THE HEAVENS IN OCTOBER.

BY GARRETT P. SERVISS.

The increasing crispness of the air in the middle of autumn imparts a livelier sparkle to the stars. But at this season of the year the greatest of the constellations are absent from the evening sky, although their coming for the winter carnival of celestial wonders is already heralded by signs well known to the habitual stargazer. For the contemplative observer, who knows the order of the procession of the Zodiac, the southern and eastern heavens in an October night wear an aspect of preparation, an expectant and prophetic air, as if the curtain of the sky had been dropped in readiness and rose again when the vast and sublime spectacle hidden behind it is ready for exhibition.

While the northeastern quarter and the region overhead are bright with Andromeda and Cassiopeia, Perseus and Cygnus, and the sheen of the Milky Way attracts the eye west of the meridian, the south is occupied by the broad and scattered constellation of Aquarius, high above which the four chief stars of Pegasus, like golden corner marks, stake out a huge square of gloomy sky near the zenith. Low in the south at the same hour of the evening, say 9 or 10 o'clock, hangs a single sparkler of nearly the first magnitude, the lone Fomalhaut, which the Southern Fish carries like a flaming jewel in his distended mouth. Eastward the gloom deepens.

But the experienced lover of the stars will not be content with this early evening view. He will look out again at midnight, when Cetus will be upon the meridian, with Aries overhead, while in the east the curtain has been withdrawn, the spectacle is in full swing, and the head of the celestial armies, with the Pleiades glittering like an oriflamme high in advance, comes marching up the sky. Orion and his matchless cortege are on their way, foretelling the splendors of their winter reign. At the same moment when Sirius, the winter's prince of stars, is rising, Vega, the glory of the summer heavens, is setting, and thus the autumn sky, like the autumn landscape, is at the same time full of reminiscence and of expectation.

THE PLANETS.

The constellation of Libra, a somewhat featureless province in the geography of the heavens, will, during October, shine with borrowed and unusual splendor. It will be the scene of the assembling of four of the great planets, Jupiter the mightiest of all, Venus the most beautiful, Mars the enigmatical, and Mercury the eccentric. Jupiter is within the borders of Libra at the beginning of the month; the other three will arrive upon the field, coming from the west, before its close. All of the planets named, together with Saturn and Uranus, which lie further east, and Neptune, which is in Taurus and rises before midnight, are evening stars. In fact, there is no planet left to play the role of morning star in October. Every one of the earth's sister planets, no account being taken of the tiny asteroids, is in the competition for evening honors, while the pale dawn must brighten as it can alone. Unfortunately, however, this galaxy of evening stars will fail to create a furor among the admiring inhabitants of the earth, because, with the exception of Saturn, they are either so faint or so near the sun that only the initiated will be able to recognize them.

October will also witness the beginning of a remarkable series of planetary conjunctions, culminating in November, and continuing through December. Six of the seven large planets besides the earth will be assembled in one quarter of the sky, in or near the zodiacal sign Scorpio, which I believe is of ill repute among astrologers. Some effects, interesting to mathematicians, in the great balance of forces that constitutes the stability of the solar system, are produced when nearly all the larger members of the sun's family of worlds have gathered on one side of the domestic circle, but all predictions of evil to the earth, or its inhabitants, proceedingfrom planetary conjunctions are, of course, based only on imagination or superstition.

Stated in detail, the planetary phenomena during October are as follows: Mercury is an evening star, passing from Virgo into Libra. It is so near the sun that it will not be easily visible until November. It is in conjunction with Venus on the 10th at 6 A. M., when the apparent distance apart of the two planets, if they could be seen, would be only three-quarters of a degree. On the 25th Mercury will be in conjunction with Jupiter just before midnight. On the 23d Mercury reaches its greatest distance from the sun, which, in the case of a planet having so eccentric an orbit, and so short a period, must mean a fearful drop of temperature as compared with the heat endured only six weeks before.

Venus is an evening star, moving from Virgo into Libra, but, although slowly receding from the sun, it is too near the solar orb and too far from the earth to be well seen. It will brighten during the winter and attain its greatest brilliancy next May, within three days after the total solar eclipse, to which astronomers everywhere are now looking forward. It is in conjunction with the star Alpha Libræ at 1 o'clock P. M., on October 26, at which time an apparent space of only six minutes of arc will separate the star from the planet. On the 29th, at 8 P. M., Venus and Jupiter pass one another within a distance about equal to the apparent breadth of the full moon.

