POSITION OF THE PLANETS IN JULY.

JUPITER

is evening star, and, as usual, during the month after opposition, is most favorably situated for observation. He rises before sunset on the 1st, and a glance at the southeastern sky will reveal his presence as soon as the twilight begins to fade. At the close of the month, he has so far advanced on his course toward the sun that he is on the meridian soon after 9 o'clock. He is very brilliant in spite of his great southern declination. Jupiter sets on the 1st at 4 h. A. M. On the 31st he sets at 1 h. 47 m. A. M. His diameter on the 1st is 44".6, and he is in the constellation Sagittarius.

VENUS

is morning star. She reaches her greatest western elongation, or greatest distance west of the sun, on the 10th, at 4 h. A. M., being then 45° 44' west of the sun. After elongation, she retraces her steps toward the sun, her brilliancy slowly decreasing as she recedes from the earth. She will be a charming object in the morning sky throughout the midsummer month, especially on the morning of the 23d, when approaching conjunction with the waning moon. Venus rises on the 1st at 1 h. 50 m. A. M. On the 31st she rises at 1 h. 37 m. A. M. Her diameter on the 1st is 26".4, and she is in the constellation Taurus.

MERCURY

is morning star. He reaches his greatest western elongation on the 12th, at 5 h. A. M., and then, like his more brilliant neighbor Venus, begins to retrace his steps toward the sun. At elongation he is 20° 47' west of the sun, and favorably situated for observation with the unaided eye, on account of his high northern declination. Mercury rises on the 1st at 3 h. 39 m. A. M. On the 31st he rises at 4 h. 17 m. A. M. His diameter on the 1st is 10".0, and he is in the constellation Taurus.

SATURN

is evening star. He is so near the sun as he approaches conjunction, that he will soon be hidden in the sunlight, setting less than an hour after the sun on the last day of the month. He is visible in the early part of the month in the northwest, moving eastward and slowly approaching Regulus. Saturn sets on the 1st at 9 h. 41 m. P. M. On the 31st he sets at 7 h. 52 m. His diameter on the 1st is 15".4, and he is in the constellation Leo.

MARS

is morning star, and makes seemingly little progress in his approach toward our planet. He rises on the 1st at 4 h. 11 m. A. M. On the 31st he rises at 3 h. 47 m. A. M. His diameter on the 1st is 4".0, and he is in the constellation Gemini.

URANUS

is evening star. He is in quadrature with the sun on the 9th at 8 h. P. M. He is in good position for telescopic observation, and may be easily found on account of his near approach to Spica. Uranus sets on the 1st at midnight. On the 31st he sets at 10 h. 3 m. P. M. His diameter on the 1st is 3".6, and he is in the constellation Virgo.

NEPTUNE

is morning star. He rises on the 1st at 2 h. 11 m. A. M. On the 31st he rises at 0 h. 15 m. A. M. His diameter on the 1st is 2".5, and he is in the constellation Taurus.

Mercury, Mars, Venus, and Neptune are morning stars at the close of the month. Jupiter, Uranus, and Saturn are evening stars.

The 36-Inch Lick Telescope.

We have received from Messrs. Warner & Swasey, Cleveland, O., who constructed the mountings of this great instrument, a fine print of same which they have lately caused to be engraved.

This instrument, the largest and most powerful refracting telescope in the world, was erected in 1888 at the Lick Observatory, which is located on Mt. Hamilton, in Santa Clara County, California. It is about fifty miles southeast of San Francisco, and twenty-six miles east of San Jose. It is 4,200 feet above sea level, and in sight of the southern end of San Francisco Bay.

The column is of cast iron, 10×17 feet at the base and 4×8 feet at the top, and weighs 20 tons. On this rectangular column rests the head, weighing 4 tons, in which is journaled the polar axis.

Around this head is a balcony, on which the assistant astronomer is stationed. By a system of wheels he is able to adjust the instrument on any star desired, and read its position by microscopes illuminated by electric light. Access to the balcony is gained by a spiral staircase on the south side of the column.

The polar axis is of steel, 12 inches in diameter, 10 feet long, and weighs 2,700 pounds. The declination axis is also of steel, is 10 inches in diameter, 10 feet long, and weighs 2,300 pounds.

The tube is of steel, 57 feet long. Its diameter is 4 feet at the center, tapering toward each end to 38 inches. The tube complete, with all its attachments, weighs 5 tons. This is made to follow the star by means of a driving clock, weighing one ton, controlled by a double conical pendulum which is placed near the top, and within the column, and is reached by a landing from the spiral staircase. At the side of the great tube three small telescopes of 6 inch, 4 inch, and 3 inch aperture are attached, which serve as finders.

The magnifying power ranges from 180 to 3,000 diameters.

The object glass is 36 inches clear aperture, and weighs, with its cell, 532 pounds. By special accessories the telescope is adapted to spectroscopic, photographic, and micrometric work.

The center of motion is 37 feet above the base, and when the telescope is pointed to the zenith, the object glass is 65 feet above the base of the column. When turning the instrument in declination, the weight that is put in motion is 7 tons, and when turning it in right ascension 14 tons is being moved. The total weight of the instrument is 40 tons.

The Paris Exhibition.

THE FRENCH LOCOMOTIVE EXHIBIT.

PARIS, June 5, 1889.

