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(Illustrated articles are marked with an asterisk.)

SCIENCE IN THE COURTS.

As science has advanced, it has become an important aid in the discovery of crime. The experts, so called, whose examinations, investigations, and opinions are made a part of evidence in important legal cases, are called by the prosecution and defence and make their statements, upon the value of which as evidence the jury must decide. Now it most generally happens that the judge, who is a master of civil and criminal law, knows comparatively little of Nature's laws. The counsel, *pro* and *con*, are generally as unscientific as the judge, and the jury, as a rule, know even less of science than of law. To prevent their making mistakes on law points, it is the duty of the court to instruct the jury as to the law and the rules of evidence; and it is the duty of the jury to accept his instructions as correct in every particular, and, applying the rules of evidence to the testimony before them, to give a verdict in accordance with these rules upon the is ues of facts involved in the case.

Experts, so called, are introduced for the purpose of instructing the jury upon matters upon which neither the court nor jury are supposed to be informed. If the experts, so called, differ in opinions and statements, the jury must judge of the weight to be given to each opinion and testimony, and the evidence of experts, like that of other witnesses, must be taken for what it seems to be worth.

This is, we believe, the rule as concerns such evidence in modern courts of law. It certainly works in a very peculiar manner, and, as applied, does, in our opinion, as often defeat as it helps the administration of justice. Besides, its effect is to throw odium upon science and those who are really scientific, as neither judge, counsel, nor jury are qualified to decide from the evidence given—unless very gross ignorance is exhibited—whether the witnesses are really qualified to testify as to the points upon which they presume to pronounce authoritatively.

To establish the qualifications of the witness as an expert, he is generally asked his age, profession, and experience in the matters upon which he is required to testify. If he swears he has been twenty years a professor of chemistry in some public institution, has practiced medicine a certain length of time, or has been an engineer in some industrial establishment for a stated period, he is thenceforward to the jury, an expert chemist, physician, or engineer. as the case may be; and if he is possessed of the *otium cum dignitate*, coupled with a free use of formulated expressions having the sound of profundity and learning to a juryman's ear, he may swear to any absurdity he likes, and the average arbiter of the jury box will gulp it all down as gospel. To be a professor in an institution of learning, ought to, but does not, always indicate professional acquirements. We all, probably, know some physicians of many years' standing, whom we would not invite to "throw physic to the dogs,' if the dogs were *our* dogs. We have many of us met professed engineers who have hardly the qualifications requisite for a boiler tender. It is not what a man ought to know, but what he does know that renders him competent to give an authoritative opinion.

Wo have plenty of examples of the different, and even conflicting, evidence of this class of witnesses. The testimony taken before the coroners' juries in the celebrated *Westfield* case, is one. Truly, the average juryman must have had a good time in trying to reconcile the legion of theories and opinions ventilated in that memorable investigation.

In Albany, quite recently, one set of physicians swore that in death from abortion, certain *post mortem* appearances must inevitably appear. Another set of medical witnesses swore to just the opposite.

In Philadelphia we have had recently the spectacle of a professed chemist and toxicologist making an examination of the body of a man supposed to be poisoned, and carrying his investigations far enough to convince himself of the presence of antimony, and forgetting there was a jury and a public to be convinced as well, appearing on the witness stand without a particle of proof that he found it, except his bare assertion. The prisoner in this case was acquitted, on the evidence of other experts called for the defence.

In Albany, some twenty years since, a man was hung, for poisoning his wife by aconite, on the evidence of a professed chemist, who swore he obtained aconite by a process that never detected it before and never detected it since, and this, notwithstanding that other chemists swore that the process described would, so far from detecting, absolutely prevent the detection of aconite, were it present.

In a recent trademark suit, relating to the manufacture of mustard, Dr. Ogden Doremus, of this city, swore that mustard seeds contained over eleven per cent of starch. To prove it, he used a solution of iodine upon mustard placed on filtering paper, which paper gave, when tested, the characteristic reaction of iodine with starch when no mustard was present. The error in the experiment was pointed out by Professors Seely and Chandler. Dr. Doremus was aided by Dr. Austin Flint, who tried to confirm by the use of a microscope, what Dr. Doremus tried to prove by the iodine test. Dr. Flint swore that he could see the granules of starch by the use of a high power. Professors Seely and Chandler could not see any such granules, but they did see what they thought might have been fragments of the exterior envelopes of the seeds. Dr. Doremus has, in a letter since published, affirmed the presence of starch in mustard seed (he says nothing of the percentage), and attempted to prove it by a test which would give the same results with cellulose as with starch.

