

the faint smell of a damp cellar which has been closed for a long time—an odor of mouldiness and decay.

Trees Freezing Solid.—The *Country Gentleman* states that Dr. Hoskins, who lives in the coldest part of Vermont, where the mercury sometimes freezes, says that when this takes place, he does not think that any portion of the sap of the trees remains unfrozen; yet the hardier varieties endure this cold unharmed. "We have observed," says the editor, "the shoots of the apple, pear, and peach frozen stiff (when the thermometer sank to 10° above zero) without injury. The microscope showed them to be filled with ice crystals, no injury resulting from the freezing."

Correspondence.

Alum Baking Powders.

To the Editor of the *Scientific American*:

I thank you for publishing the article of Dr. Robert Peter, on "Baking Powders, etc.," in your recent issue. Allow me to add that the poor operatives and workmen in this State, who have families of children to support, and must do it on the present low wages, make it a point always to bake their own bread in the old fashioned way with yeast. "They cannot," as they say, "raise a family on baker's bread." They have long ago found out by experience, what science has proved true by experiments, that alum in bread neutralizes its best nutritive qualities. There is no doubt that baker's bread, made as it is of second and third rate flour, is doctored with alum and alkalies to give it a white appearance. Bread made of the very best Haxall flour with yeast retains its beautiful creamy yellow tint, while the same raised with alum baking powder becomes white and dry and tasteless. No doubt many of our national diseases, such as dyspepsia, have their origin in the universal use of baking powders, and I suggest that the early decay of teeth in the United States might be traced to the deprivation of natural phosphates of lime and the substitution therefor of other alkalic salts, such as those of soda and potash, in our daily food. Anything that deteriorates or improves the "staff of life," our daily bread, in the slightest degree, is of such immense importance, that I hope you will keep open the pages of the *SCIENTIFIC AMERICAN* till the subject is thoroughly understood.

L. K.

Providence, R. I.

American Locomotives in Italy.

To the Editor of the *Scientific American*:

Mr. Edward A. Quintard, of Philadelphia, is here with a 38-ton locomotive, from the late Paris Exhibition. This is a right step in the true direction. United States manufacturers must do so, to bring effectively their products before the Italian people.

It is to be hoped that Mr. Quintard may convince the Italians that it would be to their interest to buy his great and fine locomotive, as well as many others of them which may follow.

The Stenographical Machine of Michela.—One of these machines some days since was on trial before the city fathers of this city. The machine reported the debates fully and correctly, without flattery and with exact justice. However, the city fathers preferred to be reported by the representatives of the city press. Perhaps the latter have a way of reporting which might be more pleasing to those members who may utter hasty and inconsiderate discourses, which the machine, without conscience and consideration, reports word for word and letter for letter, while the manual reporters of the press smooth harsh expressions and omit and rearrange sentences.

HENRY NOBLE,

Turin, Italy, January, 1879.

U. S. Consular Agent.

Poor England.

The London *Standard* publishes the following from one of its correspondents, who signs himself "Traveled Englishman:"

"I came back to England, not long ago, from a somewhat lengthened journey to find my fellow countrymen suffering in no small degree from depression, if not actual distress. Banks had 'broken,' large mercantile houses had failed, great industrial works had stopped, and throughout the manufacturing districts the gloomiest apprehensions with regard to the future prevailed. Some of these apprehensions have unfortunately been realized since then, inasmuch as I see that the sufferings of the poor in Sheffield, Manchester, Leeds, Newcastle, and many of our great northern towns have been so severe as to require the formation of special public committees to collect and dispense the charitable offerings of the richer classes. It is only natural in these circumstances that a brisk controversy should have sprung up in various quarters on the subject of the cause of this distress.

