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Water Supply. By JOSEPH PRESTWICH, F.R.S. Alarming pollution of water supplies. Interesting description of how our rivers, springs, wells, and artesian wells are contaminated. Relative value of the several sources of water supply, with the geological considerations involved.
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IV. CHEMISTRY AND METALLURGY.—Blowpipe Chemistry. By P. CASANAJOR. Directions for making a cheap pocket blowpipe, the shortest ever made, and other apparatus, such as sheet iron supports and charcoal borers; with 7 figures. Alloys of Tin and Lead, with four experiments, and interesting reactions. Reactions for Iodides, Bromides, and Chlorides. Improved Crucible Furnace. 1 figure.
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VI. MEDICINE AND HYGIENE.—Contagious Diseases and their Prevention. By A. J. JESSUP, M.D. Description of means for preventing the spread of contagion, and putrefactive and inflammatory changes. Instructive quotation from Professor Truillat. A simple cotton filter worn over the mouth as a protection against atmospheric germs. Successful surgery possible only in germless air. Description of model ward.—Therapeutic Value of Nitrate of Lead.—Carbolic Acid.—Treatment of Typhoid Fever.—Optical Defects and Spectacles. By DUDLEY S. REYNOLDS, M.D.
VII. NATURAL HISTORY, GEOLOGY, ETC.—That "Fatherless and Motherless Race." By Professor C. V. RILEY. The impregnation of the females of the basket-weaver; with 4 figs.—The Enemies of Books, with fragments of old books destroyed by the Traze. 2 figs.—The Intelligence of Ants. A Paper read before the British Association by Sir JOHN LUBBOCK. His observations and interesting experiments. The architectural skill of ants; their concern for their young; their remarkable organization, their possession of domestic animals, and the institution of slavery among them. Habits of the hunting, the pastoral, and the agricultural ants. The exhibition of human traits.
VIII. AGRICULTURE, HORTICULTURE, ETC.—Sixty-one Bushels of Wheat to the Acre.
Cranberry Culture. By J. EDWARD WING. Paper read before the American Institute Farmers' Club.—Preparation of Bog. Cost and profits, from actual experience.—Bees.

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POCKET LIFE BUOYS.

On the evening of September 3, the excursion steamer Princess Alice, which was returning from Gravesend to London with about 800 passengers, largely women and children, was run into by a screw collier and quickly sank. The collision occurred off Barking, a town on the Thames, about seven miles from London. The loss of life was terrible, the estimates ranging from 500 to 650. The captain and nearly all the crew of the Princess Alice were drowned. "There was no time to lower boats," the report runs, and "there were but few life buoys on the steamer." Hundreds of women and children perished in consequence.

Such a disaster could scarcely occur in American waters for the want of life buoys, though an occasion for testing their efficiency is possible any day, among the scores of crowded excursion steamers that throng our harbors. So far as our observation has gone the provision of cork floats on our excursion and passenger steamers has been abundant and fairly accessible. Whether the majority of excursionists, in the confusion following a collision, would have the coolness and knowledge required to make proper use of the buoys, is less certain. Probably not ten women in a hundred on any steamer would be able to put on a cork jacket properly in time of peril, much less attach them to her children so that they would neither slip off the moment of striking the water, nor become misplaced so as to insure the holding of the children's heads under water.

Our purpose in speaking so plainly is not to create needless alarm, but to secure two practical ends: first, to convince all persons, women especially, of the need of becoming practically familiar with the construction and use of the life buoys provided on our steamers; second, to call the attention of the ingenious to the crying need of a cheap, portable life preserver—something that the hawkers might sell at the piers for twenty-five or fifty cents; something that could be carried in the pocket without inconvenience, easily and securely attached to the trunk or shoulders, and inflated, if need be, after the wearer is in the water; something that could be attached to a child instantly, or to the largest sized adult with equal facility. A circle of waterproof cells, each provided with an automatic valve, so as to be easily inflated, and yet have all so independent of each other that the bursting of one would not affect the rest, would probably be as simple and efficient a device as could be asked for.

