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(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

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NEW PROCESS FOR THE PROTECTION OF IRON.

The problem of preserving iron from oxidation may fairly be termed one of the great issues of the present day. Hitherto it has been effected in widely opposite ways. One method has consisted in converting its surface into an oxide, another in applying paint or enamel, another in coating it with zinc—a metal more readily attacked than itself. All these methods bear the aspect of being expedients merely, and do not present a definite solution of the problem.

Of all the ordinary metals, lead, which resists some of the stronger acids, such as sulphuric or hydrofluoric, may be regarded as the most durable. A new process for coating iron with an adherent layer of this metal has recently been discovered and perfected by Mr. F. J. Clamer, of the Ajax Metal Co., of Philadelphia. By it the iron is covered with a uniform coating of silvery lead. The roughnesses and indentations of the iron receive the lead, as well as the smooth parts. The result is a perfectly protected piece as long as the lead endures, and it is practically everlasting. No oxidation can affect the iron.

We have before us some admirable specimens of work done under this new process. It is specially adapted for the protection of sheet iron for car and other roofing, for spikes, bolts, nuts, pipes, boiler tubes, water tanks, iron bridges, and wherever the protection of iron or steel, wrought or cast, is desired. Its cost is no greater than that of the ordinary zinc or galvanic process. The superior excellence of the new method, its comparative cheapness, and the wide range of its applications, mark it, in our opinion, as one of the most important of recent improvements in the useful arts.

SEA LIONS IN CENTRAL PARK.

The little artificial pond in the rear of the lion house in the Central Park is now occupied by a group of interesting visitors from Alaska. They drowse lazily upon the stone coping of the banks, and, tiring of this, wabble awkwardly to the brink and dive deep into the limpid depths below. When at home in the cold North, they keep a sharp eye out for bears and sealers while lying upon the frozen rocks, and must devote a large portion of the day a-fishing, else they will be supperless. Here there is no one to disturb them; their only neighbors being a pair of taciturn pelicans and a sad-eyed stork who seems to have one leg more than he has any use for. They no longer have to catch fish for a living, a supply being fetched them daily from the Fulton Market stalls; and perhaps the only flaw in what might be an ideal existence is that they are unable to name the quality of the fish they prefer on certain days.

These newly arrived visitors are called sea lions, though why such inoffensive looking creatures should have so terrible a name it is hard to understand; and the visitor to the park, after taking a good look at the lords of the forest as they pace their cages in haughty fretfulness only a few steps distant, will scarcely see any resemblance in these mild-eyed, almost timid, creatures. They came from Alaska by boat, though fully able to swim the entire distance, and, being landed in San Francisco in four large crates, they were transferred to a great refrigerator, in which they journeyed hitherward, wondering, perhaps, as they gazed through the slats of the car, how the natives of the country through which they passed could find it so very warm.

There are eight of these sea lions in all, five cows and three bulls, and it was an interesting sight to see them removed from their separate crates on the bank of the little pond. A big bull, some eight feet long, was the first released. He craned his neck, thrust his nose high in the air, and took a good sniff, and then, catching sight of the water, shuffled over to the coping, poised himself on his flanks, described a crescent with his back, dipped his nose, and the loose jointed, loose skinned body seemed to leave ground in series, and to describe the same curve as that which had been traced by his nose. He remained below about a minute, and reappearing set up a terrific roaring, which may have meant that he found the pond neither deep nor salt enough, and disappeared just in time to miss the answering roars and gruesome howls which came from the lion and tiger dens hard by. The other sea lions seemed anxious to miss them too, for they hastily waddled over to the water and disappeared. The only exception was a cow sea lion, who stubbornly refused to leave her dead calf—it died during the journey hitherward—and three men were engaged in the struggle before the dead infant could be removed. Four of the sea lions steadily refused all offers of food, and have not broken their fast since their capture, some three months ago. This is a peculiarity of seals, large and small, for, though tenacious of life and easily tamed, they will often refuse to eat for many months while in captivity, living apparently on their own tissue, as in hibernation.

