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EUROPEAN PRACTICE IN STEAM BOILERS,

Users' Association, on steam boiler practice in Europe revolving or oscillating shovels. The Vicars is the 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 it. In this respect the coking stoker had a decided the Cornish, with one. It is generally about 7½ feet in advantage over the sprinkling. Neither stoker kept 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. As built in England to carry say 160 pounds pressure, it costs \$2,500, and will deliver 6,000 pounds of steam per hour, Used with an the chief reasons for their adoption being the diminueconomizer and worked at a lower rate, it is "as economical as any type of boiler." In France and Elsass (Alsace), Germany, a type known as the "elephant" is standard. This is classed under the head of externally fired cylindrical in Mr. Hiller's table given below. It is not as regular in size or proportion as the Lancashire. The upper shell is generally from 20 to 30 feet long and some 5 feet in diameter. The two lower shells, called "bouilleurs," are about 2 feet in diameter. They have one and sometimes two connections to the main shell. This boiler has the advantage of allowing a very large grate surface, an important consideration with the poor coals in use on the Continent.

ER	CENT	$\mathbf{0F}$	BOILERS	\mathbf{OF}	VARIOUS	TYPES	USED	IN
EUROPE.								

	United Kingdom. 1895.	France. 1893-4.	Germany. 1893-4.	Switzerland. 1803-4.	Austria. 1893-4.	
		——	<u> </u>	<u> </u>	· ·	Į.
Lancashire and similar types	38.0	4.7	35.7	19.6	. *	ŀ
Cornish and similar types.	23.7	8.2	15.3	40.8	, *	L
Externally fired cylindrical +		57 3	14.8	15.5	41.0	
Externally fired multitubular		13.4	5 2	3.2	7.5	
Locomotive.	ii 0	51	52 17·3	57	10.2	
Small verticals.		3.6	5.0	13.2	6.1	
Water tubes		5.7	4.6	1.4	38	r.
	2.1	20	2.1	14	14	
Other types	~ 1	20	41	••••	14	
Totals	100·0	100.0	100.0	100 · 0	100.0	

* Lancashire, Cornish and similar types, 29.7. † 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. The longitudinal seam of the flues is generally welded, and corrugated flues are frequently used, though "most frequently the improvement did not " appear to " warrant the expense." As compared to 140 to 150 pounds pres-Belgium and Germany.

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. In Belgium, however, they were recommending one small pared on the evaporation per pound of coal "pure and economizer to each boiler. Scrapers are used to keep the fire surfaces clear of soot. The water surfaces are subject to scaling if the water be bad, and it is chiefly in the bad water districts that economizers are not used, though they are not much, if any, worse in this respect than water tube boilers. But when the economizers are taken out, the heating surface of the boilers must be more than doubled to get the same economy." An advantage claimed for the Lancashire boiler and for the economizers was that the large amount of hot water in them afforded a reserve of heat for a sudden call. An interesting application of this principle was the feed storage and steam storage system of D. Halpin, of London. It consists in providing tanks in which the feed is heated to the steam temperature by steam from the boiler during light demand, so that during the heavy demand the feed water is supplied hot (360° F. instead of 100° or 200°). The steam storage consists in

rocating motion of the grate bars. The sprinkling The report of Mr. R. S. Hale, expert to the Steam stokers throw the coal over the grates by means of is a valuable document, being a record of the personal best known coking stoker and the Bennis is the most observations of a practical man upon a subject which widely used sprinkling stoker. Opinion as to the value of mechanical stokers is divided, but the drift of opinion was as follows: "No stoker absolutely prevented smoke, but both types very largely diminished up the steam pressure on a sudden call as well as hand firing; in this respect the sprinkling stoker was considered to act more quickly than the coking." Opinion as to whether they saved coal was divided, tion of smoke and the use of a cheaper fuel. "It was thought that stokers and coal handling appliances together saved about one-third of the boiler room labor in large plants."

Boiler fittings in Europe differed considerably from ours. They were "heavier and stronger." Springloaded safety valves are regarded with distrust, the common types being the lever and the dead-weight valves. Two gage glasses are used instead of try-cocks, the use of which has been "entirely given up." The dampers are of the sliding and not the butterfly type, and are always regulated by hand. The various forms of artificial draft are "no more and no less in use than with us." The water gages are usually covered

by guards. "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. Some plants, of course, had very good coverings, and there was a custom of covering the top of the boilers very thickly with some cheap covering, with the result that nine times out of ten the space over the boilers was noticeably cooler than it is in America." The variety in sizes and theories with regard to chimneys is as great in Europe as here. In boiler operation Mr. Hale observed that occasionally the admission of air above the fire at the door or at the bridges was practiced with the idea of diminishing smoke. The drift of opinion was that

this resulted in a slight loss of fuel. Boiler surfaces are kept cleaner. When the specific gravity of the water is 1.005 they blow out and clean the boiler. Soda, lime, and potash are used in England, and they are beginning to "know about the advantages of kerosene on the Continent." Purifying plants "are not infrequent."