"In London society people may not know much about it, but I can assure you, from what I have myself seen in some of the most important commercial and manufacturing districts, that the keenest interest is taken by all classes in the discussion of this question. What has brought about the present deplorable stagnation of trade? is the inquiry universally put nowadays in the North of England. 'High wages,' say the masters, and 'over production,' say the men, when they are asked this question. I belong to neither class, and I by no means set myself forward as an authority on the point at issue. But it happens that I have learned both at home and abroad a few facts which seem to me to have an

important bearing on this question, and which, therefore, with your leave, I shall lay before your readers. How is it, I want to know, that my wife's maid, when she went, at Aix les Bains, at Homburg, and at Florence, to buy calico, found in shops where two years ago nothing but English goods were kept that the calico or cotton in stock was of American manufacture? I am not a judge of this article myself, and I really do not pretend to know whether the American goods are better or worse than those formerly supplied from the English markets. What I do know is that in this, one of our own staple manufactures, we appear to have been fairly beaten out of the field upon the Continent, and that in each case the shopkeeper when applied to for an explanation declared that he preferred American to English materials because he got a larger profit upon the former than upon the latter. How is it, again, that here in England if I want tools for my garden or my workshop I am constantly being invited by my ironmonger to try new American 'notions,' in the shape of spades, and hammers, and saws, and chisels, and axes?

"Some months ago I read a letter of Mr. Gladstone's upon a subject on which his authority can hardly be contested. In it he gave his opinion upon the common American woodman's ax, and described—as I happen to know quite accurately—the difference between it and the English article manufactured at Sheffield. The comparison, I need hardly say, was all in favor of the Yankee production. Sheffield is too conservative—in its manufactures, I mean, not in its politics—to make an ax of the best shape. So the sharp American comes in and wins. And he does this not merely in axes and the other tools I have mentioned, but in locks, bolts, stoves, lamps, and a thousand-and-one other household requisites which a dozen years ago were the peculiar production of this country. You have only, indeed, to cast your eye over your own household, sir, in order to see to how large an extent the English manufacturer has been beaten, even in articles of domestic use. Nor is it in the hardware trade only that we seem now to be getting flooded with American goods. American leather comes over here to be made up into shoes; and our famous English carriages are to a large extent built out of materials which have crossed the Atlantic, and for which the American has been duly paid. 'Glue, hair, and sandpaper' are mentioned in a recent copy of the *Philadelphia Ledger* as being now among articles largely exported to this country; and even slates—shades of the Welsh magnates!—are now quarried in the United States in order to roof in our English homes.

"Can any of your readers tell me how all this is brought about? And is not the fact alone sufficient to account in a large measure for the present depression in our manufacturing industries? I do not grumble because, if I want tomato sauce with my cutlets at this season, it is probably made out of American fruit; nor can I complain because my grocer, my buttermilk man, and probably my butcher also, deal so largely in American goods of all kinds, for I freely admit that as a source of food supply the United States is naturally infinitely superior to our limited and over-populated country. But what I want to know is why, in the special manufactures which were once entirely ours, and which only a few years ago belonged to us more largely than to any other country in the world, we now seem to be running a bad second to the United States? Why, sir, even the cigarettes which I smoke are made in Richmond, Virginia, and the pen with which I write comes, not from Birmingham, but from an American manufactory.

"If I liked to prolong the list of articles of use and luxury which are now made for the English market in the United States, instead of being made for the United States in England, I might do so indefinitely; but I have too much respect for your space and for the time of your readers to do anything of the kind. It would be easy also to speak of those Belgian girders which are now used in the very heart of our own iron districts in the construction of buildings, and of those French engines which compete dangerously with the products of our own best engineering establishments. But I have said enough, I think, to show that, in addition to 'high wages' and 'over production,' foreign competition must be reckoned among the causes of the present distress; and I conclude by asking if any one can explain to me how it is that this competition should so suddenly have become serious, if not actually fatal to us, in the very fields of which recently we were the undisputed masters?"

Steam Boilers.

A very interesting and valuable lecture was lately delivered at Hartford, Conn., by Mr. J. M. Allen, President of the Hartford Steam Boiler Inspection Company, the discourse being devoted to the consideration of steam boilers. Mr. Allen commenced by speaking of the famous Corliss engine at the Centennial, remarking that although every one admired and wondered at it, but few really stopped to think of the source of its power and energy. Few recalled the fact that all this splendid machinery derived its motive power from the concealed steam boilers in the low line of buildings outside the Main Centennial Hall. In crossing the Atlantic in an ocean steamer, how few think of the unsightly, unattractive boilers that furnish the power for the machinery that carries the vessel forward.

