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II. BIOGRAPHY.—The Sixtieth Anniversary of the Accession of Queen Victoria.
III. CIVIL ENGINEERING.—Note on the Canal Work of the State of New York.

EUROPEAN PRACTICE IN STEAM BOILERS.

The report of Mr. R. S. Hale, expert to the Steam Users' Association, on steam boiler practice in Europe is a valuable document, being a record of the personal observations of a practical man upon a subject which should command a widespread attention.

The standard type of boiler, with one or two exceptions, is "the internally fired flue boiler," of which there are two types—the Lancashire boiler, with two flues, and the Cornish, with one. It is generally about 7 1/2 feet in diameter and 30 feet long, with a grate 6 feet in length, and provides 36 square feet of grate and 1,000 square feet of heating surface.

PER CENT OF BOILERS OF VARIOUS TYPES USED IN EUROPE.

Table with 6 columns: Type, United Kingdom, 1886, France, 1893-4, Germany, 1893-4, Switzerland, 1893-4, Austria, 1893-4. Rows include Lancashire and similar types, Cornish and similar types, etc.

\* Lancashire, Cornish and similar types, 297. † Including elephant.

In boiler construction Mr. Hale "judges the English workmanship to be fully equal to our best." The plates are planed on the edges, drilled in place and no punching is allowed, and steel is almost exclusively used.

Economizers are more common in Europe than here, the type known as the "Green" being standard. "The most general practice was to put one economizer for each battery of boilers, making the economizer heating surface and the boiler heating surface the same.

The use of superheated steam is very much in the air all over Europe. There has never been any doubt that it saved from 10 to 20 per cent of the coal; but there has been difficulty in lubricating the engine cylinder and in keeping the many superheater joints tight.

The grates in ordinary use resembled those in America. In Germany some of the under-fired boilers were provided with grates that inclined downward to the rear as much as a foot or a foot and a half, which was thought to be easier for the firemen and to give better combustion.

Mechanical stokers are used in probably over one-fourth of the boilers in England. They may be divided into two classes: the coking and the sprinkling stokers. The first feed the coal at the front, where it cokes, and is then carried to the rear by the recip-

rocating motion of the grate bars. The sprinkling stokers throw the coal over the grates by means of revolving or oscillating shovels. The Vickers is the best known coking stoker and the Bennis is the most widely used sprinkling stoker.

Boiler fittings in Europe differed considerably from ours. They were "heavier and stronger." Spring-loaded safety valves are regarded with distrust, the common types being the lever and the dead-weight valves.

"The average quality of the boiler and pipe coverings did not seem to the writer as good as those in general use in this country. Occasionally he saw wood and even rope covering on high pressure piping, some of which was already distinctly charred.

"Boiler testing is in some respects more advanced than with us, chiefly in that they attempt to tell where all the heat supplied goes to, and thus to determine the reasons of good and bad performance."

"In boiler economy I could not see that they were ahead or behind us; they get 60 per cent to 80 per cent of the heat in the coal, according to the air supply and evaporation per square foot of heating surface."

Tall Buildings in Antiquity.

That even tall buildings are not modern ideas is shown by Professor Lonciani, in the North American Review. In Rome much the same tendency was shown to erect tall buildings as has been experienced of late years in America.

**Sylvanus Dyer Locke.**

This noted and highly successful inventor of harvester and binder machinery, whose inventive genius also had a notable development in many other directions, died at his home, near Hoosick Falls, N. Y., on September 27, aged 63 years. His latest work was on a machine, of which he is said to have made a successful trial just before his death, for automatically making a detachable and continuous steel sprocket chain from a strip of steel. It was at Hoosick Falls, in 1870, that Mr. Locke succeeded in so far perfecting his automatic harvester and binder that it was conceded to be a practical success, and it became soon afterward a leading product of the Walter A. Wood Mowing and Reaping Machine Company. The machine cut and bound rapidly and well a swath eight feet wide, and the demand for it increased so rapidly that in 1878 more than 5,000 machines were manufactured and sold. Mr. Locke secured in all 104 patents in the harvester and binder field, besides numerous other patents relating to jointless vertical plane car couplers, electric vote annunciators for deliberative bodies, steel cross ties for railroads, underground wires and pipe conduits, snow melting for streets of cities, line guide copy holders for typewriting machines, hop picking machines, malleable iron detachable iron link chains, paper testing machines, etc.

Mr. Locke was a public spirited citizen whose personal worth was highly appreciated by everyone in the community of which he was so conspicuous a member for more than twenty-five years, and he took an active interest in all religious and charitable work. Many of his patents were obtained through the SCIENTIFIC AMERICAN patent agency, and during the several years in which we were so frequently brought into personal contact with him his strong convictions and rigid principles were always as marked a characteristic as was the self-reliant and energetic nature which contributed so powerfully to his success in life. He is survived by a wife and three children.

**The American Institute Fair.**

The popularity of this interesting exhibition has been greatly enhanced by the opening of the display of flowers, fruits and vegetables which is made in the concert room of the Madison Square Garden. The exhibit of palms is magnificent and there is a wonderful variety of dahlias, gladiolas and asters. Some five hundred varieties of grapes are arranged on the tables. Among the leading exhibitors in this department are Peter Henderson & Company, J. M. Thorburn & Company, and Weeber & Don, of New York City.

