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THE BATTERING RAM AS A TUNNEL BORER.

Mr. Charles Bergeron, C. E., in a recent issue of the *Engineer*, contributes a paper on the St. Gothard Tunnel, and more especially relating to the modes of drilling which have been adopted. The Dubois and François perforators, which are of more simple construction and of higher efficiency than the similar machines employed at Mont Cenis, have been mainly employed, but more recently the McKean apparatus has been substituted. Compressed air is furnished at a pressure of from five to eight atmospheres, by means of three powerful turbines of 220 horse power each, forming a total amount of 660 horse power; at each end of the tunnel. With such powerful engines, M. Favre, the contractor expects to execute three blastings by dynamite per day, advancing each time 4.8 feet at each end of the gallery, the entire extent of which it is believed will be completed in less than five years.

Mr. Bergeron, in considering the plans of M. Favre for the use of dynamite, points out a number of different operations, as well as objections incident to the employment of the same, and thinks that there is a way of accomplishing the work in less time and with a much smaller amount of trouble and inconvenience.

In making their long subterranean aqueducts, it is stated that the Romans used a battering ram to pierce the way through rock. This engine consisted of a long wooden beam suspended at its center of gravity and heavily weighted. A number of men on each side, acting together, gave it a swinging motion, so that it struck with great force any obstacle in its path. When the instrument was to cut hard rocks for tunnels, the metallic head was armed with points like a stonecutter's hammer, intended to divide and reduce the stone to fragments or dust. Captain Penrice, an English engineer, some time ago conceived the idea of constructing a rock drill on the same principle, and to employ steam or compressed air for pushing, like a steam hammer, a perforator of four or five feet diameter. This was tried in the Vaugirard quarries near Paris, and made five feet advancement per hour; and since, another has been

built, 3 feet 6 inches in diameter, which, it is asserted, will penetrate a distance of from two to three feet in similar time. By suitable mounting of the cylinder on the trunnions of a gun carriage, it can be made to take all the positions of a marine or siege gun, and strike the rock with blows of eight or ten tons weight. The hammer weighs two tons and a half. The engraving of the apparatus will render its construction clear. A is the framing, suspended on the wheels, B B. The end wheel serves to direct the carriage, and the whole is moved forward by the aid of the hand spike, Fig. 6, inserted in the holes, O O, in the wheel, B. D is the steam cylinder, mounted on trunnions, and its angle is determined by the segment, N, and pinion and handle, M. E is the valve chest; K, the hand lever by which the valve is actuated; H' is a heavy balance weight; H is the ram head fitted with cutters, shown on an enlarged scale in Figs. 2, 3, 4, and 5. The holes, O, are used to extract the cutters when worn. J is the air pipe, to which a flexible pipe is attached. By moving K backwards and forwards, H will be made to act as a battering ram on the face of the heading in a way that will be obvious.

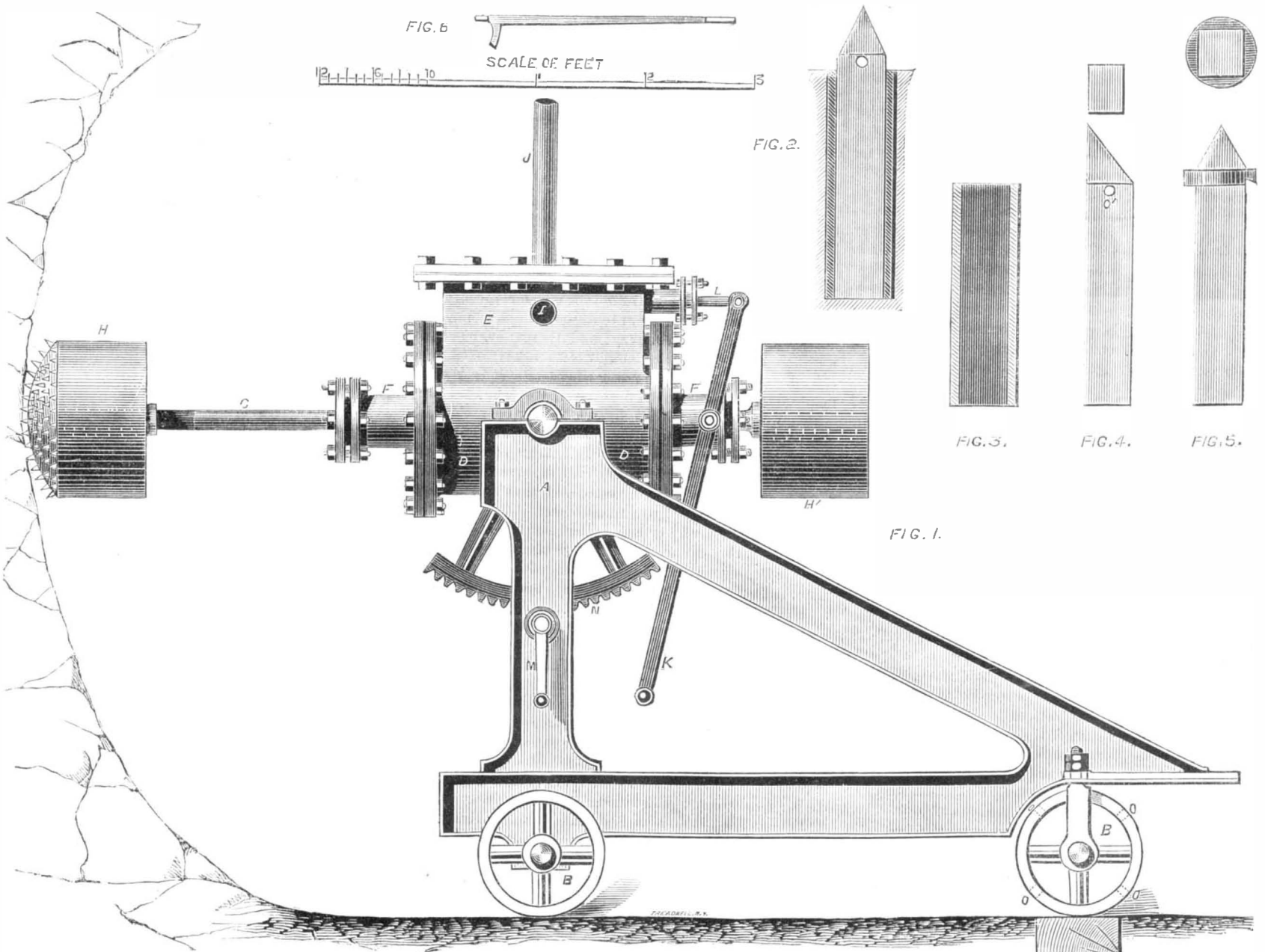
The gun carriage may be placed upon a turntable; and jets of water, projected against the place where the hammer is striking, will serve to carry off the rubbish. The operation would suppress the transport of the latter by wagons; and the work, it is stated, would be continuous, which is not the case when blasting the rock by gunpowder or dynamite.

In connection with the St. Gothard tunnel, we note that, up to November 30, 1873, the drift had reached an extent of 3,353 feet. The total length of the bore is to be 47,680 feet.

PURE glycerin should not produce, when locally applied, a burning sensation, which it always does when the fatty acids are not all extracted. But even absolutely pure glycerin, when undiluted, is a water-extracting body. It should therefore, when used as a cosmetic, or for medical application, be always diluted with water.

Uniform Mean Time.

The extent of the territory of the United States forbids the adoption of one mean time for railroad use, found so convenient in the countries of Europe. It is therefore the practice, on our railroads, to run by Portland time, New York time, Altoona time, or by the mean time of some other center of railroad traffic. The Pennsylvania Railroad and some of its dependencies, extending from New York to St. Louis, use Pittsburgh time, which is transmitted by electricity from the Allegheny observatory, an astronomical clock of the best construction being used. This clock is regulated by a telescope, aided by other mechanism, such as the chronograph, which records, by the aid of electricity, the time that the clock keeps, to the hundredth part of a second. The telescope shows its return, every twenty-four hours, to the point of observation of a fixed star, so that the earth itself becomes the regulating clock of the observatory. Four lines of telegraph, says the *American Exchange and Review*, enter the observatory, one of which connects with the railroad wires. The circuit is led through the standard clock, in which a wheel with sixty teeth revolves once a minute. One of the gold terminals of the wires is in contact with a jewel, which is moved slightly every second by a passing tooth. At this instant the circuit is broken, and, by filing away some of the teeth, certain beats may be omitted, to designate the end of the minute, while another piece of mechanism holds the circuit open for the last minute in each hour. The action is purely automatic and continuous, and the clock beats are repeated, through the twenty-four hours, in the principal offices at Pittsburgh, with which they are united by a line specially devoted to their use. At a certain hour the current is switched into the main circuit, and then the clock may virtually be heard ticking in New York and Chicago, and at every intermediate station, at the same instant. The system has been in use, as the official standard of the Pennsylvania Central Railroad and its eastern connections, for some years; more recently it has been extended to the western roads. The aggregate length of main and branch lines thus supplied is several thousand miles.



THE BATTERING RAM AS A TUNNEL BORER

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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 tons 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 tons 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 tons, 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 tons 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 tons 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 tons, 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 tons. 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 tonnage, 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 heightening 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 attendant 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 interesting deposits.

Two principal mineral species are represented in the Mis-

souri 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) overlying 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 crystalline 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 tons of workable ore: Iron Mountain, in St. Francis county (specular ore).
2. With less than 2,000,000 tons and more than 500,000 tons: Pilot Knob (quartzose specular), in Iron county; Benton creek (specular in sandstone), Crawford county; and Simons Mountain (specular in sandstone), Dent county.
3. Estimated to contain between 100,000 and 500,000 tons: 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 tons sufficed for the manufacture of the sulphuric acid consumed in Europe. Now 275,000 tons 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 tons, enough to fill a canal 64 feet deep, 32 feet wide, and from 15 to 18 miles long.

In Marseilles, thousands of tons 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 tons 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 crystalline 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 tons 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 tons. 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 tons.

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.....	278
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

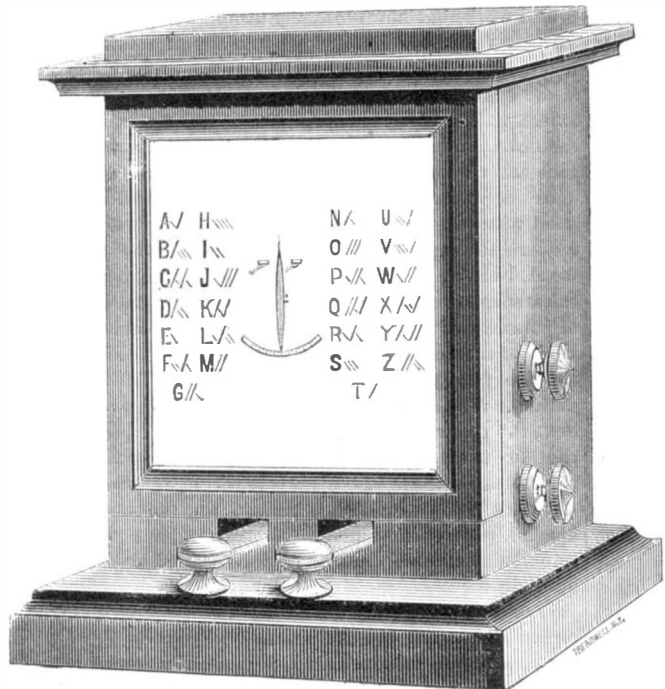
A NEW Bunsen gas burner has been recently invented, which gives a heat of about 3,000° Fah. A furnace of thirty burners generates steam enough to run an engine of one and a half horse power.

THE ENGLISH TELEGRAPHS.

The apparatus employed upon the English lines embraces almost every form which has ever been practically used, but the bulk of the traffic is performed with the Morse ink writers, the greater part of which are worked in connection with the double current key and Siemens' polarized relay. The speed of these instruments depends mainly upon the skill of the operators who work them, being generally about the same as that of the Morse recording apparatus employed upon our own lines. The speed of the Bright's bell apparatus is about the same as that of the Morse sounder, depending, like the latter, upon the skill and experience of the operators. "I timed the operator at Edinburgh," says a correspondent of the *Journal of the Telegraph*, "and found him receiving by the bells at the rate of 32 words per minute."

The Hughes type printing instruments are only used to a limited extent in England, and the speed attained is not much in excess of the Morse sounder. The instruments are carried by weights, and the type wheels make about 120 revolutions per minute, or a little more than half the speed of the Phelps combination instrument.

FIG. 1.



