

Scientific American.

ESTABLISHED 1845.

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS TO SUBSCRIBERS.

One copy, one year, for the United States, Canada, or Mexico.....\$3.00
 One copy, one year, to any foreign country, postage prepaid, \$0.16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....\$3.00 a year.
 Scientific American Supplement (Established 1871).....5.00
 Scientific American Building Edition (Established 1885).....2.50
 Scientific American Export Edition (Established 1878).....3.00

The combined subscription rates and rates to foreign countries will be furnished upon application.

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MUNN & CO., 361 Broadway, corner Franklin Street, New York.

NEW YORK, SATURDAY, OCTOBER 8, 1898.

NEW CHEMICAL DISCOVERIES.

It is doubtful whether as many discoveries of new elements have been made in as many years as in the three or four months since the first of June. In every instance the announcement of the discovery has been supplemented by complete proof, without which, the scientific world would be loth to accept the discovery. The amount of chemical research necessary to detect these new elements has been enormous.

A pronounced sensation was created in 1895, when Lord Rayleigh and Prof. Ramsay discovered the existence of a gas previously unknown in the atmosphere which they termed "argon." It resembled nitrogen in being inert and unwilling to make combination with other elements. A few months after Prof. Ramsay discovered alone, in a mineral brought from Sweden, the gas helium, which up to that time had been found only in the sun and a few stars. The Russian chemist Mendeleeff has devised a table which is considered of great importance by chemists, as by it the elements can be easily arranged according to chemical law, based on the tendency of the elements to arrange themselves in classes in which the numbers would have certain properties in common, and it has been found that a regular ratio would then prevail between the atomic weights of the elements of the class so formed. By reason of this law Prof. Ramsay suspected that an element not yet detected existed, and that when found, it would possess an atomic weight between that of argon and helium. We have already referred to his paper before the British Association at Toronto, and his discovery has also been stated. Last June he announced that with Mr. Travers he had discovered a new element which did not fit in the designated place in the scale, but was related to argon. This was the gas "krypton," which was obtained directly from argon. These two English chemists pursued their investigations and found two other substances combined with argon. They had different weights and spectra from each other, from argon and from krypton. One was named "neon" and the other "metargon."

Following close upon the heels of the last two elements came the announcement of two others, one from France and one from America.

Two or three years ago M. Becquerel the French chemist reported that uranium salts threw off an invisible radiation, something like that discovered by Prof. Roentgen. Following up this line of inquiry, M. and Mme. Curie found that a variety of pitch blende possessed this characteristic in a far higher degree. This led them to believe that the mineral contained a new element. Up to the present time they have not succeeded in isolating it entirely, but they had reported to the French Academy of Sciences that they had obtained it in the form of a sulphide and they proposed to call the element "polonium." The new substance resembles bismuth, but is of far greater radiating power than uranium.

Mr. Charles F. Brush read a very important paper before the American Association for the Advancement of Science at its Boston meeting, in which he describes the experiments which he has been carrying on for a year or two in eliminating from the atmosphere a gas which is lighter than hydrogen and which he believes he has succeeded in doing. The new substance has been called "etherion," and if his supposition is well founded, the element will probably exceed "coronium" in lack of weight and density. Mr. Brush says that the ability of etherion to conduct heat is fully a hundred times as great as that of hydrogen, from which he bases arguments on the velocity of its molecules. Mr. Brush considers that a gas possessing these peculiarities cannot be confined to the earth, but must reach out indefinitely into space. Mr. Brush suggested the possibility of several new elements besides etherion being found in the atmosphere and that all of them may prove to be lighter than hydrogen.

The latest announcement of the discovery of a new element was made by Sir William Crookes, in his presidential address before the British Association for the Advancement of Science. He had been examining certain rare earths like those which are used in the manufacture of the Welsbach mantle, and in the spec-

trum of a part of a specimen which had been isolated from the rest, he discovered lines that were unrecognizable. Eventually he found that he had discovered a new element, and he is now making investigations on it. He has been able to determine, however, some of its properties. It is heavier than "yttrium," but lighter than "lanthanum," its atomic weight being estimated at 118. It shows a marked disposition to combine with other elements. The characteristic lines of its spectrum are in the ultra-violet and stand alone, and from this latter circumstance Sir William has decided to call it "monium."