"Boiler testing is in some respects more advanced sure for a new mill in America, 200 pounds would be than with us, chiefly in that they attempt to tell where the practice in England, 180 in Alsace and 140 to 150 in all the heat supplied goes to, and thus to determine the reasons of good and bad performance." The bomb calorimeter is used for determining the heat value of a coal. The Thompson and other calorimeters of that type are not considered in the least available for prac tical work. Coal tests are compared on the evaporation per pound of coal, boiler tests were generally comdry," dry referring, of course, to the moisture correction, pure to a correction of the earthy matter contained in the coal, but not allowing any correction for the unburned coal in the ashes.

> "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." The European engineers were fully alive to the "immense importance of the air supply, as compared with any other factor in boiler economy." It has been found that economy is modified by the air which leaks through the settings of some types of boilers; and in some places they were using heavy tar paint or even sheet iron casings to make the settings air tight.

-----Tall Buildings in Antiquity.

having very high pressure boilers, which pressure is re-That even tall buildings are not modern ideas is duced at the engine. The system, however, did not im- shown by Professor Lonciani, in the North American press the writer favorably, for the reason that coal can Review. In Rome much the same tendency was shown probably be saved equally well by using high pressure to erect tall buildings as has been experienced of late years in America. They had not steel construction to steam directly at the engine. The use of superheated steam is very much in the aid them or elevators to land their tenants on upper air all over Europe. There has never been any doubt floors, yet the desire to build lofty buildings was strong upon them, and successive emperors issued edicts $\frac{41}{41}$ that it saved from 10 to 20 per cent of the coal; but there has been difficulty in lubricating the engine cylinder limiting the height of houses, seventy feet being allowed 39 and in keeping the many superheater joints tight. by Augustus on the street front, but these regulations The difficulty in lubrication is met by using a high were repeatedly violated. With our facilities for iron ⁴⁵ grade mineral oil. or steel construction and the knowledge of elevators, the The grates in ordinary use resembled those in Romans would doubtless have matched us in "sky-America. In Germany some of the under-fired boilscrapers." As it was, these ancient houses were often a 338 ers were provided with grates that inclined downhundred feet high. The Romans were great builders. ward to the rear as much as a foot or a foot and a half, and their speculators in this line would, without doubt, which was thought to be easier for the firemen and to match ours in utilizing every inch of space without regive better combustion. gard to light and air. Tenement house reform would Mechanical stokers are used in probably over onehave had in those early days a wide field to work in. fourth of the boilers in England. They may be di-Whatever else may be said of their Cæsars, it must be 350 vided into two classes: the coking and the sprinkling recognized that they had an eye to the health and comstokers. The first feed the coal at the front, where it fort of the common people and used their efforts to se cokes, and is then carried to the rear by the recip- check such buildings.

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Svlvanus Dver 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 ma chine, 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 pear as often as cases arise in which his opinions are 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 toriety which these cases have attained. Whether it product of the Walter A. Wood Mowing and Reaping be the fault of our patent system or of our judicial sys-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 se- against perhaps as many more on the other, and if each cured 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 science should be willing to sell their opinions indisstreets of cities, line guide copy holders for typewriting criminately to either contending party, often being 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 evil which has justly brought forth criticism, must be community of which he was so conspicuous a member acknowledged, and unless modified or changed in for more than twenty-five years, and he took an active some form, calls for future condemnation also. interest in all religious and charitable work. Many of his patents were obtained through the SCIENTIFIC lantic Monthly, Prof. John Trowbridge calls attention ful examination led to the following results. AMERICAN patent agency, and during the several years to the imperiled dignity of science and the law if the in which we were so frequently brought into personal practice of indiscriminate scientific testifying is to concontact with him his strong convictions and rigid prin- tinue. He points out the difficulty in which a judge is ciples were always as marked a characteristic as was placed when required to carefully weigh statements on the self-reliant and energetic nature which contributed scientific points; his attitude toward the scientific exso powerfully to his success in life. He is survived by a pert and the little regard he frequently holds for his wife and three children.

----The American Institute Fair.

The popularity of this interesting exhibition has been greatly enhanced by the opening of the display hibit of palms is magnificent and there is a wonderful court to court with the ultimate hope that a former variety of dahlias, gladiolas and asters. Some five decision will be reversed. hundred varieties of grapes are arranged on the tables. Among the leading exhibitors in this department are and can be vouched for by several of the larger manu-Peter Henderson & Company, J. M. Thorburn & Com- facturing companies who have invested millions in this pany, and Weeber & Don, of New York City.

that of Francis Bannerman, of New York, manufac- The chief benefit has been derived by patent lawyers turer of the Spencer repeating gun. The display in- and patent experts, while the stockholder has been cludes a 12 inch nickel steel solid projectile whose forced to respond with the shekels. Prof. Trowbridge point only has been slightly damaged by firing, in a does not, however, raise his criticisms without suggestgovernment test on the navy proving grounds, at ing a remedy. It is to the effect that a judge may call nickel steel armor plates. Other shells and shot, to his assistance any well known professor of science not similarly tested, are also shown, together with a great retained by the parties in dispute. The state should variety of curious and interesting relics and samples provide and the judge should appeal to the state for connected with military equipments of the past and such assistance so that he might be aided in rendering present, at home and abroad.

