in America. Then a course in naval construction was started at Annapolis under the direction of Lieut. Hobson. Congress at its last session withheld all appropriations for a course at Annapolis, under the impression that several American colleges had established adequate courses in naval architecture, but it has been found in many cases that these courses were wholly prospective, so the Navy Department does not now feel justified in sending officers to take these courses until they are more firmly established. It is extraordinary that naval architecture should not be taught in our great naval schools. But in view of the present condition of affairs it has been determined to return to the former practice. Two of the members of Constructor Hobson's class will, therefore, be sent to the University of Glasgow, two to the Ecole Polytechnique in Paris, while the remaining two will be compelled to abandon the construction corps and will become line officers.

NEW SYSTEM OF WIRELESS TELEGRAPHY.

A system of wireless telegraphy differing in principle from that of Marconi is attracting attention just now in the world of science, according to The New York Tribune. The essential fact which is utilized in the new method was discovered by Hertz in 1887, and has since been developed more fully by other investigators.

Ordinary white light when analyzed by a prism is broken up into a spectrum of various colors, each one representing vibrations of the ether at a different rate from those of the others. The violet rays have a much shorter wave length than the red ones. By photography and other means it has been ascertained that in addition to the waves which produce visible colors and the visible effect which is called "light" there are others which are shorter than the violet waves, and some that are much longer than the red ones.

What are called the "ultra-violet" rays, because they proceed from a region in the spectrum beyond the visible violet, possess peculiar properties. They have a singular relation to electricity. One of their characteristics is that if they are projected upon an electrified object, they will assist in discharging the store of electricity thereon. Here is another peculiarity: Suppose that a narrow gap is created in a circuit through which an electric current has been flowing; that the wires on each side of the gap terminate in knobs, and that the knobs have been so near each other that the current can leap across, in a shower of tiny sparks. Now, if the distance be increased a trifle, just enough to check the flow of sparks across the gap, and then a beam of ultra-violet radiance be made to fall upon the knobs, the flow is restored, and the sparks will again begin to leap from one terminal to the other with almost incalculable frequency.

Prof. Zickler, of Brunn, Moravia, has perfected a method of signaling with ultra-violet rays, in which he employs apparatus operating on the principle just indicated. At the sending station he uses an electric light of the arc pattern, inasmuch as the electric arc is particularly rich in ultra-violet rays. The light from the lamp is concentrated by means of a concave mirror, as in the case of a searchlight, and is projected in a slender, compact beam. A lens used in the front of the lamp to assist in the work of concentration is made of a specially selected material, a kind of quartz, which will not filter out of the light the invisible ultra-violet rays. Immediately ahead of the lens is placed a movable screen of glass, that has also been chosen carefully, because it will obstruct these ultra-violet rays, although it will not interfere with the visible radiance from the arc.

Any one at all familiar with the ordinary system of telegraphy knows that the operator alternately closes and opens an electric circuit by bringing one terminal in contact with the other and then withdrawing it. The length of time during which a contact lasts and the size of the space between the contacts can be varied enough to constitute a full alphabet. In the Zickler system the letters are formed after the Morse code or any other that may be preferred simply by removing the glass screen from in front of the lamp and then restoring it. The interruptions of the invisible radiance effected in this way are of such lengths and are so spaced as to fall into an intelligible scheme. Instead of opening and closing a "key" as in ordinary telegraphy, the operator uses a convenient device for altering the position of the glass screen in front of his arc light.

At the receiving station a bit of apparatus is used, in which a suitable lens catches the pencil of parallel rays and focuses them. Just inside the box in whose front this lens is set there are two terminals of an electric circuit brought near to each other, but without touching. One of the terminals is a small globe coated with platinum foil. The other is a round, flat plate, having a polished surface, so as to serve as a reflector as well as an electrode. It not only helps to complete a circuit for the flow of a current through wires in the station, but it also catches the focused incoming ultra-violet rays, so that they fall in a tiny spot on the center of the disk.