As to the exact genus of these sea lions, it is not easy to say with anything like certainty, there being much difference of opinion among the authorities. It resembles Steller's sea lion (*Platyrhynchus*, Stelleri, Less.), though by no means so large, for this is sometimes 15 feet long. Though harmless in appearance, these sea lions are really very fierce at times. They eagerly attack and always defeat the sea otter, often much larger, and having powerful teeth. They will even attack a boat when they are wounded, and the sea bear (O. [A.] *Ursina*, Cuv.) flees at their approach. The sea lion has a keen scent and good sight in a dim light, such as prevails during Arctic winters and in polar seas.

They are very tractable, and have been taught to turn an organ, stand erect on the hind limbs, shoulder a gun, and shake hands.

It is the sea lion which it is supposed that Jason, in the mythological story of the Argonautic expedition, mistook for sirens, who sat upon the adjacent shores and essayed to allure his crew by their singing. Orpheus' superior music kept them aboard, however, and the quest for the Golden Fleece was not interrupted.

DANIEL DAVIS.

On March 22, at the age of 74 years, Daniel Davis died at Princeton, Mass. Forty years ago he was one of the leading electricians of this country. He was born at Princeton, and worked on his father's farm until he attained the age of 20 years, when he came to Boston. After working in the soda factory of Mr. Darling, he became acquainted with Dr. William King, a manufacturer and dealer in static electrical machines, and who also erected lightning rods. The flat copper rod now on the Boston court house was put up by Mr. Davis, for Dr. King. Eventually, after various business changes, he began business alone in 1837 as a manufacturer of electro-magnetic apparatus. He had as an associate in much of his work Dr. Charles G. Page, the well known inventor. In 1847, he published "Davis' Manual of Magnetism," one of the earliest works on the subject.

He did not patent his inventions, many of which would have yielded very large returns. Thus, the invention of electrotyping in copper for reproduction of type and engravings is attributed to him. He reproduced by electrotypy the arm of a girl; the object is said still to be in existence. He was the pioneer in this country of gold and silver plating. Many medals and awards testify to his achievements. He developed and improved Morse's telegraph, making a practical system out of the not fully developed devices of Morse. Many of the scientists of the day were intimate with him and interested in his work. Among them the names of Hare, Silliman, Henry, Abott, Farmer, and Webster are given. In 1852 he retired to his farm, relinquishing science for agriculture. He died comparatively unknown, as he suffered the march of progress to go by him.

THE CELESTIAL WORLD.

THE CONJUNCTION OF SATURN AND DELTA GEMINORUM.

The planet Saturn cannot fail to be easily recognized in the western sky in the early evening, as the twin stars, Castor and Pollux, on the north, plainly point out his position in the sky. He is an interesting object, for his light is soft and serene, and his color is like that of pale gold.

Keen-eyed observers will see with the naked eye a star of the third magnitude a little way east of the planet. We wish to direct attention to this star. It is known on star records as Delta Geminorum, and Saturn will be in conjunction with it on the 25th of April, at 9 o'clock in the morning, being at that time only 12' north of the star. Planet and star will not be visible when at the nearest approach, but on the evening of the 24th Saturn will be near the star and west of it, while on the evening of the 25th he will have passed the star, and will be found east of it.

The conjunction is interesting, for it is a phenomenon that every observer can see for himself as he watches the apparent approach and recession between a planet and a fixed star. It is the planet that moves, the star remains fixed.

Saturn occupied nearly the same position in the heavens on the 6th of February that he will occupy on the 25th of April, only he was then 8' farther south. On the 6th of February, he was 4' north of the star, and so near that on several successive evenings planet and star seemed to touch each other. The view through an opera glass, when they were separated by only a thread of sky, was very beautiful.

The planets, as seen from the earth, present three different aspects. They have what is called direct motion, when they move eastward, and retrograde motion, when they move westward, and they are sometimes stationary, or seem to be standing still.

Saturn on the 6th of February was retrograding, or moving westward. He continued in this course until the 17th of March, when he was stationary for a few days. He then turned a celestial corner, and has since moved eastward, or in direct motion. On the 25th of April, he will be again directly north of Delta Geminorum, just 8' north of the point he started from seventy-eight days before.