Mars is an evening star, moving from Virgo into Libra. Like the others, it is too near the sun for observation. It is in conjunction with Jupiter at noon on the 11th.

Jupiter is an evening star in Libra, and can easily be seen in the twilight at the beginning of the month, but it rapidly loses its brilliancy, as it is apparently swallowed up in the solar rays. It plays the greatest part in the planetary conjunctions of the month, meeting Mars on the 11th, Mercury on the 25th, and Venus on the 29th.

Saturn is an evening star in Ophiuchus, and is the only planet that can be well seen in October. It appears in the southwest in the early evening, and its rings continue to present an admirable telescopic spectacle.

Uranus in Ophiuchus and Neptune in Taurus are too faint to be interesting, except for the working astromomer.

THE MOON.

New moon occurs on the afternoon of the 4th, first quarter on the morning of the 12th, full moon on the afternoon of the 18th, and last quarter on the morning of the 26th. The moon is nearest the earth on the morning of the 16th, and at the greatest distance about midnight on the 27th. The lunar conjunctions with the planets occur as follows: Mercury, the 5th; Venus, the 5th; Mars, the 7th; Jupiter, the 7th; Uranus, the 8th; Saturn, the 9th; Neptune, the 23d.

ELECTRIC LIGHTING AT THE COVENT GARDEN THEATER.

The new lighting plant of the Covent Garden Theater, London, presents many points of interest. It should be said, while called a "theater," it is really a great opera house in which masterpieces can be effectively staged. The old gaslight has now been entirely done away with, and a complicated system of electric lighting has been substituted, adding greatly to the efficiency of the stage setting.

In the stage lighting several novel features were introduced, the first being the provision for four colors, white, red, blue, and orange, for obtaining stage effects. This is probably the first time that orange-colored lamps have been used for stage work in England, the effects being previously obtained by burning white lamps at very low candle power. Of course, good effects may be obtained in this way, but the method is extremely wasteful. The switch gear is placed below the stage in a fireproof room, from which the electrician can obtain a full view of the scenes as lighted.

According to The English Electrical Engineer, from which we glean our facts, there are seven battens, six of which are 61 feet long and one 40 feet long, which is used to light the back drop or the back wall. Each batten carries 220 lamps of 16 candle power, divided in colors as follows: 80 white, 40 amber, 50 red, and 50 blue. For these battens no less than twenty-eight regulators with liquid resistance are provided, so that the illumination can be easily varied and changed in color without causing any flickering. There is one regulator for each color in each of the battens, so that they can be varied independently. Arrangements are provided by which the cables which supply the battens can be discontinued in case they have to be removed. The battens have a rise and fall of 12 feet; in each of them four pilot lamps are installed, which can be controlled from a special switch on the stage switchboard. They are used to give sufficient light to the stage hands without having an electrician operating the main switchboard.

The large battens weigh practically 16 cwt., and are suspended by six ½-inch steel ropes, an insulated support being placed between these ropes and the bridle chains to the battens.

There are five wing lights on each side of the stage. The framework of the reflecting part is much the same as that of the battens, each being supported by lattice steel work and provided with an oak filling to carry the cables. In each of these wing lights there are seventy-five 16 candle power lights, of which thirty are white and fifteen are colored respectively amber, blue, and red. The wing lights are supported on ladders which run on wheels on the mezzanine floor. By this means the wings have a travel of 16 feet; that is, 8 feet each way from their normal position. There are iron boxes and switches for the wing lights at the bottom of each. The proscenium lights, which are placed just inside the frame of the stage, each contain 50 white lights, 30 blue, 30 red, and 25 amber. They are similar in construction to the wing lights. In addition to the fixed lights, two circuits are run around the stage and are connected with plugs in various parts, from which portable lights can be applied to light ground-rows, transparencies, etc. Feed wires are run in canvas hose, which, by flattening out on the stage, is the least liable to cause accidents. The heavy scenery can be run over such hose without damaging the cables.