Now, in view of such facts as these, is it any wonder that the public is beginning to mistrust the value of this kind of evidence? Such a mistrust is based upon good grounds enough. As now presented to juries, the testimony of the both competent and incompetent witnesses, only serves to muddle their intellects, and to complicate rather than make plain the facts.

If it be necessary to give juries authoritative instruction on points of law, how can it be less necessary that they should be similarly instructed in matters involving scientific knowledge. To bring before them A, who swears to one thing, and swears to the truth, and then bring B, the charlatan, who looks and talks twice as wisely as A, and denies under oath all that A has asserted, is not to instruct but to mystify them. When Counseller X tells the jury in his address that something is law which is not law, the Court quietly corrects the assertion in his charge, and the correction has the weight of authority. The jury believe the judge and discredit Counsellor X. But when Charlatan B tells them something is science that is not science, the true, yet modest A's assertions are no more authoritative to decide the question than B's. The jury must decide, or rather make a guess, as to what is right or wrong; and the average juryman is rather more likely to guess wrong than right in matters of science.

Now there is a plain, simple, and practical remedy for this state of things. In all cases where there are points of law to be decided, there is an arbiter on the bench to perform that office. There should be an equally authoritative tribunal to decide on scientific points, a separate jury of experts, if may be, constituting, for the time, a scientific court, whose charge to the jury should be as authoritative as that of the judge. Would it not be refreshing to hear such a witness as the one mentioned above, who swore to finding aconite, disposed of in the following fashion "It is my duty, gentlemen of the jury, as foreman of the scientific jury in this case, to instruct yon that aconite cannot be detected by the process described in the testimony of the witness. However much he may be convinced that he did so, it is contrary to known laws of chemistry to suppose that he so obtained it. You are, therefore, to dismiss from your minds the possibility of such a result, in your deliberations upon this case." Or perhaps this:

"The process sworn to by A will obtain arsenic from the stomach of a person poisoned by that substance. The process sworn to by B will not obtain it. A says that by his process he found no arsenic. B says he found it in a process by which he could not have found it. It remains for you to judge whether, if by an accurate method arsenic could not be found, the testimony of one who swears he found it by an impossible process proves its presence."

Let such a course be pursued, and we soon should have somewhat less of *pseudo* science on the witness stand, and true scientific testimony would become of real value.

BEET SUGAR IN THE UNITED STATES.

As our readers are aware, we have done our utmost to promote the establishment of this industry, and we may therefore, with all the more reason, rejoice at the encouraging statements of the Commissioner of Agriculture in regard to it, published in his monthly report for January. He regards the future of the industry as now mainly dependent upon the comparative profit of beet sugar and cane sugar manufacturing.

The introduction of this business into this country met with many obstacles, notwithstanding the remission of duties on importations of machinery intended for beet sugar making. Perhaps no branch of chemical manufacturing needs to be conducted with greater nicety; and as in the outset we had to depend upon foreign skill—much of it hardly fit to be called skill—there were many failures, and success has come slowly.

The pioneer experiment at Chatsworth, Ill., failed disastrously; yet at Freeport, in the same State, the lessons of that failure are being turned to such good account that success is confidently anticipated. At Black Hawk, Wis., a coöperative beet sugar manufactory is pushed with great vigor, and gives large promise of good results But the most decided success has been met with in California, where two companies are in full operation, the California Beet Sugar Co. at Alvarado having produced over a million pounds of sugar in the second year of its operation. Success is also reported from the Sacramento Valley Beet Sugar Co. A third company is delayed from the difficulty of obtaining seed.

The percentage of sugar obtained from Silesian Beets raised in California is quite extraordinary. The superintendent of the Sacramento Valley Beet Sugar Co., Mr. S. Ehrenstein, states that an average shows a yield of from 13 to 14 per cent, and exceptional instances occur in which 18 per cent is obtained, a much larger yield than ever was obtained in Europe.

It seems from these facts that *the* sugar producing region of the West is to be California, that land of wonderful resources and unprecedented development. Though the beginnings are comparatively small, there is little doubt that they will prove the foundation of a gigantic interest. The struggles of the pioneers in this field have been severe, but those who have held out will be ultimately rewarded.

