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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 850.

For the Week Ending April 16, 1892.

Price 10 cents. For sale by all newsdealers.

A REMARKABLE CHEMICAL COMPOUND—NICKEL CARBON OXIDE.

A most curious and interesting chemical compound, one which may yet be the basis of important industrial processes, is the newly discovered nickel carbon oxide. Ludwig Mond, F.R.S., while working upon nickel and investigating its remarkable power of dissociating carbon monoxide into carbon and carbonic dioxide, accidentally produced the new compound. If nickel is heated in an atmosphere of carbon monoxide, it separates carbon, and if the hot mass of carbon and nickel is exposed to the air, it spontaneously takes fire. To avoid this result, Mond, in his laboratory work, very naturally cooled the carbon and nickel in a stream of carbonic oxide gas, and in order to avoid poisoning the air of the laboratory passed the gas into a Bunsen burner and lighted it. As the mass cooled, the flame became luminous, and grew brighter and brighter as the temperature fell.

This very extraordinary phenomenon was investigated. The gas before reaching the burner was passed through a glass tube which was heated, as in the well known Marsh test for arsenic. A bright mirror was deposited on the tube and the flame lost its luminosity. Evidently the substance of the mirror was the agent in making the flame luminous. On analysis, it proved to be nickel of a high degree of purity.

In short, a discovery was fairly stumbled upon, that the hard, difficultly expansible, iron-like metal, nickel, could be carried off at ordinary temperatures by carbon monoxide gas, the metal and gas combining to form a volatile compound.

By special care the substance was produced in quantity, and was condensed by cold into a liquid of high refracting power, expanding very much with heat, and very volatile. Its specific gravity is 1·3185. At 13° F. below 0 (—25° C.) it solidifies into needle-shaped crystals. It is quite explosive; sudden changes of temperature or jarring, by scratching with a file the tube containing the pure vapor, determines its violent explosion. Mixed with air, it explodes when a flame is applied to the mixture. Its formula is, $Ni(CO)_4$; one atom of nickel to four molecules of carbon monoxide, giving 34·28 per cent of nickel.

The compound is decomposed by heat without explosion, when the heat is properly applied. This was what took place in the first experiment with the Bunsen burner. At 392° F. the metal separates. The entire percentage of carbonic oxide is liberated, and perfectly pure coherent metallic nickel is produced.

In the above there are suggestions of the possibilities of this reaction. It now seems practicable to plate with nickel by this process. A heated body, whether a conductor or not, is rapidly coated with a fine coating of nickel, if acted on by the new compound. This suggests the plating of glass, china, and many other non-conductors, something which necessitated formerly an initial coating with graphite, platinum, or some equivalent, to act as a conductor for the electric current. Again, this nickel deposit may be made very thin, and may then be employed as a base for gold or silver plating on glass or china.

When the possibilities of the process in the extraction of nickel from its ores is considered, the subject assumes new importance. It is suggested that nickel may be separated by carbon monoxide gas, the metal may be separated by heat, and the same gas may be used over and over again until the ore is exhausted as if by a gaseous leaching process. The metallurgy of nickel has hitherto been anything but satisfactory. If it leads to the economical production of pure nickel, Mond's discovery will have accomplished a great deal.

The chemist sees in it a basis for the analytical separation of nickel and cobalt. The method, if practicable, would be a most elegant and neat one. Many substances have been examined, but iron is the only one that forms an analogous compound, and this compound is obtained far less readily than is the nickel one. Its use in analysis seems quite feasible.

In experimenting with it the highly poisonous nature of carbon monoxide gas should be kept in view. None should be allowed to escape into the room, and the nickel compound itself is highly poisonous if respired. This suggests one other property which was investigated—its physiological action on the animal system. If injected into the veins, it lowers the temperature to a remarkable extent. The experiment was tried upon a rabbit; an extremely small dose produced a fall of temperature of over 20° F.

For fuller accounts of this substance, Prof. Mond's paper given in a recent SCIENTIFIC AMERICAN SUPPLEMENT (No. 823) should be consulted. Should the new compound realize but a small proportion of what it suggests, it will prove the most valuable of recent discoveries.