The conditions to be met are few—simplicity, lightness, portability, buoyancy, and cheapness. If these were fairly well met the single city of New York would furnish a market for thousands every summer. The inventor could not fail of an ample reward financially, in addition to the gratitude of the entire community.

THE HEROES OF THE PESTILENCE.

The old sentimental cry against the alleged materialistic and ultra practical tendency of scientific habits of mind—the charge that our busy, utilitarian modern life is essentially unheroic and fatal to the highest development of humanity—does not receive much support in times of public calamity and peril. The spirit of practical charity, of open-hearted self-sacrifice for humanity's sake alone, never prevailed more generally or showed results more praiseworthy than where the objugated modern spirit most prevails. And it is a notable circumstance that the heartiest and most liberal responses to the call for help from the afflicted usually come from the busy marts of trade.

The record of the last few weeks, in connection with the plague smitten valley of the lower Mississippi, will compare favorably with that of the most heroic days of the unscientific past. And not the least noble of the grand army of workers for humanity, from Hickman to New Orleans, must be numbered many whose callings fall under the ban of scientific character and practical utility. At such a time invidious distinctions would be as cruel as uncalled for; yet, without detracting in the least from the credit due to the clergy who have not deserted their flocks, or to the sisters of charity and other volunteer nurses who have shrunk from no labor or peril in the disheartening work of nursing the sick and burying the dead, we may say that the votaries of utilitarian science have not stood last in the public demonstration of true heroism. Among these we must number the scientific physicians who have periled their lives or sacrificed them outright in their unpaid work among strangers; and we must not forget the obscure yet not less generous heroes who have stayed to keep up communication with the outer world, and to study the climatic condition and changes, the mastery of which may some day make the spread of pestilence impossible. The telegraph operators, who have stuck to their posts, or who have volunteered to take the places made vacant by death, are proof enough that the sentimentalists are wrong. No more splendid heroism was ever displayed than by young Reading of Grenada, and others like him in every fever smitten town. To labor as they have had to in the midst of peril, while kindred and friends are fleeing or dying, passively enduring privation, exposure to the disease, ceaseless emotional strain, and the prospects of a sudden and terrible death, that the afflicted may not be deprived of means for making known their condition and want, calls for more patient and sterling heroism than is required even in the watchers in the chambers of death.

And of the sergeants of the Signal Service—a calling still more scientific in scope and aim—not less must be said. Several have already been struck down, yet the perilous work of observing goes on, fresh volunteers stepping for

ward to fill up the broken ranks. It is of these that a contemporary has eloquently and justly said that they deserve all the more honor because their work apparently has but a remote bearing in checking the disease.

"The physician, the Howard nurse, the clergyman, who remain faithful to their work in that dreadful valley of death, are at the bedside of the sick and dying. They can see and feel the good results of the tremendous sacrifice they make. But the Signal Service officer gives his life to set down observations on rain and wind. Science, with the material he accumulates, may stay the march of the pestilence hereafter; but he does not know that. Nobody knows him, or the nurse who falls at his post. The papers have ceased to name them in the haste of the wholesale slaughter. 'What good, then, to the world did Priscus do, who was but a single person and unknown? Why, what good doth the purple to the garment? To make it royal and beautiful?'"

It is true that the dominant spirit of the age is scientific, and science is essentially utilitarian in its character and results. But the utility it seeks is the highest—truth, and human well-being, founded on real knowledge and right action, re-enforced by the largest attainable command of the useful materials and forces of nature. If it fails to develop the highest traits of humanity, as the anti-scientific have so often asserted, then the records of the past must have been strangely falsified, to say the least. Certainly no other age, no other phase of civilization, ever outshone the present in those traits of humanity which go to enhance the essential nobility of man.

SILVER MINING HERE AND ABROAD.