Wheatstone's automatic instruments are employed upon 33 message circuits, varying in length from 159 to 515 miles each, and upon six new circuits, varying in length from 166 to 475 miles each, making a total of about 11,000 miles.

The speed of these instruments varies from 38 words per minute upon the London and Cork circuit, to 120 words per minute upon the London and Liverpool circuit. The average speed of the apparatus is about 70 words per minute, or about twice as fast as the speed of a first class sound operator. The time occupied in the preparation of the messages for transmission depends somewhat upon the skill of the operator, but an expert clerk will easily prepare them at the rate of 25 words per minute. The automatic system, as compared with the Morse, requires rather more than double the number of clerks to do a given amount of business, and, therefore, for distances less than 200 miles, it is cheaper to put up additional wires than to make use of it.

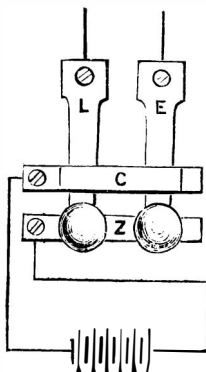
The automatic system finds its most appreciative use in forwarding press messages, which are transmitted over several circuits in succession with only one preparation.

The single needle instrument, of which there are over three thousand employed on the English lines, is one of the simplest forms of telegraph apparatus in use, being simply a combination of a vertical galvanometer or galvanoscope, and a current-reversing key.

Fig. 1 represents the exterior of the instrument. In the center of the face is suspended the index or pointer, attached to the magnet, which can deflect only a short distance to the right or left of its zero, on account of the stops. The alphabet is formed by movements of the needle or pointer to the right or left. A turn of the top point of the needle to the left indicates a dot, a turn to the right a dash. Thus A is made by a movement to the left and one to the right; H by four movements to the left.

The interior of the apparatus consists of two helices of fine silk-covered copper wire, in the middle of which is suspended a small magnetic needle, having at the end of its axis a pointer, seen on the outside face of the instrument. There is also a current, changing key, the two knobs of which protrude through the front of the instrument near the base. The key is represented in Fig. 2. L and E are two levers connected respectively with the line and with earth. When they are not depressed, they both press against the upper bar, C, which is connected with the positive pole of the battery. Either lever can be depressed so as to come in contact with the bar, Z, which is connected with the negative pole of the battery. If L is depressed, a negative current flows into the line; and if E is depressed, a positive current flows into

FIG. 2.



the line. The receiving instrument at the other end of the line is so constructed that the depression of the left hand key causes a deflection of the pointer to the left; a depression of the right hand key, a deflection to the right. The needle, S N, and pointer, a b, are shown in Fig. 3.

FIG. 3.



The alphabet used in England contains precisely the same combinations as the Morse alphabet, but differently expressed.

THE HEBERLEIN BRAKE.

Herr Von Heberlein, Locomotive Superintendent of the Royal Bavarian States Railway, has recently invented a novel railway brake which, it seems, is eliciting considerable attention on the continent. The device, which we find described in the *Engineer*, is not a continuous brake, though it may be fitted to every vehicle in the train. The inventor prefers to divide the train into sections, including one brake car in each, and the operator in this car can apply the brake to his own coach, and to one or more others in connection with it.

The brakes are applied to the wheels by the agency of a friction pulley which engages with a friction wheel on one of the axles of the engine or of the brake car above noted. The revolution of this friction wheel winds up a flat link chain, like that of a watch, and this, pulling on a set of rods under the carriages, applies the blocks to the wheels. The pulley is of iron, but the friction wheel on the axle is built up of wooden segments, with grain radiating, and jammed between two plates set up tight with screws and nuts. The wheels of the brake car are not intended to stop running. The friction wheel instantly revolves, and its friction against the iron pulley supplies the force which applies the brake.

The mode of throwing the apparatus into action is exceedingly simple. A line extends over the roofs of the seats from end to end of the train. By pulling this cord, a detent is thrown out of gear, and the friction pulley, which is hung on a weighted

bell crank lever, is suffered to fall into contact with the friction wheel on the axle, and the brake is applied as soon as the train has run far enough to wind up the slack of the chain. The cord is kept taut, so that in case a car run from the track or become detached, a strain is brought upon the line and the brakes instantly applied. Similarly also the same effect can be produced by any of the employees about the train, as readily as they can now pull the ordinary bell cord.

The *Engineer* says that, on trials with the invention on an English railway, no jar was apparent on the application of the brake, which was fitted to the two cars at each end of a train of five. On the first test all the brakes were applied, both to the engine and train, up an incline of 1 in 123, and round a curve, speed about 35 miles per hour; train stopped in 135 yards, and in 19 seconds. Another case is given on the Royal Hanoverian Railway, with a train weighing 76 tons, with 17 axles, to eight of which the Heberlein apparatus was applied, when the train, traveling 35 miles per hour, was stopped on a down grade of 1 in 64 in 25 seconds.

SOUTH AFRICAN WONDERS—EXPLOSIVE DIAMONDS AND TURTLES WITH TEETH.

Diamonds liable to explode spontaneously, and turtles provided with canine teeth, are two natural marvels indigenous to the fields of Southern Africa. The former are found at the present time, the latter existed ages ago, and are recognized by their fossil remains which have been discovered in the same deposits with the gems. One of these disintegrating diamonds is represented in our first engraving in its na-

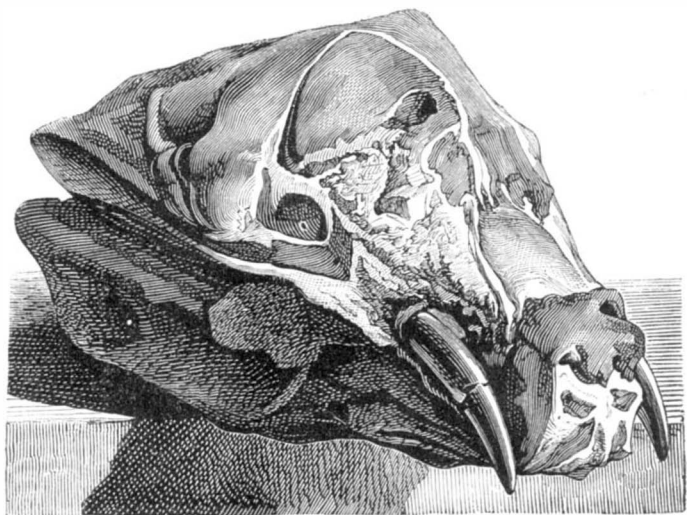


EXPLOSIVE DIAMOND, IN ITS NATIVE SANDSTONE.

tural size. It is a rounded octahedron, imbedded in a conglomeration of fine grained sandstone. Some idea may be gained of the richness of the South African beds from the fact, it is stated, that more than three thousand diamonds have been found during the past eight months. The mines are of two distinct kinds; the first, called "dry," are located in the centers of plains, and consist of layers of rock, in which the precious stones are mingled with garnets, pyrites,

etc.; the others, termed "river mines," are established on the beds or banks of water courses, and the diamonds in these are mixed with agates, emeralds, and chalcedony. In both, however, the gems are rarely found other than in a fragmentary state, and this is ascribed to the strange peculiarity of the finest and largest stones in suddenly disintegrating or exploding. Ordinarily rupture takes place during the first week after the diamond is brought to light, but cases are known where it has occurred three months subsequently. It is said that covering the stone with tallow will prevent the trouble; but of course, if the grease has to remain permanently upon the diamond to preserve it, its value is destroyed.

Although the geological age of the African diamond fields has not been absolutely fixed, it is generally believed that they date from the triassic epoch. In the strata are found the remains of crocodiles, denosaurians, labyrinthodontes, and other monsters of antiquity, but the most interesting and curious are those referred to in the beginning of this article. The skull, from which our engraving was made, strongly resembles that of the turtle, but it has two long tusks analogous to those of the walrus. Professor Richard Owens, who has profoundly studied this remarkable fossil, believes that the animals, or *dicynodontes* (the name is derived from the Greek, and means literally two dog's teeth), were, when living, oviparous, cold blooded, and yet with pul-



FOSSIL SKULL OF A TURTLE WITH TEETH.

monary respiration; and he also recognises peculiarities which ally them closely to the lizard family. Huxley is of opinion that they were provided with long tails. The peculiar genus to which the reptile, the remains of which our engraving represents, belongs is termed *ptychognatus*, and the species, *depressus*. The bones are not perfectly preserved, and were found in hard sandstone of fine grain and greenish color. In the lower jaw two cavities are noticeable, resembling incisive alveolæ which may be really rudimentary teeth.

The characteristics of the animal are remarkable from the fact that they seem borrowed from those of creatures most widely separated in Nature. As a whole, the bones indicate a reptile between the lizard and tortoise. That is, the forward portion of the head resembles that of the former; and the edges of the edentulated jaws, covered during life with a bony covering like a beak, relate to the latter. The oblique manner of opening the mouth recalls the same peculiarity in certain fish. Huxley, on the other hand, asserts that the nostrils and various points in the osteology are those of birds. The tusks are more analogous to the teeth of mammals, while the sutures of the skull resemble those of the latter, and are never met with in the case of reptiles.

Sunday Science.

There exists in Switzerland a "Society for the Observance of the Repose of Sunday" (*literatim*), and this body invites the views of the world generally on the subject of resting on the Sabbath, considered from a hygienic point of view. A prize of two hundred dollars is offered to the author of the best essay on the question. The points requiring especial discussion are: (1) The favorable effects of rest on Sunday on people of various ages, and their influence on the family and the nation. (2) Diseases which may be engendered or increased by continuous work in persons who, by the nature of their calling, are deprived of this weekly recreation, as, for instance, railroad employees, journalists, telegraph operators, bakers, etc. (3) Practical results drawn from the observation of cited facts. The essays must be written in French or German, and sent in, before September 30th next, to the President of the above named society, at Geneva, Switzerland.

THE NEW AUSTRIAN ATHENÆUM.—An institution destined to survive the Vienna Exposition, and at the same time to serve as a memorial of that event, is the Austrian Athenæum, an establishment founded in the interest and for the instruction of mechanics and working men, and constructed after the plan of the *Conservatoire des Arts et Métiers*, in Paris. Large numbers of articles left by exhibitors at the Exposition have been transported thither, together with a quantity of models and other instructive apparatus, and a library of 3,412 volumes.

MORE valuable and practical information is furnished to the readers of the SCIENTIFIC AMERICAN, through the correspondence columns of this paper, than can be obtained from any other source.

THE SIAMESE TWINS.

The autopsy on the bodies of the Siamese twins has, at last, been consented to by the relatives, and the remains have been transported to Philadelphia. A commission, consisting of Drs. Pancoast, Allen, and Andrews, recently visited the place of residence of the twins, and, after considerable persuasion, succeeded in overcoming the scruples of the two families. The bodies, which had been deposited in cases packed with charcoal, were removed from their temporary sepulcher and carefully examined. Slight change had taken place in their appearance; but as the rapid setting-in of decomposition was feared, the physicians decided to postpone operations until the remains could be taken to Philadelphia, where every facility for a thorough investigation would be at hand. A number of photographic views were accordingly taken, after which a partial embalment was completed, when the bodies were packed into an airtight tin chest and forwarded to their destination. At the time of writing the dissection has not been completed, and public curiosity, now fully aroused regarding the matter, will look with much interest for the forthcoming report. The main question to be decided will be settled as soon as the knife severs the connecting ligature. Opinion now inclines principally to the belief that the strange band contains a large artery and many veins, which made the circulation in both bodies identical. This was the view held by many eminent British surgeons, Sir Benjamin Brodie among the number, and appears to be substantiated by the fact of a compression of the ligature causing the fainting of the weaker brother. On the other side is no less an authority than Nélaton, the great French surgeon, who always maintained that separation could be safely effected, while the family physicians of the twins consider that the circulation in either body was entirely independent from that in the other. The post mortem, in deciding this interesting point, will also necessarily determine whether Eng died from the shock due to the realization of his brother's death, or from a cessation of the flow of his blood.

The illustration which we give herewith conveys an excellent idea of the appearance of these remarkable people. They were of decidedly ugly faces—our picture rather flatters them—and were far from amiable in temperament. Eng was the smaller, and generally stood in the peculiar position represented, bent somewhat backward. The details of their early history are somewhat meager. It is said they belonged to a low order of peasantry, and were born in Siam in 1811. Captain Abel Coffin, of Newburyport, Mass., found them in the city of Meklong, and bought them from their mother. In 1850 Barnum brought them before the world, since which time they have been exhibited throughout this country and Europe. Their subsequent history we have already sketched in a previous notice of their death.

How to Keep a Situation.