The student who wishes to become familiar with the movements of the planets will find that a careful observation with his own eyes will impress a simple incident like this upon his memory far more powerfully than a hundred descriptions as seen by other eyes.

The conjunction of Saturn and Delta Geminorum proves by actual demonstration that the planets were rightly named "wanderers," for they are always on the move. The observation of this conjunction is easily made. Planet and star may be followed in their course every clear evening for a month to come. The unaided eye may behold the scene; a marine glass will greatly aid in the observation; and a good telescope will reveal a spectacle of surpassing beauty. For within its field of vision, the wonder of the system will be seen, encircled by his glowing rings, the picture including several of the Saturnian satellites, while the far away star, Delta Geminorum, will shine, previous to the 25th, on the east, and, after the 25th, on the west of the planet.

THE NUMBER OF STARS IN OUR UNIVERSE.

M. Hermite, a French astronomer, has made some curious mathematical observations concerning the number of the stars. According to his computations, the total number of stars visible to the naked eye of an observer of average visual power does not exceed 6,000. The northern hemisphere contains 2,478, and the southern hemisphere contains 3,307 stars. In order to see this number of stars, the night must be moonless, the sky cloudless, and the atmosphere pure. Here the power of the unaided eye stops. An opera glass will bring out 20,000; a small telescope will bring out at least 150,000; and the most powerful telescopes that have been constructed will show more than 100,000,000 stars.

It is well known that in order to compare stars with each other, they are divided into classes or magnitudes according to their apparent brightness. There are 20 stars of the first magnitude. In passing from one order of magnitude to the succeeding, it is found that the number of stars follow the law of an increasing geometrical progression, of which the first term is 19 and the ratio 3. There are therefore 57 stars of the second magnitude, 171 stars of the third magnitude, and so on. When the fourteenth magnitude is reached, the number of stars has increased to over 30,000,000. The number of stars really observed corresponds nearly with those found by calculation.

M. Hermite elaborates another law, which is that the total luminous intensity of the different orders of magnitude of the stars follows also an increasing geometrical progression, of which the first term is 19 and the ratio is $\frac{3}{2 \cdot 56}$. Thus it takes 110 stars of the sixth magnitude to equal one of the first, and no less than 202,314 stars of the fourteenth magnitude to equal one of the first.

M. Hermite concludes that the light emitted by all the stars upon the whole surface of the globe is equal to one-tenth of the light of the full moon. According to Sir William Herschel, the light of the full moon is equal to that of 27,408 stars of the first magnitude. The light of all the stars is therefore equal to 2740 8 stars of the first magnitude. Using these data in carrying out the law, the astounding result is reached that the sum of all the stars down to the twentieth and a half magnitude is 66 millions of millions!

THE DESIGNS FOR U. S. WAR VESSELS.

On April 1 there were opened in the office of the Secretary of the Navy the plans submitted by various engineers and constructors for an armored cruiser and for a line of battle ship. The Navy department had for a long period advertised for these plans, offering to pay $15,000 each for such as they might select. This liberal offer secured a competition from foreigners as well as Americans. The following companies and individuals offered plans:

England.—The Thames Iron Ship Building Company, London; the Barrow Ship Building Company; Mr. Watt, of Birkenhead.

France.—A. H. Grandjean, Marine Engineer, St. Nazaire.

New Zealand.—Capt. N. S. Clayton, Auckland.

United States.—Lieut. W. I. Chambers, United States Navy; Chief Constructor T. D. Wilson, United States Navy (Chief of Bureau of Construction); Constructor S. H. Pook, United States Navy; N. L. Tonns, New York City; F. L. Norton, Washington.

The plans varied in execution as well as design. Some were mere suggestions, while some went into the greatest detail and were accompanied by models. The Thames Iron Ship Building Company propose to give the battle ship a speed of 18 knots with 10,000 horse power, and the cruiser 20 knots with 6,000 horse power. The Navy department plans contemplate a speed of 18 knots for the battle ship with the same horse power. The plans from the department were specially ordered by Secretary Whitney to provide for possible failure to procure plans from outside sources.

The result of the competition as indicated by the plans accepted will be watched for with much interest. It is evident that the new vessels will be fast, a quality that has now become absolutely necessary in war vessels.