DRYING SUBSTANCES BY HOT AIR.

Drying by hot air differs very materially from drying either by confined, saturated, or superheated steam, which convey their heat to metal racks, cylinders, or pipes, the latter radiating their heat and thus reaching by it the material to be desiccated. It also differs in principle from that of drying by superheated steam forced into interstices between solid bodies or injected into solutions. The latter, as we have shown in a previous article, acts by its superfluous heat over that of normal, saturated steam, converting more moisture into steam, and itself passing off as saturated steam.

When hot air is injected into a solution, it parts with its heat slowly; decreasing in volume and taking up a portion of watery vapor, it passes off as warm, saturated air, or air loaded with moisture. The use of air in this way would be practically uneconomical, the application of the heated gas would be very imperfect, and could not compare in convenience even to the injection of superheated steam, to say nothing of that most admirable of modern contrivances for evaporating liquids, the steam jacketed pan.

But hot air blown through the interstices, between bodies wetted upon their surfaces, will dry them very rapidly. The general principles of such drying are as follows:

Air always contains a quantity of watery vapor, which quantity varies with the temperature, the formula expressing this variation being that, with every increase of 27° above 32° Fahr., the capacity of air is doubled.

Thus air at 32° holds suspended one 160th part of its weight of water as vapor; at 59° it holds one 80th part; at 86° it holds one 40th part; and at 113° one 20th part; and so on, the temperatures increasing in an arithmetical series, the common difference of which is 27°, and the quantities of vapor suspended increasing in a geometrical series, the first term of which, taking air at 59°, is one 160th of the weight of the air, and the common ratio of which is 2.

Now the specific heat of air under atmospheric pressure, or any constant pressure, does not practically vary between the limits of —22° and 392° Fahr., as proved by Régnault in his elaborate investigations on this subject. That is, the amount of heat necessary to raise the temperature of one pound of air one degree of the Fahrenheit scale, is the same for all temperatures between these limits, and this law holds good for all non-condensible gases, or gases that cannot be liquefied, by cold or pressure or both combined.

It takes $\frac{2375}{10000}$ of a heat unit to raise a pound of air one degree. To raise one pound of air, from say 59° to 113°, would take 12·825 heat units. At 59°, one pound of air holds one 80th of a pound of water, At 113°, it holds one 20th, hence, by the increment of 12·825 heat units, it has been able to absorb one 20th its weight minus one 80th, = three 80ths. Now if we add to it 25·650 more heat units, we shall raise its temperature 54° more, heating it to 167°, whereupon it will suspend one fifth part of its weight of watery vapor,—an increase of three 20ths of its weight, or just four times as much effect as was produced by a rise of temperature, of an equal number of degrees, from 59° to 113°.

In drying by air, then, it is economy to admit the air at as high temperatures as the substance to be dried will sustain without damage; and as fast as the air has taken up its specific load of moisture, to change it.

It is further evident that the temperature of the air should as far as possible be kept from falling during its passage; since if it does this, a portion of the moisture it first seized upon will be deposited before it escapes, and a portion of the due effect will be lost. It should also be allowed to remain in contact with the substance to be dried till it arrives at the point of saturation, for if ejected before this, a portion of the due effect will also be lost.

We have seen that 51·3 heat units absorbed by one pound of air at 59° raises the air to 167°, and imparts to it the power of absorbing fifteen 80ths of a pound more water than it first possessed. To convert fifteen 80ths of a pound of water at 59° into saturated steam, and thus remove it, requires 209·8 heat units, or more than four times as many as required for the removal of the same amount by heated air.

When, therefore, mere surface drying is all that is sought, there is a clear showing in favor of heated air on the score of economy when only theoretical principles are considered. But practically there are many sources of loss in the use of air for drying that cannot well be avoided even by the best applications of the principles we have endeavored to elucidate; so that a practical comparison, of the economy of this system with that of steam drying, would give very different figures. There is no doubt, however, that for mere surface drying, the greatest economy would be secured by hot air properly applied.

THE AMALGAMATION OF ORES OF THE PRECIOUS METALS.