An observing correspondent in the *Western Rural* gives the following hints on the above subject:

Be ready to throw in an odd half hour or an hour's time when it will be an accommodation, and don't seem to make a merit of it. Do it heartily. Though not a word be said, your employer will make a note of it. Make yourself indispensable to him, and he will lose many of the opposite kind before he will part with you.

Those young men who watch the clock to see the very second their working hour is up—who leave, no matter what state the work may be in, at precisely the instant—who calculate the extra amount they can slight their work, and yet not get reproved—who are lavish of their employer's goods—will always be the first to receive notice, when times are dull, that their services are no longer required.

The Telephon.

This instrument, popularly known as the "steam jackass," is the invention of a farmer in Illinois. This gentleman was the owner of a mule possessed of unusual ability for producing sweet sounds, it having been ascertained that his voice could be heard over a circle of eight miles diameter. The mule was killed, and the inventor severed the head from the body. The head was then carefully preserved from decay, and the inner organs were covered with a substance that was impervious to steam. We are indebted to the *Brooklyn Eagle* for a description of the first trial of the invention.

"A short piece of rubber hose was attached to the windpipe and connected with a steam boiler. It was a moment of agony to the inventor, as he placed the head in the hands of an assistant and slowly pulled the valve open, a moment of thrilling interest; as the steam was turned on, it passed into the windpipe, expelling the air and producing a sigh followed by a groan, a snort, a chuckle, then a violent coughing and sneezing. As a full head of steam was turned on, the most fearful noise, the most frightful guffaw, the most vociferous bray, that ever assailed mortal ears was produced. The lips were contracted, disclosing a terrible array

of teeth; the features developed a satanic grin, and the jaws rose and fell as the steam crowded the passages; and the ears participated in the general movement, giving to the head an excited and animated appearance. The man who was holding the head gazed upon it a moment with dilated eyes, colorless cheeks, knocking knees and protruding tongue; then, suddenly losing all interest in the performance, he emigrated. As for the inventor, his success ex-

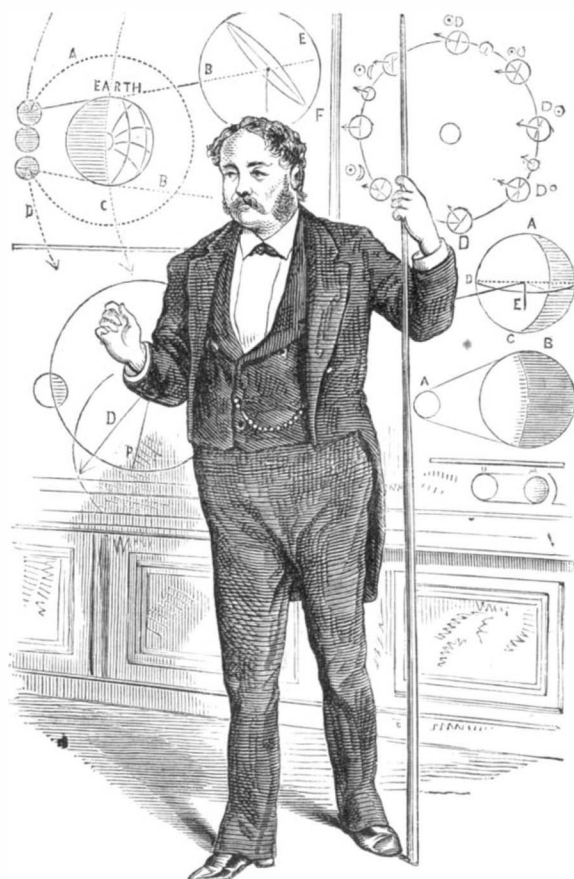


THE SIAMESE TWINS.

ceeded his most sanguine expectations. For an instant he contemplated the head, his countenance working with every manifestation of intense delight; then he, too, started, probably to learn the greatest distance to which that voice would penetrate."

PROFESSOR R. A. PROCTOR.

There are few instances on record of a man attaining so distinguished and, withal, so well earned a reputation, in so



short a period of time, as that of the eminent astronomer who has recently delighted the public of this city with his admirable lectures on the wonders of the heavens. Professor Proctor is now in the thirty-seventh year of his age; and although he gained honors in his collegiate course, and at-

tracted some attention by literary efforts as early as 1863, it was not until 1865 that he definitely adopted the profession in which he is now universally admitted to be one of the ablest masters. To his celebrated controversy with the English Astronomer Royal, regarding the proper method of observing the coming transit of Venus, ending in the virtual defeat of the latter, and the subsequent corroboration of Professor Proctor's views by the first American, Russian, and German astronomers, we have already found occasion to allude; and with his published works, the clearest popular expositions of modern knowledge regarding the constitution of the celestial bodies extant, we presume our readers to be already familiar. His books are a remarkable combination of lucid and vigorous expression with scientific accuracy; and while never superficial, their subjects are treated, even when most abstract and uninviting, in a semi-imaginative manner, which lends to them a charming freshness and interest.

Professor Proctor's most recent work is a collection of essays on topics more of a general than of a purely scientific interest. Lack of space at present at our disposal prevents our here alluding to the "Border Land of Science" in such detail as we could wish, and hence we reserve its review for a more fitting opportunity. We may remark, however, that the author undertakes, in its pages, voyages to the sun and to Saturn, tells about life in Mars, and even ventures into the shadowy realms of ghosts, only, however, to demolish those vagaries of the brain, by the bright light of scientific investigation and logical deductions of cause and effect.

Professor Proctor is of genial and pleasant appearance, and is a fluent and ready speaker. His lectures are excellent even as literary efforts; and although in some instances technically above the ordinary scientific discourse as usually adapted to the comprehension of a general audience, they nevertheless are so agreeably delivered and so brilliantly illustrated, that the interest of his hearers is kept constantly alive from beginning to close. An artist contributes a sketch as he appears upon the platform.

To Destroy Insects.

Hot alum water is a recent suggestion as an insecticide. It will destroy red and black ants, cockroaches, spiders, chintz bugs, and all the crawling pests which infest our houses. Take two pounds of alum and dissolve it in three or four quarts of boiling water; let it stand on the fire until the alum disappears; then apply it with a brush, while nearly boiling hot, to every joint and crevice in your closets, bedsteads, pantry shelves, and the like. Brush the crevices in the floor of the skirting or mop boards, if you suspect that they harbor vermin. If, in whitewashing a ceiling, plenty of alum is added to the lime, it will also serve to keep insects at a distance. Cockroaches will flee the paint which has been washed in cool alum water. Sugar barrels and boxes can be freed from ants by drawing a wide chalk mark just round the edge of the top of them. The mark must be unbroken or they will creep over it, but a continuous chalk line half an inch in width will set their depredations at naught. Powdered alum or borax will keep the chintz bug at a respectable distance, and travelers should always carry a package of it in their hand bags, to scatter over and under their pillows, in places where they have reason to suspect the presence of such bedfellows.

The Taylor Steam and Hydraulic Cotton Press.

About a year ago, we illustrated an improved form of steam and hydrostatic cotton press, the invention of Mr. John F. Taylor, of the Phoenix Iron Works, Charleston, S. C., and in the accompanying description, page 15, volume XXVIII, the reader will find a full explanation of its working. The power is transmitted to the oil, water, or other liquid in the press from the pistons of two steam cylinders, which act upon the plate alternately, one imparting the initial and the other the finishing pressure. The latter is operated by live steam from the boiler, and the former is actuated by the exhaust. The steam is thus used twice over, on the compound principle, thus effecting no inconsiderable saving of fuel.

One of these machines has recently been erected in the warehouse of Mr. E. C. Pentz, foot of West 11th street, in this city, where it is now in operation re-pressing cotton for shipment. The motion of the apparatus is uniform and entirely free from jar, and its capabilities are stated as extending to the pressing of 100 bales of cotton per hour. The inventor submits testimonials to the effect that 700 bales have been pressed in a working day of ten hours. The power of the machine is 2,006,400 lbs. under 80 lbs. of steam. A continuous and steady pressure, we understand the inventor to assert, is maintained so long as steam is kept up in the boiler. The construction is strong and simple, and there appears to be a notable absence of pumps, valves, and other portions liable to be quickly worn out.

The sand blast is said to work well in cleaning the walls of iron and stone buildings.

Geographical Progress in 1873.

Judge Daly, in an able address before the American Geographical Society in this city, of which he is the President, recently reviewed the progress of explorations and other efforts toward increasing our geographical knowledge, made during the year just ended. The lecture was an exhaustive review of the whole subject and a summing up of the results obtained. The utility of geographical societies as organized means of promoting geographical discovery, as well as the necessity for their existence, is proved from the fact that there is yet one seventeenth part of the globe of which we know nothing except by conjecture.

The region which surrounds the south pole, the antarctic, covers an area of 7,000,000 of square miles. The arctic measures nearly 3,000,000. The unexplored portion of Africa may be put down at least as 1,000,000. The unknown part of Australia is certainly more than two thirds of that amount; and in this connection, attention may be drawn to the great islands of the East Indian Archipelago, stretching from the northeast corner of Asia to New Zealand, occupying the most favored part of the earth, and which have in extent the magnitude of a continent. One of this great group, Borneo, is considered the second largest island on the globe. A strip along the coast of about 100 miles deep represents what we know of it; the interior and larger portion remains unknown. So also of Papua or New Guinea, which is as large and may even be larger than Borneo. Sumatra is 1,000 miles in length, and Celebes and Luzon are inferior only to Sumatra; and there are in addition numerous islands of considerable size, some as large as Ceylon, and thousands of minute islands, many abounding in spices and mineral ores.

Regarding recent

ARCHAEOLOGICAL DISCOVERIES.

the speaker stated that late excavations made in Rome have revealed that the ancient city, before the Republic, in the time of the kings, was large and strongly fortified, and must have contained an immense population. This is contrary to the impressions of modern historical critics. The foundations of the ancient city have been laid open, which consist of enormous works, many of which were great tanks and wells. The foundations are constructed of oblong blocks of tufa, put together without mortar, the style of building being the same as found in the ruins of Etrurian cities.

Dr. H. Schlieman terminated his excavations upon the supposed site of Troy last summer. He thinks that he has discovered Skaean gate, Priam's palace, and the great wall described by Homer. He writes of his discovery of a great wooden box containing jewels, precious stones, ornaments, and arms, such as battle axes, shields, and an immense goblet of pure gold, with two handles and two mouths, which box, he says, has disappeared. In the island of Delos a whole temple has been laid bare and the ruins of a whole city discovered, and additional excavations, attended with important discoveries, have been made in Pompeii.

A stone has been found on a farm in Parahyba in Brazil containing an inscription, which, upon examination, was found to be in Phœnician characters, which would prove that the Phœnicians had visited America at a very early period.

After fully referring to the various surveying expeditions in Central and South America,

ASIAN EXPLORATIONS

were noted, and it was stated that the Russian campaign which culminated in the capture of Khiva has produced valuable geographical results. The most important information of changes is the addition of the right bank of the Oxus to the Russian dominions, embracing the country north of that river, east of the Sea of Aral. Forty thousand slaves have been liberated in the conquered territory, and slavery has been abolished for ever.

Mr. Jacob Halevy has explored the southern part of the Arabian Peninsula, through the interior of Yemen, a country little known and where traveling is perilous. His journey extended from Hodegeda, on the Red Sea, in a northerly direction, through the Wadi Flabouna, 18° 55' north latitude.

In this part of the country he found many Sabœan inscriptions, and saw the source of the River Kharid, which runs toward the interior of Arabia and disappears, after fertilizing the numerous oases of the Djaouf. He believes this to be the river which is alluded to in a passage of Strabo as having been crossed by a Roman army, Aelius Gallus, before entering the country of the Sabœans. Innumerable ruins in a crumbling condition, he says, cover the soil on the banks of the Kharid and its affluent, the Medheb.

THE ANCIENT JERUSALEM.

Concerning the explorations in Jerusalem, the speaker said:

The details of this work, which occupied nearly three years, are too numerous to enter upon; shafts were sunk below the present city in various places to a considerable depth, and discoveries were made of extensive subterranean passages and galleries, winding aqueducts and canals which were cut in the solid rock, chambers, drains, sewers, wells, and tanks. A stream of running water was found, showing that fountains exist far below the surface, and are still running, a circumstance of interest, as there is now a dearth of water in Jerusalem. Inscriptions in the Phœnician characters in red paint were found upon walls, and many objects of interest were gathered, such as lamps, pottery, weights, seals, gems, and sepulchral chests, some of them very beautiful, containing human remains. An attempt was made to determine the exact position of parts of the Temple and the

site of Solomon's palace; but while the investigations have had the effect of disturbing many of the previous theories as to the precise locality of places, they have not been sufficiently certain to remove doubts, or dispense with further inquiry.

