Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year	$3 00
One copy, six months	1 50
CLUB RATES { Ten copies, one year, each $2 50	25 00
CLUB RATES { Over ten copies, same rate, each	2 50

VOLUME XXX, No. 8. [NEW SERIES.] *Twenty-ninth Year.*

NEW YORK, SATURDAY, FEBRUARY 21, 1874.

Contents:

(Illustrated articles are marked with an asterisk.)

THE STATE OF THE IRON TRADE.

The present condition of the iron trade of the country is fully set forth in the recent report of the American Iron and Steel Association. Rather a discouraging view is taken of matters on the whole, and to the panic is ascribed a state of affairs on which no immediate improvement is predicted. The question of British competition is dwelt upon at length; and judging from the tone of the English industrial journals, there seems foundation for the belief that the foreign iron masters expect a reduction of duties in their favor, and, in any event, can afford to reduce their profits and continue shipments. The report strongly deprecates any reduction of tariff and advocates an increase, pointing its argument by citing the fact that during last year the British ironmasters sent to this country 371,164 tuns of iron and steel, valued at $25,000,000, and this while our own blast furnaces and rolling mills were lying idle. In other words, we paid to foreign manufacturers, prices for their goods which our own producers would, in the time of their distress, have been glad to have accepted.

In discussing the effects of the panic, it is stated that the home iron trade was more injuriously affected than any other industry. During December, signs of a revival appeared and some pig iron changed hands at a very low rate, but many of the sales then effected were merely speculative. January has been dull, and the present month has opened with no brighter promise. The stoppage of railroad orders is considered as the principal cause of the depression, for the reason that fully half of our iron production and importation has ordinarily been required for locomotives, bridges, car wheels, relaying tracks, etc. Until the railroad companies re-enter the market, there can clearly be no general improvement in any branch of the iron business. Subordinate causes of the continued dullness may be found also in the interruption caused by the panic in all operations largely requiring iron, and in the enforced economy of the people in dispensing with minor articles of iron manufacture which they could temporarily do without.

At the close of 1873, there were 650 blast furnaces in the country, which were either making pig iron or were prepared to make it. From 385 of these, reports have been collected and tabulated. Assuming that a proportionate number of the furnaces not heard from were out of blast and had a proportionate quantity of tuns of pig iron on hand or unsold on January 1, 1874, the total number of stacks at that date, out of blast, would be 233, or thirty-six per cent of the whole number. The total amount of pig iron on hand or unsold would be 520,726 net tuns, and the number of men out of employment, 21,141.

Fifty out of the fifty-seven rolling mills have sent returns. Of these 17 were running, December 31, 1873, 10 on full and 7 on half time; 33 were standing; 11,490 men were wholly unemployed, 10,150 were at work at half time; 37 mills were not selling rails, and there were 36,744 net tuns of rails on hand and unsold at the above date.

This exposition of the state of the two leading branches of the trade is, at best, far from encouraging. Over 30,000 hands are wholly unemployed; and this aggregate does not include ore and coal miners, not directly connected with furnaces or mills, and who are also thrown out of work from the same causes. The iron ore statistics of the Lake Superior region show an increase in the amount shipped for 1873, as against that of 1872, of 211,002 tuns gross. Much of the ore, however, mined was not shipped, owing to the panic. At the beginning of 1873, the price at Cleveland, for first class Lake Superior specular ore, was $12; during the panic this fell to $10, and it is believed that for 1874 the price will be as low as $9. Iron Mountain ore will be $8 delivered at St. Louis.

The total number of miles of railroad in operation, January 1, 1874, was 71,109, as against 67,104 a year back. Increase, 4,005 miles built, or considerably less than the figures of 1872, when 6,427 miles were constructed.

