

some other and vaster source of supply must be found, if the world is to be provided with the 12,000,000 tons of sodium nitrate which must be distributed annually to secure the necessary increase in the crops. Sir William proposes the fixation of atmospheric nitrogen as the best solution of the problem.

As far back as 1892 he exhibited at one of the soirées of the Royal Society an experiment on "The Flame of Burning Nitrogen," which showed that nitrogen is a combustible gas, and the reason why, when once ignited, the flame does not spread through the atmosphere and deluge the world in a sea of nitric acid is that its igniting point is higher than the temperature of its flame. By passing a strong induction current between terminals, the air takes fire and continues to burn with a powerful flame, producing nitrous and nitric acids. The lecturer, basing his estimate on an experiment of Lord Rayleigh, estimates that one ton of sodium nitrate could be produced by this process at a cost of \$130. Electricity from coal and steam engines would be too costly; but, by utilizing waterpower, the product might be turned out at a cost of not more than \$25 per ton. In reply to the question how to produce by the combustion of the atmosphere the enormous annual total of 12,000,000 tons of nitrate of soda, the lecturer states that Niagara alone is capable of supplying the required electrical energy without much lessening its mighty flow.

THE HEAVENS IN OCTOBER.

BY GARRETT P. SERVISS.

Those who begin their acquaintance with the constellations in the month of October are quite likely to become enthusiastic star gazers. It is in this month that the splendid group called "The Royal Family," including Andromeda, Cassiopeia, Perseus, and Cepheus, becomes conspicuous. Nearly overhead at about 10 P. M., on October 1, will be seen the great square of Pegasus, about 15° on a side. The star at the northeastern corner of this square belongs in reality to the constellation Andromeda. It is nearly of the second magnitude, and, with two other stars of equal brightness, forms a line extending toward the northeast from Andromeda's head to her feet. North of the middle star in this line are two fainter stars, constituting the girdle of the imaginary chained figure. Not far from the uppermost of these fainter stars the naked eye, on a clear night, detects a hazy speck. It is the Great Nebula of Andromeda, and its central condensation can be glimpsed with an opera glass.

North of Andromeda the eye is caught by a zigzag row of stars resembling the letter "W;" these mark the constellation Cassiopeia. The western part of the "W" forms, it will be observed, a more perfect triangle than the other part. Beginning at this end, the stars are named, in their order, Beta, Alpha, Gamma, Delta and Epsilon. Less than half way from Alpha to Gamma is a fainter, yet fairly conspicuous, star named Eta. This is a very beautiful double, and a splendid object for those who have telescopes of three inches or more in aperture. The components are of magnitudes 4 and 7.5 and their distance apart is about 5". The larger star is yellow and the smaller purple, a peculiar combination.

A test for a more powerful glass, say not less than 4 inches aperture, is furnished by the star Iota. This will be found next beyond Epsilon in extension of a line drawn from Delta through Epsilon. It is a triple, the largest star being of the fourth magnitude. Its nearest companion, distant only 1.5", is of the seventh magnitude. At a distance of 9" is another companion of the eighth magnitude.

Following Cassiopeia and Andromeda from the east appears Perseus, the hero armed with diamond sword and flying sandals who, in the old classic story, rescues Andromeda from the sea monster. Perseus is a striking constellation marked by a bow-shaped row of stars, the middle one of which is the brightest of the group. With an opera glass or a telescope the background of the sky on which Perseus appears flying is a wonder of starry beauty. The principal star of Perseus, in particular, has an amazing double loop of small stars apparently attached to it as if they were gems strung upon a swinging whip lash. Interposed between Perseus and Cassiopeia appears the glowing starry mass of the Sword Handle, plainly visible to the naked eye, and a glorious object for a modern binocular glass.

Between Perseus and the last star in Andromeda is the marvelous Algol. Although this star's changes have been noticed for centuries, it is only within recent years that their cause has been known. It seems certain that the remarkable loss of light which Algol experiences every two days, twenty hours, and forty-nine minutes is due to an eclipse caused by the passage across the star of a huge black companion revolving close around it. The fading of Algol and its subsequent recovery are very interesting to watch. The process occupies several hours. There will be a minimum at about ten minutes before 10 P. M. on the 22d of October.

