

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations in the following notes, I am indebted to students. M. M.

Positions of Planets for July, 1873.

Mercury.

Mercury rises on the 1st of July at 6h. 18m. A. M., and sets at 9 P. M. It is not at its greatest elongation from the sun until the middle of the month; but as it then has a lower altitude at meridian passage, it cannot be so well seen as earlier in the month.

On the 31st it rises at 6h. 46m. A. M., and sets at 7h. 48m. P. M.

Venus.

Venus was at its greatest brilliancy on the 10th of June, at which time it was easily seen at noonday, and a glass of low power showed it as a beautiful crescent.

In the first half of July, it will pass the meridian a little before nine in the morning, rising on the 1st at about 2 in the morning, and setting at near 4 P. M. On the 31st Venus rises at 1h. 37m. A. M., and sets at 4h. 13m. P. M.

Mars.

Mars rises on the 1st at 30 minutes after noon, and sets a little after 4 in the morning. On the 31st it rises at 1h. 10m. P. M., and sets at 11 P. M.

Mars is easily known by its ruddy light; it passes the meridian in July before sunset, and can be seen in the southwest after twilight. But little can be seen of its peculiarities with a small telescope, although a powerful one will show very decided markings on its disk.

Jupiter.

Jupiter is still conspicuous in the evening sky among the stars of *Leo*. On the 1st of July it rises at 8h. 39m., and sets at 10h. 12m. On the 31st of July it rises at 7h. 12m., and sets at 8h. 28m.

It is much less favorably situated for observation than in the winter, and very few of the phenomena of its satellites are visible in this locality for the whole month.

Saturn.

Saturn is more favorably situated for observation, but it is so far south that it does not reach, when on the meridian, an altitude of much more than 27°. It will be best seen at midnight on the 22d of July. It is among the stars of *Copricornus*, rising on the 1st of July at 8h. 48m. P. M., and setting at 6h. 14m. the next morning.

On the 31st Saturn sets at 4h. 13m. in the morning, and rises again at 6h. 43m. P. M.

Uranus.

Uranus is still among the stars of *Gemini*, and is very unfavorably situated for observation, rising in the morning and setting at 9 P. M. on the 1st of July, and at 7h. 7m. on the 31st.

Neptune.

Neptune rises between 12 and 1 A. M. on the 1st of July, and sets a little before 2 P. M. On the 30th it rises at 10h. 39m. P. M., and sets at 11h. 46m. A. M., on the 31st.

Meteors and Sun Spots.

Meteors were frequent on May 1, but have thus far (June 18) been rare in this month. It has also been a very remarkable period for the absence of sun spots. No spot could be found on the sun's surface (a glass of low power being used) from June 13th to June 17th. On June 18th a very small one was perceived.

New Planets Discovered in 1872.

Since the beginning of last year, twelve small planets have been discovered, as follows:

Peitho, discovered at Bilk, by R. Luther, March 15.

A not yet named planet, discovered at Ann Arbor, Mich., by Watson, April 3.

Lachesis, discovered at Marseilles, by Borelly, April 10.

A not yet named planet, discovered at Ann Arbor, by Watson, May 12.

Gerda, *Brunhilda* and *Alceste*, discovered at Clinton, N. Y., by C. H. F. Peters, the two first on July 31, and the last on August 23.

A not yet named planet, discovered at Paris, by Prosper Henry, September 11, and two others, at the same observatory, by Paul Henry, November 5.

A not yet named planet, at Ann Arbor, by Watson, November 25, and another at Clinton, N. Y., by C. H. F. Peters, on February 5, 1873.

Railways of Massachusetts.

Massachusetts has today invested in railroads one hundred and forty million dollars, of which eighty-one million is stock and fifty-nine million bonds, and there is one mile of road to each four and three fourth square miles of territory. This is a greater development than in any other portion of United States, and equals the average of any country in Europe. The average cost per mile is \$51,250, and, adding equipment, \$58,125. The gross earnings last year were over \$80,000,000, and the cost of operating 72.2 per cent. The average dividend on stock of paying roads was 8 per cent.

A Cheap Fire Alarm.

J. N. J. says: Take an old gun or pistol; put a heavy charge of powder in it, and put it in the most dangerous place in a house or barn (near the rafters in the latter;) and if the building should take fire, it would immediately give the alarm, and thus might save many lives and much valuable property.