In addition to the discovery of these elements the discovery of terrestrial "coronium" is most interesting and is one of the greatest scientific triumphs of the year. It is hoped that soon Prof. Nasini and his collaborators will be able to obtain a sufficient quantity of this gas so that it may be liquefied. It is believed that a degree of cold may be obtained by its use which will exceed that which results from the liquefaction of hydrogen and may even touch the "absolute zero," which is hypothetically placed at minus 273°. It is assumed that this temperature probably represents that of interstellar space. The Italian chemists are hoping to find the other substances in connection with coronium. As the year 1896 was rendered memorable by the discovery of Prof. Roentgen, so the year 1898 will be celebrated as one of unparalleled importance as regards the world of chemistry, and the theater of action has in this case extended over a number of countries.

THE LIMITATIONS OF THE TORPEDO BOAT.

There is no disputing the fact that the torpedo boat operations of the Spanish war have cast a certain amount of discredit upon this type of vessel. On the few occasions in which torpedo boats were in action the results were such as to leave this much dreaded engine of war shorn of its terrors, at least in the popular mind. In every case the torpedo boat was either crippled or sunk, without being able to make a single successful launch of its torpedoes. The disablement of the "Winslow" and the "Terror," the tragic sinking of the "Furor" and the "Pluton," would seem, at first sight, to demonstrate that such craft have not only been greatly overrated, but that they are practically useless for the purposes of modern warfare.

As a matter of fact, these reverses prove nothing of the kind.

The torpedo boat is a highly specialized engine of war, designed with sole reference to a particular kind of attack, and admittedly useless for any other purpose. In every instance mentioned above it was dispatched to do work for which it was never intended and for which it was utterly unfit. Hence the disasters which overtook it were natural and inevitable. At Cardenas the "Winslow," carrying three little 1-pounder guns, was sent into a harbor against gunboats which were armed with quick-firing rifles of considerable power. She ran into a zone of fire which quickly crippled the boat and decimated her crew. The "Terror," armed with 12-pounders and 6-pounders, attempted in broad daylight to steam across several miles of intervening water and torpedo the "St. Paul." The latter was armed with long range 5-inch rapid-fire rifles and a good battery of 6-pounders, and working on the stable platform afforded by the lofty deck of the liner, her gunners quickly disabled the little craft, and drove her back into the harbor. At Santiago the "Furor" and "Pluton" deliberately steamed out into the concentrated fire of four battleships and an armored cruiser. The inevitable followed, and in a few minutes they were riddled and sinking. These results simply prove that the torpedo boat is a very positive failure if engaged outside of its own proper sphere of action.

In the first place, the torpedo boat was never intended for daylight work of any kind whatsoever. To use torpedo boats by day is as reasonable as to anchor buoyant submarine mines in full view at the surface of the water. Invisibility is essential to torpedo boat attack, if it is to be conducted with any prospect of success. The little craft is constructed with the expectation that it will never attempt a stand-up fight in which blow is given for blow, and hence its flimsy skeleton and fragile shell are made of barely sufficient strength to carry its load of coal, torpedoes, and crew, and endure the throbbing of its swiftly running engines. As far as protection from even the rifle fire of the enemy is concerned, her crew and engines might as well stand exposed in the open.

The sole *raison d'être* of the torpedo boat is to be found in the destructive power of the torpedo when it is once brought within launching distance of a battleship or cruiser. The torpedo boat is designed for the express purpose of bringing the torpedo within range, firing it, and, if possible, making its escape from the rapid-fire guns of the enemy.

