ray formed may be transmitted in any direction, while its effective range has been demonstrated up to a distance of 300 kilometers.

The second method referred to holds out greater possibilities, although it has proven infinitely harder of solution; this is syntonization based on electrical resonance. Sir Oliver Lodge was the first to evolve a system of syntonic wireless telegraphy in which the coefficients of inductance, capacity, and resistance were considered. Since these early essays Lodge has, in conjunction with Dr. Alexander Muirhead, devised and invented many ingenious improvements relating to the practice of syntonic wireless telegraphy. In this connection it must be borne in mind that there is a well-defined demarkation between what is called *syntonic* and *selective* systems, although at first the object of the former was to produce the latter. Not very long ago these words were used synonymously, but as the art unfolded it was found that while a transmitter and its complementary receptor could be attuned to the same wave length and were made the better for it in every way, they were not by any means rendered selective.

The latest researches of the eminent physicist and electrician named that have been made public relate to syntonizing a transmitter and a receptor in which a greater certainty of action is obtained. The invention is the outcome of an experiment wherein a long wire attached to a discharging Leyden-jar circuit was thrown into violent electric oscillation in synchronism with the jar and this is combined with an "overflow," the result of another experiment, in which a long wire appendage was employed to set up oscillations in a Leyden-jar circuit and cause it to be charged to a point where it would overflow and disrupt a minute spark-gap; these two effects were again combined with a third, also discovered by Lodge, and produced by the "syntonic" Leyden jars; in this arrangement the oscillations of one discharging Leyden-jar or condenser circuit set up similar, though more feeble, oscillations of the same phase and frequency, in a distant Leyden-jar or condenser circuit tuned with a precision to the first.

The combination of these three very pretty laboratory experiments into a hard-and-fast commercial system has brought out several novel features, the chief one being the surging of violent electric oscillations in the condenser charged by the secondary of the induction coil and the impulses of which are conveyed to the upper end of the aerial wire resulting in a series of sharp recoil kicks. This sudden rebound exerts a much greater effect in the surrounding ether than a simple periodic oscillation would. On reaching the distant station these wires set up oscillations in the receiving wire to which is attached a condenser circuit similarly attuned to that of the emitting station; in the condenser or internal circuit the oscillations work up gradually in strength until they become strong enough to break down the resistance of the coherer. This is brought about as soon as the maximum potential attained by these oscillations in the condenser circuit is high enough to cause an electrostatic overflow which takes place through the coherer; this causes a reduction in the resistance of the latter and the consequent formation of a signal by the receiving device.

The novelty in this part of the invention is found in the mode in which the coherer is connected with the receiving condenser so that it will be impressed with the overflow or cumulative action of the waves, and such is the disposition of the circuits that it is, at the same time, protected from the direct action of the elevated conductor or any sudden impulse to which the latter is exposed.

While these inventions do not by any means solve the vexatious problems of selective wireless signaling, they are vitally important in that they show that more and more effective means are being constantly devised by which the requisite energy is reduced and the accuracy of the working is increased, while at the same time the accumulated knowledge must lead eventually to a system of selectivity and all that this much-abused term implies.

THE HEAVENS IN OCTOBER.

BY HENRY NORRIS RUSSELL, PH.D.

The best "landmarks of the sky" for a beginner in the study of the constellations are the groups of stars which lie near the pole, for these, in our latitude, are visible at all hours of the night and in all seasons of the year. How this happens can be very clearly illustrated by a simple photographic observation, which can be made with any camera.

Choose a clear moonless night, point the camera toward the pole star, and expose for a couple of hours (using the largest stop). When the plate is developed the stars will appear, not as points, but as long trails, owing to their apparent motion, and these trails will all be arcs of circles, with a common center. This shows that the apparent motion of the heavens, which causes the sun, moon, and stars to rise and set, is really a rotation about a fixed point, which astronomers call the celestial pole. Each star describes a circle about this pole every day. If the star is near the pole, the whole of this circle is above our horizon, and the star never sets. For stars farther from the pole, a larger and larger part of the circle lies below the horizon. Stars in the southern sky describe circles about the south celestial pole, which is as far below our horizon as the north pole is above it, so that some southern stars are only visible to us for a small part of their circuit, and others still farther south never rise above our horizon at all.