THE PENINSULA OF SINAI

has been surveyed by Professor Palmer and Dr. Drake, and they conclude the locality to be the scene of the events recorded in the history of the Exodus, and its examination has certainly furnished a remarkable corroboration of the truthfulness and accuracy of the Biblical history. The country is extremely wild and rugged, and has one of the most complicated systems of drainage in the world. Formerly it was well wooded, its mountain sides terraced with gardens; its rushing waters regulated and utilized; and this fertility lasted until comparatively modern times. Jebel Musa is considered to be undoubtedly the Mount whence the Law was delivered.

PALESTINE.

The country lying east of the Jordan and of the Dead Sea has been undertaken by the American Palestine Exploration Society. It embraces the part of Palestine which is the least known, and is in territorial extent three times as great as the country surveyed by the English. It abounds in ruins, inscriptions and objects of great interest, and its exploration will undoubtedly throw a great deal of light, not only upon Biblical history but upon the former history of the whole country lying midway between Ancient Assyria and Egypt.

Lieutenant Steever has spent about five months in explorations east of the Jordan. He has surveyed about 600 square miles, and has prepared a very valuable map. The explorations were in Edom and Moab. Various sites have been satisfactorily identified, and the positions of Mounts Nebo and Pisgah determined. The levels of many important spots were taken, a number of ruins in Moab examined, and interesting inscriptions copied.

AFRICAN EXPLORATIONS

are represented to be less fruitful in positive results than those of former years.

MM. Compeigne and Marche have undertaken to penetrate Equatorial Africa in the vicinity of the Gaboon. Their object was to trace the course of the Ogoone and the lakes to which it is supposed to lead, one of which is reported to be very large. The last accounts of Dr. Gandy, the commander of the West African Livingstone Expedition, are that he left San Salvador, the farthest point in the Portuguese dominions, for the country east, which is nearly a blank upon our maps. A German expedition, organized by Dr. Bastian and the Berlin Geographical Society, left last spring for the exploration of Loango.

With a glance at the reports of exploring expeditions in Australasia, Judge Daly concluded his survey with a reference to the telegraphic event of the year, which he thinks has been the completion of a line of telegraph across the entire length of Australia, from south to north, from Adelaide in the south to Port Darwin in the north, a distance of 2,012 miles.

The completion of the telegraph across Australia gives a line, from Adelaide to Gibraltar, of 12,462 miles, of which 9,146 miles are submarine. The practical result is that Australia now receives news three weeks earlier than the latest brought by the mail steamers.

Correspondence.

Air Poison and its Remedy.

To the Editor of the Scientific American:

The effects of fresh air upon the human system are well known to be renewed strength, increased vital force, and heightened complexion; while the fetid atmosphere of close rooms produces pallor, weakness, and diminution of the mental capacity. It is remarkable that the same body, air, should have such diametrically opposite effects under but slightly altered conditions.

After the discovery, in the last century, of the composition of atmospheric air—which is about one fifth oxygen and four fifths nitrogen—it was ignorantly believed to be the absorption of oxygen by breathing, and consequent relative increase of nitrogen, that made the air of crowded rooms noxious; but analysis abolished this idea, and proved that the relative proportions of the two gases are always the same. The oxidation of the carbon supplied by our food causes the gas exhaled from the human frame to be largely composed of carbonic acid; but the chief impurities of the air, which cause decay and putrefaction of organic matter, are the living vibrios, which multiply so rapidly that, were it not for the eternal compensation of natural forces, they would soon suffocate all other life off the earth. Their fell enemy is ozone, which is oxygen in a negatively electric state, and exists in our atmosphere in a proportion varying from one ten-thousandth to one one-hundred-thousandth. Ozone is generated by lightning flashes, which have been truly said, from time immemorial, to clear the air. The evaporation of saline solutions also disengages ozone, which is always found in increased proportion on and near the sea. Being more dense, and one and a half times more heavy, than oxygen, it descends to the earth, from which the vibrios ascend. It has also a strong phosphoric smell, and has the important property of combining with all bodies, except gold, platinum, and water. This property is its great weapon in the destruction of the vibrios.

The open air is the space in which ozone continually rules,

while the vibrios have the supremacy in close and fetid places where ozone is very seldom or never recognized. Every breath we take in such places begins to poison and to weaken our system, while every breath in the open air neutralizes poisonous agents and renews strength. D.

The Aboriginal Americans.

To the Editor of the Scientific American:

There is, I think, abundant evidence that the osseous structure of the mound-building aboriginal peoples differed, to some extent, from that of all the present inhabitants of the globe, after making due allowance for individual peculiarities.

In my researches in this country, which was at one period densely populated by the mound builders, I have never seen anything resembling the short, strong bone running from the sixth cervical vertebra to the scapula, mentioned by Mr. R. K. Slosson, on page 244 of your volume XXVIII., and am inclined to look upon such a bone (if found) as a *usus nature*; but I have found several bones that I am unable to classify or pronounce upon, among which are the submaxillaries, of which I wrote you some time since.

I have a genuine mound builder's skull, which, although somewhat decayed, is a marvel to all who behold it and contrast it with what we know of modern man. There are marks on the skull caused by the copper ornaments with which this once noted character (for such he undoubtedly was) was buried. The man who stood under that skull was probably a stranger to disease, and knew no such thing as fear. A rifle ball would hardly fracture or enter his head, if it were to strike it in any way but perpendicularly. There is a peculiar formation where the muscles of the neck were attached, such as none of us ever saw before. This skull is an object of deep interest, and most especially would I call the attention of all phrenologists to a specimen so rare. The copper crown, with which his head was discolored, was so far decomposed that I was unable to save it.

Yellowbird, O.

S. L. N. FOOTE, M.D.

Glue as a Healing Remedy.

To the Editor of the Scientific American:

For the last twelve or fourteen years I have been employed in a shop where there are over three hundred men at work; and, as is the case in all shops of this kind, hardly a day passes but one or more of us cut or bruise our limbs. At first there were but few that found their way to my department to have their wounds bound up; but after a while, it became generally known that a rag glued on a flesh wound was not only a speedy curative, but a formidable protection against further injury. I was soon obliged to keep a supply of rags on hand, to be ready for any emergency. I will here cite one among many of the cases cured with glue.

A man was running a boring machine, with an inch and a quarter auger attached; by some means, the sleeve of his shirt caught in the auger, bringing his wrist in contact with the bit, tearing the flesh among the muscles in a frightful manner. He was conducted to my department (the pattern shop), and I washed the wound in warm water, and glued around it a cloth, which, when dry, shrank into a rounded shape, holding the wound tight and firm. Once or twice a week, for three or four weeks, I dressed the wound afresh, and it was well. The man never lost an hour's time in consequence. The truth of this statement hundreds can testify to. I use, of course, the best quality of glue.

Racine, Wis.

J. A. FIELD.

The Hartford Steam Boiler Inspection and Insurance Company.

This company's report for 1873 has recently been received. It is an unusually interesting and important paper, and the brief summary that we give below does but scant justice to its merits.

Inspections in 1873: Internal, 8,511; external, 23,312—total, 31,823.

Defects discovered: Furnaces out of shape, 599; cases of fracture, 1,003; burned plates, 682; blistered plates, 1,737; cases of deposit of sediment, 2,263; cases of incrustation and scale, 2,180; external corrosion, 818; internal corrosion, 333; internal grooving, 206; defective water gages, 561; defective blow-out apparatus, 253; defective or overloaded safety valves, 321; defective pressure gages, 1,470; boilers without gages, 682; cases of deficiency of water, 113; cases of loose and broken braces and stays, and insufficient bracing, 465—total, 13,866.

Boilers condemned in 1873, 178.

Boiler explosions in the United States in 1873, 88; number of persons killed, 139; number of persons wounded, 164.

Cases of distortion and fracture of furnace sheets occur from low water, deposits of sediment, and a cold water feed. It is economy to heat the feed water, because it both saves fuel and prevents wear and tear. Sheets are liable to be fractured, if boilers are blown down when heated. Blisters in plates occur from the use of iron which is not homogeneous. Blisters should be cut off; and if the thickness of the plates is much reduced, patches should be put on. The deposit of sediment gives the most trouble to steam users. When the feed water contains carbonate of lime, it will be deposited in a hard mass, if the boiler is blown down when hot; but it can be washed out, if the boiler is first allowed to cool. Grease in the boilers seems to combine with the carbonate of lime, and sink down upon the plates, keeping the water from them and causing overheating and burning. Feed water heaters, with separating plates or chambers, seem to work well when the water holds solid substances in solution. The deposits of sulphate of lime are the mos

troublesome. Potatoes and slippery elm seem to prevent and remove scale in many cases. Substances containing tannic acid also seem serviceable with some kinds of water. There should be frequent blowing off when these solvents are used. Crude petroleum seems to prevent scale when the water is principally impregnated with sulphate of lime, but is not recommended where the carbonate of lime is the principal foreign ingredient.

External corrosion is frequently caused by the exposure of boilers to the weather, and by leakage and dripping. It is a bad practice to put ashes on top of the boiler, wood ashes being the most liable to produce corrosion. Coatings of felt or calcined plaster can be used with benefit. Ashes are frequently allowed to accumulate in the ash pits of boilers, and, becoming wet, produce corrosion.

Internal corrosion is caused by scale, or by acid in the water. If the latter occasions the trouble, the surest remedy will be to abandon the water and get a supply from another source. The dyes discharged from factories into streams frequently render the water unfit for use in boilers. This difficulty can sometimes be remedied by neutralizing the acid by the use of soda or soda ash. It should be remarked, however, that all the solvents and neutralizers mentioned above should be used with great caution, as their indiscriminate application is frequently productive of more harm than good.

Internal grooving or channeling probably arises from unequal expansion and contraction, in connection with the use of impure feed water. Glass gages are sometimes stopped up by a mixture of grease with the impurities of the water. The lever safety valve is most commonly used, and, under the care of a competent and reliable man, is all that is needed. It should, if possible, be so arranged that it cannot be tampered with. It should be raised every day, in order to prevent corrosion and sticking to the seat. Pressure gages should be tested every few months. The height of the water in a boiler should always be ascertained before starting the fire. It is not unusual to look after the fire first and the water afterward; and in many cases, boilers have been nearly ruined from this cause.

Many boilers are braced imperfectly, or not at all. Boilers are frequently left without examination for months, and the bracing becomes defective. Steam users take too many chances, under the advice of boiler makers who are ignorant or careless.

The above will be sufficient to show that there is no need of mysterious theories to account for boiler explosions. Boilers, with the best of care, will wear out, and the process is much hastened if they are improperly set and badly managed.

The Company employs about 30 inspectors, who inspect the boilers under their care quarterly and semi-annually. Defects, when discovered, are pointed out; and unless they are repaired, the Company's liability ceases.

SCIENTIFIC AND PRACTICAL INFORMATION.

ADULTERATIONS IN YELLOW AND RED CHROMES.

The yellow and red chromates of lead, employed as pigments, frequently contain sulphate of lead. This substance is insoluble in strong nitric acid, and in this way it can be detected; but a neater and more convenient method, proposed by Dr. Julius Löwe, consists in the use of hyposulphite of soda. The finely pulverized pigment is placed in a moderately concentrated, cold solution of pure hyposulphite of soda, when the sulphate of lead readily dissolves, leaving the chromate unacted upon. After filtering, the filtrate may be tested for lead by adding a solution of the neutral chromate of potash, when the yellow chromate of lead will be precipitated. If it is desired to ascertain the amount of the sulphate of lead present, it may be precipitated by sulphuretted hydrogen gas, or by sulphide of ammonium, as sulphide of lead, which is then purified and converted into sulphate of lead by the use of fuming nitric acid, and weighed. This method is preferable to the one depending on the insolubility of sulphate of lead in nitric acid, as proposed by E. Duvillier recently, since there might be other insoluble adulterations present, as, for example, barytes.

THE DETECTION OF BLOOD SPOTS.

M. Sonnenschein states that tungstate of soda, strongly acidulated with acetic or phosphoric acid, throws down albuminoid matters from very dilute solutions. These precipitates, insoluble in a large excess of water, dissolve in alkalies, especially if hot. If defibrinated blood is treated with this salt, a red brown precipitate is formed, which becomes clotty on boiling. All the coloring matter is precipitated. To detect blood spots by this means on clothing, the suspected portion is cut off; and after having been treated with distilled water, the filtered solution is precipitated with the above reagent. The precipitate, washed and treated with ammonia, takes a reddish grey color. If phosphoric acid be present, it must be carefully washed away before treating the precipitate with ammonia.