The early torpedo boats were of 80 to 120 tons displacement. Their small size greatly aided them in escaping observation, and there is no question that the larger torpedo boats, known as destroyers, lose much of their value for attack on account of their increased and conspicuous size. The destroyer was primarily intended as an answer to the torpedo boat. It was given

increased size, speed, and armament in order to enable it to run down and disable the torpedo fleets of an enemy, the first of these craft being constructed by England as a defense against the numerous torpedo flotilla of France. But the increased dimensions that made these vessels good destroyers rendered them poor torpedo boats, the feature of invisibility being largely sacrificed to speed and armament.

Is the torpedo boat destroyer a success? As a protection against torpedo boats it is; but for service as a torpedo boat against battleships it is not. For, in addition to its visibility on account of its size, it offers a larger target for attack, and the noise, disturbance of the water, and rush of flames from its funnel, all due to its enormous engine and boiler power, render the risk of detection trebly great. Only those who have seen a 5,000 or 6,000 horse power destroyer tearing along at night under the influence of forced draught can understand how impossible it will be for one of these vessels to escape detection on any but a foggy night. The terrific rush of air through the furnaces carries flame and hot coals through the smokestacks, from the top of which it often issues in a bright column of flame. What better signal of its approach could the lookout on a battleship desire?

There is, however, one method of using the destroyer or torpedo boat which might prove to be fatal to the strongest fleet, even in a daylight attack. We refer to the method of attack by overwhelming numbers, in which a dozen or more of the little craft make a simultaneous dash on all sides upon a battleship. Here, we are free to confess, the chances of success lie strongly on the side of the many against the one. There is no battleship that could reasonably hope to sink every one of a dozen torpedo boats in the one and a half minutes intervening between the time they came within range of the battleship's guns and the time when they fired the torpedoes. If she sank four or five, she would be doing wonderfully good shooting, and five torpedo boats would represent less than one-third the cost of a single battleship. It is possible that the torpedo boat's destroyer may yet be the battleship destroyer as well. Such, at any rate, is the opinion of one of the greatest naval strategists of the day.

OUR FAULTY TRADE METHODS.

It is a fact that, while we are able to produce goods of a high quality and at the lowest price, we are not always able to sell them to advantage. One of the most valuable offices which our consuls perform is to gather information abroad as to the methods in vogue in conducting business, and also in giving advice as to how we may extend our markets. This information is forwarded by them to the Department of State, which in turn prints the reports and tries to disseminate the information as much as possible by giving these reports a wide publicity. The newspapers are supplied with advance sheets of consular reports and interested parties are furnished with them without expense. One of the most valuable collections of hints of this nature is given by Consul Marshal Halstead, of Birmingham, who writes to the department under the caption "Faults of American Trade Methods." A few days ago Mr. Halstead was shown sixteen letters from sixteen firms, all well known in their respective lines, in the United States. On twelve of these letters there was insufficient postage, most of them having only a two cent stamp to carry them. Of course, this meant that the Birmingham man who wished to buy from some of these American firms had to pay double the deficiency of the postage, which would tend to give him a bad opinion of the carelessness of American business methods. Our business methods compare favorably with those of any country in the world, and are perhaps better, but we cannot afford to get a reputation of having bad business methods by inattention to even such small matters as this. Steamer mails from the United States frequently arrive after business hours on Saturday, and if there is a deficiency in postage, the letter will not be delivered at hotels, etc., until Monday, so that the traveling representative often loses valuable time waiting instructions from home, which cannot be promptly delivered, owing to the letter being insufficiently stamped. One American house tells this agent that a deficiency of postage is a guarantee that a letter will be delivered to the right party, as no one else would pay the postage in order to get the letter!

There is no question that mulcting foreigners in these small sums is a petty annoyance which has some effect on American trade. If an English or Continental house sends a telegram, a letter always follows, even to points nearby, containing a copy of the telegram. Few American houses do this even with cablegrams, and many important messages would be delivered in time if this were done. If a letter is sent to a foreign point, a letter-press copy follows by the next steamer as certainly as the second bill of exchange follows the first. With bills of lading the European house does not depend upon the triplicate copy forwarded by the shipping agent, but itself sends a duplicate copy to the consignee, retaining the original. The American houses constantly neglect to do this; so that Ameri-

can goods are constantly being held at foreign custom houses.