The report gives extended statistics of the comparative status of the British iron trade. The total export of 1873, of iron and steel, was 2,959,314 tuns, estimated at $188,897,940 less in amount than for either of two previous years, but greater in value. The export to the United States has fallen off fully one half; the figures for 1872-3 and 4, being 840,085, 795,734 and 371,164 tuns. During the latter part of 1873, there was a decline in the cost of fuel and labor, which bids fair to be permanent, and the coming year, it is believed, will witness lower prices for iron in the British markets than prevailed during the previous year. The vessels built on the Clyde were 194 against 227 in 1872; the tunnage, however, exhibits considerable increase. The coal trade is said to be a reflex of the iron business, with declining prices as the rule.

The Iron and Steel Association is now in session at Philadelphia, and all the great establishments are fully represented. Such a gathering of capital and influence has never taken place in any iron convention, heretofore held in the United States. A memorial has been prepared for transmission to Congress, which prays for the repeal of the substance of the ten per cent reduction act, passed in 1872, affecting a large number of staple articles, suggests amendments to the bankrupt act, protests against proposed alterations in the tariff laws, against changes in the customs duties to be effected by laws now pending in the House, advocates the establishment of a department of industry, with subordinate bureaux of agriculture, commerce and manufactures, and discusses financial topics and a protective policy.

Two objects of considerable interest have thus far been exhibited. One is a twisted steel Bessemer rail from the Joliet Iron and Steel Company's Works, which is a beautiful piece of work, the rail being made into a complete spiral without developing the slightest flaw or fracture. The other is an ingot of steel, weighing 1,000 pounds, made direct from the ore, for the first time in this country, by the Blair Iron and Steel Company of Pittsburgh.

The proceedings of the convention bid fair to be of considerable importance, and will be made the subject of future comment in these columns.

OZONE—A NEW AND CORRECT METHOD OF SUPPLY.

The use of ozone as a disinfectant in hospital wards and public buildings has amply demonstrated its virtue as a purifier of air exhausted by breathing or poisoned with emanations from corrupt or decaying organic matter. The only bar to its more extended use has been the lack of a simple and trustworthy means of generating it, safely and continuously, by a process not involving scientific skill or costly materials.

The latest means suggested certainly bears the palm for simplicity, cheapness, and accessibility to all. It consists simply in the exposure to atmospheric action of common phosphorous matches moistened by water, the alleged result being the production of nitrite of ammonia and ozone—both active purifiers of air.

Knowing the efficiency of moistened phosphorus as a generator of ozone, the author of the match method, Mr. Sigismund Beer, of this city, set out one day to procure a quantity of that substance to use in sweetening the atmosphere of a room whose musty smell had successfully resisted the power of ordinary disinfectants. Failing to find any phosphorus at the drug stores in his neighborhood, it occurred to Mr. Beer that possibly lucifer matches might furnish the needed element in a condition suited to his purpose. He tried them, dipping them into warm water for a few moments, then suspending them in the obnoxious room. Their effect was prompt and salutary; and thereafter, by continuing their use, he was able to enjoy "the luxury of pure and refreshing air," notwithstanding the room was in the basement of an old cellarless house on made land, the air of which was further tainted by a quantity of moldy books and papers. In a paper lately read before the Polytechnic branch of the American Institute, Mr. Beer narrates a number of subsequent experiments with the same simple materials, the success of which convinced him that he had made a veritable discovery of great importance.

Touching the safety of the method he proposes, Mr. Beer is confident that no overcharging of the air with ozone or other injurious matter may be apprehended from the use of matches in the manner he describes. Both the ozone and the nitrite of ammonia are generated slowly, and their force is swiftly spent by combination with the impurities they are intended to remove. It is obvious that the supply of the purifying agents can be easily regulated by increasing or diminishing the number of active matches. In the room above mentioned, six bundles of matches were kept active—some near the ceiling, others near the floor—by daily watering.

In another instance a single bunch is mentioned as having sufficed for quickly purifying the air of a room in which several adults and children were lying sick, but in this case the air was fanned against the matches while they were carried about the room, thus hightening their activity. How long a match retains its ozonizing power, Mr. Beer does not say. In conclusion, Mr. Beer claims that, whatever may be said of his theory of match action, the fact is indisputable that, in the use of matches as he suggests, we have a handy, wholesome, and inexpensive means of freeing our houses from noxious exhalations and the long train of evils attendent on the prevalence of bad air. The matter is easily tested and certainly well worth trying.