The possessor of a telescope should not leave the constellation Andromeda without looking at the cele-

brated double Gamma, the last in the row of three bright stars first described.

West of Cassiopeia, and between the zenith and the Pole Star, will be found Cepheus, who was the father of Andromeda and the husband of Cassiopeia. His constellation is not very conspicuous. Four of its brightest stars form a diamond-shaped figure. Lyra, the Northern Cross, and Aquila will be seen descending the western sky, while Hercules is setting, Aquarius is on the meridian, the bright star Fomalhaut shines alone in the south, and Taurus and Auriga are rising in the northeast.

THE PLANETS.

Mercury is a morning star in October, being found in the constellation Virgo at the beginning and in Libra at the end of the month. On the 19th it passes superior conjunction to become an evening star. There is a very close conjunction of Mercury and Jupiter in the forenoon of the 16th, when the planets, unfortunately, will be hidden by daylight.

Venus is still the glory of the evening twilight, becoming brighter and brighter until the 27th, when it attains its greatest brilliancy. It is continually drawing nearer the earth, and in the telescope its crescent figure becomes noticeably narrower and more elongated from week to week. In the course of the month Venus moves from the constellation Libra into Scorpio, and on the 18th it will be near the red star Antares.

Mars is becoming more conspicuous, as it rises earlier and approaches the earth. At the beginning of the month it rises about 11 P. M. It passes from Gemini into Cancer and grows rapidly brighter. Its polar snow-cap should be looked for with the telescope.

Jupiter, which is too near the sun to be observed, passes three or four degrees north of the star Spica in Virgo, and comes into conjunction with the sun on the 13th, after which it emerges in the morning sky.

Saturn remains on the borders of Scorpio and Ophiuchus, and its brilliancy, too, is diminished by the twilight. It is in conjunction with Venus on the morning of the 22d.

Uranus, just west of Beta, in Scorpio, is in conjunction with Venus on the 10th.

Neptune still rides on the "golden horns" of Taurus.

THE MOON.

Like September, October this year opens with a waning moon. The new moon of the month occurs on the 15th, the first quarter on the 22d, full moon on the 29th, and last quarter on the 7th. The moon is nearest to the earth on October 19th and farthest from it on October 7th.

The lunar conjunctions with the planets occur as follows: Neptune, 5th; Mars, 8th; Mercury, 15th; Jupiter, 15th; Uranus, 18th; Venus, 18th; Saturn, 18th.

Out of the ninety annual meteoric showers enumerated by Mr. Denning, nine are noted as of more than usual brilliancy, and one of these falls on the night of October 18th, the radiant being in the eastern part of Orion.

NEW TROOPSHIPS FOR THE ARMY.

It is announced that the War Department will retain some of the vessels bought at the beginning of the war and fit them up for hospital troopships. The former Atlantic transport liner "Mobile" will be the first ship to be fitted up, and the Cramps, of Philadelphia, have been given the work. Plans and specifications were prepared by well-known naval architects, and they have been inspected and passed upon by the army authorities and experts whose services they secured.

According to the plans, the ship will be overhauled from stem to stern. The quarters of the officers will be on the spar deck, which will have stateroom accommodations for eighty-four. Each stateroom will accommodate two officers, and there will be one bathtub for every twenty officers. On the aft promenade deck there will be a hospital with a capacity for seventy-six cots. It will have a complete dispensary and operating room and bathroom. On this deck, forward, there will be a promenade where the men will take exercise. It will be covered with dark blue awning as on the hospital ships, so that invalid soldiers will be protected from sun and rain. The quarters for the men will be between decks. The framework of the bunks will be of tubular cast iron, and each bunk will be so fixed that it may be folded back against the side of the ship when not in use, so that when they are folded up, the men will have practically the entire space between decks, from one end of the ship to the other, to move about in. There will be two or three berths, one above the other, depending upon the part of the boat. Each berth will be provided with a mattress and blankets. Amidships, on the main deck, will be the galleys. Forward of them will be what will be known as the armory and mess hall for the men. From the ceiling of the room gymnasium apparatus will be hung, so that the men will have indoor exercise and be able to practice at sea the army "setting-up" exercises. The mess tables will be so arranged that, when the room is to be used as a gymnasium, the tables will be folded back against the wall. Aft of the galleys on the main

deck will be the lavatories and bathrooms for the men. Each bathroom will be supplied with hot and cold water and a shower bath. The entire ship will be lighted with electricity and the space between decks supplied with cooled air from a large ventilating plant. A distilling apparatus will be provided having a capacity of 3,000 gallons a day, as well as a refrigerating plant large enough to keep an ample supply of fresh beef and vegetables.