If we make a print from our negative, and mark the beginning or end of each trail with a conspicuous dot (to avoid confusion due to overlapping trails), we can easily identify the stars visible on our photograph, and in particular the pole star. It will be seen that the latter is not exactly at the celestial pole, but is some little way off in the direction of Cassiopeia. We see also that our photograph shows much fainter stars close to the pole than some distance away. This is because the close circumpolar stars have shorter trails, so that their light is less spread out on the plate, and a fainter star can thus produce a visible impression.

Of the circumpolar constellations, the most familiar is the Great Bear. At the present season this is not very conspicuous, as it lies below the pole, with the Dipper close to the northern horizon, and the Pointers almost under the pole star.

A line drawn from the middle of the Dipper handle through the pole leads us to Cassiopeia, whose principal stars form a zigzag line in the Milky Way, resembling an irregular letter W. A line drawn to the left through the pole star at right angles to this last line, points out the head of Draco, formed by a quadrilateral of stars, of which the faintest is double, much too close for the naked eye, but separable with a strong field glass. The constellation extends in a long line of stars, first upward to the right, then down to the left, then again to the right, above the Dipper. Within its curve it incloses the smaller constellation of Ursa Minor, which contains one other star about equal in brightness to Polaris.

The remaining circumpolar constellations are inconspicuous, Cepheus, which lies between Draco and Cassiopeia, being the most prominent.

To the east of Cassiopeia and below it is Perseus, whose principal features are a curved line of stars in the Milky Way, and a single bright star south of them, which is the remarkable variable Algol. Between Perseus and Cassiopeia is a bright spot in the Milky Way, which the telescope shows to be a very fine star cluster.

Below Perseus on the left is Auriga, recognized by the very bright star Capella and the irregular pentagon which it forms with the neighboring stars. On the right is Taurus with the unmistakable group of the Pleiades, and the bright red star Aldebaran. The very bright object between them is the planet Jupiter. The great square of Pegasus is southeast of the zenith, and Andromeda lies between it and Perseus. Cygnus and Aquila lie in the Milky Way to the westward, and Lyra farther northwest, with Hercules below it.

Below the groups already named are the dullest of the zodiacal constellations. Sagittarius is just setting. Capricornus follows it, marked only by a pair of small stars—both double—southeast of Altair. Aquarius comes next, and can be identified by a little group, shaped like the letter Y, lying on its side, which lies southwest of the great square of Pegasus. Pisces has no conspicuous stars, but Aries contains a small but rather conspicuous triangle, with very unequal angles, which lies below Andromeda and to the right of Perseus.

The large constellation Cetus fills the southern sky, but contains nothing to delay us at present. The isolated bright star low down in the south is Fomalhaut, in the Southern Fish. Saturn, which is a good deal brighter, is higher up and farther west.

THE PLANETS.

Mercury is morning star till the 12th, when he passes through superior conjunction and becomes an evening star. Throughout the month he is too near the sun to be seen with the naked eye.

Venus is morning star in Leo and Virgo, rising at about 4 A. M. in the middle of the month.

Mars is evening star in Sagittarius, setting between 9 and 10 P. M. all the month. On the 8th he is in conjunction with Uranus, which is about 1¾ degrees south of him.

Jupiter is in Taurus, rising about 8 P. M. on the 15th, and is rapidly becoming the most conspicuous object in the evening sky.

Saturn is in Aquarius, and crosses the meridian about 9 P. M. on the 1st, and 7:15 P. M. on the 31st. He is therefore very conveniently observable in the evening. A very small telescope will show his rings, and one a little larger will show his brightest satellite, Titan. This is west of the planet on the 4th, north on the 8th, and so on, its period being 16 days.