EDUCATION AND BOOK KNOWLEDGE.

The high water mark of a very prevalent theory in education is reached in an assertion, by one of the foremost educators of the day, to the effect that what a man can write out fully and fairly concerning any matter, *that* he knows, and no more. Whatever falls short of this simple and certain test, we are told, is no better than sheer ignorance.

The phrase expresses, with axiomatic terseness, the controlling spirit of the schools; and for this reason, we suppose, it has been echoed right and left as a settled dogma in education. From the primary school up to the highest, excepting a few scientific schools, the grand test of knowledge is verbal expression. The pupil that recites best wins the prize; and as the most credit goes to that teacher whose pupils meet the standard required most completely, the tendency is to narrow the range of teaching to those things which can be most readily reproduced in formal phrases. The premium is paid for words, and naturally the teacher gives more attention to them than to the pupils' mental health or mental development.

Not that facility of verbal expression is to be despised or neglected. It is an art second to none, and worthy of proportionate culture. In many cases it is also a first rate test of knowledge; but to make it the ultimate test, in all cases, involves a double fallacy, subversive of the highest aim in education. It implies that all knowledge worth having can be expressed in words, and consequently can be communicated by words, either for informing another or for testing his information. It implies, too, that the possession of knowledge necessarily carries with it the power of ready and accurate expression.

The fact is, on the contrary, that relatively but a small part of what one may know can possibly be expressed in words; and much, even of that which can be formulated, may be thoroughly apprehended and practically used by one who could not begin to set it down in logical sentences.

Time was when book knowledge was thought to be the sole basis of scholarship. All teaching was book teaching, and it was no more than fair to expect students to prove their knowledge in book fashion. But that time is past. The bookish estimate of culture no longer satisfies. The library alone can no longer make a scholar; and every scheme of culture which pins the pupil's attention to letters is little better than a wall set round him to keep him from learning what he ought to know. That much of what passes for legitimate schooling is such a wall is recognized by everybody except the pedagogue.

Men of real culture are well aware that ability to do is vastly superior to ability to say; and they believe that the development of skill and power ought to receive at least as much attention in schooling as the mere accumulation of second hand facts; but all that sort of basic culture is not merely slighted but suppressed as soon as the test of verbal description is made supreme.

There are less than fifty sounds in the English language. If they were all devoted to the service of a single sense, all their possible combinations would be insufficient to express the distinctions which that sense might be able to recognize. There are five thousand times fifty fibrils in the optic nerve, as estimated by Helmholtz, each demonstrably capable of conveying many degrees of sensation of the several primary colors. One need not calculate the permutations of two hundred and fifty thousand to realize how meager the richest possible vocabulary of sight terms must be for the expression of sight experiences. Still greater is the poverty of language when used for expressing the infinite distinctions of thoughts and things which the whole man is capable of apprehending. Relatively, indeed, our words are but a clumsy sort of currency for certain common needs, no more sufficient for the complete expression of thoughts and feelings than bank notes are for the measurement of values. For the grosser exchanges of life, for marketable values, money answers well enough; but how shall one express in banker's figures, or set phrases either, the value of a kindly word, a mother's love, or a cup of water to one perishing of thirst?

The killing fault with the scholastic test of knowledge is that, from its nature, it fails to reach—as it fails to encourage—more than a single phase of culture, and that one of inferior grade. It measures verbal acquisition only, not skill or power; and since conduct rather than words, ability to do rather than facility in saying what has been done or ought to be done, is the ultimate test in life, and should be the paramount aim in education, the word test is necessarily deceptive as well as inadequate. The glib art critic, scarcely able to draw a straight line, might have at his tongue's end a greater array of fine art phrases than a Michael Angelo; and if suddenly called on to write out fully and fairly his knowledge of sculpture or painting, the master might be beaten by the mere theorist. So, too, the veteran shipmaster of a hundred successful voyages might make off hand a poorer display of nautical knowledge than the cadet fresh from the naval school, or possibly the concoctor of sea stories for a sensational newspaper.