Each week's reports bring additional evidence that the constantly increasing and usually profitable production of our mines is generally accepted as proof that the better knowledge of the sciences of mining and reduction of the ores arrived at by managers and superintendents has reduced the risks in this business to nearly if not quite the measure of those of ordinary commercial transactions.

And not only with us, but in other countries as well, are idle capital and labor being turned in this direction; everywhere there seems to be an increasing inclination for new fields of enterprise.

According to the South Pacific Times of Peru the great works in progress at Catapilco have effectually aroused people to a belief in the auriferous wealth of Chili, so long despised, and there is delving and digging all over the republic. In localities where profitable mining has been carried on on a reduced scale for years, additional capital is being invested, and there seems to be good reason to believe that this long neglected branch of industry will now receive proper stimulus.

Government engineers are now examining the different routes in the province of Carabaya, one of the richest though most inaccessible parts of Peru. It contains immense alluvial gold deposits which were profitably worked by the Spaniards until 1767, when the Indians drove them out.

A wise policy now actuates these governments to afford proper facilities and safeguards to the miner.

We learn, too, that there is now every prospect of prosperity in the mining interests of Sonora, which have so long been affected by incessant political disturbances; one mine there, the San Marcel, yielded over \$1,000,000 of silver in a short time, but came to grief through the most extravagant and reckless working; but such occurrences are not likely to be so common in the future; they are now the exceptions where formerly they were the rule.

With us, even in San Francisco, the increasing distrust of speculative mining companies is a most welcome and healthy indication; their chances for successful imposition are rapidly growing less, and with their suppression comes the opportunity of making legitimate mining one of the most profitable as well as one of the safest businesses of the country.

Nothing new is reported respecting the Canadian or Australian gold fields; the former, indeed, are rather a matter of the past.

The investment of English capital in our mines is still on the increase, drawn hither, it would seem, rather by the promise of permanent investment than because of promise of profit, if we are to judge from the many prominent instances of the peculiarities of English mine management here.

The Richmond mine of Nevada, owned in England, continues to make good returns of bullion, but the inevitable quarrels of the stockholders with each other, and about the management of the property are not unlikely to result in their throwing away the mine for the pleasure of convincing themselves that they have been swindled by somebody.

The other companies of the Comstock lode are making every effort to find the rich vein which has been struck by the Ophir and Sierra Nevada, and which is supposed to underlie them all. Their future prosperity depends, apparently, upon their success.

Though Arizona accounts are still of rich mines and new discoveries, the general complaint of scarcity of water for mining purposes grows louder. The richest ores are transported to San Francisco for treatment, a proceeding which must greatly reduce mining profits.

An instance of good management which is daily becoming more common is that of the Idaho mine of Grass Valley, with a capital of \$300,000. It has paid in dividends since 1869, \$2,500,000, without calling an assessment, and is now increasing its working capacity.

Colorado seems to be the favorite district for investment of New York and other Eastern capital because of its comparative proximity to us and of its good average returns on careful investments, but a great loss of gold is reported in the working of the rich telluride belt of Boulder county, and some improved method of working is imperatively demanded. Here is a good opportunity for inventors, for the telluride ores are among the richest known.

The gold mining business on our Atlantic coast is generally characterized by extreme slowness; stronger organizations and improved methods of working are here needed for fair development of the mineral wealth.

The general and well considered renewal of these industries cannot fail of exercising a beneficent and extensive influence throughout the country.

CORUNDUM.—ITS OCCURRENCE AND DISTRIBUTION.

The recent publication in the SCIENTIFIC AMERICAN SUPPLEMENT (vide No. 125, for 1878) of an elaborate paper on the industrial applications of emery and corundum has attracted such general attention that the presentation of an article upon the distribution of this useful mineral, and the quantities available for the future demands of industry, will be read with interest.

All, or nearly all, the deposits of corundum of any magnitude found in the world occur in the serpentine (or crysolite) formations, or in rocks immediately adjoining, and associated with these.

In this country it has been found in such association in numerous localities from Massachusetts to Alabama, and in certain parts of this range of occurrence in deposits of considerable magnitude.

