense fortune; and, more than all, have demonstrated that honest ignorance can discover what skilled education has overlooked. Their method also has never been employed or even thought of by scientific men. We shall first describe it in practical operation, and then devote a few words to its theory. Having cut a forked stick from a tree—any kind of wood will answer, although the discoverers prefer a forked stick from an apple tree, an elm, or a hazel—the two forks are grasped firmly with both hands, leaving the portion above the fork projecting skyward and not earthward. With the stick held in this manner, and with a look which may be described as sublunar, the operator walks over the ground to and fro, here a little and there a little, until he perceives that the projecting part of the stick begins to point downward. Then he stops and announces that there is an earth current beneath him. He does not know what an earth current is, nor how it usually manifests itself, nor what tests are usually employed, nor does he need to know, for the green apple tree stick decides the point. He must not, however, wear rubber boots; leather boots are preferable. In this way four thousand tests have been made and repeated; sometimes with a green apple stick, sometimes with an elm stick. Changing the character of the stick, however, appeared to make no difference. Further experiments, however, are needed to clearly establish this point.

When the stick points to the ground it is clear evidence that a lightning rod must be led to this point. If no earth currents are found by this method, the house in this locality is pronounced to be safe, and does not need lightning rods. The Messrs. Prescott form a marked exception to the old adage that "a prophet is not without honor save in his own country and among his own kindred," for no other "lightning rod man" is employed in the neighborhood of their native town, Merrimac, and their fame has spread far and wide. Treasurers and presidents of banks, city engineers, teachers in academies and schools, proclaim that, however impossible it may seem, they have been witnesses to the Messrs. Prescott's skill—perhaps we should say to Mr. Prescott's skill, for one of the brothers excels the other in this matter—and no amount of scientific skepticism can change their faith in Mr. Prescott's discovery. Hundreds of people are ready to testify to the fact that Mr. Prescott has repeatedly discovered places where lightning has struck in the past; and on being led by the oldest inhabitant into places remote from the Prescott homestead, has infallibly proclaimed to the awestruck observers, "Lightning once struck within four feet or less of this point." So much for the practice. Now for the theory.

It is claimed that "the human frame is the most sensitive to electrical influences of any organized form. Indeed, so far as cognizant to the sense and present knowledge, elec-