THE IRON ORES OF MISSOURI.

The principal portion of the report of the Missouri Geological Survey for the past year is devoted to the iron ore deposits, which give the State so high a rank for mineral wealth. The geology of Pilot Knob and its vicinity is discussed by the chief geologist, Mr. Pumpelly, while Dr. Adolph Schmidt furnishes a general report on all the iron ores of the State. It is needless to add that the information thus given adds immensely to our knowledge of the character, distribution, and modes of occurrence of these interest ing deposits.

Two principal mineral species are represented in the Missouri iron ores, the hematite and the limonite (sometimes called brown hematite), the former occurring in two distinct varieties, namely, specular ore and red hematite. The first variety is found in the midst of broken and partially disintegrated porphyry, and in the (geologically) overlaying lower silurian sandstone. The red hematite forms strata in the carboniferous system. The limonites occur chiefly as deposits on the second and third magnesian limestones, except in the Osage River district, where they lie on subcarboniferous limestone. Besides these four classes of original deposits, Dr. Schmidt recognizes with each a secondary class of disturbed or drifted ores, making in all eight distinct classes of deposits.

The region of workable iron ore reaches north of the Missouri River at one point only, in Callaway county, where red hematite occurs in the subcarboniferous. South of the river, deposits are frequent throughout the whole southern part of the State. That portion richest in iron ores, however, is comprised in a broad belt crossing the State in a direction about parallel to the course of the Missouri river, between the 30th and 40th township lines. This belt is divided into three distinct regions. The first and more easterly embraces the deposits of limonite in the counties of Ballinger, Wayne, and Madison, and the small but immensely productive Iron Mountain district, with its two enormous deposits of specular ore in porphyry, Iron Mountain and Pilot Knob, besides numerous smaller deposits. The second or central region comprises the deposits of specular ore in sandstone, chiefly in the counties of Crawford, Phelps, and Dent. The third region contains the limonite and red hematite deposits of the Middle and Upper Osage, a district too remote from present markets to add very much to the immediate wealth of the State.

The oldest as well as richest deposits are in the iron-bearing porphyries of the eastern district, a formation regarded as a near equivalent, in point of age, to the iron-bearing rocks of Lake Superior, New Jersey, and Sweden. The deposits occur in the most variable shapes, and of every variety of size. There are regular veins as in Shepherd Mountain and Iron Mountain; regular beds as in Pilot Knob and in some localities east of it; irregular deposits, some of which approach veins by their shape, as in Lewis Mountain; while others have proved to be but isolated pockets, as on Hogan Mountain. In all cases, however, the mode of their formation is thought by Dr. Schmidt to have been practically the same, that is, by precipitation from iron-bearing waters, as ore deposits are still forming in numerous localities from the waters of chalybeate springs. The geological history of Iron Mountain affords a fair illustration of the manner in which the formation of all these beds of specular ore may be interpreted.

Originally the mountain was composed of porphyries, which also filled the valley east and south. In process of time the porphyries became fissured, by contraction or otherwise, and during long periods these fissures were kept filled with constantly renewed chalybeate waters, which slowly deposited the oxides of iron which they contain. As the fissures were gradually filled, the flow of the iron solutions was lessened and finally stopped. Then the ore dried, undergoing thereby a small contraction, which cracked and broke most of the veins without displacing the parts. Subsequently the porphyry was acted on by atmospheric or other waters, probably containing carbonic acid, which decomposed the rock, removing the alkalies and leaving a silicious clay. By the after erosion of the softened masses by rain and flood waters, the cracked and disjointed ore veins lost their support and fell to the ground, thus forming the beds of surface ore which cover the slopes of the hill and fill a part of the valley.