THE TELEGRAPH IN CHINA.

The Great Northern Telegraphic Company has recently established a line between Woosung and Shanghai. Twenty words are sent for a dollar. This is the first successful attempt to introduce the telegraph through the main portion of the empire, as previous efforts have been met with violent opposition from the people, who cut the wires and destroyed the poles.

NITRITE OF AMMONIA.

M. Berthelot has recently succeeded in producing this body for the first time in a crystalline state. Nitrite of baryta is placed in sulphate of ammonia. The precipitated sul-

phate of baryta is collected on a filter, leaving the nitrite of ammonia in solution in the liquid. The crystallization of the latter cannot be obtained by heat, as the same causes a rapid decomposition of the substance; hence the liquid is placed under the receiver of an air pump, with very hygroscopic materials. In spite of these precautions, however, and although the operation is conducted at the freezing temperature, about two thirds of the product become decomposed. The balance, however, is pure nitrite of ammonia, crystallized in white needles. The body is remarkable for its explosive properties, detonating violently at 165° 2' Fah., or by reason of a shock, with a force nearly equal to that of nitro-glycerin.

A CIRCULAR COMPASS NEEDLE.

M. E. Duchemer has addressed a note to the French Academy, in which he claims that a circular compass needle possesses the following advantages over the usual form:

1. A magnetic power, for a given diameter, double that of a needle whose length is equal to this diameter.
2. The existence of two neutral points instead of one, which has the effect of maintaining the position of the two poles constant; the magnetism seems to be so energetically preserved that even the strongest sparks of a Holtz machine do not cause any displacement of the poles of the magnet.
3. A more satisfactory means of suspending the magnet when it is well mounted and balanced by a plate of agate; it seems then to move as if placed in a liquid.
4. An increase in sensibility of the magnet proportional to its diameter.
5. The possibility of neutralizing the magnetism of the vessel by means of a second magnetic circle, changing the position by an amount calculated beforehand, and thus permitting the compensation of the compass before the sailing of the vessel. This idea was suggested by Captain D. Venie.—*Comptes Rendus*.

NEW EXPERIMENTS IN CONVECTION.

The phenomenon of convection of heat in a liquid, consisting in that the superior portion of the mass is always at a more elevated temperature than the lower part, can be clearly illustrated by the following novel experiments:

Two glass tanks are placed before a white surface; one is filled with cold and the other with boiling water. A solution of starch is freshly prepared in a large test tube, and, by the addition of an aqueous solution of iodine, colored a deep blue. The liquid is then warmed until this color just disappears, care of course being taken not to add an excess of iodine, which would prevent this action; and the tube is then plunged into the cold water. The blue color, brought back by the cooling, will appear first in the lower portion of the tube, and will gradually extend upward, thus proving that it is the lower portion of a warmed liquid which first becomes sufficiently cooled to cause a return of the tinge.

In the other tank, containing boiling water, a similar test tube, containing a blue liquid obtained by the addition in excess of caustic potash to a solution of sulphate of copper and tartaric acid, to which a little grape sugar is added, is placed. The formation of yellow oxide of copper begins at the surface of the liquid and descends gradually to the lower portions, showing that it is the upper part which first attains the temperature necessary to cause the re-action which precipitates the oxide of copper.

The Fireproof Building Company.

On January 12, a fire test was made of the Fireproof Building Company's concrete, at their works, corner of Corlears and Cherry streets in this city. Below we give the details, which will doubtless be interesting to our readers: The company had constructed a small house, and a model of a mansard roof. The latter was open at the top, and was made with wooden rafters, covered on both sides with the concrete blocks, the inner blocks being 1½ inches in thickness, and the outer ones, 2½ inches. The inner blocks were hollow, and the outer solid. A part of the outer covering was slated, and a small space was covered with plastic slate roofing, which consists of ground slate mixed with a residuum of coal tar until it acquires the consistency of common mortar, and is then applied with a trowel to a double layer of felting, the slate mixture having a thickness of about ¼ of an inch. This was arranged so that the edges were not exposed, being covered by the common slate. A fire was made both within and around this model, and was allowed to burn for 35 minutes. During its continuance, loud explosions occurred, caused by the hard finish breaking off from the inside of the blocks, the material not having been thoroughly dried. When the fire was extinguished, it was found that the ordinary slate had crumbled to a serious extent, while the plastic slate was uninjured. The concrete blocks were apparently unchanged.

The next test was made with the house. This was a small building about 8 feet square, and the same height. It was built near the factory chimney, with a flue running into the chimney. The walls were 7½ inches thick, and an inside wall, also 7½ inches in thickness, was built on one side, a hole being made in the outer wall on that side, so that a thermometer could be inserted. The walls were made of solid blocks. The roof of the building was composed of wooden rafters, covered with solid blocks 4 inches thick, and having blocks, 2 inches in thickness, suspended from the bottoms of the rafters. The floor was constructed in a similar manner. A large fire was made in the house with logs soaked in oil, and was allowed to burn for 50 minutes. After the fire had been burning for 20 minutes, the inner wall had hardly become heated through. The space between the two walls was filled with steam after the fire got well under way. During this test a large block of concrete with three holes in it had a piece of wood put into one, some paper into the

other, and a handful of shavings into the third. The holes were then closed with cement, and the block was thrown into the fire, a bucket of oil being also thrown in immediately afterwards. After the fire was extinguished, a workman, reaching into the building, chipped away pieces of the floor and ceiling blocks. The beams were thus exposed, and they were found to be damp and scarcely warm to the touch. The large block was broken open and its contents were found to be in a similar condition. After this test, the visitors were shown a floor, built of these blocks, and weights were put upon it to prove its strength.

The blocks with which the foregoing experiments were made are composed of cement, consisting chiefly of the hydraulic lime of Teil, which is said to combine great strength with lightness. The blocks used for partitions have been found capable of resisting a crushing force of 800 pounds per square inch, and the weight of these blocks, 4 inches in thickness, is 11 pounds per superficial foot.

We should have stated that the fire was quickly extinguished by water at the conclusion of the tests, and that the blocks showed no signs of cracking, under this severe proof.

Those who have carefully perused the foregoing statements will see that these tests are not conclusive as to the fireproof qualities of the material. As a general rule, buildings do not take fire immediately after completion, and before the cement is dry. It would be interesting to see an experiment with this concrete after it had been thoroughly dried.

THE RIBBON POST.

The Ribbon Telegraph Post Company, of Manchester, England, have recently introduced a light and graceful form of iron pole or pillar, constructed as represented in the annexed engraving, extracted from *Iron*. The ribbons are made around a mandrel, which is provided on its exterior with spiral intersecting grooves. The latter form a receptacle for the ribbons, which are wound on by machinery, without twist or strain, and in such a manner that the gradual decrease of the pole is compensated for. The first series is put on from right to left, beginning at the bottom; the next, in the reverse direction, commencing at the top. The latter ribbons, of course, overlap, and are, at this stage of the operation, temporarily secured to those beneath them by bolts fitted in holes previously punched in both, so as to coincide exactly at the points of intersection.

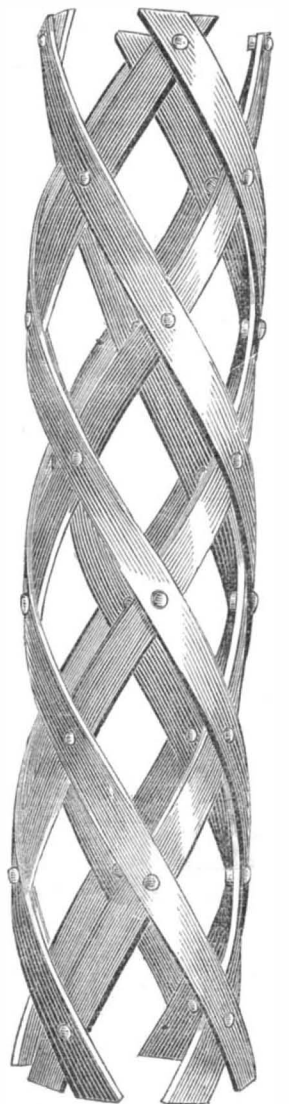
The core of the mandrel is then removed, causing it to collapse, when the pole is withdrawn and placed upon a cylindrical bar, ready for the insertion of the angle irons. These, previously punched, are secured by rivets to the intersections of the ribbons, the temporary fastenings being taken out. The cap, the nature of which depends necessarily upon the uses to which the pole is to be devoted, is then put on; and the base, consisting of various forms, strengthened with extra iron and inserted, for some little distance, with the ribbon and secured to a plate which affords a strong support, is added.

The strength of poles thus constructed is said to be very great. Two, without angle irons, measuring 10 feet by 8 inches, supported a weight of 10 tons without sinkage, deflection or collapse. The total weight of a telegraph post 31 feet long is about 434 pounds.

On rocky ground, these posts can be fastened directly to the surface of the rock; no lightning conductor or earth wire is required, since the poles are themselves conductors; no ladders are needed; they offer small resistance to the wind, and are ornamental and durable. It is suggested that they may be advantageously used as substitutes for the heavy iron pillars or clumsy wooden supports frequently employed in the construction of conservatories, porches, etc.

THE OHM.—The term "ohm" is derived from the name of the celebrated electrician who first ascertained the laws of electrical resistance, and is a measure of resistance of which it is the unit, in the same way as we use the inch or yard in the measure of length. The "ohm," as a unit of resistance, was adopted by a committee of the British Association, many years ago, and is now the acknowledged standard of resistance throughout the world. The ohm represents the resistance of about 210 feet of copper, wire No. 16, or galvanized wire No. 8, unexposed to disturbing causes and in a temperature of 60° Fah.

To pass our time in the study of the sciences has, in all ages, been reckoned one of the most dignified and happy of human occupations.—*Brougham*.



IMPROVED COTTON WORM DESTROYER.

The inventor of the device represented in our engraving proposes to exterminate cotton worms by ejecting a poisonous liquid over the plants on which they exist. To this end he has devised a novel apparatus, mounted on wheels, so as to be drawn by horses around the field, which is provided with mechanism by which the fluid is distributed in the form of a fine spray.

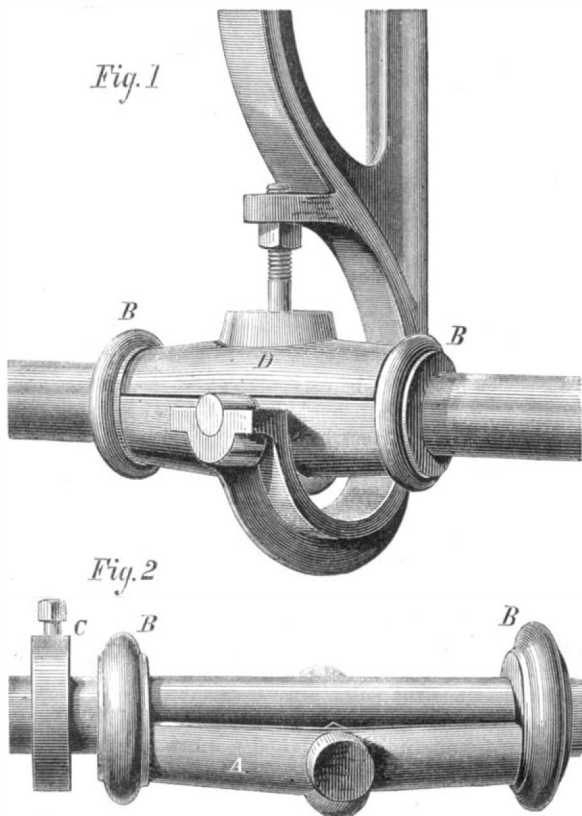
There is a large tank or reservoir, A, into which the poison is placed, and from which it is lifted by the double action force pump, B, into the two branches of a pipe, C, on top of the tank. The lever of the pumps is actuated, as will readily be understood from the engraving, by a pitman pivoted eccentrically on one of the wheels of the apparatus. From the pipe, C, the liquid passes through a suitable valve, by which its flow is readily governed, and into a horizontal tube, D, which runs transversely across the rear of the tank. To this tube are connected several shorter pipes, E, a section of one of which is represented in Fig. 2. In the interior of these attachments, which are of cast metal, are cut grooves, and their lower ends are closed by plugs of india rubber, which are secured by a rod and set screw. By means of the latter the stoppers can be tightened or loosened in the opening at will.

