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Contents:

(Illustrated articles are marked with an asterisk,)

CAUTION.

It has become necessary for us to state very distinctly that the Scientific American Patent Agency Offices are at No 37 PARK Row, and not at No 39. Our reason for making this announcement will be made to appear by reference to a notice published on page 172, last number, under head of "Police Intelligence."

SPECULATIONS ON THE FUTURE.

The able Editor of *Engineering* follows up a review of the more recent achievements in the arts with an outline of those which seem to be indicated as next in order. Farming must become a branch of engineering, with its recognised professors and professional authorities, and advanced means of improvement. Little or no waste land must be left in England. Besides steam plowing, underdraining, sanding clay and claying sand, and sewage irrigation, the agricultural engineer is to saturate the soil with carbonaceous and nitrogenous elements by penetrating it with the products of the combustion of slack coal led through the land in flues. Land will yet be made to possess almost unlimited power of production.

We must dismiss the lumbering system of "trains" for high-speed traffic, and resort to a single vehicle combining engine, tender and carriage, in which fifty passengers may go at an average rate of sixty miles an hour at moderate cost, and with but forty or fifty tuns of total weight in motion. (The obstacle to rapid traveling on railroads at present, is the great weight and unsteadiness of the vehicles, involving an enormous waste of power and increase of risk at high speed). As for goods traffic, except express freighting, we must go back to and modernize water carriage, penetrating all parts of the country with a water system, of rivers and canals, for steamboats of 250 tuns burden. A new class of ocean steamers must be had, 500 to 600 feet long, twin-screwed, and driven at the rate of 16 miles an hour, making the Atlantic passage in an average of eight days. The only requisites wanting to success in such steamers, are a full line with regular and frequent departures, and a profitable reduction of fares. A single ship like the Great Eastern can never be filled up, because nobody wants to wait for her to the end of a month or six weeks, when inferior steamers are sailing every two or three days.

In regard to motive power, thousands of readers would be astonished if it were now published *who* has said that the days of steam are already numbered, and that hot air is to become the great motor (pending the subjection of electricity to the yoke).

Probably few have formed any conception of the immense change in building which is to follow the recent perfecting of artificial stone. It has been exposed to every conceivable trial, by boiling, freezing, acids and foul gases, with some four years practical use, and appears to be unalterable—an almost incomparable stone, in all the artistic forms and colors that may be desired, at a cost less than that of brick. Hydraulic elevators are referred to as destined to supersede the use of stairs, to a great extent and to a vast saving of weary, slow and unprofitable toil.

One of the grandest improvements that must now be imminent, is the perfection and general adaptation of the Bessemer process, for the conversion of all kinds of iron direct from the blast furnace into bars and castings of steel, with mechanical treatment of whatever character in the melted condition. Mr. Bessemer himself has made excellent tin plate sheets, which would fold like a newspaper, one fold across another, without cracking at the corner,—merely by pouring the contents of a crucible of melted steel between a small pair of rolls without any other working whatever!

In warfare, the day of piston shot and gigantic guns is coming. A 20-inch shot will be fired from a 40-inch gun; a shot of a tun weight, with an initial velocity of 1,600 feet per second from a charge of 450 lbs., with but little greater destructive strain upon the metal of the gun than in the old fashioned cast-iron ordnance, and with an effect of ninety-million foot pounds, sufficient to punch a 20-inch hole in a good wrought iron plate 28 inches thick, and to go through any now existing iron-clad like a wicker basket! There are (says the writer) clear and demonstrable principles on which such guns may be constructed. In the field also, great changes are before us, not only in rifles but in bullets, in which the explosive principle is yet to be applied with all its terrible efficiency.

THE RIGHTS AND WRONGS OF THE PATENT OFFICE.