In the main body of the hill, the ore masses remain undisturbed, with more or less decomposed porphyry between, the ore constituting but a small percentage of the entire volume of the hill. The surface layer of ore boulders, pebbles, and ore sand, with very little clay, was originally from four to twenty feet thick, and must have represented a vast amount of erosion. The Iron Mountain ore may be taken as a type of all the Missouri specular ores. It is nearly pure peroxide, containing about seventy per cent of metallic iron, and is nearly free from mechanical admixture of foreign matter. Color, bluish black to steel gray. The surface ore is a little richer than the vein ore and has less phosphorus; both are nearly free from sulphur. Dispersed through all the Iron Mountain ores are magnetic particles, which can be separated from the mass with a magnet when the ore is reduced to powder. No ore with active magnetism, constituting a natural magnet and attracting iron filings, is found on the mountain. The Pilot Knob ore is slightly peculiar; color, steel gray to pearl gray, with a marked tint of sky blue. Its structure is crystaline to granular, with a very fine grain None of these ores affect the compass needle, though all are slightly attracted by a magnet when ground fine. The quality is less uniform than that of the Iron Mountain ores, the principal impurity being silica. The proportions of sulphur are very small.

The ore from Shepherd Mountain is a little more like a magnetite than any other ore in Missouri, but in the main is a specular ore, very similar to that of Iron Mountain. Its magnetic qualities are much more pronounced than those of either of the ores above described, many specimens being strong natural magnets. The ore is very uniform in chemical composition, very rich in metallic iron, and almost entirely free from phosphorus and sulphur. It is nearly as rich as the Iron Mountain ores, and much purer than either those or the ores of Pilot Knob.

At Buford Mountain the ore is rich in both iron and manganese, and is likely to prove a very valuable material for the manufacture of spiegeleisen, now so extensively used in the Bessemer process.

The specular ores in sandstone differ from those in porphyry chiefly in their tendency to change, on exposure to atmospheric influences, into brown and yellow limonites and red hematites: rarely into spathic ore. Generally these deposits are of a lenticular shape, with circular or elliptical outlines, and may have been formed either by deposition from chalybeate waters in depressions in the sandstone, or by a gradual replacement of lenticular limestone deposits. When inclined, the beds dip with the slope of the hill.

The disturbed deposits of specular ore are of two kinds: Masses of ore which have been removed from their original position by underwashing or otherwise and deposited elsewhere in a more or less irregular manner; and the remaining portions of original deposits, from which other portions have been removed. Ore banks having the appearance of drifted deposits are numerous in the central ore district, but they have not been sufficiently opened to be satisfactorily studied.

The red hematites of the carboniferous formation differ from all the other ores of the State in that they do not occur as deposits with definite limits, lying as independent and foreign developments between and across other rocks, but form and compose in themselves regular geological strata. These iron-bearing sandstones frequently extend over large areas, with varying richness. None, however, have been sufficiently opened to make it possible to decide whether the ore was formed directly after and on the surface of the underlying sandstone, or whether it was infiltrated afterwards, gradually replacing beds of limestone or the sandstone itself as it happened to be more or less readily soluble.

The deposits of limonite occur neither in veins, nor in beds, nor as strata, nor in pockets of regular shape, but in irregular cracks and crevices on or near the surface of the various limestones. These cavities sometimes have very large dimensions both in depth and width, and are generally near the present surface of the ground. So far as opened these deposits afford a denser, harder, and richer ore in the upper part than in the lower, where it is more inclined to be light, porous, ochery and clayish. This fact and the invariably stalactic structure of the ore are proofs that the solutions from which the ore was deposited was infiltrated from above. One of the largest and most coherent of these banks is the Ford Bank in the eastern district. It extends some 1,500 by 500 feet along a low flat hill; the thickness is irregular, ranging from 10 to 30 feet.

