THE LATEST EDISON STORAGE BATTERY PATENT

Thomas A. Edison was granted a patent on March 3 last for an improvement in his reversible galvanic battery in which an alkaline electrolyte and insoluble electrolytically-active materials are used. The invention relates particularly to the oxidizable element, and consists in the use of cobalt oxide, preferably mixed with metallic mercury or with metallic mercury and copper or silver, whereby a great proportion of the cobalt oxide is kept in electrical contact with the electrode and made electrolytically active in an alkaline solution to form the oxidizable element on discharge. The invention also consists in the combination of such an element with a suitable depolarizer furnishing oxygen on discharge in an alkaline electrolyte, so as to form a complete reversible galvanic battery.

In order to produce the new element, Mr. Edison says he prefers to proceed substantially as follows: "Dried oxalate of cobalt is first produced in any suitable way and is ignited and kept at a low temperature in the air until it has been wholly decomposed to form the anhydrous oxide of cobalt. This oxide is then mixed with preferably about 15 per cent of precipitated oxide of mercury if an electrode is to be obtained composed of cobalt and mercury, or, if desired, it may be mixed, preferably, with about 25 per cent of finely-divided metallic copper and 6 per cent of precipitated oxide of mercury if the resulting electrode is to be formed of cobalt and a combination of copper and mercury. These proportions, of course, may be varied; but those indicated give good results. By increasing the portion of mercury, or of mercury and copper, a larger proportion of the cobalt is rendered active; but the increase in efficiency is secured at a sacrifice of lightness and economy. Silver may also be employed in place of the copper; but it possesses the objection of being too expensive at the present time for economical use. The mixture of oxide of cobalt and oxide of mercury or of oxide of cobalt, metallic copper, and oxide of mercury is then mixed thoroughly, formed into briquettes, and utilized in any desired manner, preferably by being supported in perforated nickel-plated pockets or receptacles, which in turn are crimped in position within plates or grids, as I have described in patents already granted to me.

"An electrode containing a mixture of cobalt and mercury, or of cobalt, mercury, and copper or silver, is preferably employed in an alkaline solution of, say, 20 per cent of potassic hydroxide in water, opposed to a depolarizing element containing nickel hydroxide as the active material mixed with foliated or flake graphite. When such a combination has been charged and recharged several times, its average voltage is about 1.10 volts. When such a combination is in a fully-charged condition, the nickel hydroxide is raised to a very high state of oxidation, and the cobalt is reduced so far as its active particles are concerned to the metallic state. On discharging, the nickel hydroxide reverts to a lower condition of oxidation, while the metallic cobalt is oxidized. Owing to the relative ease, as compared to cobalt, with which mercury and copper reduce, the added mercury or copper, or silver, if used, will be reduced to the metallic state when the battery is first charged, so as to procure good electrical contact between the active cobalt particles. Since the cobalt on discharge oxidizes much more readily than either mercury, copper, or silver, the latter materials remain in metallic form, and their presence serves wholly to assist electrical conduction between the particles of the active material.

"Although it is preferable to add a readily-reducible metal, like mercury, copper, or silver, or a combination thereof, to the cobalt for the purpose of maintaining electrical contact between the active materials, it will be of course understood that any insoluble conducting material, preferably in flake form, such as flake graphite, can be used for maintaining the cobalt particles in electrical contact."

THE HEAVENS IN APRIL.

BY HENRY NORRIS RUSSELL, PH.D.

There is no other season at which so many bright stars can be seen in our latitudes as at present.

At 9 P. M. on the 15th Orion is almost due west, though very low down. His brightest star Rigel has already set, though the ruddy Betelgeuse still flares above.

Aldebaran and the Pleiades shine on the right, while Sirius is on the left. Procyon is above the latter, rather more to the southward, and Castor and Pollux are above Orion, higher still.

Capella lies in the Milky Way in the northwest. Regulus, with the attendant stars of the Lion, is almost due south, with Hydra below him and Ursa Major above. Spica lies well down in the southeast, but is less conspicuous than Arcturus, which is higher up and farther north. Mars, which is about half way between Regulus and Spica, surpasses them both in brightness.

Northeast of Arcturus, beyond Corona Borealis and Hercules, Vega is once more visible, a few degrees above the horizon.

