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For the Week ending 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 misuse, 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.

STILLÉ 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 Stillé, 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. Stillé 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. Stillé'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-

tricity seems to be the factor of the mysterious principle of life in the work of the human system." Mr. Prescott has a wonderfully sensitive organization. He has the hitherto unknown "electric sense," and he can, to speak metaphorically, smell electricity or taste it in the air or earth. He is not, however, the only person who has claimed to have this power. If he and his friends will procure a copy of Baron Charles von Reichenbach's "Physico-Physiological Researches in the Dynamics of Magnetism, Electricity, Crystallization, and Chemism," published in Partridge & Brittain's Spiritual Library, it will be found that Mr. Prescott belongs to the class called sick sensitives; in other words, to a class of persons whose systems are supposed to be peculiarly sensitive from disease to general cosmical phenomena. In the same book will also be found a long account of the use of a forked stick, which use is there called Blé-tonism, from the name of an agricultural laborer who had great success in its use. It is evident that agriculture is about to assert itself in the cognate field of electricity and magnetism. An account of the forked stick can also be found in Dr. Hutton's Mathematical Recreations, which is a translation with additions of Montucla's improvement of Ozanam's Recreations. An account of the virtues of the forked stick can also be found in Dr. Herbert Mayo's "On the Truths contained in Popular Superstitions" Letter XII. (London, 3d ed., 1851). It may interest Mr. Prescott to know that his forked stick has various names. It has been called divining rod, virgula divina, baculus divinatorius, baquette divinatoire, and the wonders accomplished by its use have been testified to by thousands of people for more than a century. If Mr. Prescott is a reader of fiction, he will also find an account of Brouster Swivel's use of the forked stick in Walter Scott's novel "The Antiquary."

It is said by Mr. Prescott's believers that if he did not use such an absurdly simple contrivance as a forked stick he would have more followers and make a greater fortune. Indeed, it has been proposed that he should get up a complicated contrivance with a maze of wheels and electro-magnets, which should have nothing, however, to do with his method; but walking forth in boots (leather), with the stick and the machine, he should attribute the discoveries to the machine. Pessimists claim that he would then be in entire sympathy with the age.

Briefly let us sum up the claims of the Prescotts. We shall put the claims against the evidence in the following table:

CLAIMS.	EVIDENCE.
A forked stick in the hands of a sensitive person is a scientific instrument capable of detecting earth currents.	No evidence has ever been submitted to men capable of judgment on this point. The belief is supported only by invalids, and is an evidence of invalidism.
Mr. Prescott belongs to the class called "sick sensitives."	No medical school of any standing believes in the powers of the "sick sensitives" to discover occult phenomena. No master of his profession believes in such powers.
Earth currents have a determinate direction, and under the action of thunderstorms will always take the same direction.	Earth currents do not have a determinate direction, and the influence of a thunderstorm does not determine their direction.
The electric discharge seeks to unite itself with earth currents.	No evidence. This can only be determined by electrical tests, which Mr. Prescott and his friends are incapable of making, from utter ignorance of the subject of electricity.

The above is our statement of the case, and it is only justice to Mr. Prescott and his followers to state his case in the same manner, with a few comments, which can be taken or rejected.

CLAIMS.	EVIDENCE.
Four thousand test cases, more or less.	Tests made of twigs from three or more kinds of trees, all taken from different localities, and cut by unprejudiced observers.
The testimony of innumerable people, including teachers in high schools, civil engineers, and prominent business men of high standing and respectability. They have seen with their own eyes. They have been convinced beyond all doubt.	Respectability has always had great weight in deciding upon scientific matters. It is reasonable to suppose that if a bank president or cashier maintains his good standing in the community, his judgment on any subject, even on one to which he has paid no attention, is of value. Civil engineers and teachers can be summoned as experts in matters of scientific evidence.
Mr. Prescott has eminently the air of an honest man. He has been known man and boy by his neighbors for many years.	Honest looking men have never deluded themselves or deluded their neighbors.

In conclusion, the use of the forked stick is recommended to mining speculators and prospectors. Thousands of re-

spectable persons in the past have testified to its efficiency in discovering lodes of precious metals, and it is one of the strangest facts in human history that mankind has stubbornly refused to discover precious metals by the use of such a simple means, and have forced themselves into what may be called complicated and theoretical scientific methods.