In discussing this question it is proper, Mr. Allen said, that we should know of what material boilers are constructed and the methods of construction. He then gave a brief account of the manufacture of iron plates, showing the necessity of obtaining an ore free from phosphorus and sul-

phur, the former making a "cold short" iron, and the latter a "red short," either of which is unsuitable for boiler plates, when high pressures are to be used.

He also explained the process of "puddling," "shingling," repeating and rolling into finished plates. He showed that the presence of slag or scoria on the bars composing the pile prevent perfect welding, causing what are known as laminated sheets, illustrating all these points with diagrams, photographs, and specimens. He then described the methods of constructing boilers, punching holes in the plates, the use of the "drift pin," which was condemned, riveting, bracing, and staying. The defects from poor workmanship were pointed out and illustrated by specimens as the description progressed.

Mr. Allen devoted considerable time to the discussion of chipping and calking, showing that by the old methods boilers were liable to be very greatly injured and incipient defects developed. He recommended the planing of the edges of the sheets preparatory to calking in preference to the old method of "chipping."

The necessity of having good material and good workmanship in the construction of boilers was brought more forcibly to the minds of his hearers when he stated that a boiler 16 feet long, 60 inches in diameter, and running at a pressure of 60 lbs. to the square inch, sustained an internal pressure of not less than 1,000 tons, the tendency being to burst the surrounding metal asunder. He also stated that the railroad locomotives, which often stand near the cross walks at the depot, carry a pressure on their crown sheets of not less than 90 tons. This point was illustrated by drawings upon the blackboard. It is not to be understood that these are dangerous or excessive pressures, but are mentioned to give some adequate idea of the immense strain to which steam boilers are subjected, and also to show again the absolute need of the best material and workmanship in making them. Anything short of this he claimed was criminal neglect.

Mr. Allen then proceeded to show at what pressure a boiler may safely be worked. He stated that there were formulæ for all these, so that the bursting and safe working pressure could be easily arrived at. He further showed that the bursting pressure of the boiler above mentioned, 16 feet by 60 inches, was not less than 525 lbs. to the square inch, but that in practice only one sixth of the bursting pressure should be allowed, leaving a wide margin for safety. This would admit of about 87 lbs. of steam to the square inch as the safe working pressure of this boiler.

At this point Mr. Allen took up the subject of water used in boilers, showing that much solid matter carried in solution was precipitated by high temperatures. The carbonate of lime, sulphate of lime, carbonate of magnesia, aluminum, and other chemical ingredients, cause a hard, indurate scale, which adheres to the fire sheets of the boiler, greatly reducing the economy in fuel and rendering the plates liable to severe overheating and consequent great reduction of strength. This was illustrated by numerous specimens of scale taken from boilers in different sections of the country.

The internal corrosion of boilers was next discussed, showing that this was caused by impurities of the water. Manufactory situated on the banks of a stream, discharging their refuse and spent dyes into the current, render the water extremely impure. It will be readily seen that if those manufactory which are situated lowest down on the stream fill their boilers with this water, they will have a very impure and dangerous liquid from which to generate steam. Cases of severe and dangerous corrosion were mentioned as arising from this cause.

Specimens of corroded plate and braces were shown, where the iron was nearly wasted away, and yet it was stated that the parties owning the boilers had rested securely in the belief that their boilers are sound and well braced. These defects were discovered by careful inspection, a means of safety too often inadequately performed or neglected altogether.

The methods of inspection were next discussed, and it was stated that in all cases where it was possible, boilers should be examined internally as well as externally. Inspection by the "hammer test" was described, showing that a practiced ear, from light blows on the sheet, could detect defects in the material. The weaknesses arising from "the wear and tear" can only be discovered by the most careful internal and external inspection. Carelessness in the management of the safety valve was considered.