There can therefore hardly be a better occasion than the present to mention some interesting observations that have recently been published by the Yale Observatory, regarding the parallaxes and distances of a number of these stars. As we have recently discussed the methods by which stellar parallax is determined, we need now only state the results of Dr. Elkin's work, translating the parallaxes which he gives into the more intelligible form of distances in light-years.

A light-year (as most of our readers probably know) is the distance which light traverses in a year's steady progress at the rate of 186,000 miles per second. It is about six millions of millions of miles, and is some 63,000 times the earth's distance from the sun, so that, on a map upon which the earth was one inch from the sun, a light-year would be represented by one mile.

According to Dr. Elkin's observations, the nearest bright star in the northern hemisphere of the sky is Procyon, whose distance is very nearly 10 light-years. Next comes Altair, at a distance of 14 light-years, and then Aldebaran, whose light takes 30 years to reach us. Vega and Capella follow, both about 40 light-years from us.

As the stars' distances increase, it becomes more and more difficult to determine them with any approach to accuracy. Dr. Elkin's parallax puts Pollux at a distance of 60 light-years, but the probable error of the determination is such that it is as likely as not that the true distance may be as small as 40 light-years, or as great as 100.

The distance of Arcturus comes out 125 light-years, and those of Regulus and Betelgeuse about 140, but these must necessarily be very rough approximations indeed, as the whole parallax is but 1-40 of a second of arc. Finally, the measures show that Alpha Cygni is actually farther away than the small stars which were chosen for comparison. Its actual distance is unknown, but must be very great—probably several hundred light-years.

We may add that determinations by other observers show that Sirius is nearer than any of the above, its distance being 8½ light-years, and that Spica is very remote—probably 100 light-years; while Rigel seems to be even farther away. The far southern star, Alpha Centauri, which we never see, is the nearest of all—a little over four light-years.

From photographic measurements it is found that the sun, if removed to a distance of five light-years, would appear as a star of about the standard first magnitude. As all the stars above mentioned, except Alpha Centauri, are beyond this limit, they must all be in reality brighter than the sun.

When the differences in their apparent brightness, as well as in their distances are taken into account, it is found that if we take the amount of light emitted by the sun as a unit, then the light of Alpha Centauri is 2, that of Procyon 6, of Altair 8, of Sirius 25, Aldebaran 33, Pollux 100, Vega 125, and Capella 150. The uncertainty of the distances of the remote stars is so great that no reliable estimate of their light can be given; but it seems probable that Betelgeuse and Regulus give fully 500 times as much light as the sun, and Arcturus, Rigel, and Alpha Cygni at least 1,000 times as much, and perhaps much more.

It is very clear that the sun is only an inconspicuous member of the stellar system. But it should be remembered that the stars we have been considering were selected on account of their apparent brightness, so that they are hardly fair specimens of the average of the stars. Some of the fainter stars whose parallaxes have been measured are found to give less than one-hundredth as much light as the sun.

THE PLANETS.

Mercury is morning star until the 12th, when he passes behind the sun and becomes an evening star. At the end of the month he is well placed for observation, near the Pleiades, setting after 8 P. M., and should be easily seen.

Venus is evening star in Aries and Taurus, and is very conspicuous, remaining in sight till after 9 o'clock. She is increasing in brightness, and will continue to dominate the evening sky all summer.

Mars is also very conspicuous, being in Virgo, just past opposition, visible all night, and by reason of his color and brightness, the most notable object in the midnight sky.

Jupiter is morning star in Aquarius, rising at 3:30 A. M. on the 15th. Saturn is morning star in Sagittarius, rising rather more than an hour before Jupiter. He is in quadrature on the 30th.

Uranus is in Ophiuchus, and comes to the meridian at 4 P. M. on the 15th. Neptune is in Gemini and sets about midnight.

THE MOON.

First quarter occurs at 9 P. M. on the 4th, full moon at 4 A. M. on the 15th. Neptune is in Gemini and sets 19th, and new moon at 8 A. M., on the 27th.

The moon is nearest the earth on the 5th, farthest away on the 18th, and nearest again on the 30th. She is in conjunction with Neptune on the 3d, Mars on the 10th, Uranus on the 16th, Saturn on the 20th, Jupiter on the 23d, Mercury on the 28th, and Venus on the 29th.