It has frequently been our duty to call attention to the great loss arising from the imperfect methods, now in use, of extracting gold and silver from their ores; and the waste has been so extensive, amounting probably to thirty-five per cent of the whole of the gold and silver mined since the first discovery of these metals in California, and the inefficient processes are still so much used, that this important subject is always demanding our attention, as well as that of miners and other persons immediately interested. Much, indeed, remains to be written and done with regard to the extraction of these metals before a system, worthy of the present age of metallurgical chemistry, will be generally practiced. These considerations give interest to a new utensil and process which not only have the merits of apparent simplicity and adaptability to their purpose, but are recommended to the mining world by a practical man having experience and knowledge in this field, whose communications on this and cognate subjects are known to all readers of the SCIENTIFIC AMERICAN, namely, Mr. Percival Stockman, of 322 Grand street, Williamsburgh, N. Y.

The metal mercury still retains its preëminence as a means of obtaining gold and silver by amalgamation; and although the use of zinc is well known, it is chiefly employed in combination with or subsequently to the quicksilver treatment. Mr. Stockman employs mercury, using specially selected chemicals to expedite the amalgamation, and treats the metalliferous earth in an iron caldron, similar to those used for evaporating cane juice in sugar manufacture, This vessel is intended to be set in brickwork, and to be heated by a fire beneath it. The caldron has a socket, cast on the bottom inside, to receive the end of a perpendicular spindle or shaft. Attached to this shaft near the lower end, so as to agitate the contents of the caldron, are three or more fans similar to those of a propeller. Power for driving the shaft is applied by gearing on its upper part. The object of these fans is to keep the pulverized metallic ore in constant motion. The ore is placed in the caldron with sufficient water to make it of a muddy consistency, and the mixture is boiled for fifteen minutes; and then, the ore being diffused in the water by the heat and by the agitation of the fans, mercury is introduced. This metal is immediately, by the same means that divided the earthy particles of the ore, dispersed into millions of minute globules, and the heat gives these greater facility for attacking the gold concealed in the earth.

Mr. Stockman states that, in the case of ore containing pure metal, the amalgamation by the above described process can be completed in one hour without the use of chemicals. But the valuable metals are frequently found in combination with the sulphurets of antimony, arsenic, and mercury, and with the pyrites of iron, copper, and argentiferous galena; and it is especially with regard to these more obstinate combinations that a new and thoroughly effective process is desirable. Mr. Stockman treats these, in his newly devised apparatus, by the addition of chemical preparations, chiefly chloride of sodium, nitrate of potassa, lime, bisulphuret of carbon, and any of the fixed or volatile oils. The latter is especially needed when orpiment (the sesquisulphuret of arsenic) is present in combination with the pyrites; and with a view to rid such ores of the arsenic, the introduction of muriatic acid in connection with sulphuretted hydrogen is recommended. As in the case of the pure ore, the mixture is allowed to boil for fifteen minutes; the quicksilver is then introduced, and the mass is again boiled for two hours longer. At the expiration of this time, a stream of cold water is introduced to precipitate the amalgam; and the whole mixture is allowed to pass, from an outlet in the bottom of the caldron, to a sluice containing a separator in which the amalgam is gathered. This amalgam is then ready for separation of the gold or silver by evaporation of the mercury in a retort. As it is well known that hardly any two ores are chemically similar, it is obviously impossible to give fixed proportions of the ingredients above mentioned; these quantities must be determined by the character and percentages of foreign matters found in combination with the metals.

To the imperfection of the extracting processes now in use must be attributed the disappointment and failures of many of those who go to seek their fortunes in gold and silver mines. Such searchers frequently base their calculations upon assays, perhaps scientifically made, of small specimens of the ores; and they have then been surprised to find that the ore did not yield, by the old methods, so much as the assay by ten, twenty, or fifty cent. This difference discourages the miner, and perhaps induces him to abandon his operation; whereas the fact is simply that the process of the assayer was more efficient than that of the miner.

The importance of this subject cannot be overrated, and any information that will add to the knowledge already possessed by our readers, many of whom are extensively engaged in the interesting and valuable industries of gold and silver mining, will always be received with pleasure by us, and communicated willingly to the public.

THE KNOWLEDGE OF SPECIFIC HEAT APPLIED TO THE DETERMINATION OF VERY HIGH TEMPERATURES.