The most important deposit in the Eastern States is that found at Chester, Mass., where, in a vein four feet in thickness, it has been traced with reasonable evidence of continuity over a distance of four miles.

The corundum of this locality is more or less abundantly mixed with iron oxide, and in this respect, as well as from its somewhat granular texture, it approaches in constitution the variety known as emery.

Small quantities of the mineral have also been found at Pelham, Mass., and at Litchfield, Conn. The Chester deposit has yielded considerable quantities of the mineral, and is still being worked.

In Pennsylvania, corundum has been found in many localities. One considerable deposit at Blue Hill has been traced with more or less certainty for about five miles, to near Rockdale, in Delaware Co. It has also been detected at Mineral Hill and Black Horse in the same county. At both the last named localities no deposits in either have yet been found, although the evidence of their existence is made probable by the finding of isolated boulders and fragments of the mineral.

The largest occurrence of the mineral yet found in Pennsylvania occurs at Unionville, Chester Co., where it forms a deposit of from five to ten feet in thickness and of unknown extent. This mine has yielded considerable quantities of the mineral, but is not being extensively worked at the present time. The product of this mine is very pure, and has been pronounced by experts to be superior in cutting qualities to the finest Turkish emery. It is prepared and brought into the market, ground like emery, graded in various degrees of fineness from grains to flour. Concerning the available quantity of the mineral at this locality, but little positive information exists, nor has the mine been worked steadily. Some shipments from this mine have been made to England. From surface indications based upon lithological characteristics, the inference would appear to be warranted that in this region of Southeastern Pennsylvania corundum will be found in quantities sufficient to meet any probable demand for it in the near future.

Proceeding southward, it may be worthy of notice that corundum has been found in Virginia, at Staunton, in Augusta Co., but only in isolated specimens. By far the most numerous and interesting occurrences of corundum in this country occur in the State of North Carolina, where there is a corundum belt, which stretches, with occasional interruptions, in a southwesterly direction from Madison Co. through the State of Georgia, and into Tallapoosa Co., Alabama, a distance of at least 250 miles.

The variety, beauty, and purity of the corundum in many parts of this belt are unequaled, exhibiting in many instances huge crystals and splendid crystalline masses, showing perfect cleavage, and displaying the fine red and blue colorations of the ruby and sapphire. It has been mined at several points in North Carolina, especially at and in the neighborhood of Corundum Hill, near Franklin, Macon Co., by Col. Jenks and others, but whether because the demand for the mineral is limited, or because of the expense of mining and transportation to market, these deposits have not as yet attained much commercial importance.

Gainesville, Hall Co., Georgia, and Dudleyville, Alabama, may also be named as localities in these States respectively where the mineral has been detected in considerable quantity. From the foregoing résumé, it will appear that there is no dearth of corundum in the United States; and that should an extensive demand grow up for it in the several industries in which it has been successfully applied, the home and foreign markets could be abundantly supplied from our domestic deposits.

Concerning foreign occurrences of the mineral, the following brief summary may be of interest:

Professor Rose, of Berlin, has described an occurrence of

corundum at Mramorsk, in the Ural regions, where it occurs associated with serpentine and allied rocks. The mineral appears, from his account, to be too much disseminated in the accompanying chloritic schists to promise any commercial value.

Great deposits of the impure dark granular variety of corundum, known as emery, occur at Naxos and Nicaria, in the Grecian Archipelago. There are also numerous deposits in Asia Minor, discovered by the American chemist, Dr. J. Lawrence Smith, to whose scientific zeal, combined with a keen practical perception, the Turkish Government is indebted for the creation of a valuable industry. Of other deposits of the mineral, in India and elsewhere, but little is positively known.

NOTES OF PATENT OFFICE DECISIONS.

In Sheldon's case, the subject matter of his application consisted in incorporating in a railway passenger ticket a contract with, and a personal description of, the purchaser. The ticket was one of that class which is good for a certain trip and for a certain length of time, and is not transferable.