The disk is set at such an angle that the rays are reflected on to the globular terminal. Both, then, feel the influence of the ultra-violet rays, and are enabled to develop a stream of sparks that would not otherwise flow. The sparking is not the important feature of the performance, though. But the flow of the current thus promoted may be made to affect other instruments in the circuit, such as a "sounder" or telephone or a bell. And when, by the interposition of the obstructing screen at the sending station, the arrival of ultra-violet rays at the receiving end is stopped, the flow of the local current ceases, too. The apparatus here described can be made to give signals by any of the approved systems.

It should be noticed that this plan differs from the heliographic method of signaling with a sunbeam thrown from a mirror in this important respect: The latter plan deals with visible light, which is completely extinguished and restored. Any one near the receiving station can see the flashes and interruptions, and if versed in the code can read the messages being transmitted. But in Prof. Zickler's system the luminous rays of the arc light continue to shine steadily. No one sees any fluctuation in their brilliancy. All that is interrupted and restored is a beam of absolutely invisible radiance, which can be detected only by a suitable receiver.

The receiver, too, must be suitably placed. Unless the beam from the sending station falls upon the lens of the receiving apearatus, its signals cannot be read. The system guarantees perfect secrecy, therefore something that even the Marconi method does not now seem to promise. The electromagnetic waves which Marconi uses are generated in such a manner that they spread in all directions and can be picked up by any one who has a receiving instrument of the right sort.

Searchlights have been made which throw a beam for a distance of thirty or forty miles, and an interval of ninety or a hundred miles has been spanned by the Chicago Fair projector, which was removed to Mount Lowe, in California, and transferred to the vicinity of San Francisco during the war with Spain. Presumably the invisible rays can be detected as far away as the luminous ones. And it is conceivable that, with improved apparatus, this system can be worked successfully for more than a hundred miles. It is a costly system, however, and available only for service in which it is feasible to lay out large sums of money for the original installation.

Thus far Prof. Zickler has covered only about a mile with his successful experiments. This must not be regarded as any indication of the limitations to which the plan is subject. Although Marconi has had a line working for a year or so between the Isle of Wight and Bournemouth, eighteen miles away, and expects soon to have another working across the English Channel, between Folkestone and Boulogne, thirty-two miles, it may not be long before Zickler outdoes him in the point of distance. The system is not yet in operation on a commercial basis, but it promises to command a great deal of notice in the near future.

WOEHNELT'S ELECTROSTATIC CURRENT BREAKER.

The new contact breaker devised by Dr. A. Woehnelt, of Charlottenburg, and described and illustrated in the current number of the SUPPLEMENT, gives such remarkable results achieved by such simple means that the following notes on its structure and action may be of interest to readers of the SCIENTIFIC AMERICAN.

The coil which I use gives normally a 5-inch spark. I remove the condenser, screw the make and break in tight, so that its poles are pressed firmly together, and insert the new current interrupter in the primary circuit.

This interrupter is made in the following manner: A plate of sheet lead, 300 square centimeters in area, is placed on the bottom of a large storage battery cell and is connected to the negative pole of the current supply (100 volt direct current). The positive pole consists of a short piece of No. 14 platinum wire fused into the end of a glass tube filled with mercury, so that the platinum makes contact with the mercury. The glass tube is then fixed upright in the jar, so that the end of the platinum wire is about ½ inch above the plate. The jar is half filled with water, and the positive pole from the current supply is pushed into the mercury of the tube. The current is now turned on, and sulphuric acid diluted with twice the volume of water is added little by little until the water becomes conductible enough and the coil begins to act. This action is signaled by the formation of an arc between the platinum pole and the lead plate, together with the passage of a perfect torrent of sparks between the terminals of the secondary coil. These sparks come so fast that they appear as a thick, continuous band which wavers and curls about in a most remarkable manner. The arc between the platinum pole and the lead gives out a loud hum, the tone of which is close to middle C (512 vibrations), while the spark-band of the secondary emits an ear splitting note in the neighborhood of high C (1024 vibrations per second). On increasing the distance between the terminals, the note of the secondary becomes lower in tone, while on decreasing the distance it becomes higher and higher. The length of the spark appears to be about one-half the wave length of the sound produced.