The Report of the Commissioner of Patents, which we republish in this paper, is important enough and short enough to be read by everybody, and we could especially wish it read by every member of Congress. Eloquence could add nothing to the almost pathetic facts which make up this unadorned statement, or one would be tempted to wish the Commissioner had taken the opportunity to urge the just complaint of the Inventors more at large. In the first place, there is the tabulated history of the institution, in figures, for thirty years. And what does it show? Why, that the Inventors of the country, wealthy only in genius and enthusiasm—"poor, but making many rich"—have built up unaided this national monument, illustrious already in other lands, out of their own pockets have largely overpaid all its expenses and erected a magnificent building for its use, and at this day, with a surplus of $264,125 of their money in the hands of the Government, their important business lies neglected month after month, with fees pre-paid and interests often perishing by delay—because other departments have taken possession of the Patent Office building and crowded its legitimate business almost out of it, in a stifling corner where it cannot be transacted.

And this injustice and cruelty are aggravated every day with the increasing activity and beneficence of the inventive genius which is thus encouraged (!) by the United States. The cash received from inventors last year amounted in round numbers to half a million dollars: the application fees exceeded those of 1865 by nearly fifty per cent, while the caveat fees exceeded by nearly two hundred per cent, and the total receipts by more than forty-two per cent! At the present rate it is calculated that the applications the present year will rise to TWENTY THOUSAND. How is the business to be done? Without prompt provision for more room and force it *cannot* be done.

The plain question is: Gentlemen of the Senate and House of Representatives, do you intend to TAX INVENTION, and that retrospectively, for the benefit of the general treasury, or do you intend to give that great element of public welfare simply free and fair play, on paying its own expenses? But taxed or untaxed, inventors claim at least the common rights of men—that when services are agreed on and paid for, they shall be performed and not neglected. Name your price, gentlemen, but in the name of common honesty let the work be done.

MISTAKEN ECONOMY AND POOR MATERIALS.

Every successful manufacturer, particularly the builder of machinery, well understands that it does not pay to employ poor material any more than to turn out poor workmanship; yet it is too often apparent that men will jeopardize their reputations as workmen by using materials whose only advantage is a slightly reduced cost. In machinery this practice is reprehensible, for not unfrequently life as well as property is at stake, and not always is the end desired—diminished cost—reached, the poor material sometimes being really no cheaper than a better quality. The saving effected by the use of cast iron crank shafts and connecting rods on a small steam engine is very slight, while the danger of fracture and disaster is great. Strength, lightness, proportion, and durability are all sacrificed to the saving of a few cents or dollars. Even the reputation of the builder is risked and his character impaired for this paltry consideration.

A few days ago we saw a turbine wheel the upper boxes of which were held against the vertical shaft by wedges of cast iron. These wedges were perhaps ten inches long by two and a half wide and one inch thick at the heavy end. Certainly they cost a trifle less than they would if forged from wrought iron, but in moving the machine one of them had broken off and probably the other would follow on the next removal. The purchaser would be compelled to replace them by forged wedges or wooden ones, which really would be preferable to those of cast iron. The shafts of grindstones for shop and farm use may be well enough, if properly proportioned, made of cast iron, but who would not be willing to pay more for one forged from tenacious wrought iron? Many who purchase such articles do not know the difference between wrought and cast metal, and it is these who are imposed upon. Their confidence in the dealer or the maker once shaken, they shun them thereafter, and then the maker or seller suffers.

Undoubtedly there are many cases where cast iron is fully equal to wrought, where either may be used, but the practice so common of substituting the inferior material for that best adapted to the work to be done is carried to a ridiculous extent, sometimes the extra work on the inferior article making its cost fully equal to that of the better material. There can be no true economy in this, and neither is it goodeconomy to pursue this plan even when a trifle of the first cost may be saved. Sooner or later the wares of such workmen become a drug in the market, while the conscientious manufacturer will in time build up a reputation which will prove of more value to him than his money capital.

The market is full of miserable counterfeits "made to sell." So-called plated ware, revealing the base material before the gloss of newness has disappeared; brass jewelry, corroding at the first touch of moisture; tin ware, thin as vanity and soon eaten through and through; wooden ware gaily painted with evanescent water colors to go at the first handling; indeed, so common has become the practice of employing poor materials that it is absolutely difficult to obtain a good article, as tin ware, for instance. Surely a reform is needed, and he who will in any of these departments of industry manufacture and put into the market a really good article at a fair price and profit, will find a return in the support of an appreciative and humbug-ridden public.