It will be seen that the liquid, being continually carried up by the force pumps, will, in passing through the lower end of the tubes, E, escape by way of the grooves, and assume the form of fine spray, which will penetrate and evenly distribute itself over the foliage of the plant. The wheels upon which the apparatus is mounted are smaller than those ordinarily used for wagons, and are attached to the tank by means of vertical bars. The machine is thus enabled to pass over the rows of plants without injuring the same; while, at the same time, the dimensions of the wheels are such as to give the required number of strokes to the pump lever necessary to the production of a constant and full volume of spray from the pipes, without auxiliary gearing. The action of the device is necessarily automatic, and hence but a single hand is needed to regulate the spray openings, admit or cut off the liquid, and guide the horse or horses attached to the machine.

Patented December 16, 1873. For further particulars address the inventor, Hon. J. W. Johnson, Columbus, Texas.

IMPROVED BEARING FOR SHAFTING.

In examining the annexed engraving, the reader will notice that the box through which the shaft passes (instead of being made in the ordinary manner, that is, divided longi-

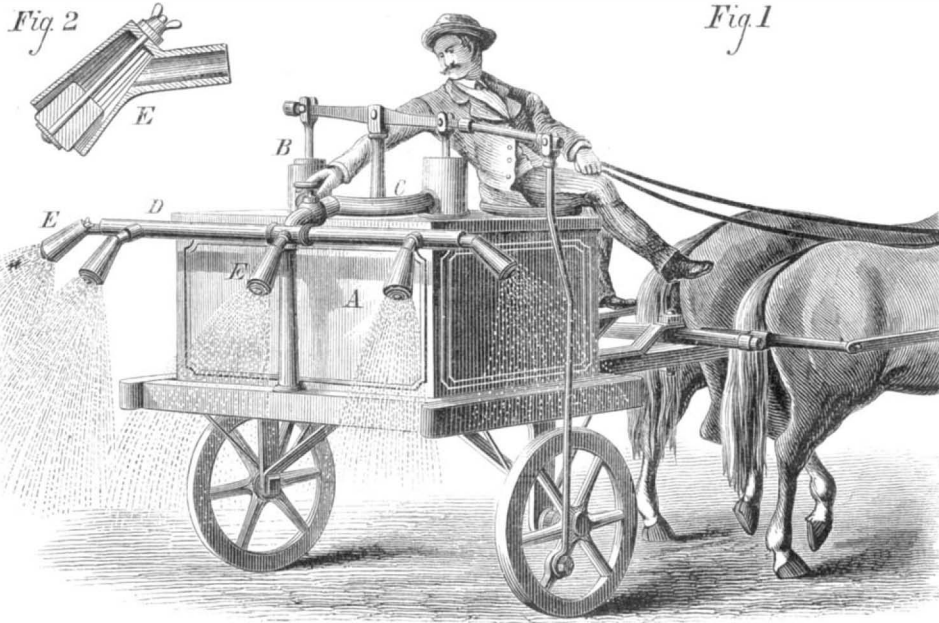


tudinally, and the halves united by bolts) is constructed of two portions of unequal size. The idea of the inventor is to produce a bearing, the ends of which, in taking against the usual collars or rings, secured to the shaft to prevent end motion of the box, shall not cause the unequal wear of the collars and the consequent disagreeable noise.

The lower portion of the box, A, Fig. 2, is cast hollow to fit the shaft, and in a single piece; while at its extremities rings, B, are provided to abut against the collar, C, on the shaft. These rings present a smooth surface to the collars, and hence exercise but very little wearing effect upon the same. In putting up a line of shafting, the box, A, has to be slipped over the end, the shaft passing through the rings which, of course, support the box when bearings are being fitted, and also during repairs, etc. The upper part of the

box, D, fits, as shown in Fig. 1, in the opening between the rings, B, and, if both portions are made with flanges, the bearing is readily attached together by bolts in the usual way.

In our engravings, however, these flanges are omitted, and the mode of securing the box in the hanger is clearly shown in Fig. 1. Lugs are cast upon the box, A, which fit in suitable sockets in the hanger; and an indentation with raised sides is formed upon the cover, D, into which a screw, passing through a projection on the support, is, by a nut, firmly turned. It will be noticed that the apparatus, while thus held tightly in place, can, by loosening the screw, the work



JOHNSON'S COTTON WORM DESTROYER.

of a minute, be quickly opened for any purpose. In practice, the apertures in all boxes of the same size are designed to be of similar dimensions, so that all the covers may be cast alike, and hence all fit any one box. The inventor states that the difficulty often met with in losing line by taking off the ordinary boxes and then replacing them accidentally end for end, as may easily be done, is here necessarily avoided, as the lower portion of the bearing is always on the shaft, unless removed over the extremity. The interior of the box is lined with the usual Babbitt or other suitable metal.

Patented December 16, 1873. For further particulars, address Messrs. Pierre J. Hardy & Co., 156 West 19th street, New York city.

Manganate of Baryta as a Green Pigment.

The manganate of baryta, possessing a handsome green color, has attracted the attention of color manufacturers; and it has been proposed to employ it as a pigment. Two methods of preparing it have been published: One consists in igniting together the nitrate of baryta and manganese oxide or dioxide; the other consists in fusing a mixture of pyrolusite or black oxide of manganese, caustic baryta, and chlorate of potash. By either process a green mass is obtained, but the second method seems to yield a more beautiful and homogeneous product. In experimenting with other and more direct methods for preparing a baryta green of great purity and beauty, Fleischer has made several observations of its properties not generally known, which will, we think, prove of interest to our readers.

If a green solution of manganate of potash be precipitated while boiling, by chloride of barium, a heavy, granular, but not crystalline, precipitate of manganate of barium is obtained. This precipitate has a violet color, approaching blue, can be washed by decantation at first, and afterwards may be collected on a filter. On drying the precipitate, its color grows lighter with the increase of temperature; and on being heated to a dark red heat, it looks almost perfectly white, with only a shade of grayish blue. If then it be heated still higher with free access of air, or in an oxidizing flame, it gradually turns green; by carrying the process farther, the color becomes a beautiful greenish blue, and finally at a very high heat a dirty grayish brown mass is formed from the reduction of the manganic acid to binoxide of manganese.

On adding chloride of barium to a solution of the permanganate of potash, and boiling, a precipitate is slowly formed, of a peach blossom color, while the liquid retains a deep violet color. By decanting and bringing the mass, diluted with water, on a filter, the precipitate is not decomposed and can be dried at 100° C. without changing color. When the dry permanganate of barium is gradually heated, its color also grows paler, but does not, like the manganate of baryta, acquire a green color at a still higher temperature; for after the color has once vanished, an increase of temperature soon converts it into the grayish brown mixture of the binoxide of manganese and baryta, or carbonate of baryta. Hence it is impossible to prepare the green manganate of baryta from the permanganate.

In regard to the color itself, experiments have shown that the most beautiful green is that formed by igniting the manganate as described above. The green prepared by Rosenstiehl's process,—fusing together caustic baryta, chlorate of potash, and binoxide of manganese—is less beautiful than

the above; while that attained from nitrate of baryta and binoxide of manganese is far inferior to either of the others. Perhaps, however, this color could be improved by preparing it in a reverberatory furnace with a strong oxidizing flame.

The blue green baryta pigment has different shades according to its preparation, some being almost pure blue with only a shade of green, and resembling the light blue quill feathers of many parrots. The greener the color, the more it gains in intensity, but it loses in fineness, although still surpassing the green manganate of baryta.

The production of the blue or bluish green baryta color is due entirely to the alkaline property of the mass. Whether each definite color is due to a definite composition is doubtful, since the temperature, which must not exceed that of a bright red heat, exerts a great influence on the color. This much is however certain, that both manganic acid as well as the permanganate of baryta, when mixed with about 20 per cent of hydrate of baryta and ignited at a red heat, will always produce this blue green color. It is evident that the blue green color is dependent entirely on its basic character; for on placing this powder in weak acids, it first turns green and is then gradually decomposed. The baryta pigment is quite permanent, and may be subjected to the action of strong sulphuric acid for hours, at the ordinary temperature, before the color will be destroyed. Boiling potash solution has no perceptible effect on it. The permanence, especially of the blue shade, is increased by adding a little baryta, which increases its alkalinity. It is also worthy of remark that the pigment prepared from the nitrate of baryta is much less permanent, because the nitrous acid present will after a time exert a reducing action.

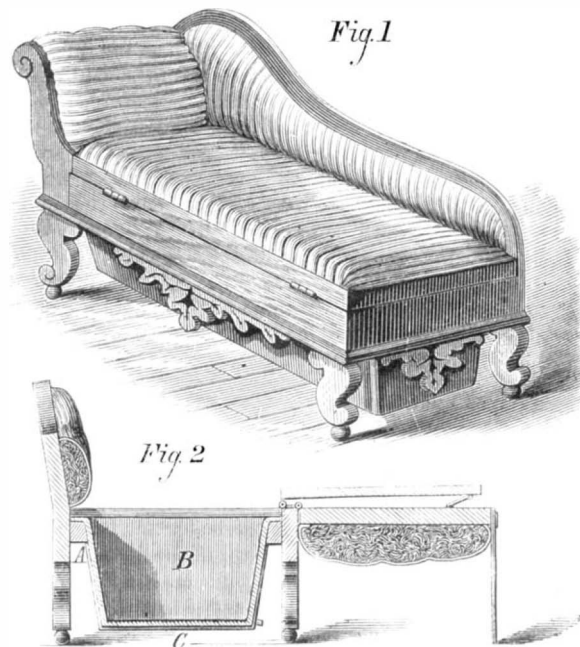
The baryta pigments seem especially adapted to fresco painting, because they appear very bright and lively on stone, and especially on lime, where many other pigments lose their beauty or are entirely destroyed.

The Bridge over the Alleghany, at Warrenton, Pa.

We are indebted to a correspondent, Mr. A. Hertzell, for the following particulars regarding the structure above named, which is one of the handsomest of the many iron bridges crossing the rivers of the United States. The length of span, from center to center of the towers, is 470 feet. The latter extend 44 feet above the abutments, the masonry of which is 24 feet above the water. The floor beams are 33½ feet long, giving a roadway of 19 feet and a sidewalk of 5 feet on each side. The two main cables are composed of 7 two inch steel wire ropes each, manufactured by J. A. Roebbling's Sons, of Trenton, N. J. The cost of the work was \$45,000.

COMBINED LOUNGE AND BATH TUB.

This is an ingenious combination of two indispensable ar-



ticles of household utility, which will be found a convenience to persons occupying apartments in which economy of space is of importance. The invention, which was patented by Mr. Conrad Wendel, of New York city, consists in arranging, under the seat of a lounge, sofa, or bench, suitable supports, A A, for a bath tub, B, Fig. 2. The seat is hinged to the frame so as to form a cover for the tub, and to be readily thrown forward when it is desired to use the latter, in the position shown in the sectional view. The tub is provided with suitable flanges to rest on the cleats, A.

The seat is shown closed in Fig. 1, and serves to conceal the tub, and also as a cover for the same, to prevent the entrance of dust, etc. The tub is also supported by straps, C, which embrace its body at suitable distances apart, and which are secured to the frame.

THE ARTIFICIAL MANUFACTURE OF BUTTER.

The preparation of butter from substances other than cream, and by means other than the time-honored churn, is a subject which seems to be attracting considerable attention. With the view of presenting the fullest possible information on this interesting subject, we have obtained descriptions of various plans, for butter making and refining, patented in the United States, from which we are enabled to compile a comprehensive statement of the progress of invention in this direction. The extent of the topic necessitates its subdivision, and hence, in its consideration, we propose to treat it under the following heads: Manufacture of butter and shortening for culinary use from fats; manufacture of butter from whey; modes of purifying and improving butter; and, finally, butter-coloring compounds.

THE MANUFACTURE OF BUTTER, ETC., FROM FAT.

Taking the various processes in their chronological order, the earliest on record is the patent of H. W. Bradley, of Binghamton, N. Y., and is dated January 3, 1871. It consists in a mixture of refined vegetable or fixed oil, hog's lard or stearin, and tallow, heated and agitated with water by means of a current of steam. After a suitable length of time, the oil is drawn off and allowed to cool. This produces a purified grease, which may answer for some culinary purposes, but is hardly, we should imagine, palatable for table use. The same inventor, in a specification dated October 3, 1871, describes a mode of removing the offensive taste and smell from cotton seed oil, by adding one ounce of chlorate of potash and niter to each gallon. After heating and agitation, the oil is drawn off and treated with a current of pure oxygen, the effect of which is to deodorize and oxygenate it, rendering it, according to the patentee, sweet and palatable for cooking purposes.