The contract was to be signed by the purchaser in the presence of the person who sold the ticket, and contained a provision that in consideration of selling the ticket at a reduced rate, it should be good only for the person named and described, for the passage and time mentioned therein; that if transferred to any other person it should be forfeited; that the execution of the holder's signature should be made in the presence of the conductor when required, etc. Following this contract was a form or schedule containing the personal description of the purchaser, together with his signature.

The personal description, and the requirement that the purchaser should sign his name in the presence of the conductor upon the delivery of the ticket, when requested by the conductor, were the means of identification adopted by the applicant for a patent. His claim was for the ticket, with the description and executed contract, arranged substantially as shown and described.

The acting-commissioner finds that, considered as a mere structure, the claim was made up of three elements, all of which were old, and each of which performed the same function that it had performed in other places and in other kinds of business. A non-transferable ticket was old; the contract signed by the purchaser was old; and the personal description of a person holding a contract or other paper, by which he might be identified, was also old. It was a common means of identifying depositors at banks to require the depositor, upon drawing from the bank, to write his signature, for the purpose of identification by comparison with the signature already recorded in the books of the bank. It was a common method in the military service, upon giving a discharge to a soldier, to incorporate therein a description of his person for the purpose of subsequent identification. It was usual also to incorporate a personal description in a passport.

The acting-commissioner, however, holds that the matter should not be regarded as a structure; but that if patentable at all, it was as a new method of doing business.

The primary object of this railroad ticket, like all other similar tickets, was to grant the privilege to a purchaser thereof to travel on a certain railroad over a certain distance. It was the token of a contract entered into between the railroad company and a passenger, by which contract it is provided that in consideration of a certain amount paid by the passenger he has the right to ride on the railroad mentioned, the distance therein indicated. Any conditions other than this are held by the acting-commissioner to be simply additions to the contract. The essence of this so-called invention, therefore, was a contract. The making of the original signature, the re-signing, and the submitting to a personal inspection and description on the part of the passenger, were all conditions of one and the same contract. An ordinary ticket without any signatures, such as is generally sold to passengers for a single trip, is a contract, and the present ticket is the same thing, with additional conditions annexed thereto. The case, therefore, resolved itself into the question: Does a business contract constitute a proper subject of a patent? The acting-commissioner answers the question in the negative, and rejects the application for a patent.

Trade with Russia.

Since the first of January, 1878, eighty-one shipments, consisting of tools, machinery, rope, and other articles, have been made from this country to Russia, through the efforts of a Russian gentleman who is trying hard to divert to this country that portion of the Russian trade now commanded by England. In a recent interview with a representative of the Philadelphia Press, he said:

"The trade of England with Russia amounts to 133,000,000 rubles. I do not despair of reducing this one half in favor of America within five years. We want to fight England; if we cannot do it by warfare, we can by striking at her where she is most sensitive and vulnerable—in her trade. I find your manufacturers here willing to lend their aid and to sell for the smallest profit, looking to the future. It keeps the mills going; it brings our money here instead of to England. In Pittsburg and Oil City, and especially here in Philadelphia, where I have had transactions, I find everybody willing to co-operate in this way, and I have found assurances that distance will be no barrier to a suc-

cessful trade. There is now, more than ever before, a splendid field for American goods in Russia. It is not to be supposed that we will put one cent more than we can help into British pockets, while we do want to build up our trade and more closely cement our friendship with America. But one thing must never be forgotten. The goods must be of the best quality; the price must be such as to compete with the British. There is no sentiment in business. I venture to say that if an effort is made here by your merchants to push a trade with us on these terms, they will find a most gratifying response."

Patentees Rewarded.