Among the interesting exhibits on the main floor is that of Francis Bannerman, of New York, manufacturer of the Spencer repeating gun. The display includes a 12 inch nickel steel solid projectile whose point only has been slightly damaged by firing, in a government test on the navy proving grounds, at nickel steel armor plates. Other shells and shot, similarly tested, are also shown, together with a great variety of curious and interesting relics and samples connected with military equipments of the past and present, at home and abroad.

The Rex Fire Extinguisher Company, of New York, manufacturers of chemical engines, exhibit a fine specimen of their hand machine, which can be readily drawn by one or two men to any section of a town or village not reached by water systems. It will throw over an ordinary house a stream of carbonic acid gas and water, claimed to be forty times more powerful as a fire extinguisher than water. In many places where there are steam fire engines these chemical engines are being added to the fire department to supplement the services of the more powerful steam fire engines.

The Photogravure Wood Company, of New York, show some excellent samples of carved mouldings and decorative solid wood and veneers, their artistic fire etchings, or pokerwork, being quite unique.

On the machinery floor, in the basement, the Law Company exhibit specimens of the work of the Standard Machine Company, of Holyoke, Mass., manufacturers of grinding and polishing machinery for all purposes.

Near by is shown the "Peerless Universal Sander" of E. J. Bein, of Newark, N. J., which presents a large flat surface to the work, the latter being guided by a gage. The belt is made of merchantable sand cloth of any desired number, the changing of the belt being the work of only a few seconds, while the tension is readily regulated.

The heavy head shaft hanger, adjustable in all directions, and with changeable sole plate for varying drops, shown by the Dodge Manufacturing Company, of Mishawaka, Ind., is a standard article which has had very extensive use, as is also the case with their adjustable pillow block and short drop head shaft hanger.

Among other exhibitors on this floor are the Watson-Stillman Company, of New York, manufacturers of hydraulic machinery, tools and supplies, and the Excelsior Machine Works, Charles Hvas proprietor, manufacturer of street sweeping machinery and implements.

**Expert Testimony.**

Within comparatively recent years there has arisen in our judicial system an apparent need for evidence bearing upon scientific questions requiring a knowledge not ordinarily possessed by the lay witness, and which is gradually being more and more supplied by the so-called "expert." He is paid to testify on behalf of one side or the other and not infrequently is retained to appear as often as cases arise in which his opinions are desired. That the most flagrant abuses in expert testimony have made themselves most prominent in criminal cases is perhaps to be attributed merely to the notoriety which these cases have attained. Whether it be the fault of our patent system or of our judicial system, the expert has become a prominent factor in all recent cases pertaining to patent litigation. It is not uncommon to find several experts on one side arrayed against perhaps as many more on the other, and if each side has been able to retain men of practically equal prominence, that side having the greater number frequently produces no little effect on influencing the judicial decision. That men devoted to the interest of science should be willing to sell their opinions indiscriminately to either contending party, often being obliged to so modify their views as to make them harmonize with the unscientific but legal opinions of the counsel by whom they are employed, has become an evil which has justly brought forth criticism, must be acknowledged, and unless modified or changed in some form, calls for future condemnation also.

In a contribution to the October number of the Atlantic Monthly, Prof. John Trowbridge calls attention to the imperiled dignity of science and the law if the practice of indiscriminate scientific testifying is to continue. He points out the difficulty in which a judge is placed when required to carefully weigh statements on scientific points; his attitude toward the scientific expert and the little regard he frequently holds for his opinions. He is therefore tempted to entirely ignore expert testimony and rely upon his own common sense for framing his decision. The consequence has been that judges may be classified under several headings, a classification based simply upon their legal decisions in the past, some being known as patent breakers and others the most strenuous advocates of broad patent claims. It is for this reason that suits are carried from court to court with the ultimate hope that a former decision will be reversed.

The result of this method has been well illustrated and can be vouched for by several of the larger manufacturing companies who have invested millions in this way during the past few years, with no immediate prospects of any material return on the investment. The chief benefit has been derived by patent lawyers and patent experts, while the stockholder has been forced to respond with the shekels. Prof. Trowbridge does not, however, raise his criticisms without suggesting a remedy. It is to the effect that a judge may call to his assistance any well known professor of science not retained by the parties in dispute. The state should provide and the judge should appeal to the state for such assistance so that he might be aided in rendering a decision based upon scientific facts.

By this method both the standing of the bench and that of the professor would "gain in dignity and the pursuit of truth will again be considered one of the chief characteristics of a scientific life." Whether the method suggested by Prof. Trowbridge could be put in practice and would be effective even if adopted can only be determined by an actual trial. It is, however, well to call attention to these points, so that those who are tempted merely from a pecuniary standpoint to offer evidence on scientific questions, when such evidence would not be in entire accord with their best belief, may stop to consider the effective gain to be derived by so modifying their convictions as to make them harmonize with those of the contending counsel. It is not improbable that the day of the expert will soon be waning and that the costly litigations of the past will not be duplicated in the future.—The Electrical World.