Another point which Americans are apt to neglect is the discrepancy in weights and measures between those abroad and our own. In Great Britain jewelry is measured on the arbitrary system of measurements called "forty-line scale," which means forty lines to the inch, instead of one-twelfth of an inch, which we usually understand to mean a line. A declaration was sworn to before Mr. Halstead of returned American goods, the Birmingham manufacturer having ordered from an American manufacturer a lot of "indestructible pearl," giving the measurement he required in lines. Not knowing what lines meant, the American, without inquiry, had recourse to the metric system. By this time the American manufacturer has undoubtedly received his goods, which are of a size which will render them valueless. A few weeks ago \$500 worth of fountain pens were returned to a manufacturer because they were not like the sample, although they were superior to it. From what has been already said, it will be seen that Americans, to be successful in foreign trade, must pay attention to the methods of conducting business in vogue abroad, and must particularly attend to postal matters, and must in all cases follow instructions implicitly as to measurements and shipping.

HOSPITAL ARRANGEMENTS IN THE SOUDAN.

It is interesting at this time of criticism and complaint to note the elaborate arrangements made by the British Army Medical Department for the final advance on Khartoum. Of course it should be remembered that the conditions which prevail in the Soudan army are much worse than anything which our medical officers have had to contend with, and in no case was the American army ever more than two or three days' sail from the base of supplies, while the British army is in the heart of Africa.

The arrangements made for the treatment of General Kitchener's army are as follows: A medical officer is attached to each infantry battalion, one also to the cavalry and to each battery of artillery. From each battalion are drawn thirty-two trained men who retain their arms and can be otherwise used in an emergency, but it is their business to give "first aid" to the injured and convey them to the field hospitals, which will be at a convenient distance behind the brigades in some sheltered position. Behind each brigade are to be five field hospitals, each with one medical officer and accommodation for twenty-five men. These five field hospitals act as one, but are made sectional in order that the sections may be adapted to follow any battalion that may act independently of the brigade. With each brigade there is also a senior medical officer. From the field hospitals the wounded are to be conveyed for treatment, as soon as possible, to barges moored off the river bank, where there will be accommodations for 200 men. These barges are to be cleaned and disinfected and fitted up as hospitals. Other barges will be used for operating purposes. Two outfits of Roentgen ray apparatus are on the barges. Additional hospital facilities will be provided on the river banks. Between Khartoum and Atbara there were to be eight lines of communication hospitals, with fifty beds, each having a medical officer attached to it. At Atbara camp ample and special accommodations have been provided, the hospital has been built of mud bricks, with walls three feet thick, and the lofty roofs protect the men from the heat. The walls are sealed with matting and thickly thatched with straw, so that this hospital is probably as cool a place as there is in the Soudan, and here there is accommodation for 250 men.

The wounded reaching this hospital are provided with hospital clothing and bedding, having sheets for their beds. Six medical officers are in charge.

There is another hospital lower down the river at Abadeah. Fifteen miles north of Berber is another mud brick hospital, with accommodations for 300, and it is to have eight medical officers. From these places and from the Atbara camp trains specially fitted up for conveying the sick and wounded will be run. At Halfa and Assuan, where there are breaks between the rail and the river, there will be severally a fifty bed and a twenty-five bed hospital for the accommodation of the men who need rest after the journey. On each of the gunboats is a medical officer. Every kind of drug and instrument that may be required is plentifully supplied, and everything is of the best quality. The organization is so thorough that there is every reason to believe that in this war there will be no mismanagement whatever in the medical treatment of the British troops. There is a force of 20 medical officers, 149 non-commissioned officers and men, and 11 women nurses to take care of 500 patients. By successive lessons of experience the authorities have been schooled into forethought and attention to medical and sanitary details with results that are highly creditable to them.

In modern warfare with weapons of such great precision and long range the number of wounded is so enormous that it is beyond the means of the existing medical service of any army to deal with them at once, if the service is not largely increased, as in the present

case. The surgeon of to-day, with all the modern appliances for the relief of the injured men, can do far more for the wounded than his predecessors in other wars could do, but this can be accomplished only by a radical increase in the number of surgeons who are sent with the army.