A STEAM wagon is to run from Nashville to Pulaski Tenn., commencing regular trips in October next.



NOTES FROM THE VIENNA EXPOSITION.

The bird's eye view herewith presented of the vast building erected in Vienna will convey as good an idea of the magnitude and splendor of the World's Fair of 1873 as is possible in so small a space. The site chosen is the Imperial Park or Prater, along one side of which extends the new channel of the Danube, while on the other runs the Danube canal, which separates the Park from the city.

The central rotunda, with its conical roof, occupies the most prominent position in the view presented. It springs from the ground, a circular façade of piers of no less than 426½ feet in diameter, with Roman-Doric columns at either side, and connecting arches filled with glass. Within this is a gallery 50 feet wide, covered with its own roof, while above rises the great arcaded circuit. The large lantern seen above the roof is 105 feet in diameter, and is surmounted by a second lantern and cupola fully 300 feet above the ground. The rotunda stands in the middle of the grand quadrangle, which is 755 feet square. The vast central gallery or spine is 2,985 feet long, width 82 feet, and its height from floor to wall plate 52½ feet. The cross galleries are 250 feet in clear length by 49 feet in width.

The building annex is a substantial brick building, shown in our illustration to the rear of and parallel to the central gallery. It is intended to be permanent, and after the Exposition will be used for mercantile purposes. The extreme length is 2,614 feet, and the width nearly 155 feet in the clear. The side walls consist of brick piers, running up to the roof, with segment arching between, at a level to suit the side buildings. Ample means of lighting and ventilation are provided. Boiler houses are constructed at various points along the length of the building, and steam and water introduced from end to end.

The building faces the southwest. The thirty-two transverse galleries are for the reception of the lighter articles of industry, and the assignment of divisions to the different nations corresponds to their geographical situation, the extreme right or eastern division being given to India, and that to the extreme left or west to America. The gallery to the extreme left and front is occupied by the United States, and the gallery directly back of that by South America.

The Exhibition closes October 31, 1873.

THE EXHIBITION WATER WORKS.

The arrangement, as carried out, is the design of Professor Grimburg, and has for its object the supply of the fountains, hydrants, and fire engine reservoirs, the feeding of the boilers and the kitchens of the different restaurants, and also the sluicing of the water closets and other sanitary conveniences. The plan is as follows: For the supply of the high pressure water necessary for the fountains, hydrants, and water closets, a water tower, 138 Austrian feet high, was erected, this consisting of a reservoir of riveted boiler work, 24 feet in diameter by 20 feet in depth, supported on nine cast iron tubular columns, each 105 feet in height, which stand on an octagonal pedestal of brickwork, 15 feet high. The columns are bound together and stiffened by means of wrought iron rings and diagonals; two of them serve as outlet pipes, while the third one, in center of the group, feeds the reservoir, which contains 8,000 cubic feet of water. This water tower furnishes about 18,000 cubic feet of water per hour, and supplies the fountains, nine in number, as well as 180 hydrants. It draws its supply from a well 18 feet wide and 22 feet deep, by means of a double cylindered horizontal steam engine of 100 horse power nominal.

Two of the larger fountains are fed by a separate apparatus, which serves also as a reserve to the water tower just described. The arrangement is rather peculiar, for there is no reservoir, the pumps forcing the water directly into the pipes which lead to the fountains. The plan is, says *Engineering*, an American one, and everything about it is original; the two engines, which are each of 50 horse power, work the pumps by direct action, without the intervention of cranks; as there are no crank axles, there can also be no eccentrics, and so the valves are worked by tappets. The well from which the water is drawn is in this case 12 feet wide by 20 feet deep, and has to furnish 6,000 cubic feet per hour.

The boilers and condensers of the machinery hall are supplied by another set of pumps, which are quite different from the two sets already mentioned. The system in this case is a sort of Norton's tube well on a large scale. Continuous iron piping is driven into the ground till water is reached, and then the pumps are attached to the heads of the pipes; thus no well is needed, and the water is sucked

up through the pipes and delivered into a reservoir, which in this case is situated 18 feet above the level of the floor of the machinery hall. It will convey an idea of the requirements of a large exhibition in the matter of water when it is stated that the united length of the pipes connected with the waterworks in the Prater is about 12 miles.