MRS. MARIA LOUISA PIKE.

Mrs. Maria Louisa Pike, wife of Col. Nicolas Pike, died at her residence in Brooklyn, N. Y., on March 23. She was a lady of many scientific accomplishments. Born in England, and when seventeen years of age accompanied her father, Hon. Benjamin Hadley, to his station as British Commissioner to South Africa, acted as his secretary for a number of years, and employed her leisure hours in acquiring knowledge of South African flora and kindred subjects.

In 1870 she resided in the island of Mauritius, which is in the Indian Ocean, at least a thousand miles from the mainland. Col. Nicolas Pike, her future husband, was the United States Consul there, and was making a thorough study of the scientific features of the island. He gave special attention to the fish of the Indian Ocean, many new and valuable specimens of which he collected and sent to Prof. Agassiz for his museum at Cambridge, Mass. Mrs. Pike, who had made great progress in the acquirement of scientific knowledge and also in the art of drawing from nature, assisted Col. Pike in classifying the more than eight hundred different species which he secured, and she also made drawings of them, which she colored to represent the wonderful hues peculiar to the fish of that locality.

Mrs. Pike came to this country about seventeen years ago and here married Col. Pike. Since then she has written voluminously, contributing many interesting articles on various subjects to the SCIENTIFIC AMERICAN, *American Agriculturist*, *American Garden*, besides English and French journals. Her effectiveness as a writer was greatly enhanced by her skill as an artist. Her illustrations were skillfully executed and aided greatly in elucidating the subject treated. Among many other works from her pencil, Mrs. Pike illustrated in colors various portions of a very complete collection of spiders which her husband made, and she also executed drawings with pen and ink of the snakes of the United States. This work required a vast amount of labor and patience.

Mrs. Pike was a member of the Brooklyn Institute of Arts and Sciences, and took special interest in the department of botany, where her wide experience and store of knowledge were of great service to her associates. She was, however, an enthusiastic and painstaking student in many departments of science.

The Pogonip Fog.

The city of Carson, Nev., experienced the other evening the thickest and coldest pogonip fog "in the memory of the oldest inhabitant," says a writer in a recent issue of the *Evening Post*. The pogonip fog is peculiar to elevated altitudes in the Nevada Sierras. It ascends from the valleys, and its chill embrace is so much feared by the Indians, who are predisposed to affections of the lungs, that they change their camp if apprised by the atmospheric conditions that the dreaded fog is approaching. Mr. Ogden, a chemist of the Nevada Mining Bureau, furnishes this pleasing description of the pogonip:

"In the White Pine Mountains, the Toyabi, the Hyko, and the Pahranagat ranges it is quite common to see the trees, houses, and everything out in the open gradually become white without any apparent cause. There is no perceptible fog, but the hot air from the valleys gradually ascends up the mountain side, and, becoming crystallized, the minute crystals attach themselves to anything in sight. This phenomenon affects human beings in just the same manner, and when the fog passes by, the frozen particles will adhere to the hair and clothing, producing a very grotesque effect. Hot Creek Valley is situated right in the center of the mining district, and is so called because of the warm springs that are always to be found there. These springs cause a pogonip in that district every night, and for this reason: The wind in the valley always blows from one direction in the daytime, and after sunset it invariably blows from the opposite point. The effect of the cooler air passing over the hot valley is to force the heated air to rise. When it reaches a temperature of about 25°, the result is a pogonip."

The Best Mosquito Remedy.

Mr. C. H. Russel, of Bridgeport, Conn., has recently communicated to us the following interesting fact: A very high tide recently broke away the dike and flooded the salt meadows of Stratford, Conn. The receding tide left two lakes nearly side by side of the same size. In one lake the tide left a dozen or more small fishes, while the other one was fishless. A recent examination showed that while the fishless lake contained tens of thousands of mosquito larvæ, that containing the fishes had in it no larvæ.

An English gentleman living on the Riviera, according to a correspondent of *Nature*, having been troubled by mosquitoes, discovered that they bred in the large tanks kept for the purpose of storing fresh water, which is rather a rare commodity at this Mediterranean resort. He put a pair of carp in each tank and succeeded in this way in extirpating the insect pest.