**A Fraud Upon Inventors.**

Samuel S. Fisher, when Commissioner of Patents, in one of his annual reports to Congress, called attention to the great abuse to inventors and annoyance to the Patent Office by irresponsible patent agents, of which there were many at that time, and they have increased fourfold since. We quote from the Electrical Age, which says: "To arouse false hopes and cause an individual to invest in a worthless patent is fraudulent. It is a gold brick scheme, a phase of buncoism that has existed for years. Commissioner Fisher was right in warning the inventor. His language is direct and to the point: 'The tendency of many agents to be more solicitous about the number than the quality of patents is aggravated by those who solicit patents on contingent fees, or who without special training and qualification adopt this business as incident to a claim agency, and press for patents as they do for back pay and pensions. Such men are often more desirous of obtaining a patent of any kind, and by any means, than they are of obtaining one

which will be of any value to their clients. Inventors are often poor, uneducated, and lacking in legal knowledge. They desire a cheap solicitor and do not know how to choose a good one. They are pleased with the parchment and the seal and are not themselves able to judge of the scope and value of the grant. Honest and skillful solicitors, with a thorough knowledge of the practice of the office and of patent law, and who are able and willing to advise their clients as to the exact value of the patents which they can obtain for them, may be of much service to inventors. There are many such. But those who care for nothing but to give them something called a patent, that they may secure their fee, have in many instances proved a curse. To get rid of their client and of trouble they have sometimes been content to take less than he was entitled to, and in many cases they have, with much self-laudation, presented him with the shadow when the substance was beyond his reach. Between such men and the office strife is constant.'"

**Lucium, a New Element.**

In the course of researches on monazite sand M. P. Barriere appears to have come upon a new elementary body, to which he has given the name lucium, and which he purposes using for the production of an incandescent gas light in opposition to that of Auer von Welsbach.

Hence he has sought to show the new and independent character of lucium in order to prove that its use was not anticipated by the Welsbach patents. A careful examination led to the following results.

The chemical properties of lucium are as follows: The salts of cerium, lanthanum, and didymium form with sodium sulphate insoluble double salts; lucium does not. Thorium and zirconium form insoluble double salts with potassium sulphate; this is not the case with lucium. Yttrium, ytterbium, and erbium are not precipitable by sodium thiosulphate, while lucium chloride is precipitable. From glucinium lucium differs, as its salts are precipitable by oxalic acid.

According to the results obtained by Prof. Schutzenberger, confirmed by those of Cleve, Fresenius, and Lecoq de Boisbaudran, lucium dissolves in sulphuric, nitric, or acetic acid, forming salts either white or slightly tinted with rose color. All its salts are soluble in water, forming limpid, colorless solutions.

The spectral rays of lucium are special, and only approximate slightly to those of erbium. Erbium oxide, on ignition, appears of a very pure rose color, and its nitrate is red. On the contrary, lucium oxide is white, slightly grayish, and its nitrate is white. The aqueous solutions of the erbium salts are red or rose color; those of lucium, even if containing 15 or 20 per cent of the salt, are almost colorless.

The atomic weight of lucium is calculated as = 104, while—

Thorium.....	= 233
Yttrium.....	= 89
Ytterbium.....	= 173
Scandium.....	= 44.5
Cerium.....	= 140
Lanthanum.....	= 156
Erbium.....	= 166
Zirconium.....	= 90
Samarium.....	= 150
Glucinium.....	= 9

Hence the authorities cited regard lucium as a new, distinct elementary body.—Chemical News.

**Interesting Facts Regarding Divers.**

The dress of a fully equipped diver weighs 169½ lb., and costs about \$500. First of all comes 8½ lb. of thick underclothing, then follows the dress itself, weighing 14 lb.; boots, 32 lb., monstrous things with leaden soles; breast and back weights, 80 lb.; and, lastly, the helmet, which weighs 35 lb. When the hull of the Great Eastern was cleaned by divers as she was being loaded with the cable for the Indian submarine telegraph the contract price for the work was £1,800, and it was completed in six weeks by twelve divers. The incrustation on her bottom was more than a foot thick, and after it was removed she lifted fully two inches. The greatest depth at which a diver may safely work is 150 feet. There have been, however, rare instances of diving to 204 feet, and sustaining a pressure of 88½ lb. on every square inch on the body of the diver. Diving was first invented by the action of the elephant in crossing a deep river, when he swims beneath the water, elevating his trunk, by which method he breathes. The work of a diver consists in recovering lost articles, and slinging them in such a manner that they can be easily hauled up, cleaning and coppering ships' bottoms, cleaning propellers, and communicating by slate and voice. When able to work at a depth of 120 feet a diver is considered fully qualified. The flag ships in the British navy carry eight divers, and the cruisers four each, fully equipped.—From the Strand Magazine.

THE Board of Education of Bayonne, N. J., have, through Mr. Charles M. Davis, city superintendent, ordered the introduction into the public schools of MacCord's system of mechanical drawing published at the office of the SCIENTIFIC AMERICAN.