THE AMERICAN INSTITUTE PHOTOGRAPHIC, HOR-TICULTURAL, AND AGRICULTURAL EXHIBITION.

This exhibition opened on September 26, at the Academy of Design, this city, corner of Fourth Avenue and Twenty-third Street, and closes on October 8.

The photographic portion was got together by the secretary of the photographic section, J. W. Bartlett, M.D., and is a well arranged and interesting exhibit, comprising as it does beautiful prize genre photographs and novel effects in portraiture. The exhibit is confined to the north and east galleries and the corridor.

One exhibitor, Johannes Meyer, M.D., shows specimens of printing on silk and other fabrics by an improved process, and the Nepera Chemical Company in a special booth exhibits its quick printing process by gas light on what is called "Velox" paper. An exposure is made in the printing frame to a kerosene round flame light, about 6 inches distant, for 15 seconds, then the exposed sheet is removed from the frame at a short distance from this same light, placed in a developer and developed out by the aid of this light without damage in a very few minutes, giving an image of a rich black color or other color, as may be desired. The exhibition is more diversified and up to date than any the Institute has ever had, and is very instructive in showing the picturesque effects now obtainable by photographic apparatus and materials. About thirty-seven prizes were awarded by the judges—Charles I. Berg, William M. Murray, W. M. Hollinger, J. Carroll Beckwith, N.A., A. T. Bricher, A.N.A., and Edward Bierstadt.

The display of dahlias of all varieties and hues in the east room is very attractive. The west room is devoted to fruit and vegetable products, the center table holding examples of fruits exclusively, four-fifths of which is taken up in an exhibition of many varieties of grapes, including a few bunches of hothouse grapes of mammoth size. The south room contains large sized flowering plants of numerous kinds, and the corridor stairs, as one enters the gallery, is lined with exquisite delicate leaved ferns of many varieties. On the entrance floor were to be found several full sized models of garden implements, planters, plows, etc.

Altogether, the exhibition is unique in its way, combining as it does photography, flowers, and agriculture under one roof.

THE UNIFORM OF THE SOLDIER.

The returning regiments, clad in all kinds of costumes, have aroused considerable curiosity on the subject of uniforms in general. It is said that the Emperor Valerius Maximus ordered the Roman soldiers to wear red, so they would not be frightened at the sight of their own blood, and even now red forms a conspicuous part of the uniforms among the French and British forces. Red has been ruled out of our own army of recent years, except for facings, largely upon the theory that the color was too conspicuous to carry into the field. This is not, however, strictly true, if we rely upon experiments made by the European military experts. German rifle range practice has shown that a blue target is hit three times while a red target is hit once. Other interesting tests have been made with a view to determining the distance that soldiers are visible; and out of a squad of ten soldiers clad in gray, scarlet, dark blue, and green, dark gray was the color that remained longest in view; next came the dark blue with the dark gray, while scarlet was the second to disappear, being excelled only by the dark gray.

The evolution of the uniform is the subject of an interesting article in The New York Evening Post, from which we glean the following facts: When the Revolutionary war broke out, each colony had its militia, and the uniforms of no two bodies were alike. At Lexington and Concord it does not appear that the patriots had any uniforms. The same is true of Bunker Hill, but soon after the latter battle, some general rules for a military costume were adopted. The higher officers came to be known by the colors of the fibbons worn across their breasts. The officers lower in rank were distinguished by the cockades worn in their hats. Throughout the war there was no special system of uniform in force for the rank and file of the patriotic army, for obvious reasons; the colonists were poor, and the war made it impossible to import material for clothing from England. Homespun did not lend itself readily to great variations of color, and even after it had been decided to make blue the standard color of the American uniform, the local jealousies existing between the colonists required the use of different colors for facings. In 1802 a uniform was prescribed for our army consisting of a dark blue coat reaching to the knee, scarlet lapels and cuffs, white waistcoat and cross belt, and dark blue pantaloons for the winter