The disturbed and drifted deposits of limonite have not been sufficiently opened to enable a judgment to be formed in regard to their character. The more important deposits in the entire list are as follows, the most of them being described at length in the report:

1. Containing more than 2,000,000 tuns of workable ore: Iron Mountain, in St. Francis county (specular ore).

2. With less than 2,000,000 tuns and more than 500,000 tuns: Pilot Knob (quartzose specular), in Iron county; Benton creek (specular in sandstone), Crawford county; and Simmons Mountain (specular in sandstone), Dent county.

3. Estimated to contain between 100,000 and 500,000 tuns: Shepherd Mountain (specular and magnetic), Iron county. Scotia No. 1, (specular and red hematite in sandstone), Iron county. Cherry Valley No. 1 (specular in sandstone), Crawford county. Laub Bank (specular in sandstone), Phelps county. Pomeroy Bank (specular in sandstone and limonite), Dent county. Iron Ridge No. 1 (specular and red hematite in sandstone), Crawford county. And the Meramee bank, (specular and red hematite in sandstone), Phelps county.

MODERN PROGRESS OF CHEMICAL INDUSTRIES IN EUROPE.

In the course of a recent lecture before the French Association for the Advancement of Science, M. Aimé Gérard gave a very interesting and instructive sketch of the rise and progress of many of the principal chemical industries of Europe. Beginning with sulphuric acid, which he regarded as a common pivot about which turn all the industries which call in chemical reactions to their aid, it was pointed out that, heated with rock or marine salt, the product gives us on one hand sulphate of soda, and on the other hydrochloric acid, in other words, the primary agents for the manufacture of soap, of glass wares, of paper stuff, of bleaching matters, of dye, etc. Heated with saltpeter, it gives nitric acid, the creative agent of the beautiful coloring matters used for dyeing silks. Again, by the aid of sulphuric acid we clean metals, purify oils, manufacture candles, and plate and gild by galvanic action. It is quite clear that it would be impossible to obtain the enormous amounts of the product now required from the limited sources of supply of forty years ago. Then native sulphur, obtained from the volcanic ground of Sicily, was burned at the top of large leaden chambers, and about 20,000 tuns sufficed for the manufacture of the sulphuric acid consumed in Europe. Now 275,000 tuns would barely meet the demand. This vast drain could not be met by the Sicilian sulphur grounds, and hence were engendered the attempts to utilize iron pyrites obtained in the French mines of Chessy, near Villefranche. These successful, the industry spread to England and Germany, and now the estimated production of Europe, of concentrated sulphuric acid from iron pyrites, is 880,000 tuns, enough to fill a canal 64 feet deep, 32 feet wide, and from 15 to 18 miles long.

In Marseilles, thousands of tuns of salt from the marshes are made into soap maker's alkali. Formerly the hydrochloric acid gas produced from the decomposition was lost and, escaping in white clouds from the chimney of the factory, brought destruction to crops and vegetation near. It was in England that the condensation of this gas was made obligatory on manufacturers, and laws were passed in Parliament to that effect, resulting in the transformation of the fumes into the yellow liquid from which decolorating chlorides, products which render valuable service in the bleaching, dyeing, and making of paper, are obtained. It is a strange fact that the importance of these secondary manufactures has greatly increased, and it is to the perfecting of the processes through which chemistry may manufacture these decolorating agents that the efforts of inventors are tending. In England, Weldon regenerates manganese, which generally serves for the transformation of hydrochloric acid into chlorine. Deacon seeks from the air itself the oxygen necessary to the transformation, and announces the production, now almost certain, of chloride of lime at $2 per 220 pounds: an immense progress, for, whenever we are able to extract readily from hydrochloric acid the chlorine it contains, we shall have furnished to textile industry a means of inexpensive bleaching, and to the paper manufacturer a mode of utilizing now waste products.

With the hydrochloric acid there is obtained sulphate of soda, and this is converted into soda and carbonate of soda. To effect this, it used to be heated to 2120° Fah., in a reverberatory furnace, mixed with zinc and charcoal. In front of the door stood two or three workmen, who, with huge iron pokers, kept up a continual agitation of the molten mass: brutal work, but now gradually disappearing. In England a rotating furnace is used, which consists of a horizontal cylinder, 16 feet long by 10 feet in diameter, on which a small steam engine impresses the movement of rotation about its axis. This is traversed from end to end by the flame from the hearth, and the matters, violently agitated, react upon each other without requiring the muscular force of man.