The spark-band formation continues until the distance of the terminals is 6½ inches, when it breaks down into the spark form ordinarily seen, and so continues until 7½ inches is reached, the maximum length under these conditions. The spark capacity of my coil is thus increased from 5 to 7½ inches. No condenser and no make and break other than the one described is used.

Experiment shows that the length of spark obtained depends on the current introduced into the primary, and this may be governed with ease; in fact, the length of spark depends on: (1) The resistance in the outside circuit; (2) the area of the lead plate; (3) the strength of the electrolytic solution; (4) the distance of the platinum terminal from the lead plate; (5) the area of cross-section of the platinum wire.

For X-ray work I use a No. 18 platinum wire and let the sulphuric acid in drop by drop, stirring the while until the proper intensity is reached. The result is a surprising increase in penetrating intensity and general effectiveness, while if discretion is used in dropping in the acid, no harm follows to the tube.

This new current interrupter is likely to be a boon to the holders of comparatively small coils, for the effect obtained seems to depend more on the primary current at the service of the operator than on the length of the wire in the secondary. It is certain, at least, that a coil receives a great increase in effectiveness through very simple means. This discovery of Dr. Woehnelt's will give a fresh impetus to X-ray work, wireless telegraphy, vacuum tube lighting, and to the phenomena connected with alternating currents of high frequency.

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THE HONEY BEE NOT A NATIVE OF AMERICA.

No one seems to have taken the time and trouble to thoroughly investigate the early history of the honey bee in America. Enough is known, however, to assure us that it is not indigenous to the country, but was, in all probability, imported by the early colonists.

The earliest mention of honey in America, so far as considerable research discloses to the writer, is in Irving's account of De Soto's wanderings. While the adventurer was at the village of Ichiaha, in June, 1540, his men found "a quantity of bears' grease preserved in pots, likewise oil made from the walnut, and a pot of honey. The latter they had not before seen, nor did they ever again meet with it during their wanderings." *

Some have inferred from this that the honey bee was in Florida at this period, and that it was indigenous to America. But this does not follow; first, because the village in which the honey was found was located in the country since known as Northern Georgia, or, perhaps, Northern Alabama, and not in Florida; second, the honey mentioned was very possibly the product of the humble bee, which was a native and very widely scattered.

Nevertheless, the honey bee was probably introduced by the Spanish settlers, in Florida, at least, at a later period, for Bartram, who explored the country in 1773, mentions honey and beeswax as articles of barter among the Indians. He speaks of honey in so many places in his book, that it must have been quite common, and, therefore, could not have been the product of the humble bee, whose store of honey is very scant. Bartram was told by a physician that there were few or no bees west of the peninsula of Florida, and but one hive in Mobile, which latter had been brought from Europe. Traders had also informed him that there was none in West Florida.†

At this period the honey bee was common all along the eastern shore of the country, from Nova Scotia southward. The fact that it was not found in the interior is good evidence that the insect was not a native of America. Otherwise natural swarming would have distributed it throughout the land long before the arrival of the white man.

Jonathan Carver, an Englishman, explored Wisconsin and the adjacent territory in 1766-67, and in his book, published soon after, he mentions the commonest insects. The honey bee is not among them, but the humble bee is referred to as follows: "The bees of America principally lodge their honey in the earth, to secure it from the ravages of the bears, who are remarkably fond of it."‡

According to a writer in The American Bee Journal for July, 1866, the honey bee was first noticed by white men in Kentucky in 1780, in New York in 1793, and west of the Mississippi in 1797. At the present day this industrious little bee is scattered throughout America, and the production of honey is constantly increasing.

CHARLES H. COE.

THE International Air Power Company has purchased the plant of the Rhode Island Locomotive Works and the Corliss Steam Engine Works, at Providence, R. I, where auto-trucks will be manufactured. It is stated that operations will begin at once.

* Conquest of Florida, page 12.
† Bartram's Travels.
‡ Carver's Travels.