The utilization of fish in this way is an old suggestion, and a very practical one under some circumstances. Many people suffer from the mosquito plague when the insect breeds in a circumscribed and easily accessible place, and where it could be destroyed by some such method as that used by the level-headed Englishman. —*Insect Life.*

New Mode of Producing Colored Photographs.

This is a process by James W. McDonough, of Chicago, Ill., who describes it as follows:

I take a support of plain glass, celluloid, paper, or other suitable substance, upon the surface of which is a sensitive photographic coating, preferably forming what is known as an "orthochromatic dry plate." This may be rendered tacky by immersion in water or diluted glycerine. If preferred, however, the plate may be used before it becomes quite dry in the course of its manufacture. I dust the plate, either while it is somewhat moist in the course of its manufacture or after it has become tacky, as above explained, with a mixture of colors composed of fine or powdered particles containing the colors desired. I thus obtain a colored surface composed of particles lying side by side which have the properties of stippled colors instead of the properties of a true mixture of pigments. In order to get these colored particles, I use colored powdered glass, transparent pigments, gelatine, resin, shellac, or similar substances stained by aniline dyes, etc. In the preparation of the colors by means of shellac I take a sufficient quantity of clean white shellac dissolved in alcohol, to which I add aniline colors—say for one lot red and yellow colors—in such proportions that the result will be a red, which when viewed by transmitted light in layers will cut off or absorb as much green, blue, violet, and yellow as possible, or which, in other words, will transmit as far as possible a pure red. Another lot is colored with as pure a green as may be formed by mixtures adding yellow to absorb blue. Another lot is colored blue. As the mixture of colors formed in this way by red and green does not form a bright yellow, I may use in addition another lot colored as near the yellow of the spectrum as possible. These lots, after being thus colored, are allowed to dry, forming colored masses, which are then reduced to powder by grinding, sifting, etc.

If now proper proportions of red and green are mixed, a nearly black or gray mass will be formed, and if proper proportions of red, green, yellow, and blue are mixed, a mass will be formed that is nearly black or gray; but if this same mixture is dusted or finely spread upon the prepared sensitive surface, it will reflect or transmit a mixture of all these colors, which will be white in proportion to the purity of color, cleanliness of mixture and quantity of light transmitted or reflected. The glycerine may be washed out, so that only the colored particles in the mass in which they are arranged remain. When viewed under the microscope, the white surface is seen to be composed of a multitude of different colored particles lying side by side and separated by small distances. This surface may be flowed with a thin coat of gelatine, which will penetrate the spaces between the colored particles, or the ground and colored particles may be coated with gelatine before applying them to the tacky surface by mixing them with a small quantity of dissolved gelatine and regrinding them, according as a mat or smooth surface is required.

The process of producing the effect called "color," above described, is by absorption of light; but inasmuch as color effects may also be produced by refraction, dispersion, or diffraction of light, I do not mean to limit myself to absorption only as the means of producing them.

The photographic plate thus obtained, consisting of colored particles applied to its sensitive surface, may be exposed to the action of the light from the object to be photographed through a camera in such manner that this light will pass through the colored particles and affect the sensitive film, thus producing a latent image of the object. The plate may then be developed by the use of the so-called "alkaline pyro developer," so that the colored particles will adhere to the surface, which is penetrated by the same colored light as the particles themselves, because gelatine is rendered insoluble in proximity to the silver particles in the sensitive compound where acted upon by light. Thus particles which do not allow the passage of colored rays on account of absorption may be washed off, because as to such particles the gelatine remains soluble. Thus blue rays will cause blue particles to remain as an image, white light all the colored particles in that space acted upon by white light, and all will be removed where black occurs, which does not act upon the photographic film. After the development, the picture may be treated with thiosulphate of soda to remove the sensitive compound not acted on by the light and developer. By thus developing the plate a picture is produced composed of the particles of silver and the colored particles remaining on the plate after the development. This picture may be used as a negative or backed with a black or other colored surface, as in an ambrotype. The colored image is formed by the reflection of light from the particles or through the particles from the silver image or by the transmission of light through them when not cut off by the image. The use of the orthochromatic sensitive plates and colored screens before the camera for the purpose of sifting light and regulating the action of different colors upon the film is too well known to require explanation. I will merely add that the particles are dusted, spread, or placed upon the plate in such proportions as to produce a white or transparent surface.