On the evening of the 11th there is a partial eclipse of the moon, most of which is visible in the United States, though the earlier phases occur before the moon has risen. The moon enters the shadow at 5:34 P. M. Eastern standard time, and, as seen from Washington, rises eclipsed. The middle of the eclipse is at 7:13 P. M., by which time she is visible as far west as Pittsburg. By the time she leaves the shadow, at 8:52, she can be seen from points as far west as Denver; and when she leaves the penumbra, at 10, she is visible throughout the country. The eclipse is very nearly total, as at the greatest phase all but one-fortieth of her diameter is immersed in the earth's shadow.

Cambridge.

SCIENCE NOTES.

An interesting astronomical phenomenon was recently witnessed by M. Flammarion, the famous French observer, at his observatory at Juvisy, in connection with the casting of the earth's shadow on the moon. This phenomenon is sometimes seen in the east at the moment when twilight fades into night. On the occasion in question M. Flammarion noticed that the moonlight, notwithstanding its apparent intensity, was too weak to permit the phenomenon's being seen except by the experienced eye. The immense shadow of a greenish black color ascended slowly toward the zenith. It was a regular circle in form, surmounted by a line of reddish light of weak intensity, arising from the refraction of the light in the atmosphere. Though the sky was generally clear, it was traversed by a large number of small storm clouds, and the presence of the latter prevented the observer's measuring the light, in order to calculate thereby the height of the atmosphere.

An interesting attempt is to be made to locate the magnetic pole by means of a small boat, and a crew of eight men, under the command of Capt. Arundsen. The boat is being fitted out for the expedition at Christiania, and she will depend upon propulsion from both sail and a small naphtha motor, of sufficient power to supply a speed of five knots per hour. She will carry a reserve supply of fuel sufficient for one hundred days' steady use, though of course she will be mainly dependent upon her canvas. The expedition will set out in April next, and it is intended, if possible, to remain in the ice four years. Owing to the diminutive size of the vessel, she will not be able to carry a large supply of provisions, but it has been arranged to obtain further supplies from time to time from the Dundee whalers. A station will be set up and furnished with self-recording instruments, which will collect scientific data. The members of the expedition will make journeys for geographical and other investigations.

The government of the Punjab Province of India has commenced an undertaking which when completed in five months' time will be the largest bacteriological enterprise the world has yet seen—the inoculation of 7,000,000 persons for protection against the plague, the only beneficial course yet discovered to insure immunity from this disease. The superintendent of the laboratory at Bombay is to supply plague serum at the rate of 50,000 doses a day. The serum is being supplied from England in 14,000 flasks, and will entail the manufacture of four huge sterilizers costing $1,500 each, the planning of a new system of pipes and sinks for extra gas, and water, and churns. A very good idea of the prevalence of the disease in India, and the high mortality that accompanies it, may be formed from the fact that in the third week of August there were 3,547 fatal cases. England has now been combating this disease for nearly six years, and no remedy attempted has proved successful except inoculation.

Some fresh data has recently been gathered relative to the great Lisbon earthquake of 1755, when the city was destroyed and 80,000 people lost their lives, by fresh discoveries recently unearthed under the debris of the old city. Evidently Lisbon in former days was rich in costly temples, palaces, tombs and works of art, as the occasional discoveries of the Lisbon Archæological Association testify. Recently a member of this institution observed the capitals of a highly ornate portico projecting, in an excavation, close to the spot where the tomb and remains of an illustrious personage of ancient Lisbon were unearthed in 1900, in the Alfama quarter. Excavations were carried out, a gate forced, and a beautiful mortuary chapel was unearthed, containing the tomb of a young girl, while within the tomb a skeleton clad in a coat of rich brocade ornamented with "glories," or representations of "O Espirito Sancto," was found. The fabric is still perfect in color and fiber, and if proper care is observed it may not deteriorate from exposure to the air. Further investigation has proved that this skeleton is undoubtedly that of the favorite daughter of King Alfonzo, the child wife of Count Henry of Burgundy, grandson of Duke Robert, who fought successfully under King Alfonzo's banner against the Moors in Spain, and was rewarded in 1005 for his services by the monarch, with the hand of his daughter, with Portugal as her dowry.