The Fastest Boat in the World.

The application of twin screws to torpedo boats is practically a new departure, for although twin screws have been suggested and even used in fast launches capable of carrying a spar torpedo, they have never been adopted or even tried on a large scale in torpedo boats of the first class. The more interest therefore attaches to the trial trip made recently of a twin screw torpedo boat, one of two built for the Italian government by Messrs. Yarrow & Co., of Poplar. This boat has the following dimensions: Length on water line, 140 ft.; beam, extreme, 14 ft.; draft, 5 ft. 4 in.; displacement, 100 tons. Steam is supplied by two locomotive boilers, one forward and one abaft the engine room. Either boiler can supply either engine or both. The screws are driven by two pairs of compound engines, indicating over 1,400 horse power combined. Condensing water is supplied by centrifugal pumping engines, arranged to pump out of any compartment in case of leakage, while ejectors and hand pumps are fitted to each of the main compartments. This boat is fitted with no less than ten water-tight bulkheads, and Yarrow's patent water-tight ashpan arrangement to both boilers, by which the fire is prevented being put out in case of water entering the stokeholes, and the boat can run 50 or 60 knots after the stokehole is flooded, an advantage the importance of which cannot be overestimated. Double steam steering gear is fitted to work either rudder quite independently of the other.

The armament consists of two bow tubes and two at a very small angle with each other on a turntable aft for side discharge simultaneously, to insure at least one torpedo hitting. She also carries two quick firing Nordenfelt guns. Cabins are fitted for the crew forward, petty officers right aft, and a saloon, lavatories, etc., are provided for officers further amidships.

The trial trip took place in the Lower Hope, below Gravesend. The weather was very rough, the number of people on board thirty-three, equipment complete, and load carried 12 tons.

	Steam pressure.	Vacuum.	Revolutions.	Speed.	Mean.	Second mean.
				knots.	knots.	knots.
1	135	27	365	22 641		
2	129	27	364	27·272	24·956	
3	128	26½	365	22·360	24·816	24·886
4	130	26¼	370	27·692	25·026	24·921
5	131	26⅜	372	22·360	25·026	25·026
6	132	27	364	27·692	25·026	25·026
Means	130	26¾	366	--	--	24·964

This is practically a speed of 25 knots or 28 miles per hour. *This is the greatest speed ever attained through the water by any ship or boat*, and is a wonderful performance. We shall have more to say concerning this Italian torpedo boat. Meanwhile we may point out that our own government would use only a necessary precaution if they took care to provide this country with an adequate number of similar boats.—*The Engineer.*

Phosphorescent Photography.

At a recent meeting of the Photographic Society of Philadelphia, Mr. Frederick E. Ives made a short address on the subject of "Photographing by the Aid of the Phosphorescent Tablet." He said:

Photography by the aid of the phosphorescent tablet is not a new discovery, having been known since 1880. It is not even a practically useful method, and is interesting only from a scientific point of view. My own experiments with the method having resulted in the discovery of certain facts not previously known, I have been persuaded to show the results, and make some remarks concerning them.

The facts, already well known, are that Balmain's phosphorescent paint, which probably consists chiefly of sulphide of calcium in a suitable vehicle, becomes luminous when exposed to light, and the light emitted acts powerfully on photographic sensitive plates; also that heat releases phosphorescent energy. Solarized phosphorescent tablets have been used as a source of light for contact printing in the dark room; and negatives have been made by exposing the tablet in a camera, and then making a contact exposure on a photographic sensitive plate in the dark room. Such a photograph I now show. It has a somewhat granular appearance, due to the coarseness of the particles of sulphide of calcium, and although the lines are partly sharp, they appear surrounded by a sort of halo. The editor of the *British Journal of Photography*, in a recent editorial, advanced the theory that this effect was due to a spreading of the phosphorescence, and that it would be impossible to obtain a sharp camera photograph by the aid of the phosphorescent tablet. My belief is that the phosphorescence does not spread, and that the effect is due merely to the fact that the luminosity of the phosphorescent coating extends to considerable depth, and the light from the lower part of the layer acts diffusely, because it is radiated from a point at some distance from the surface of the photographic sensitive plate.