Instances of overloading safety valves far beyond the limit of safety were mentioned. In one instance, at least, a steam user was found to have wedged his safety valve down by driving a stick between the lever and the beams of the building overhead.

The principle of the steam gauge was described, and its importance in connection with the use of steam boilers. It is liable to defects and variations which can only be detected by comparing it with a gauge known to be correct. This process of comparison was illustrated by very unique apparatus, prepared expressly for use by the Hartford Steam Boiler Inspection and Insurance Company. The standard by which these test gauges are corrected is a mercury column, which is invariable and therefore reliable. The column in use at the company's office, which Mr. Allen described, is inferior to none in the country.

Mr. Allen next considered ebullition, the conduction of heat, and the generation of steam. These subjects were illustrated by diagrams prepared for the purpose, showing the great force which is stored up in the water in boilers, kept in place only by the superincumbent pressure of steam.

When this pressure is suddenly released, a great disturbance follows within the boiler. The water may be projected against the sides of the boiler at a velocity approximating 2,000 feet a second, which was considered sufficient in most cases to account for the terrific explosions which rend boilers in pieces, throwing portions of them hundreds of feet. Instances of terrific explosions were cited, and photographs illustrating them were exhibited.

Mr. Allen touched briefly upon the subject of the spheroidal condition of water, repulsion and deaerated water as the cause of mysterious (?) boiler explosions. His opinion, however, was that we need not look for mysteries in this manner, when we consider that there are so many things to decrease the ability and working age of a boiler, arising from poor material, poor workmanship, and careless management. He alluded briefly to the explosion of the boiler of the steamer *Adelphi*, at Norwalk, Conn., by which 16 lives were lost, and showed how this disaster might have been prevented by thorough inspection and timely repairs. This was illustrated by photographs and blackboard sketches and drawings.

The lecture closed with a brief history of the formation of coal, the carboniferous age, the wonderful growth of plants, the absorption of carbonic acid gas from the atmosphere, all energized by the rays of the sun, illustrating the words of Sir Robert Stephenson, who said that the energy in the coal was derived from the sun, the source of all power. The thinking mind, however, sees a power back and beyond all this, though science can go no further. We are on the boundary of the realms of faith.

Convict Labor.

First workman.—No; what I say is that no criminal ought to be allowed to work. 'Cause if he works he works cheap, and it knocks down your wages and mine.

Second workman.—Wal, I dunno—you see—

F. W. (quite warm)—There ain't no "see" about it! I tell you it degrades every human man's labor to have a State prison bird doing the same sort of thing fer a quarter of the wages. It ought to be forbid by law!

S. W.—Wal, I dunno; you see if—

F. W. (deeply excited)—Nonsense with your "ifs" and "buts" and "mebbies!" It's easy enough to see. If a lot o' chaps works fer 20 cents a day, you ain't goin' to get \$2, be you? Not much! Don't it bring you right into competition with degraded culprit labor? D'ont it? Say! Don't it? Why don't you speak and say something?

S. W.—Wal, I dunno. Ain't it true that—

F. W. (furious)—No, it ain't true! They ain't a word of truth in it! You know ez well ez I do that—

S. W. (bristling up and interrupting)—Look a-her! You yaup every minute. 'Spose you jest shet your fly-trap tempo-ra-ri-o-ly and give me a chance to say a word.

F. W. (toning down)—Very well, ef you reely think you got anything to say thet amounts to anything, jest spill it.

S. W. (tuning up)—This ere: Ef prisoners don't work an' support themselves, somebody's got to work to s'port 'em.

F. W.—Wal, capital 'll support 'em.

S. W.—And who s'ports capital?

F. W.—Why—nothin'—it s'ports itself.

S. W. (laying his hand on the first workman's shoulder)—That's where you make your mistake. Labor s'ports capital.

F. W.—How do you make that out?

S. W.—If the State's prison don't s'port itself, it is s'ported by taxes. Whenever a property holder pays a tax he adds to the price of what he sells enough to reimbuss him. And labor eventooally pays every cent.

F. W.—It seems to me that if—

S. W. (now thoroughly aroused)—"Seems!" They ain't no "if" 'bout it! Any fool can see it! Somebody's got to pay that pris'ner's board. Ef he don't earn his own board, you an' I 've got to pay it out'n our wages.