"OZONE."

This is one of the comparatively recent articles in the repertory of science, having been introduced thereto only about twenty-five years ago. As its name is more and more frequently occurring in chemical notes and disquisitions, to the mystification of most persons not professionally read in such matters, it has seemed good to us that the lay readers of the SCIENTIFIC AMERICAN should not be any more mystified in the matter than are the *savans*; and that is undertaking to give them only a very little knowledge indeed, with perhaps a slight addition of plausible conjecture.

That which may be said of this important but obscure substance, is included under three divisions—its history, its nature, and its uses. It was discovered by Schönbein, who named it from the Greek participle ozōn, *smelling*, by which property it first announced itself to us. The peculiar odor, like sulphur or phosphorus, attendant upon a copious evolution of electricity, natural or artificial, had been observed to be attended also by certain chemical effects, such as the decomposition of iodide of potassium. In 1840, Schönbein announced that precisely the same evidences of a mysterious chemical agent appeared at the positive pole of the battery (if of platinum) when water was decomposed by electricity, and moreover that he had intercepted the agent and confined it in a bottle. Ten years later, he had discovered that it was evolved in the slow combustion of phosphorus and of ether, and might be detected in the atmosphere as the result of electric changes. Faraday took it up, and subjected its supposed properties to a strict test by first passing it through a solution of potash to arrest any possible acid which might have been the chemical re-agent, and finding the chemical effect still the same, established its distinct character beyond suspicion.

We will describe the usual test, by which any one may measure the indications of ozone in the atmosphere at a particular locality or season, and thus obtain important evidence, perchance, on the question of salubrity. A strip of soft unsized paper, or muslin, after being starched in the common way, is dipped in a solution of iodide of potassium. No substance common in the atmosphere, except ozone, attaches itself to potassium energetically enough to break its union with iodine. But wherever the test paper is exposed to the influence of ozone, the potassium is attracted and united to the latter, so that the iodine is set free, and its native violet color appears in the starch, which first turns brown, and on being moistened shows different shades, from pinkish white and iron gray to blue, according to the amount of ozone in action. A standard chromatic scale, covering ten degrees of color, has been made, with which the tints of the wetted test paper may be compared, and the relative proportions of ozone in the atmosphere thus measured.

The wonderful delicacy of this chemical action is realized by considering that the characteristic odor is perceptible when the air inhaled contains but $\frac{1}{500000}$ part of ozone, and yet the four lower shades of the test, at least, are obtained from the ordinary odorless atmosphere! This effect from such inappreciable quantities suggests also the marvellous power of the agent, which impresses us still more forcibly on finding that (if we may credit a statement we have seen) an intermixture of $\frac{1}{5000}$ part of ozone in atmospheric air renders it quickly fatal to animals breathing it. To the human respiratory organs it is highly irritating, and produces catarrh, in proportions far below the "smelling" point, and this, with its presence in all wholesome air, seems to intimate that it may be the true excitant of animal life.

To our second inquiry—what is it?—chemistry as yet answers vaguely. At first it was supposed to be a new element, afterward a superoxide of hydrogen, and it has been settled but lately that oxygen is another of those substances, as carbon and boron, which exist in a trinity; ozone being one extreme, antozone the opposite, and the common form of oxygen, the mean. In the peroxide of barium, for instance, it is found that the metal has been oxidized or rusted by ozone; while in the peroxide of manganese there appears evidence of antozone, or an oxygen which acts differently from both that combined with barium and that found in air or water. The most remarkable indication of the nature of this element, is the fact that pure dry oxygen is entirely converted into ozone by a silent current of electricity, and then, by a continued application of electric sparks, or by a moderate heat of 450 to 500 degrees, it is entirely re-converted to oxygen; as indeed it may be, in whatever manner it has been produced.

Finally, what are its uses? It is oxygen *par excellence:* that king among elements which subdues them to the pur-