To test this, I exposed a tablet in the sunlight until fully solarized, then removed it to the dark room, and placed it in contact with another tablet, under pressure. It was impossible to discover any communication of phosphorescence by contact, and if any occurs it is insignificant. I also observed that prints and camera impressions on my tablets appear perfectly sharp to the eye, and found that they could be reproduced sharply by photographing in the camera. I therefore conclude that it is possible to make sharp camera photographs by the aid of the phosphorescent tablet, but that the method has no value, because it is always easier and better to make photographs in the usual way.

It has been suggested that the tablet might offer some advantage in the reproduction of colored objects. It is true that the color sensitiveness is not the same as that of silver bromide, but the difference has been found to be altogether in favor of the silver bromide.

The second known fact that I mentioned is that heat releases (exhausts) phosphorescence. It does not appear to have occurred to any one that this might be made a means of producing camera pictures by the action of the heat, until I discovered that the obscure heat rays of the lime light spectrum produced a strong impression on a solarized phosphorescent tablet. I succeeded in producing heat pictures of objects under certain conditions, which are described in a communication to the Franklin Institute and published in the Institute journal for this month.

Mr. Ives showed on the screen several photographs, among which was one showing some buildings, made by the use of a phosphorescent tablet in the camera, and another in which a metallic object had been photographed by the action of reflected heat rays on the tablet in the camera.

Lecture on the Pneumatic Dynamite Gun.

A paper on the above subject was read by Lieut. Edmund L. Zalinski before the Military Service Institute, in the upper room of the Army Museum on Governor's Island. The meeting was called to order by Major-General Schofield. Quite a distinguished audience was present, including General Abbot, Lorettus Metcalfe, of the *Forum*, and other military and civil notabilities. The points treated of by the lecturer were in the main the same that have been already presented in our columns.* The benefit of the high trajectory was well brought out. For use on ships this was shown to be an actual benefit, as the range of shot would be less affected by the motions of the vessel in general proportion to the height of the trajectory. The practicability in an emergency of arming ferryboats with these guns was touched upon.

Lieut. Zalinski, in concluding, recited the names of those who had been instrumental in perfecting the weapon, claiming as his portion the system of electric firing. A discussion followed, and the proceedings closed with a short address of commendation and appreciation from General Schofield, after which an adjournment was taken. Sectional drawings of the new dynamite cruiser, an 8 inch shell, and the wet and dry batteries, and safety cut-offs, were exhibited.

Asbestos Paper.

Mr. Ladewig has devised a process of manufacturing from asbestos fiber a pulp and a paper that resist the action of fire and water, that absorb no moisture, and the former of which (the pulp) may be used as a stuffing and for the joints of engines.

The process of manufacture consists in mixing about 25 per cent of asbestos fiber with about from 25 to 35 per cent of powdered sulphate of alumina. This mixture is moistened with an aqueous solution of chloride of zinc. The mixture is washed with water, and then treated with a solution composed of 1 part of resin soap and 8 or 10 parts of water mixed with an equal bulk of sulphate of alumina, which should be as pure as possible. The mixture thus obtained should have a slightly pulpy consistency. Finally, there is added to it 35 per cent of powdered asbestos and 5 to 8 per cent of white barytes. This pulp is treated with water in an ordinary paper machine and worked just like paper pulp.

In order to manufacture from it a solid cardboard, proof against fire and water, and capable of serving as a roofing material for light structures, sheets of common cardboard, tarred or otherwise prepared, are covered with the pulp. The application is made in a paper machine, the pulp being allowed to flow over the cardboard. Among other uses, the asbestos paper has been recommended for the manufacture of cigarettes.—*L'Industrie Moderne.*

THE Senate of Pennsylvania have passed a bill providing for the infliction of capital punishment by electricity. If we are not mistaken, it was the SCIENTIFIC AMERICAN that first advanced the idea of applying electricity for executions, and it was not long after our publication that two or more patents were issued for chairs provided with wires for the purpose.

* See SCIENTIFIC AMERICAN, April 9, 1887, p. 225; and October 31, 1885, p. 271.