LABOR AT HOME AND ABROAD.

The reports of American Consuls in Europe, with respect to the conditions of trade in their several districts, have in many instances been laid before the readers of this paper. It will be no news to them, accordingly, to be told that the average condition of industrial communities abroad is far below that which has obtained here, even in the worst of times. The effect of these reports is naturally intensified when they are massed together, with the evidence on which they were based, as they have been in a volume just issued by the Department of State. Covering, as they do, all phases of the labor question in Europe, these reports furnish a telling picture of the condition of the working people of Europe—their continued struggle with adverse circumstances—as compared with the condition of the working people of the United States, and show, as perhaps no single volume has ever done before, the difference between labor disfranchised, degraded, and hopeless, and labor free, honorable, thriving, and an equal sharer in political power.

The following deductions are said by the department to be clearly proved by the reports:

1. That wages in the United States are double those of Belgium, Denmark, France, and England, three times those of Germany, Italy, and Spain, and four times those of the Netherlands.
2. That the prices of the necessaries of life are lower in the United States than in Europe, and that the laborer in the United States, were he satisfied with the scanty and miserable fare upon which the European laborer must live, can purchase like food for less money than it can be purchased for in Europe.
3. That the French working people, with far less wages, are happier than the working people of Great Britain, who receive the highest wages in Europe, on account of the steadiness and the economical habits of the former, and the strikes, drinking habits, and consequent recklessness of the latter.
4. That more misery results from strikes, drinking, socialism, and communism in England and Germany than from all other causes combined, hard times included.

DRAGON FLIES.

"Dragon flies," "mosquito hawks," "devil's darning needles"—these are some of the common names for certain well known neuropterous insects of the family *Libellulidae*. They are commonly seen skimming in swift flight over the surfaces of ponds and other bodies of still water. The head and thorax are greatly enlarged—the eyes entirely covering the sides of the former—and the hind body is very long and slender, terminating in the male with a pair of clasps for seizing the female. The two pairs of wings are nearly equal in size, transparent, and finely netted, and in many species clouded with broad bands of brown, blue, or crimson. The flies attach their eggs to the submerged leaves of aquatic plants or drop them carelessly upon the surface of the water.

The larvæ are aquatic, living at the bottom of the pool or stream they inhabit, and breathing by means of *tracheæ* situated in the tail. They are further characterized by what is known as a "mask," which is an elbowed extension of the *labium* or under lip, and is armed at the extremity with two sharp hooks for seizing and holding the prey. When not in use this apparatus is folded up over the lower part of the face, but to grasp a victim may be suddenly thrust forward. These dragon fly larvæ feed upon young mosquitoes or "wrigglers" and other aquatic insects, particularly the young of May flies (*Ephemeridae*). They are active and predacious in the pupa as well as in the larva and perfect states. When about to change into a fly the pupa leaves the water and crawls upon some plant or other object above the surface of the water. After clinging there a short time a rent appears on the top of the thorax, through which the fly emerges.—*Prof. C. V. Riley.*

Louis Favre.

The news of the death of Mr. Louis Favre, the contractor of the Great Tunnel of the St. Gothard, spread through the city of Geneva on Saturday, July 19, calling forth, says the *Swiss Times*, universal expression of sympathy and regret. Louis Favre was a man of more than ordinary merit. He commenced life as a day laborer and won his way up to the front rank by sheer force of will and honest industry. This name will be handed down to posterity in connection with the great enterprise of his life, and his descendants may speak of him with more pride as Favre du Gothard than if he had been born to one of the thousand titles to a *de* or a *von*. At the time of his death he had overcome the great obstacles to the success of his gigantic undertaking, and it is no secret that these obstacles came rather from men than from nature. He falls, as fell Sommelier of the Mont Cenis, after years of persistent and weary warfare at the moment when his labors were to be crowned with honor, riches, and the calm enjoyment of a world-wide reputation which all men love so well.

To those who had the good fortune to meet him in his great natural workshop, the bowels of the St. Gothard, he

leaves a remembrance of a lion hearted man, endowed with all the charm which comes from strong will tempered by rich experience and a buoyancy of spirits which nothing could repress.

THE AMERICAN ONION-SMUT IN FRANCE.