[FOR THE SCIENTIFIC AMERICAN.]

Inventors' Persistence.

Starting with Professor Morse, the great discoverer of transmitting messages by lightning and inventor of the first machine for that purpose, his struggles and remarkable success is certainly one of the wonders of the nineteenth century. About 1832 the professor is said to have conceived the idea while on a voyage across the Atlantic, and soon after his return set at work experimenting in a small way in connection with his devoted wife.

For nearly ten years they worked and struggled, most of the time poor, until at last they hoped for success in long distances. The professor, through a few New York Congressional Representatives and one of the New York Senators, who promised to aid him in getting an appropriation of, I think, $30,000, to construct an experimental line from Washington, D. C., to Baltimore, Md., a distance of about 30 to 35 miles. The professor had obtained permission to string several miles of wires through the United States capital and set up his machines, with himself at one end and Mrs. Morse at the other, at remote corners of the capital. The President of the United States was the first to investigate, and expressed himself very favorable to the appropriation. Committees were appointed from the House to investigate, and finally succeeded in getting the bill passed by that body by a small majority.

But this must be confirmed by the Senate. Several times the bill was called up and tabled. All of this time the professor's expenses were increasing, even his board bill at his hotel. Finally on Saturday night, between 11 and 12 o'clock, the bill, with others, was called up and defeated by one single vote. The professor left the capital a very sad man. The other New York Senator had been trying to get a bill through for a New York harbor appropriation and it failed by one vote also, each Senator being hostile to the other's bill. After the professor left, his friend walked over to the other New York Senator and said: "This is too bad. I now propose to move to call both these bills up if you will second my motion." This was agreed, and the Morse bill was hitched on as a tail to the harbor bill kite and both passed, and the President was there to sign them. The professor said that he went home, but could not sleep. In the morning (Sunday) when he came down the landlady met him. "Professor, allow me to congratulate you." And next came the landlord with congratulations. And next his Senator friend, who took him by the hand. Said the professor, "What does all this mean? I wish you could congratulate me, but my bill was defeated."

"No, sir," said his Senator friend, "your bill passed and was signed after you left the House, and there is $30,000 in the Treasury to your order."

I was one of the fortunates who stood in Central Park, New York City, when the bronze statue to Professor Morse was unveiled, and there stood the grand old man to whose achievement this memento had been erected by the telegraph operators, and it was then that the professor telegraphed under the Atlantic Ocean in that cable that is strung along among huge monsters that roam in its endless abysses and chasms, and onward clear around our globe. Never was such an achievement realized by one mortal being. Almost every one knows the first message of four words, "What hath God wrought!"

Elias Howe with the sewing machine met a similar fate. His first machines were crude made machines indeed, and his first claims were on the machinery, which was subject to vast variations and numerous evasions. But a happy thought came to Mr. Howe, so he surrendered his first patent and took out a new one, in which he claimed a needle with the eye at or near the point. For about seven years young Howe struggled to get his machines into use; but the early prejudices against using any machine that would throw poor sewing girls out of work defeated him, so he tried England, and there met a similar fate. Finally he raised enough money to get his wife home, and he worked his passage as cook in a sailing vessel, with bare money to get home to Massachusetts.

In walking up Broadway he saw large warerooms of finely finished machines, all using his needle. He went home and induced his father to mortgage his farm for money and commenced suit against every firm using his needle, and carried it to the Supreme Court and got judgment against them. The master brought in $5 damages on every machine made, and it is said that his first money on this royalty paid him over $160,000, and he died an eccentric millionaire.

The next struggler was Hussey, with his guard tooth mowing machine. Mr. McCormick had invented and patented a reaper and used a heavy sliding cutter bar that often caused it to clog by the grass or grain to bend over and wedge it. Hussey saw this and made the guard tooth having a slot through near the center to prevent the grain bending over and clogging the cutter. This improvement he patented, but Mr. McCormick claimed the sliding cutter very broadly, and commenced suit against Hussey for infringement, and beat poor Hussey in the lower courts.