F. W.—P'raps you're right. Ef thet's so, he might jest ez well go to work.

S. W.—And keep to work. Seems to me labor is degraded more by 'lowing a lot of rogues to shirk for the privilege of payin' their board, then by makin' 'em work at some price or other.

F. W.—But they work for less wages than we kin.

S. W.—But there's very few of 'em, and ez they work to pay the expense of keeping of themselves shet up, I don't see ez it makes much difference whether they earn a cent a day or \$5 a day, ez fur ez we are concerned.

F. W.—But they shouldn't be let out on contract.

S. W.—Certin they should. They should be made to work, and their services should be let out to them that'll pay the most for it.

F. W.—Then sposen they earn more'n they cost?

S. W.—In that insposable case the surplus should be turned right into the State treasury.

F. W.—Ain't it demorlizin' and undignified for respectable folks to let their gov'ment be s'ported by the crim'nal classes?

S. W.—No, sir! It ain't! What awful stuff hev you got into your head? The more work you can git out of criminals the better! That's all they're good fer whilst they're bein' punished. Why, ef 'twan't fer the crim'nal classes there wouldn't be no need of gov'ment. Did you ever think of that? They ought to s'port it!

F. W.—That does look sort o' reason'ble after all. Why, that ain't wot that feller said down to the Union.

S. W.—Don't let anybody fool ye! Make all prisoners work jest as much as possible. It'll do 'em good. Make 'em earn ez much ez they kin, either under the superintend-

ent or outside contracts. And remember that every cent a prisoner earns is jest so much in the pockets of the laborin' men.—*New York Graphic.*

American Locomotives in Switzerland.

English people are wanting work, and yet for some reason or want of it our locomotive builders allow a country nearly 2,000 miles farther away from Switzerland than we are to supply locomotives to that country. It is stated that the enterprise of our most energetic competitors in manufactures has sent a locomotive to Geneva specially in order to test its capabilities of producing steam from the anthracite coal found in the Valais. This cannot be used in Swiss or French locomotives, as at present constructed, but the experiment with the American appears to have been an entire success. The furnace arrangements of the American locomotive are said to be admirably adapted to the employment of this coal, which is not unlike, in its behavior in the fire, that used in America. The engine will run with fuel which would bring the ordinary continental locomotive to a standstill; and the system, if adopted in Switzerland and other parts of Europe, as some such doubtless will be, will effect an important saving in coal to those countries, and give work to others.—*London Engineer.*

THE ALHAMBRA VASE

The beautiful vase represented by our engraving was found in the Moorish palace, Alhambra, in the 16th century.



THE ALHAMBRA VASE.

It was filled with gold coins, the inscriptions upon which showed it to have been made not later than the beginning of the 14th century. The body of the vase is of dark terracotta, splendidly decorated with colored enamels and gold. It is regarded as the most valuable specimen of Moorish industrial art that has been preserved.

It will be remembered that at the time this vase was made the Moors of Spain monopolized almost entirely the civilization of Europe. Decorative art was especially encouraged among them, their skill excelling not only that of their most skillful rivals, but in many respects has never since been surpassed. Their most extensive potteries were situated at Malaga, where several thousand workmen were employed. The art of enameling was well understood there, as the Alhambra Vase so admirably shows, silica and the oxides of lead, tin, cobalt, etc., being used for such decorative purposes.

The Chesapeake and Delaware Ship Canal.

The surveys for the proposed canal across the peninsula of Maryland are being prosecuted with vigor. The *Baltimore Sun* says that very careful and accurate measurement of the tides in the two bays is being made, and it is a singular fact that when it is high water in the Delaware Bay it is low water in the Chesapeake.

Eight routes have been surveyed, and they all cross each other at some points, so that they may be modified indefinitely.