Among the most important investigations, for finding methods to determine temperatures so high that no practical thermometer can give a uniform and reliable result, are those founded on our present knowledge of the specific heat of bodies. When, for instance, we know the specific heat of a body which can resist the effects of very high temperatures, say platinum, and we take a mass of this metal of known weight, place it in a blast furnace, and when the mass has acquired the temperature of the furnace, we transfer it quickly to a vessel surrounded with a known weight of water, we have only to observe the rise of temperature of this water, by means of an ordinary thermometer, to find how many units of heat were transferred from the furnace to the water by the intervention of the platinum; and from this it is easy to determine the degree of heat to which the latter was exposed. Pouillet was the first to examine the specific heat of platinum, and he found that it differs for different temperatures, which is, in fact, the case with most substances, even with water; and the saying that a unit of heat is the heat required to raise the temperature of one pound of water one degree is only approximately correct; in order to express ourselves with proper scientific accuracy we must say: The unit of heat is the amount of heat required to raise the temperature of water from 32° to 33° Fah. Régnault found that the specific heat of water increases, in consequence of its expansion, with the rise of temperature, and that if accepted at 1,000 for 32° Fah., it becomes 1,003 when the water becomes heated to 200°, or near its boilingpoint.

The specific heat of platinum is approximately equal to that of gold and mercury (see page 372, Vol. XXV.); but in order to use the metal for the purpose of measuring heat, a correct determination is required, and this was elaborated by Pouillet by means of air thermometers of peculiar construction. We here give:

POUILLET'S TABLE FOR THE MEAN SPECIFIC HEAT OF PLATINUM.

From	32°	"	212°	0·03350
"	32°	"	572°	0·03434
"	32°	"	933°	0·03516
"	32°	"	1,292°	0·03602
"	32°	"	1,832°	0·03728
"	32°	"	2,192°	0·03813
"	32°	to	2,732°	0·03938

The table shows that the specific heat of platinum, when taken at the common temperature, is nearly one thirtieth of that of water, while at some 2,700° it is about one twenty-fifth.

In order to make this more clear, we will state it in other words: At the common temperature, 30 pounds of platinum, losing one degree of heat, will produce one unit, and thus raise the temperature of one pound of water from 32° to 33°; while at the temperature of the blast furnace, say 2,700°, only 25 pounds of platinum, losing one degree of heat, will produce the same results.

We must, in passing, draw attention to a fact of much importance in regard to the theory of steam economy. The above table shows that the same quantity of heat will not raise the temperature of a mass of platinum equally for all parts of the thermometric scale; and for water, there is a still greater difference. So one unit of heat, being accepted as sufficient to raise the temperature of one pound of water of 32° one degree, will not suffice to do this to boiling water. If such water is heated in a closed vessel from 212° to 213°, it will require 1·013 units.

It is thus seen that in the case of water, it requires one seventy-seventh part more heat to raise the temperature of water from 212° to 213° than from 32° to 33°, and that, in the case of platinum, it requires only one ten thousandth part more heat to raise the temperature from 212° to 213° than from 32° to 33°, while, for the very high temperatures, it takes about one hundredth part more heat for one degree of thermometric ascension.

Applying the knowledge attained to the determination of the temperature of a blast furnace, we have only to observe by the thermometer the moderate amount of heat diffused in a large mass of water by means of a comparatively small mass of platinum, possessing a great amount of sensible heat or very high temperature at the moment that it is taken from the furnace. It is evident that precautions must be carefully taken against loss of heat by radiation, and against any other exterior disturbing influences, and the determination is then very easy, as we will illustrate by an example.

Suppose we have heated a mass of one pound of platinum in a blast furnace, and left it a sufficient time to be heated to the temperature of the flame. Outside we have say ten pounds of water, kept at 32°, surrounded by non conducting material, and enclosed between the double walls of a vessel, in the interior empty space of which the platinum is placed immediately after its withdrawal from the furnace. It is cooled without touching the water, and precautions are taken not to lose heat by evaporation of the water or radiation. Suppose now that, under the circumstances accepted, we find that, after a sufficient time has elapsed, the temperature of the ten pounds of water has increased from 32° to 43½°, or 11½°; this is, for ten pounds of water, equivalent to 115 units of heat, which, reduced to degrees in one pound of platinum of which the mean specific heat between 32° and 2,732° is equal to 0·03938 (see table), gives 115 divided by the latter number, or 2,920 for the degree of heat to which the platinum was exposed; so that the temperature of the blast furnace must have been 2,920° Fah. If the result of the calculation had given us a much lower temperature, say some 1,800, it would be necessary to renew the calculation with another coefficient of specific heat; in this case it would be 0·03728, which corresponds nearer to the specific heat of the temperature of about 1,800°, and would thus give a more nearly correct result.