Uranus is in Sagittarius, and can best be identified by its proximity to Mars on the 8th. Neptune is in Gemini, and comes to the meridian about 5 A. M. in the middle of the month.

THE MOON.

First quarter occurs at 8 A. M. on the 5th, full moon at 6 A. M. on the 13th, last quarter at 8 A. M. on the 21st, and new moon at 2 A. M. on the 28th. The moon is nearest us on the 27th, and farthest away on the 14th. She is in conjunction with Mars on the 4th, Saturn on the 8th, Jupiter on the 17th, Venus on the 26th, and Mercury on the 28th.

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SCIENCE NOTES.

Some interesting photos and particulars of huge gorillas hitherto unknown have been obtained by M. Eugene Brusseaux, a French official and explorer from Northern Africa. One of these huge monsters was shot by one of the official's sharpshooters. The animal measured 7 feet 6 inches in height, was 4 feet in width across the shoulders, and weighed 720 pounds. One of the hands when dismembered weighed 6 pounds. It required the united efforts of eight native soldiers to drag the corpse of the beast from the point where it was killed to the French residency at Quessou, the administrative center of Central Sangha. The animal was here skinned and buried. Reports have been received at this station frequently during the past few months of the presence of these huge monsters in the upper valleys of Lonani and Sangereh, but hitherto it had been impossible to come to close quarters with them. According to native reports, however, the animals are unusually ferocious, not hesitating to attack caravans during their passage through the country. The beasts differ essentially from the gorillas familiarly known. The ears are small, the shoulders and thighs are covered with dense and long black hair, while the chest and stomach are almost bare. It is believed that they belong to a species that has not heretofore been known.

The action of ultra-violet rays upon glass has been observed by Franz Fischer, a German scientist. In order to make the researches, he uses a mercury arc contained in a quartz tube as a source of the rays. Samples of different kinds of glass are placed quite near the tube, separated from it by a very thin layer of air, or the air can be replaced by hydrogen. By using a water-cooling device the apparatus is not allowed to become unduly heated. This precaution is not always needed, however. He uses a low tension of 18 volts on the arc. Under these conditions he exposes eight samples of glass to the light of the arc. Four of them are not acted upon, and remain colorless. The other four take a strong violet color at the end of 12 hours. The color can be seen at the end of 15 minutes exposure. Upon analyzing the samples of glass it is found that the ones which are colored all contain manganese, while in the other specimens it is absent, or nearly so. These results seem to explain the phenomenon which was observed by Crookes, who observed that pieces of glass exposed to the sun at an altitude of 12,000 feet at Myni, Bolivia, took a violet color by degrees. At this altitude the sun's light contains a large proportion of ultra-violet rays which act upon the manganese salts of the glass and cause the violet coloration. It is found that the color quickly disappears when the glass is heated to the softening point. Then when it is cooled and again exposed to the mercury arc, it takes the violet color, as before. That it is only the rays of short wave-lengths which produce the color is proved by placing a sheet of mica over the glass, and in this case no color is formed. The mica itself is not colored in this case.

Researches on Radium and Radio-activity.—In a paper read before the Société des Ingénieurs Civils M. Besson explains the method by which M. and Mme. Curie were led to discover new radio-active bodies in the ores of uranium, and reviews the preparation of radium, the composition of the Becquerel rays emitted by radium, and the demonstration of MM. Curie and Dewar that radium is converted into helium; and finds in this decomposition the source of the energy of radium. He holds that the decomposition for bodies of light atomic weight would be general; uranium would be converted into radium, then into helium; thorium would be converted into argon. He states that the ores recently discovered in the Department of Saône-et-Loire are pyromorphites, probably rendered radio-active by emanations proceeding from dissolution in water of the phosphites of uranium found in the same lands. The simplest process for search is that of photographic plates. It is sufficient to pulverize the ore believed to be radio-active, to put it in a cup and leave it for twenty-four hours, well surrounded with black paper. By comparing the marks produced by a small parcel of the uranium metal with those produced by the ore supposed to be radio-active, it is easy to ascertain whether this contains radium or not.