The modest claims above noted are somewhat overshadowed by the numerous advantages which Dr. de la Perouse, of Paris, considers are obtained by his method of preparing fatty matters, patented November 21, 1871. He proposes to render fats, however rancid, neutral and pure—to produce a low priced cooking butter, which will always remain sweet—to give the prepared material improved digestible qualities—to preserve meat by enveloping it in unoxidizable fat—to make superior candle tallow, and, lastly, to mix liquid fat with flour of leguminous plants (peas, beans, etc.), or with chopped meat, to form a nutritive food. This last seems to be simply pemmican, an article of diet well known to the inhabitants of the northern part of this continent. The operation consists in placing a tun at a time of raw fat (beef, pork, or mutton) with distilled water, in which is dissolved a quantity of the sesquicarbonates or bicarbonates of oxide of potassium or aluminum. A solution of chloride of sodium or potassium is then added, and the whole boiled, first actively and then moderately, for several hours, when all the fat becomes separated from its cellular tissue. After a repose of two or three hours, the melted fat is passed into refrigerators, and thence into casks for the market.

Mr. Alfred Paraf's patent, which is next in date, April 8, 1873, is that under which the oleomargarin butter is made. This process has already been fully described on page 246, Vol. XXIX. of the SCIENTIFIC AMERICAN, but a brief review of its salient points will not be here out of place. The fresh fat, finely chopped, is mingled with its own weight of water at 120° Fah., at which temperature it is maintained for hours. The whole is then allowed to cool, when the mixture of congealed oleomargarin, stearin, and membrane is separated from the water and worked with common salt between cylinders, after which it is placed in bags and squeezed in a hydraulic press. This operation is performed in rooms at a temperature of 60° Fah., which is the melting point of oleomargarin, so that, by this means and by the mechanical contrivances, the latter is separated. It is finally reworked with salt, and churned into butter in the ordinary manner, with a proportion of buttermilk.

Mr. Joseph R. Brown, in a patent dated December 23, 1873, proposes to purify tallow, remove its smell, and render it hard and solid at all seasons of the year, by placing the substance in one fourth its weight of water, to which two per cent of strong sulphuric acid is added. This is heated to 200°, and the melted tallow, after an hour or so, is drawn into another tank in which there is a solution of alum. The temperature of 200° is again imparted, when air is forced into the mass for half an hour. Cooling then follows, and the water is drawn off. The tallow is lastly brought to 230°, and more air driven in, when, after settling, it is made up into suitable packages. Bleaching is effected by mixing chloride of sodium vapor with the air that is forced in.

A process which seems different from any yet described, and which is claimed to consist of artificially performing the natural functions of the lacteal system of the cow, when it absorbs its fat in order to transform the same into butter, was patented December 13, 1873, by M. Hippolyte Mége, of Paris, France. The first operation is to neutralize the ferments; and to this end the fat, as soon as the animal is killed, if possible, is immersed in a solution of sea salt and sulphite of soda. Crushing under millstones follows, and then artificial digestion, at a temperature of 103° Fah. This is accomplished by a compound of half the stomach of a pig and biphosphate of lime. When the fat is perfectly liquid, showing no lumps, more sea salt is added, and it is drawn off into water, at 86° Fah., contained in wooden tubs. Here most of the stearin is deposited in the form of teats in the middle of the liquid, which then goes to a hydro-extractor, or centrifugal machine, which effects the complete separation of oleomargarin and stearin. The former, says the inventor, is an excellent butter for kitchen use, but he improves it as follows: Cream, bicarbonate of soda, and the

udders of a cow, chopped, are macerated and passed through a fine sieve. This mixture, with coloring matter, is added to the margarin, which becomes thick, tastes like cream, and, when cold, is passed through large cylinders, which give it a homogeneous mass, and complete the production. When the butter is to be kept for long periods, water is substituted for cream in macerating the udder. The stearin is used for candles or may be saponified.

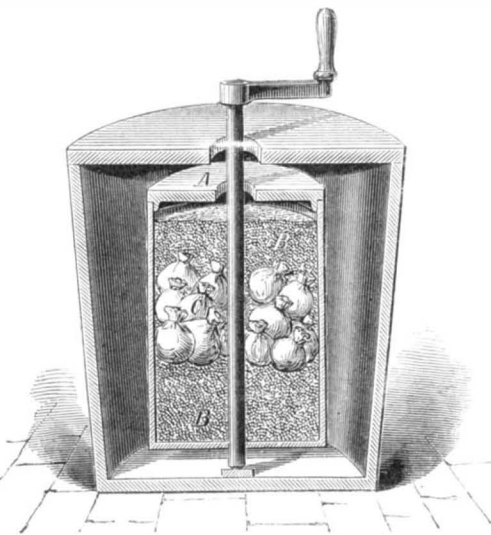
BUTTER FROM WHEY

is made by three processes. The first is that of Homer C. Markham, of West Turin, N. Y., and dated December 11, 1866. After cheese making, the whey is drawn off into a kettle, and to it is added dairy salt and a kind of acid made of old and sour whey. This is heated to about the boiling point, when the cream rises, is skimmed off, and, after cooling, is churned in the ordinary manner. The amount of whey given off by 450 pounds of milk will, it is stated with suitable proportions of the ingredients above mentioned, give three pounds of good butter.

Mr. James Suggett, of Cortlandville, N. Y., in a specification dated December 18, 1866, describes the second process, the first operation of which is to pass the whey into a cooling chamber which is surrounded with cold water. A solution of saltpeter, borax, and saleratus is added, and the whole left in the cooler for twenty-two hours, at the end of which time the cream, having risen to the surface, may be removed and made into butter.

Mr. Ira Page, of Adams, N. Y., patented June 23, 1868, the third process, in which the whey is allowed to stand 24 hours; and to the cream, which is then skimmed off, saltpeter is added. The butter obtained by churning is worked with salt and sugar.

There is another plan for butter making which, though not properly coming within the above sub-heading, may nevertheless be found worthy of notice and, doubtless, of trial. It is the invention of Mr. Adolphe Mot, of Washington, D. C., patented July 19, 1870; and we add a small engraving, which shows its construction. There are two



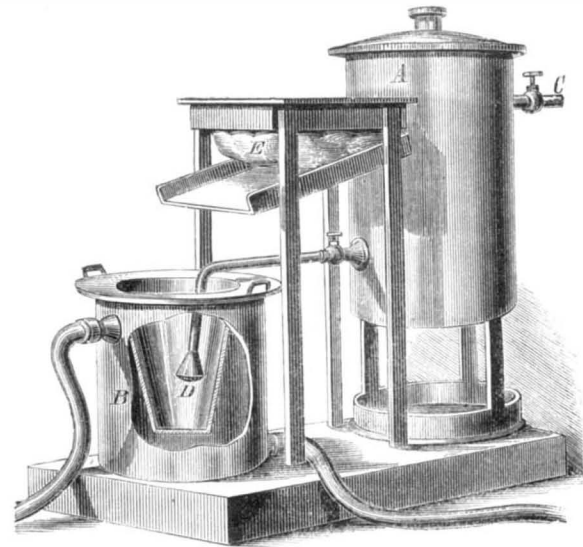
tubes, the inner one, A, of which may be revolved by suitable means within the outer. Within the tub, A, the sides of which are perforated, are placed, first, a quantity of pumicestone, baked clay, or similar porous substance, B, the cream, C, tied up in small bags, and, finally, more pumice. The effect of the latter is, after a few hours, to separate the buttermilk from the cream, leaving pure butter in the bags. Tub A is then revolved, and the liquid is projected through the perforations into the outer vessel, and, lastly, water is added for washing purposes, which is got rid of in a similar manner.

We now pass to the

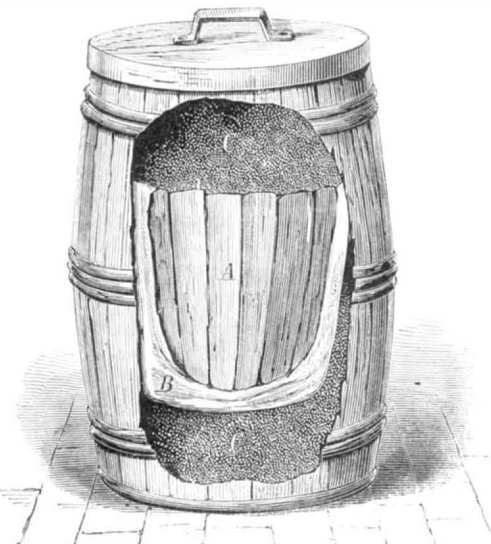
REFINING AND PURIFYING OF BUTTER.

Mr. D. H. Gregory, of Detroit, Mich., patented (September 10, 1867) a process which consists in adding to one pint of milk, fresh from the cow, the yolks of two eggs and a pound of poor butter. This is churned, salted, and worked in the usual way, producing, it is stated, two pounds of fresh wholesome butter. Mr. Joseph Sigler, of Anderson, Ind., in a patent dated November 5, 1867, proposes a somewhat similar operation, churning together 1 gallon of sweet milk, 1 ounce of loaf sugar, 20 grains of nitrate of potash, 1 ounce of liquid rennet, and 10 grains of annatto, with 8 pounds of butter. The weight of the resulting compound is not given. Louis S. Robbins, of New York city, suggests, in his patent of July 28, 1868, that butter, after churning, will be less likely to turn rancid if heated to a semi-liquid condition, and then washed, first with warm and afterwards with cold water, so as to remove the buttermilk and other impurities. Butter already rancid, according to the patent of Mr. Calvin Peck, of Marshal, Ill., dated November 20, 1869, may be restored and purified by adding two ounces of pulverized alum to every five pounds of butter, the latter being melted. The butter, while still liquid, is passed through a fine sieve into clear cold water, from which it is removed and worked with dairy salt, saltpeter, and sugar. We add an engraving of the apparatus recently devised by Mr. George Kirchhöffer, of Chicago, Ill., and patented June 10, 1873. A quantity of butter in a melted condition, is put in a reservoir, A, its temperature being kept between 100° and 120° Fah. B is the congealer, which is filled with milk or buttermilk, and through the hollow sides of which a current of cold water is maintained so that the temperature of the milk is retained between 55° and 65° Fah. Pressure is next applied to the

surface of the melted butter in the reservoir, through the pipe, C, and, a valve being opened, forces the butter down through the tube, D, and out of the perforated nozzle at its end into the cold milk. The congealed particles, after being skimmed, are thrown into a filter, E, through which the milk escapes and runs down the inclined trough, back into the congealer. The butter is subsequently worked in the ordinary way.



Different from any of the above plans, and apparently much simpler, is the process patented by Mr. Josiah W. Prentiss, of Pultney, N. Y., October 4, 1859. It consists simply in removing the hoops from the firkin, A, containing the spoiled butter, placing it in a bag, B, and burying the whole in charcoal, C, contained in a barrel or other recepta-



cle. The illustration shows the arrangement, and necessitates no further explanation. Two

COMPOUNDS FOR COLORING BUTTER

have been made the subjects of patents. One, devised by Mr. D. W. Dake, of Brooklyn, N. Y., consists in adding annatto to pure oil obtained by melting the butter. The annatto is mixed mechanically with the liquid, and produces a compound of a reddish golden color, 75 pounds of oil to 5 pounds of annatto being the proportions. One or two pounds of the coloring matter suffice for 100 pounds of butter. Messrs. Bogard, Cramer & Lewis, of Laporte City, Iowa, patented September 16, 1873, another coloring compound composed of annatto, 5 ounces; curcuma, pulverized, 6 ounces; saffron, 1 ounce; lard oil, 1 pint, and butter, 5 pounds. It is said that the amount of coloring thus obtained is sufficient for 5,000 pounds of butter.

The Suez Canal.

It has been proposed that the European Powers should buy the Suez Canal, and throw it open for the benefit of the whole world of commerce. The present dues levied by the company, it is stated, are absolutely prohibitive against the greater portion of the imports and exports on both sides of the canal; and a recent increase which has been made, of some 43 per cent on the original charges, on the basis of tonnage, operates to shut out small vessels and heavy goods. Each country, it is suggested, should contribute a certain quota of the purchase money, to be estimated by a determination of the amount of benefit which each individual commerce would receive by the enfranchisement; and by this means, the entire estimated amount of \$70,000,000 (at par, and without interest), it is said, could be collected. Vessels in such a case would be required to pay only such dues as would aggregate sufficient for the simple maintenance of the work, and not be heavily taxed as at present for the accretion of large dividends. It is believed that the commerce of the world would thus be immensely benefited.

Light Draft Iron Steamers.

A paper by Mr. Theodore Allen, on "Iron Hulls for Western Steamers," has lately been published in the "Transactions of the American Society of Civil Engineers." Mr. Allen is about to remove to the west, to test by practice the correctness of his theories. We give a brief summary of the paper:

In England, steamers are constructed almost exclusively

of iron; and in this country, the proportion of iron to wooden steamers, now in process of construction, is as 21 to 4.