The Rex Fire Extinguisher Company, of New York, manufacturers of chemical engines, exhibit a fine speci- that of the professor would "gain in dignity and the men of their hand machine, which can be readily drawn pursuit of truth will again be considered one of the by one or two men to any section of a town or village; chief characteristics of a scientific life." Whether the not reached by water systems. It will throw over an method suggested by Prof. Trowbridge could be put in ordinary house a stream of carbonic acid gas and water, practice and would be effective even if adopted can claimed to be forty times more powerful as a fire extin- only be determined by an actual trial. It is, however, guisher than water. In many places where there are well to call attention to these points, so that those who steam fire engines these chemical engines are being are tempted merely from a pecuniary standpoint to added to the fire department to supplement the ser- offer evidence on scientific questions, when such evivices of the more powerful steam fire engines.

show some excellent samples of carved mouldings and rived by so modifying their convictions as to make 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 Stand- past will not be duplicated in the future.-The Electri- pleted in six weeks by twelve divers. The incrustation ard Machine Company, of Holyoke, Mass., manufactur- cal World. ers of grinding and polishing machinery for all pur-

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 socalled "expert." He is paid to testify on behalf of one side or the other and not infrequently is retained to apdesired. That the most flagrant abuses in expert testimony have made themselves most prominent in criminal cases is perhaps to be attributed merely to the notem, 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 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 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

In a contribution to the October number of the Atexpert 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

The result of this method has been well illustrated way during the past few years, with no immediate Among the interesting exhibits on the main floor is prospects of any material return on the investment. a decision based upon scientific facts.

By this method both the standing of the bench and dence would not be in entire accord with their best The Photogravure Wood Company, of New York, belief, may stop to consider the effective gain to be dethem harmonize with those of the contending counsel. It is not improbable that the day of the expert will

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. Barrière 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 care-

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 opinions. He is therefore tempted to entirely ignore 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, of flowers, fruits and vegetables which is made in the others the most strenuous advocates of broad patent nitric, or acetic acid, forming salts either white or concert room of the Madison Square Garden. The ex- claims. It is for this reason that suits are carried from 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 1691/2 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 consoon be waning and that the costly litigations of the tract price for the work was £1,300, and it was comon 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 of E. J. Bein, of Newark, N. J., which presents a large one of his annual reports to Congress, called attention 204 feet, and sustaining a pressure of 881/2 lb. on every square inch on the body of the diver. Diving was first incepted by the action of the elephant in crossing a deep river, when he swims beneath the water, elevating the work of only a few seconds, while the tension is fourfold since. We quote from the Electrical Age, his trunk, by which method he breathes. The work of readily regulated which says: "To arouse false hopes and cause an a diver consists in recovering lost articles, and slinging The heavy head shaft hanger, adjustable in all direc- individual to invest in a worthless patent is fraudu- 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

poses.

A Fraud Upon Inventors,

Near by is shown the "Peerless Universal Sander" flat surface to the work, the latter being guided by a to the great abuse to inventors and annoyance to the gage. The belt is made of merchantable sand cloth | Patent Office by irresponsible patent agents, of which of any desired number, the changing of the belt being there were many at that time, and they have increased

tions, and with changeable sole plate for varying drops, lent. It is a gold brick scheme, a phase of buncoshown by the Dodge Manufacturing Company, of ism that has existed for years. Commissioner Fisher Mishawaka, Ind., is a standard article which has had was right in warning the inventor. His language very extensive use, as is also the case with their ad- is direct and to the point: 'The tendency of many justable pillow block and short drop head shaft agents to be more solicitous about the number than navy carry eight divers, and the cruisers four each, hanger.

plements.

Samuel S. Fisher, when Commissioner of Patents, in

the quality of patents is aggravated by those who fully equipped.-From the Strand Magazine. Among other exhibitors on this floor are the Watson- solicit patents on contingent fees, or who without spe-Stillman Company, of New York, manufacturers of cial training and qualification adopt this business as hydraulic machinery, tools and supplies, and the Ex- incident to a claim agency, and press for patents as through Mr. Charles M. Davis, city superintendent, celsior Machine Works, Charles Hvass proprietor, they do for back pay and pensions. Such men are manufacturer of street sweeping machinery and im- often more desirous of obtaining a patent of any kind, MacCord's system of mechanical drawing published at and by any means, than they are of obtaining one the office of the SCIENTIFIC AMERICAN.

THE Board of Education of Bayonne, N. J., have, ordered the introduction into the public schools of