According to M. Max. Cornu, in a note recently presented to the French Academy, the onions are being attacked in the vicinity of Paris by a fungus which fills the interior of the bulb-scales and the base of the leaves with a black powder. A longitudinal section of the bulbs attacked (which belong to the early variety of the white onion and the onion of Nancy) shows that the black dust occupies the entire substance of the scales or of the leaves. The presence of the parasite, in addition to the decay which it produces, greatly modifies and alters the normally white appearance of the onions. The black dust, examined with the microscope, is seen to be composed solely of an enormous quantity of spores; and these spores are characteristic of a genus of *ustilagineæ*, which was first called *polycystis* by Leveillé, and afterwards *urocystis* by Robenhorst.

The particular species under consideration is new, not only to France, but to Europe, and is not mentioned in the works of Tulasne. Dr. Farlow, of Harvard College, in his report on the diseases of onions, first called attention to it, and described it as new under the name of *urocystis cepulæ*. It is only in recent years that the fungus has made its appearance in America, its ravages for a dozen years past having been confined to the States of Connecticut and Massachusetts, where the culture of onions forms an important branch of agriculture. Here it has produced a damage amounting to many thousands of dollars a year. At the date of Dr. Farlow's report the disease was as yet unknown in New York. Dr. Farlow thinks that the fungus has come from some of our wild species of onions. Mixing the seeds with lime or special treatments of the soil have no effect, and it appears that it is necessary to wait four years before commencing onion culture in the same soil again. "It is not the first time," says M. Cornu, "that a new infection has come to us from America. Without citing the phylloxera and dorysophora, insects equally to be feared, I may mention the oidium of the vine, and *puccinia malvacearum*, the latter of which I first noticed the presence of in Europe."

We are willing to father the potato-bug, the phylloxera, and, perhaps, the onion-smut, since it was first detected here; but the so-called "oidium" of the vine occurs here, not on native vines, but on those of European species raised in hot-houses. As for the mallows-brand (*puccinia malvacearum*), no American mycologist has as yet reported its presence among us; we have seen specimens from Africa, however.

NORDENSKJOLD'S EXPEDITION.

The fact was announced not long since that Professor Nordenskjöld's expedition had survived the winter, ice bound near East Cape, Siberia, and that the explorer hoped soon to be able to proceed to Behring Strait, about 400 geographical miles from the Vega's winter quarters. Dispatches from Stockholm and Berlin, August 3 and 4, state that the Vega had got clear of ice and passed the strait; but no information is given of the route through which the alleged intelligence came. On the other hand, the Alaska Fur Company at San Francisco strongly doubt the truth of the report. Their advices from the neighborhood of Behring Strait were to the effect that the season had been very late on the Asiatic side, and that strong east winds had prevailed, piling up the ice so as to make the possible passage of the Vega very doubtful.

Activity in the Iron Trade.

Though it is now midsummer, usually a dull season in the iron trade, the demand for iron is great and prices are tending upward. The intelligent secretary of the Iron and Steel Association of the United States predicts that the product this year will be the largest the country has known. He also believes that the activity which prevails to-day in all branches of the iron and steel trade will continue for at least a year to come. Nearly all the favorably situated rolling mills are in operation, and numbers of these mills, as well as furnaces and steel works, have orders ahead for several months. The truth is the iron industry has been so long under a cloud that the actual need of iron throughout the country is enormous.

MANY persons are puzzled to understand what the terms "fourpenny," "sixpenny," and "tenpenny" mean as applied to nails. "Fourpenny" means four pounds to the thousand nails, or "sixpenny" means six pounds to the thousand, and so on. It is an old English term, and meant at first "ten pound" nails (the thousand being understood), but the old English clipped it to "tenpun," and from that it degenerated until "penny" was substituted for "pounds." When a thousand nails weigh less than one pound they are called tacks, brads, etc., and are reckoned by ounces.

The Paper Makers' Association.

The second annual convention of the Paper Makers' Association of America assembled at the Grand Union Hotel, Saratoga, N. Y., July 30. About forty manufacturers were present. Wellington Smith, of Lee, Mass., presided. He said that although prices were lower than last year the trade was in a better condition, there being an increased demand; that a year ago the trade was in the lowest condition ever known, but now the mills throughout the country were running on full time.