The first iron vessels were built in the same general manner as wooden ones, with iron ribs and sheathing. It soon became evident, however, that the same strength could be secured with much less material, by building vessels in the same manner as beams are made, and hence the introduction of the longitudinal system.

In this country, iron vessels have generally been constructed on the transverse system. The vessel proposed by the writer for service in western waters is to be built on the longitudinal system; and the bottom sheathing, to ensure great elasticity for resisting shocks, is not secured to the transverse bulkheads or frames, the connection of the bottom plates being made exclusively to the longitudinal frames.

	Iron vessel. Tons.	Wooden vessel. Tons.
Hull.....	147	270
Deck.....	112	112
Machinery and wheels.....	93	93
Water in boilers.....	20	20
Joiner work.....	40	40
Fuel, fittings, etc.....	25	25
The total weight..... 437 tons 560 tons		
Mean draft.....	26 inches	32 inches
Cost complete.....	\$100,000	\$85,000
Durability.....	30 years	10 years
Value at the end of this time.....	\$20,000	\$15,000
Annual depreciation during service.....	\$4,000	\$7,000
Freight carried on mean draft.....	638 tons	535 tons
Net profit finally.....	\$23,137	\$14,250

A New Use for Chicken Feathers.

Chicken feathers are among those waste products of the farm of which no regular means of utilization has heretofore been suggested. Myriads of them are strewn over the barn yard, packed into the floor of the chicken house, or are converted into positive nuisances by the wind which bestraws them over lawns and flower beds, or drives them into open doors and windows.

"According to statistics very carefully compiled," says a writer in La Nature, "we throw away yearly a quantity of chicken feathers, the intrinsic value of which is equal to the money which we pay out for cotton." A startling statement, but the author considers it true; and he proceeds to explain how the feathers are prepared to render them valuable: The operation is to cut the plume portions of the feathers from the stem, by means of ordinary hand scissors.

The chicken down is said to form a beautiful cloth when woven. For about a square yard of the material, a pound and a half of down is required. The fabric is said to be almost indestructible, as in place of fraying or wearing out at folds, it only seems to felt the tighter.

Bergen Hill Tunnel.

Work on the Bergen Hill tunnel, for the Delaware, Lackawanna and Western Railroad, has been lately commenced in earnest. Seven shafts are to be sunk, and 500 men kept at work day and night. The tunnel begins on the east side at the foot of Ferry street, Hoboken, and will be considerably above the Erie tunnel.

IMPORTANCE OF ADVERTISING.

The value of advertising is so well understood by old established business firms that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation, among

the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of more than 42,000 copies per week, which is probably greater than the combined circulation of all the other papers of its kind published in the world.

Inventions Patented in England by Americans.

- ENGINE, PUMP, ETC.—W. D. Hooker, San Francisco, Cal.
- FILTERING LIQUIDS, GASES, ETC.—T. R. Sinclair, New York city.
- GRINDING MACHINE.—C. Heaton, New York city.
- MAKING SCREWS, ETC.—E. Nugent et al., Brooklyn, N. Y.

DECISIONS OF THE COURTS.

United States Circuit Court—Northern District of Illinois.

SHINGLE MACHINE PATENT.—HARRY H. EVARTS et al. vs. DAVID M. FORD. [In equity.—Before Blodgett, District Judge.—Decided November 26, 1873.] This suit was brought to recover damages for an alleged infringement of a patent for an improvement in shingle machines, issued to H. H. Evarts, dated October 1, 1854, and extended for a term of seven years from October 1, 1868.

The court held substantially as follows: A claim for "presenting the sides of the fibers of the wood to the action of the saws in the sawing of shingles or equivalent articles, for the purpose of giving them smoother surfaces than can be produced by the usual mode of sawing, if construed literally, asserts a right to a result, and cannot be sustained. But if read as it should be with the specification, and interpreted to embrace the mechanism therein described, by which the result is accomplished, it is a valid claim. A patent for a machine, in which a shingle bolt is automatically fastened by dogging teeth upon a rotating carriage which presents it sidewise to the action of a circular saw, is not infringed by a machine in which the bolt is by hand fastened to a reciprocating carriage and shoved up to the saw.

United States Circuit Court—District of Massachusetts.

PRINTING PRESS PATENT.—CYRIL C. CHILD vs. BOSTON AND FAIRHAVEN IRON WORKS. [In Equity.—Before Shepley, Judge.—Decided January 1, 1873.] Letters patent No. 98,087 were granted December 21, 1869, to Charles Montague assignee to Cyril C. Child, the plain tiff, for improvement in printing presses.

In the use of a vibrating lever for moving the type bed, constructed in two parts, one of which is made to slide out and into the other somewhat like the joints of a telescope, so that the upper end of the lever may be attached directly to the under side of the bed (dispensing with the use of a link) and the lower end of the lever, with the upper portion of said lever moving out or into the lower portion, as the distance of the fulcrum of said lever to the point of attachment to the bed is greater or less in the different parts of the movement of the bed. The plaintiff's claim is for the extensible vibrating lever in combination with a reciprocating type bed substantially as described. Defendants admit the manufacture and sale of printing presses containing the extensible vibrating lever in combination with a reciprocating type bed, as described in complainant's patent.

NEW BOOKS AND PUBLICATIONS.

HUSSEY'S NATIONAL COTTAGE ARCHITECTURE, or Homes for Every One. By E. C. Hussey, Architect. Price \$6. Published by George E. Woodward, and sold by Orange Judd & Co., New York.

This work is a collection of sixty-three plates of pleasing and tasteful architectural designs for suburban homes, ranging from the modest cottage to ornate and handsome villas. The drawings are accompanied with full details, estimates of cost, hints as to construction, specifications, and enough general descriptive matter to enable the searcher for an appropriate plan for a projected dwelling to determine at once whether any in the pages before him will or will not meet exactly his requirements.

AN ELEMENTARY COURSE OF PERMANENT FORTIFICATION. By D. H. Mahan, LL.D. Revised and Edited by Brevet Colonel J. B. Wheeler, Professor of Military and Civil Engineering, United States Military Academy. Price \$6.50. New York: John Wiley & Son, 15 Astor Place.

Professor Mahan's text books on civil engineering and field and permanent fortifications are so widely and generally known that it is unnecessary to allude to the volume before us, other than as a standard work of its

class. The reviser, in the new edition, has supplied several alterations and omissions in the original text, and made various necessary improvements. Prominence is given to the bastioned system over others, as it is considered as having best withstood the test of experience, and Nolzet's method is largely explained. The book is used for instruction at West Point. A large number of lithographic plates are supplied, together with the regular engravings in the text.

A TREATISE ON ASTRONOMY, SPHERICAL AND PHYSICAL, with Astronomical Problems and Tables. By William A. Norton, M. A. New York: John Wiley & Son, 15 Astor Place.

The fourth edition of this standard work appears in an entirely remodeled form, with many of its most important chapters wholly rewritten, and is, in brief, a complete exposition of the present condition of the science of astronomy from both a theoretical and practical point of view. The results of recent investigations concerning the physical constitution of the heavenly bodies are given in full, together with the author's own researches on the sun and the comets.

ART CULTURE, a Handbook of Art Technicalities and Criticisms, selected from the works of John Ruskin. Arranged and supplemented by Rev. W. H. Platt. New York: John Wiley & Son, 15 Astor Place.

As indicated by its title, this work is a compilation from the original and exhaustive writings on art criticism which have been given to the world by perhaps the greatest living art critic. It is intended for educational purposes, and aims to give the student a thorough appreciation, based upon the correct principles of a true and refined taste, of the handiwork of the painter, the architect, and the sculptor.

Recent American and Foreign Patents.

Improved Mole Trap.

Robert I. Huggins, Bethel, O.—To locate the trap, the earth is pressed gently down, so as to fill the burrow, and the trap is set directly above, with sill pieces parallel with the burrow, and with a cross piece on such depression. The mole, finding its hole obstructed, will commence repairing damages, and in forcing its body through the old track the cross piece will be raised, which raises a rod, and this, acting on a lever, releases a cross head which drops with its teeth on each side of the cross piece.

Improved Windlass and Crank for Brakes.

Henry M. Howard, Brooklyn, assignor to John Stephenson, New York city.—The windlass, around the lower end of which the brake chain is wound, is made polygonal, with the upper end reduced in size with a loose collar placed thereon, which is kept in position by a screw nut. The crank has two pairs of jaws. The former is made to fit two opposite sides of the windlass, and the latter are attached by swivel pins, to the loose collar. By raising the outer end of the crank, the jaws will be detached from the windlass and the crank may be turned round to allow the jaws to engage with any other two of the sides of the windlass.

Improved Sash Fastener.

John G. Spathelf, Sandusky, O.—This invention consists of a casing with bolt and lever arrangement, which catches into recesses of the window frame, and is withdrawn by pressure of the finger upon it, returning into the original position by a suitable spring.

Improved Road Scraper.

Thomas M. Tate, Longview, Texas.—This invention relates to means whereby road scrapers may be loaded with more facility, drawn with less expenditure of muscular power, and made to perform an increased amount of work in a given time. The invention consists in combining with a road scraper two front wheels, movable, to let them below or carry them above the bottom of scraper; in end-angled levers, having journals and fulcrum pivots combined with wheels and bearings in the sides of the scraper; in levers connected by a bar and combined with shoulders on scrapers, and a spring latch working therethrough; and in combining with the latch, held forward by a spring, a cross bar and arm of the latch lever.

Improved Lantern.

Joseph Kintz, West Meriden, Conn., assignor to himself and P. J. Clark of same place.—The object of the construction is to facilitate insertion and removal of globes and clamping or securing them between the base and top of the lantern. The vertical guards are hooked into the top through holes in the sides so that the top can swing sidewise.

Improved Car Coupling.

Frank A. Markley, Waynesborough, Va.—This invention relates to car coupling generally, but more particularly to that class of them in which is employed a link with spring grapple at each end. The invention consists in pivoting the spring catches to the hook piece as nearly as possible in the same transverse median plane, in order to shorten the coupling link, and allow the cars to come as closely together as possible.

Improvement in Boots and Shoes.

James McMillin, Ripley, O.—This invention contemplates the use of a wedge as a remedy for the tendency which so generally exists to wear the heel of a shoe or boot on one side. If the tendency is to wear out the subjacent edge of heel on the inner side, the thicker part of wedge is caused to abut against the corresponding side of the upper, thus throwing the strain toward the center, and not only preventing the edge wear on heel, but tending gradually to correct a slovenly habit of twisting the ankle when the weight is pressing thereon in standing or walking.

Table listing various patents and their details, including engine valves, equalizers, evaporators, feeders, fences, fire arms, and sewing machines.

Table listing various patents and their details, including stove-polishing machines, suspenders, and track cleaners.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent.

EXTENSIONS GRANTED.

26,891.—SPECTACLE CASE CATCHER.—G. N. Cummings. 26,902.—PLANING MACHINE.—S. S. Gray.

DISCLAIMERS.

26,919.—REPEATING FIRE ARM.—W. H. Morris et al.

DESIGNS PATENTED.

7,112 to 7,115.—CARPETS.—A. Heald, Philadelphia, Pa. 7,116.—NECK RUFF.—U. D. Mannville, New Haven, Ct.

TRADE MARKS REGISTERED.

1,598.—FLOUR.—J. Hannan, Chambersburg, Pa. 1,599.—GYPSUM.—H. C. Hulbert, New York city.

SCHEDULE OF PATENT FEES.

Table listing patent fees: On each Caveat \$10, On each Trade Mark \$25, On filing each application for a Patent (17 years) \$15.

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA,

JANUARY 3, 1873.

Table listing Canadian patents granted in January 3, 1873, including patents for messenger pipes, marshbank furnaces, and knitting machines.

Table listing various patents and their details, including railway switches, improvements on machines for making ox shoes, and seal locks.

HOW TO OBTAIN PATENTS IN CANADA.

PATENTS are now granted to inventors in Canada, without distinction as to the nationality of the applicant.

PRELIMINARY EXAMINATION.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch.

VALUE OF EXTENDED PATENTS.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted.

CAVEATS.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention.

DESIGN PATENTS.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

COPIES OF PATENTS.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a reasonable cost, the price depending upon the extent of drawings and length of specification.

VALUE OF PATENTS And How to Obtain Them.

Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent, even when the invention is but a small one.

HOW TO OBTAIN PATENTS. This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A positive answer can only be had by presenting a complete application for a patent to the Commissioner of Patents.