The switch-room, which is placed below the stage at one side, is built up of iron plates. Access to it is obtained by means of an iron door in the mezzanine floor, from an iron door in the orchestra, and by means of a trap-door and ladder from the stage. The main receiving switchboard and fuseboards are placed two floors below. The liquid resistance which is used is the most interesting point, and switches control the lights in the usual way. Iron wheels control one color or as many of the circuits of that color as may be required. Each regulating switch or "dimmer" works around the main axle, which is operated by means of a bicycle chain, which raises or lowers the cone in the liquid resistance cans in the cellar. When the lever is right home it short-circuits two contacts, which cut out the liquid resistance entirely. The resistance room is fireproof. The insulated cables are attached to terminals on the copper rods coming from the lead cones. The liquid used in the jars is zinc chloride.

In addition to the stage lighting, all dressing rooms, passages, and corridors, the "gridiron" and the "cellars" around and beneath the stage have been provided with electric lights. Wingfield Bowles, Esq., was the consulting engineer.

AN IMPROVEMENT IN THE MANUFACTURE OF ARSENATE OF LEAD.*

In a paper read before this Association at its meeting in August, 1897, the writer referred to a method of producing arsenate of lead by using nitrate of lead as a source of soluble lead. According to our chemist, Mr. F. J. Smith, arsenate of lead formed by this process is the diplumbic, or more exactly, a mixture of about one part triplumbic and two parts diplumbic, and not the triplumbic entirely, as is produced where arsenate of soda is neutralized with acetate of lead, as in the ordinary process of manufacture. Arsenate of lead made from the nitratecontains a slightly increased percentage of arsenic (about five per cent); and as the nitrate of lead may be purchased at a less cost than the acetate, the saving made where several tons are to be prepared is quite an item.

At the time when the diplumbic arsenate was first brought to the attention of this Association only a few experiments had been carried on. Since that date the insecticide has been tested in an extensive series of laboratory and field experiments, and in 1898 and again the present year by actual spraying operations in the field. A part of the results of the experiments have been published in the report of the gypsy moth committee, January, 1898, and without presenting the mass of details, from the numerous tests we may state in brief that in every case the arsenate of lead made from the nitrate has proved itself equal if not superior to that prepared from the acetate.

In preparing arsenate of lead by either process it has been found most economical to use a high grade of arsenate of soda, as the impurities, such as salt, in the lower grades neutralize a considerable part of the soluble lead before the reaction with the arsenate of soda can commence. The gypsy moth committee obtained from an English firm an arsenate of soda that showed on analysis 67·5 per cent of arsenic. This material costs when delivered, $0.052 per pound. To make one ton of arsenate of lead there are required 888 pounds of this arsenate of soda at a cost of $46.18, and 2,398 pounds nitrate of lead at a cost of $161.87, the total cost being $208.05. With the same grade of arsenate of soda, but using acetate of lead, there are required for one ton of arsenate of lead, 758 pounds arsenate of soda costing $39.42, and 2,593·8 pounds acetate of lead costing $207.50, a total cost for ingredients of $246.92. This leaves a balance of $38.87 per ton in favor of the arsenate of lead made from the nitrate.

Where the proportionate amounts of arsenate of soda and acetate of lead are tied in a package as in the ordinary procedure, the dampness of the acetate of lead will set up a partial reaction, and thus a part of the value of the insecticide is lost. When nitrate of lead is used, there is but little of this partial reaction.

ARRIVAL OF SIGNOR MARCONI.

Signor Marconi arrived on the "Aurania," September 21. As we have already stated, he is to assist in reporting the races for the America's cup. He was accompanied by Messrs. Rickard, Bradfield, and Denshan, skilled operators who have been engaged with experiments on wireless telegraphy across the English Channel and who will be in charge of the instruments and send the messages to The Herald during the yacht races. Signor Marconi began his experiments in 1895, when he tried to establish communication between various parts of his father's estate near Bologna, Italy. In 1896 he arrived in England, and after working in conjunction with Mr. W. H. Preece, then chief electrician of the British post office, he gave a demonstration of the possibilities of the system during the volunteer evolutions on Salisbury Plain and also in the British Channel.

*A paper by A. H. Kirkland, of Malden, Mass., Assistant Entomologist of the Massachusetts State Board of Agriculture. Read August 19, 1899, at the Ohio State University, Columbus, O., before the Association of Economic Entomologists, an affiliation of the American Association for the Advancement of Science. Revised by the author.