In the production of the potassic compounds, we probably meet with the most remarkable progress presented by the modern history of chemical industries. The ash left by wood, burnt in our fireplaces, is no other than a mixture of calcareous compounds, insoluble in water, and soluble salts of potash, among which the carbonate predominates. This mode of making potash from wood now only exists in America, Hungary, and Russia, and bids fair to become entirely extinct. The sources from which potash is now derived are, first, the sugar industry. A sugar beet of 4·4 pounds weight contains from 15 to 30 grains of potassic compounds. From the molasses, these in concentrated form are obtained. The molasses by fermentation is formed on the one hand into alcohol, which is obtained by distillation, and on the other into distiller's wash, which, evaporated and calcined, reproduces in the saline state the potash which the beet originally held fixed in its tissues; 6,000 tuns of potassic compounds, valued at $6,000,000, are thus annually obtained. But even this vast amount would not suffice for commerce, and hence we turn to a second source, sea water. In every quart there are 375 grains of marine salt (chloride of sodium) and 15 grains of chloride of potassium. Imagine, now, this sea water introduced into salt marshes, over immense areas, and left to evaporation. The salt is finally deposited in a crystaline state, and when some 3 inches thick it is gathered. Formerly the mother water, rich in potassic compounds, was drained off and wasted; but by M. Balard's refrigerating processes, the valuable potash is now extracted. The discovery of large mines of rock salt in Stassfurt, Prussian Saxony (where it was only necessary to hew out the potash mineral, the carnallite, with the pick axe, and boil it with a little water, to obtain chloride of potassium almost pure) dealt a powerful blow to the French industries; but after a ten years' contest, the latter, by the aid of improved processes, are again firmly established in commerce. From 10,000 to 12,000 tuns of potassic compound are now produced yearly at Camarque, France.

M. Gérard continues at some length regarding ammoniacal compounds, phosphates, sulphate of ammonia, etc. A few facts relative to the progress realized, by industries which make use of chemical products, will serve as a conclusion for our *resumé* of his discourse. As regards paper, it is stated that the production in 1873 was 143,000 tuns. Each Frenchman consumes annually in different forms more than 6·9 pounds of paper, and the entire amount yearly used in France would be sufficient to encircle the earth at the equator with a belt 192 feet wide.

The cultivation of wine in France covers 60,000,000 acres, Owing to the ravages of the *oidium* between 1850 and 1860. the production fell from 115 to 73 quarts per head per annum. Brief notice is made of the present trouble with the phylloxera. As regards the sugar beet industry, the yield for 1873 is stated at 495,000 tuns.

Operations of the Patent Office in 1873.

The annual report of the Commissioner of Patents, for the year ending December 31, 1873, shows the following:

Number of applications for patents during the year 1873	20,414
Number of patents issued, including reissues and designs	12,864
Number of applications for extensions of patents	273
Number of patents extended	233
Number of caveats filed during the year	8,248
Number of patents expired during the year	4,482
Number of patents allowed but not issued for want of final fee	2,783
Number of applications for registering of trademarks	534
Number of trademarks registered	492

Of the patents granted, there were to—

Citizens of the United States	12,371	
Subjects of Great Britain	341	
Subjects of France	64	
Subjects of other foreign governments	88	
		12,864

STATEMENT OF THE PATENT FUND.

Amount to the credit of the patent fund, January 1, 1873	$794,111 42
Amount of receipts during the year 1873	703,191 77
Total	1,497,303 19
From which deduct expenditures for the year 1873	691,178 98
Balance January 1, 1874	$806,124 21

A NEW Bunsen gas burner has been recently invented, which gives a heat of about 3,000° Fah. A furnace of thirty burners generates steam enough to run an engine of one and a half horse power.