The following compiled from the Tribune indicates the manner in which Great Britain rewards her inventors:

Since 1860 England has paid £102,775 to inventors for discoveries in connection with ordnance and small arms. Mr. Henry got £5,600 for breech-loading rifles and improvements in firearms; Mr. Westley Richards, £2,375 for his breech-loading carbine; Mr. Snider, Mr. Wilson and Colonel Roden, £16,000 for their plan for converting muzzle-loaders into breech-loaders; Colonel Snider got another sum of £5,000 for the Snider rifle, and Mr. Lancaster £4,000 for his plan of rifling guns and small arms. In artillery, Major Palliser got £15,000 for his chilled projectile, £7,500 for his plan for converting cast iron guns, and £1,500 for improvements in artillery; Captain Moncrieff got £10,000 for his method of mounting guns, with £1,000 a year and £5,000 when his engagement ended in 1875; Mr. Hale got £8,000 for rockets; Mr. Frazer, £5,000 for construction of guns; Captain Scott, £2,000 for improvements in gun carriages and £8,000 for other gunnery inventions, and Commodore Harvey, £16,000 for torpedoes.

The Velocity of Light.

One of the most important papers read at the recent meeting of the American Association was that by Albert A. Nicholson, of the United States Navy, on experimental determination of the velocity of light. He said:

"The two methods by which the velocity of light was determined experimentally gave in the hands of Foucault and Cornu results which differ by nearly 1 per cent. To find the correct result is the object of the experiments I have undertaken. The method which I have adopted is essentially that pursued by Foucault, but has this important advantage, that it permits the use of any distance between the mirrors. This is accomplished by using a lens of great focal length, which collects the light from the revolving mirror into a series of parallel pencils, which are reflected back from the surface of a plane mirror. The distance between this and the revolving mirror in the preliminary experiments was 500 feet, and the displacement obtained was 0.63 of an inch—about 25 times that obtained by Foucault. The apparatus used was adapted from the material found in the Naval School, and the experiments were performed under difficulties. The following is a table of results: 186,730; 188,820; 186,330; 185,330; 187,900; 184,500; 185,000; 186,770; 185,800; 187,940; 186,508 mean. 186,600 Cornu. 185,200 Foucault."

Remarkable Steamboat Speed.

The highest speed ever attained by any boat or ship was that obtained by the steam launches recently built for the English Admiralty by Messrs. Yarrow & Co.

The boats are each 85 feet long, 11 feet beam, and draw 3 feet. They are constructed of steel, and have engines capable of indicating 420 horse power.

Run with the tide the one made 22.59 knots, or 26 miles per hour; the other, 23.92 knots, or 27.56 miles per hour. Against the tide, one made 17.69 knots; the other, 18.09. The mean of the two was, respectively, 20.14 knots, or 23.2 miles, and 21 knots, or 24.2 miles.

The Strongest Steamer in the World.

The Italian Government has just launched the ironclad Dandolo, sister ship of the Duilio. Both are to be armed with 100-ton guns, and be armored with 22-inch plates. Not content with these ships, which carry heavier metal than anyone in the English navy (the English Inflexible has 24-inch armor, and carries a pair of 80-ton guns), the government is constructing two others, which are to be armored with 24-inch plates, and are to carry cannon of perhaps 200 tons.

It is a matter of general surprise that Italy should be expending enormous sums for such an irresistible navy. Simple pride of possession cannot be the only impelling motive.

A Runaway Reaper.

The Salem (Oregon) Statesman tells a funny story about the performance of a self-binder reaping machine while following unattended a team of runaway horses. Their course lay through a field of wheat containing about a hundred acres; and, strange to say, the machine kept together, and bound every bundle that came to it with lightning rapidity. When the team was stopped, the machine had cut and bound about a hundred and fifty bundles; but the swath was "crookeder than the tangle of the Mollala."

Each inhabitant in the United States pays \$2.02 for the support of the public schools, and \$1.39 for military purposes. These two items of expenditure in other countries of the world are as follows: Prussia 51 cents and \$2.29; Austria, 34 cents and \$1.39; France, 29 cents and \$4.50; Italy, 13 cents and \$1.57; England and Wales, 66 cents and \$3.86; Switzerland, 88 cents and \$1.