The next ship to be refitted will be the "Mohawk." Other ships to be refitted are the "Mississippi," "Michigan," "Massachusetts," "Manitoba," "Minnesota," "Roumanian," "Obdam," and "Pamela." The War Department desires to make these vessels the finest troopships afloat, and it is particularly desired to make the men as comfortable as possible. The discomfort and downright hardships which our soldiers suffered in going to Cuba and Porto Rico and returning from these islands in a sick and enfeebled condition certainly warrants the expenditure of a large sum of money in the equipping of proper troopships. We should at all times have vessels, ready at a moment's notice, which could transport an army of 10,000 or more troops.

END OF AN ELECTRICAL WAR.

It is announced that two of the largest electrical manufacturing concerns in the country are about to unite. We refer to the Westinghouse Company and the Walker Company. It is probable that the plants of the latter company at Cleveland and New Haven will continue their operation as in the past. This company has been extremely successful of late in securing contracts for work, and at the present time there is about \$1,300,000 worth of work going through its shops. Among the recent orders taken by them was one for a 5,000 horse power dynamo, for the West End Railroad in Boston, the equipment of the Brooklyn Elevated Railroad system, besides several orders from abroad; one for 600 street car motors to be distributed over the Continent of Europe by French syndicates.

The work of the Westinghouse Company is well known. The growth of the Walker Company marks a peculiar development in the manufacture of machinery in this country. At one time the shops in Cleveland were devoted to the manufacture of heavy machinery required by the operation of the street cable system. For a time the cable appeared to be the governing factor in traction systems for city use, but suddenly it was found electricity was destined to displace the cable, and the huge business built up by the company began to fade away. At this juncture the Walker Company leased the shops on advantageous terms and began manufacturing electrical machinery, and they were soon able to rival the older concerns. Naturally a young company pushing its way into the electrical field was sure to meet obstacles in the way of patents. The result is that the Walker Company has been in almost constant litigation with other electrical concerns. Of course, the new combination will end the costly and unfruitful litigation, which will result alone in the saving of a large sum each year. It will be remembered that, some time ago, the General Electric Company and the Westinghouse Company made an arrangement for operating on a pool basis as to the business done and as to the enjoyment of the patent rights, each licensing the other.

A 35-2-KNOT TORPEDO BOAT.

A cable dispatch says that the extraordinary record 40.8 miles an hour was made at the second trials of the torpedo boat destroyer "Hai Lung," just built at Elbing, Germany, by the Schichau works for the Chinese government. The runs were made in the open sea between the lighthouses at Pillau and Brusterort, which are 19 knots apart. The wind was fresh (five by the scale) and there was considerable sea on. The "Hai Lung," according to the Kölnische Zeitung, traversed the course several times, the average time for the runs being 32 minutes 28 seconds, which gives a speed of 35.2 knots, or 68 kilometers, or 40.8 statute miles. This exceeds by far any speed heretofore made on the water, surpassing even the best performance of the "Turbinia."

A STATUE OF CHAMPLAIN.

The British and American Commissioners assisted, with the Governor-General, Lady Aberdeen, the Lieutenant-Governor of Quebec, officers of the U. S. S. "Marblehead," and officers of the British fleet and Canadian garrisons, at an interesting celebration at Quebec, on September 21. This was the unveiling of a beautiful monument to the memory of Samuel de Champlain, discoverer of Lake Champlain and founder, in 1608, of the city of Quebec. The monument is fifty feet high and cost \$30,000. It is by the architect La Cardonnel, of Paris, and the heroic sized bronze of the navigator which surmounts it is by M. Chevre. The monument is on Dufferin Terrace overlooking the St. Lawrence River, and is a prominent object for miles around.