This method gives at the same time the means of corroborating the specific heat of platinum in another way. If, namely, we make two experiments, in the same furnace and at the same temperature, with unequal quantities of platinum, we may obtain two equations of two unknown quantities, namely, one quantity the specific heat of the platinum, the other the temperature of the furnace. From these two equations, we may easily extract, first the specific heat in question, and secondly the desired temperature of the blast furnace. In this way, a few fragments of any substance able to withstand the heat of the furnace may be employed to determine its temperature. We reserve the further elucidation of this method to a future article.

SCIENTIFIC AND PRACTICAL INFORMATION.

VACCINE MATTER.

The terrible visitation of small pox, which has largely increased the death average in many of our cities, has created an unusual demand for vaccine lymph; and, moreover, it has drawn especial attention to the sources whence the virus is derived, and the need of obtaining it of the greatest possible purity. A Boston physician has recently found the applications for vaccine matter so numerous that he has devoted much time and attention to its propagation by vaccinating heifer calves. The animals chosen are between the ages of three and six months, and are selected with particular regard to their sound and healthy condition. As the disease affects the calf but for the short period of fourteen days, and as the pustules are ready for the lymph to be taken on the sixth or seventh day only, a considerable number, no less than three hundred, of calves are yearly required to supply the customers of this one collector.

The animal is thrown, and a portion of its abdomen is shaved clean; the virus is then inserted in small incisions about one inch apart. Vesicles are thus originated, and on the sixth or seventh day, the lymph can be removed by squeezing the spots with pliers. The exudation is carefully collected on ivory points. Hundreds of points can be prepared from one animal in this way. The crusts which afterwards form on the pustules are removed and fixed on gutta percha mounts, many surgeons preferring to communicate the vaccination by their use. In many localities, the vaccine disease has lost its vigor, and the operation is seldom followed by appearances of the cow pox; but the necessity of the latter as a prophylactic has called attention to the deficiency, and a supply fresh from the cow is valuable to ensure the taking of the vaccination.

A SUBSTITUTE FOR A RUDDER.

The screw steamer *India* of the Anchor line, plying between Glasgow and New York, put into Halifax, N. S., on February 23d. She had been twenty-seven days out from Glasgow, having lost her rudder on February 8th. Thirteen days afterwards, she fell in with the American fishing schooner *Joseph H. Chandler*, and lashed her to her stern, the schooner steering the strange vessel compounded of two craft dissimilar from each other in every respect.

EXPERIMENTAL SCIENCE AT CORNELL UNIVERSITY.

Professor Burt G. Wilder, referring to his request, published on page 49, current volume, encloses us some further suggestions for the guidance of such of our readers as may be able to forward him specimens:

"It sometimes occurs that the heads of rare and valuable animals come into the possession of individuals or associations, when only the skulls are to be preserved on account of the great expense of an alcoholic collection of brains. In such cases, for the sake of the brains, I shall be glad to open the skulls, by either vertical or horizontal section, as may be preferred, properly prepare them by maceration, etc., and return to the owners, free of expense."

The Professor desires also to mention that 500 copies of a circular nearly like this were distributed during the past month, and kindly copied by many scientific and agricultural papers; already specimens and letters of inquiry and information are arriving from all parts of the country and from all classes of people. In fact, the museums contain but a very small proportion of the valuable scientific material of a country; every village has its malformations, which are there regarded as mere curiosities and gladly put into the hands of scientific men when asked for; every hunter, butcher, and farmer has it in his power to furnish most interesting specimens every year, and according to Professor Burt's experience, is glad to do so, when assured of their scientific value.

COLEMAN, RAHM & Co., of Pittsburgh, Pa., have put into use Stearn's smoke burner improvement, in connection with some of their iron furnaces, and find that it heats the iron quicker, with a less quantity of coal, and prevents the smoke nuisance. The estimated total saving in time and fuel, by the use of the invention, is thirty-three per cent. There are about one thousand furnaces in operation at Pittsburgh. If the smoke nuisance could be abated, and money saved in the doing of it, Pittsburgh would become famous.

RECENT letters from Professor Agassiz report the safe arrival of his exploring ship at Pernambuco, Brazil. His explorations of the sea bottom are continued with undiminished zeal. He has made many discoveries of fossil and live animals, sponges, etc., the mere nomenclature whereof is enough to break the uninitiated jaw.