and white for the summer. These articles of clothing were exchanged later for single-breasted coats without facings, and during the whole period the height of the collar kept rising, ending with the requirement that it should be worn high enough to reach the tip of the ear, and in front as high as the chin would permit in turning the head. It was in this costume, including a high silk hat, that our ancestors fought the British in the war of 1812. In 1821 dark blue was declared to be the national uniform color for both officers and enlisted men, the only exception being scarlet coats for musicians and gray coats for cadets. Various changes took place in the shape of the clothing of the soldiers until 1863, when our uniforms became practically fixed, the cloth for the trousers being light blue and the facings being light blue for infantry, yellow for cavalry, and red for artillery.

For general campaigning, the old Continental uniform, which was largely used during the Revolutionary days, is the most satisfactory. The British came to associate with this costume the idea of the skilled hunter and marksman, as found in our soldiers of that day, and they dreaded nothing more than coming upon a large body of colonists clad in this garb.

With the refinements of the uniform came a series of changes in the fashion of wearing the hair and beard. In the days of the Revolution, the troops, when on dress parade, wore their hair queued and powdered, and they themselves were clean shaven. One of Washington's orders was that at general inspection and reviews two pounds of flour and one and one-half pounds of rendered tallow for a hundred men should be used in dressing the hair, and another reminded the men that they would "not be allowed to appear with their hair down their backs and over their foreheads and down their chins at the side, which makes them appear more like wild beasts than soldiers," and that "any soldier who comes on the parade with beard or hair unkempt shall be dry shaved immediately and have his hair dressed on parade." It was not until a half century later that the order regarding whiskers was rescinded, the only rule since then being that they be kept short and neatly trimmed.

SAVING THE "MARIA TERESA."

The successful floating of the "Maria Teresa" has revived speculation in regard to the possibility of floating the "Colon." It is understood now that the government will afford Lieut. Hobson every facility for carrying forward this task. The difficulties in the way of raising the "Colon" are well understood, and any one examining the view of the "Colon" published in the SCIENTIFIC AMERICAN of July 30, as she lies on her side battered by the breakers, will appreciate the serious obstacles to be overcome.

The "Teresa" was blown off the rocks into deep water by dynamite on September 23, and proceeded to Guantanamo Bay accompanied by a wrecking tug, and she will shortly leave for a Northern navy yard, where she will be docked. Lieut. Hobson had charge of the raising of the "Teresa." His scheme for floating the "Colon" is most elaborate, and involves the use of air bags and dynamite. He has also suggested to the department the advisability of pulling the "Colon" around so that she will lie parallel to the shore instead of stem on. Reports received from Santiago show that the "Reina Mercedes" can be raised without any great trouble. She is sunk just at the mouth of Santiago Harbor, in a position well protected from storms, and when the work on the "Colon" is ended the wreckers will turn their attention to her. The "Mercedes" is a protected cruiser of 3,090 tons, and was built eleven years ago. The authorities consider her well worth saving. It is a curious fact that the Spanish officers of the "Mercedes" considered that, after the destruction of Cervera's fleet, the Americans would be caught napping, and that the "Mercedes" would have no trouble in forcing the blockade. The "Maria Teresa" will certainly form a great object of interest when she is refitted and when she appears flying the stars and stripes.

"SLATE WRITING AND KINDRED PHENOMENA."

It gives us great pleasure to announce that we commence in this number the publication of a series of articles under the heading given above. They are from the pen of Mr. W. E. Robinson, who is a well known authority on magic art, as he has been identified with it for the past twenty-five years. The articles are of particular value, as in his youth Mr. Robinson was brought up in the spiritualistic belief, but when he commenced to dabble in magic and understood the clever tricks of the prestidigitateur, the phenomena he often witnessed at séances became mere delusions and shams. He has made it a life study to deal with the methods employed by mediums to dupe their victims. Mr. Robinson has devised some of the cleverest stage illusions ever produced, and for many years was the assistant of the late Herrmann. He was also connected with the celebrated magician Kellar and is now stage machinist of the present Herrmann company. The articles will be profusely illustrated.