P. H. Watson, then a prominent patent attorney, and afterward Assistant Secretary of War under Stanton, and afterward president of the Erie Railroad Company, and who died the same day that General Grant died, told me that poor Hussey came to him and said:

"Watson, I can't carry on this suit. I am in debt now over $3,000, and can't get money to make the appeal."

Mr. Watson said: "Mr. Hussey, if you will assign me a one-half interest in your invention, I will give you $5,000 ready cash and carry on the suit for you without further charge."

Hussey did not lose a moment, but made the assignment at once, and Mr. Watson told me that when he handed him a check for $5,000 Hussey was the happiest man to all appearance that he ever saw. They carried on and won their case before the United States Supreme Court, and Mr. Watson told me that he (Mr. Watson) made over $300,000 clear out of that one transaction.

J. E. EMERSON.

Electrical Tanning.

The following report has recently been issued by Mr. Georges Hannenstein, at Verviers, Belgium, upon some experiments recently conducted there in "electrical tannage."

The apparatus consisted of a rectangular wooden vat, 6 ft. 6 in. long, 4 ft. 10 in. wide, and 5 ft. 3 in. high, with two electrodes, frame work and shafting, the cost of which was £30 7s. 6d., together with a dynamo, amperemeter, voltmeter, and shafting, etc., costing £24. The installation was capable of supplying six vats.

Forty ox and cow hides from the Brussels *abattoir* were experimented upon, weighing, without the horns, 1,380 kilogrammes. These hides, after having been put in lime, unhaired and fleshed, were swelled and colored.

The forty butts derived from these hides were hung up in vats on October 12, 1891, and taken out on November 16. They were subjected to the action of electricity during four weeks, or 24 days, from six to seven hours each day. The weight yielded, when finished and dry, was 379 kilogrammes.

The offal, bellies, throats, heads, hung up in the vat on November 16 were taken out on December 7. These parts were, therefore, subjected to the action of electricity during three weeks, or 18 days, from six to seven hours per day, and the weight yielded when finished and dried was 344 kilogrammes.

The forty hides, therefore, with a given weight of 1,380 kilogrammes, gave a total weight of finished leather of 723 kilogrammes, or 52 $\frac{4}{10}$ per cent.

The tanning materials employed to swell, color, and tan these forty hides were as follows:

		£	s.	d.
880 kilos.	oak bark	5	5	6
85 "	mimosa bark	1	7	0
700 "	oak extract	6	8	0
		13	0	6

No details are available as to strength of current supplied during these operations, nor to the cost of driving the dynamo, labor, etc.

Magic Picture.

This is the contrivance of F. Tschofen, of Vienna, Austria. It consists in an apparently blank piece of glazed paper or card or other suitable material which, on being rubbed over with colored pencils or crayons, or with colored powders or the like, produces pictures or words—such as answers to questions—visibly printed above.

A piece of glazed paper, card, or other suitable material is inscribed with letters or words or pictures, preferably in outline, either drawn, written, or printed with a mixture of finely powdered chalk, water, and gum arabic, or of any suitable mixture which is capable of imparting to the said lines a rough surface. Such inscriptions will, on being dried, be totally, or at least almost, invisible, but on rubbing the card, etc., thus prepared with colored crayons, powder, etc., the latter will adhere to the roughened lines, but not to the glazed surface of the card, thus bringing out the inscription or picture.

A Rain of Mud.

On April 4 there was a shower of mud along the Union Pacific Railway at Onaga. The rain commenced early in the day, and soon the south and east sides of all houses were covered with yellow clay. The windows received such a coating as to shut out the sun's rays.

A Union Pacific train which ran through the storm had its windows covered, and the headlight was so completely plastered that the light was shut in and the train ran in darkness to Rossville, the next station, where the mud had to be scraped off.

This storm lasted until after daylight. As far east as Topeka, the windows showed that the edge of the mudstorm had extended this far. It was more severe about fifty miles northwest.