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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 spectrum 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-