This number, however, covers all the courses that can be called main routes. There is nothing new in the suggestion of this work; it has been often made, and for many years the intelligent portion of the population of both States has looked forward to the undertaking and accomplishment, under the developing influence of the necessities of trade, as a maritime improvement which sooner or later must occur. Foreign or coasting vessels coming to Baltimore through this canal would require no pilots, as the mouth of the Delaware Bay, unlike that of the Chesapeake, is freely navigable. There will be no locks, as in ordinary canals, to lift up or let down the boats. The ship canal will be nearly level throughout, and only guard locks will be required, which will be to regulate the entrance of tide water at each end, and the inflow of water from any rivers or streams which it may cross.

Australian Exhibitions.

Mr. Samuel H. Roberts, Hon. Corresponding Member of the Society of Arts, London, writes as follows: Preparations are being actively carried on for no less than three exhibitions. The International Exhibition at Sandhurst (one of our largest mining centers), to be held next year; a Juvenile Industrial Exhibition, also to be held next year in Melbourne; and the great International Exhibition of Melbourne, to be opened in 1880. Tenders for the building are to be opened next week. A splendid design has been prepared by the architects, Messrs. Reid & Barnes. The estimated cost of the building is between £60,000 and £70,000. The commission to carry out the undertaking consists of about fifty members, and they have just appointed J. C. Levey, C.M.G., as the secretary. I send circulars and programmes of the Sandhurst and the Juvenile Exhibitions. Those of the International Exhibition are not yet out, but are expected before the mails leave to-morrow. If they are issued I will send you them also.

There is also to be an exhibition in Sydney next year, and so many applications for space have been received, that the enterprise has assumed a magnitude not at first expected, and above the present means of the committee; it is, however, probable that the New South Wales Parliament will come to their aid with an adequate grant.

The question of Chinese immigration is agitating the minds of the people of Sydney and the northern portions of Australia. Public meetings have been held, and resolutions adopted, calling upon the government to take measures to restrict these in coming to the colony. One very serious result of the antipathy to the Mongol race is a strike of the seamen engaged by the Australian Steam Navigation Company, owing to the Chinamen being employed on some of their steamers, and the probability of the number being shortly increased; meanwhile the ships of the company are laid up for want of crews. The commerce of the port is, for the time, much injured by the dispute.

Large additions are in progress at the Melbourne University through the princely generosity of Sir Samuel Wilson, who has presented £35,000 to the institution. This good example has just been followed by Mr. Ormond, who has promised £10,000 toward building a Presbyterian College in connection with the University, on condition that an equal sum be subscribed within twelve months. As already £8,000 has been sent to the committee, there is no doubt as to the condition being fulfilled.

Money by Mail.

A correspondent offers the following suggestion with regard to an inconvenience widely felt. The plan proposed would doubtless prove as great a convenience to the receivers as to the senders of small sums by mail. The writer says:

"Now, since postal currency has gone out of use and dollar bills are getting scarce, we, in the country, need some mode of sending small sums of money by mail. The money order system is excellent, but the charge for sums less than one dollar is too high a percentage on the value of the thing wanted. I would suggest that postmasters be authorized to receive change in sums less than one dollar, and issue certificates for the same, which shall be receivable at any post office for stamps, or when presented in quantities of five dollars and over to be cashed. The certificates to be issued to postmasters in book form, and so printed that the piece torn off will represent the sum, the whole page representing one dollar. The certificates to be at the sender's risk. Postmasters to make returns when a book is used up. Such a system would facilitate trade between distant points and increase the revenues of the post office department."

Railway up Vesuvius.

It is thirty years since a concession was granted for a railway up Vesuvius. It has been promised many times, but never so positively as now. The plan proposed involves the construction of an iron elevated railway about three feet high above the ground, on which is to run a train of eight cars operated by a steel cable. Each car is to be furnished with two automatic brakes. The cable will be double, in case of accidents. The actual tension on it will be 3,000 kilogrammes, but it will be made to support a tension of 33,000 kilogrammes. A small station with a restaurant will be constructed on the cone and another at the foot of the mountain. The ground has been chosen where there is least danger from an eruption, and all the material is movable, so that it can easily be taken up and stored in the observatory in case of eruption. It is expected that the railway will be completed before the summer of the present year.