BOILER ENGINEERING.

In respect to stationary boilers, the *Engineer* pronounces the display as disappointing and unsatisfactory. As regards size, the number of boilers of any importance is small. Nothing especially new is exhibited in this line, and little concerning the construction of the boilers shown can be learned, because they are so put up as to render it difficult and impossible to get at their dimensions with accuracy. Nothing is on exhibition to illustrate boiler construction, and this omission our cotemporary thinks is unfortunate.

THE AMERICAN FLAG.

The Austrians, in getting up a United States flag to adorn one of the transepts of the exposition building, left out all the stars, added two extra stripes, and set the flag as a signal of distress, that is, "Union down." So says a correspondent of the *Boston Advertiser*.

Clarke's Combination Lock.

We were recently shown, by Mr. W. F. Beasley, the agent of the Clarke Lock Company of Louisville, Ky., a very ingenious and novel form of combination lock, as manufactured by the above corporation. It obviates the necessity of a key, acts as a secure fastener upon any object to which locks are applied, and also serves, upon doors, drawers, etc., as a convenient knob.

The device principally consists of a number of tumblers arranged in longitudinal slides on the periphery of an inner solid metal cylinder. Enclosing the latter there is another cylinder, within the inner end of which are radially disposed a number of small steel projections which take against the inner extremities of all but a certain number of the sliding tumblers, and thus prevent the acting of the fastening mechanism. The outer ends of the tumblers extend through an exterior small circular plate upon which are letters or other marks. By suitable means the tumblers can all be drawn forward at once; then by pushing in certain ones (previously known by the letters or otherwise distinguished) by means of suitably arranged notches in their extremities, permitting the projections to pass, the lock can be turned and the bolt drawn or withdrawn. It is impossible to open the lock without pushing in the right tumblers. The combination, or relative position of the latter, can be altered by interchanging their positions in the slides of the cylinder, a process easily accomplished.

The invention cannot be picked, as there are no orifices giving access to its interior, nor can the projecting lock be rotated by a wrench. The combination can be readily actuated in the dark, it being merely necessary to feel for the proper tumblers which, projecting, are easily distinguished. The mechanism is simple and not readily thrown out of order; and the device, as a whole, appears of considerable merit, both in design and construction.

A New Telegraph Instrument.

Mr. G. M. Phelps, of the Western Union Telegraph Company has recently completed a printing instrument, for the use of the Gold and Stock Telegraph Company, which is really remarkable for its ingenuity and compactness. This instrument works on one line wire, without local batteries, has two type wheels, one for letters and the other for numerals, with a device for shifting the impression instantaneously from one to the other, and is capable of working continually at the rate of forty words per minute. The whole affair is, perhaps, eight inches in diameter, and of about the same height. Mr. Phelps may well take an honest pride in this creation of his mechanical genius, as it is, probably, the most elegant printing instrument ever yet produced. It is probable that this machine will, in time, be exclusively used by the Gold and Stock Telegraph Company for their work, as its speed of transmission is nearly or quite five times as great as the one now in use by them.

A Useful and Interesting Picture.

Messrs. Kimmel and Voigh, of Nos. 254 and 256 Canal street, in this city, publish a neatly executed lithograph which will doubtless prove an acceptable ornament on the walls of the houses of those to whom it is dedicated, the mechanics and tradesmen of the United States. The subject is a group of workmen engaged at their different occupations in the foreground, while the distance presents a view of a harbor with vessels, etc., and also of factories, railroads, bridges and other structures indicative of industrial pursuits. The picture bears the appropriate title "By industry we thrive—Progress our motto." It is of quite large size, and in execution is a fair specimen of recent advancement in the lithographic art.

Hampton Normal and Agricultural Institute.

There has recently been established at Hampton, Va., an institution for technical education, where employment is furnished to colored students who are unable to bear the whole of their expenses; and thus they are enabled to help themselves. There are now 200 scholars of both sexes, whose ages range from 14 to 25 years. They are employed on the farm of the institute, and in the printing office, sewing room and laundry which are attached to the establishment. But these do not afford sufficient occupation, and it is proposed to add some light manufacturing business. Mr. S. C. Armstrong, the principal, will be glad to receive suggestions on this subject from any of our readers.