If as much could be said of the design of the French locomotives as can be said for the workmanship, this would be a grand exhibit for quality as well as magnitude, but the French seem to have got very little further than Crampton did in the improvement of the locomotive. Crampton undoubtedly did a very great deal for the locomotive of his day, but very little of it remains in present practice outside of France. When Napoleon the Second visited Queen Victoria the engine which took him from Dover to London was No. 149, a Crampton engine, with an intermediate crank shaft and having a single pair of driving wheels behind the firebox. A very large part of the journey was made at a speed of over 60 miles an hour. This class of engine has, however, gone out of use even in France, notwithstanding that it survived all other forms of Crampton engines in England. None of Crampton's designs was copied in America that I ever heard of, except perhaps the use of a perforated pipe running along the steam space, so as to dispense with the steam dome.

A very large proportion of the French locomotive exhibit consists of compounded engines, and in this case the Crampton plan of a return crank carrying the eccentrics serves well for the outside cylinders. Locomotive No. 2,367 of the Chemin de Fer du Nord is a compound six-wheel coupled engine with Crampton valve gear. In this engine there is a good deal of overhanging weight forward of the leading wheels—an alleged defect for which Bodmer's locomotive was condemned by the English government after it had run off the rails. Another exhibit of the same company has the Joy valve gear, which lends itself with many advantages to the compound system.

Locomotive No. 623, exhibited by the Chemin de Fer de l'Ouest, has inside cylinders, with Crampton valve gear. The coupling rods on this engine are outside the Crampton eccentrics, so that the return crank not only drives the valve gear, but also drives the trailing driving wheels—a construction which seems to me to be thoroughly bad. The valves are on top of the cylin der, inside the smoke box. The links for the valve gear are straight bars, the link itself lifting upward and the link die moving downward. On account of the eccentrics for the link motion being inside the side rods, the back driving-wheel axle box has a collar on it equal in thickness to the two eccentrics, this construction being necessary in order to keep the coupling or side rods in line. This engine is provided with a screw for working the reversing lever. The workmanship of this engine is exceedingly good. The Society Alsatienne des Constructions Mecaniques exhibit a compound locomotive in which the inside cylinders connect to the front pair of 5 ft. 6 in. driving wheels, while the outside cylinders drive the back pair of 5 ft. 6 in. driving wheels, the two pairs of wheels not being coupled. This arrangement I consider to be decidedly objectionable, considering that there is but little room for a receiver in a locomotive. A Joy's valve gear is employed for the outside cylinders, the slide spindle guide being suspended from the lower guide bar. In connection with this engine a peculiar feature of French locomotive practice may be noted, viz., that the steam chest comes in beneath the cylinders, and parallel with the ground, so that it can only be got at when the engine is standing over a pit. On speaking to a French engineer on this point, he answered, "We do not find it inconvenient. What could we want to get at the valves for, unless the engine is in the shop for examination or repairs? When we put the valves in, we put them in right and we attend to the lubrication properly, and if you in England or America have to arrange to get at the valves when the engine is in service, there is something wrong in your practice or construction." To an argument of that kind nothing can be said, unless one has statistics to fall back upon to show that it does or does not in practice prove inconvenient to place the cover in such a position.

The Chemin de Fer de Paris-Orleans exhibit engine No. 479 of 1889, which has inside cylinders, but Crampton valve gear with Gouch links. The piston stroke of this engine is greater than I ever saw in modern locomotive practice, being at least twice the piston diameter. A feature on this engine (the bracing of the inside cranks with iron hoops) is noticeable as representing common French practice. At the works of the Chemin de Fer du Nord at Hellemmes, they told me they found this necessary. But it is not found necessary in England (where a very large majority of the locomotives have inside cylinders, and therefore crank shafts), unless in the case of the appearance of cracks. Hence it naturally suggests itself that the use of the Crampton gear throws extra strain on the crank shafts, thus rendering the hooping necessary. The connecting rods of this engine have their straps and butt ends fitted with dies V-shaped at the ends—a construction rarely found nowadays in England or America. Another and not by any means a pleasing feature of this engine is that it is lagged all over with sheet brass, which is both unmechanical and in bad taste, besides being both ugly and expensive. The axle boxes are highly polished, in fact, burnished, as are also all that is visible of the springs. The buffer plates also are highly polished and have, at the back, some unnecessary fancy curves belonging to an era of the past when ogee scrolls were considered beautiful on engines or machines.

A compound locomotive on the Malet system appears among these exhibits to advantage, the high pressure cylinder being on one side of the engine and the low pressure cylinder on the other. This avoids a good deal of the excessive complication shown on some of the other compound engines, but it does not follow that it accomplishes what is required in a compound engine, and I may refer to it and some other features of French locomotives at a future time.

The Societe Alsatienne, Usine de Belfort, exhibit a locomotive with a valve gear composed of a sort of a trip mechanism actuated by a Crampton return crank and a rod from crosshead *a la* Joy. It is a wonderful compound of cam, screws, bevel gears, tongues, spiral springs, etc., all of a heap, and is doubtless the first, and is pretty sure to be the last, of its race. I hope the inventor had a good idea of what he wanted to accomplish, but cannot compliment him on his method of accomplishing it.

Another compound locomotive has the low pressure cylinder on the outside and a Joy valve gear. The high pressure cylinders are inside, with an ordinary link motion. The piston rods of the outside cylinders of this engine are, say, 3 inches in diameter and 10 feet long, passing through a bush guide provided in the guide bar hanger—a piece of designing not likely to be followed. There is one locomotive with a truck of the American form in the front, and I understand that, in a new and improved form of locomotive being got out by the Nord, the American truck is to be used, and some other features tending more toward English and American practice. The general appearance of French locomotives is not at all elegant or attractive to a mechanical eye, for there are too many bent pipes, cranked arms, and twists and turns in the various parts. It must be confessed that in this matter there is room for improvement in American practice too, and that the most pleasing and mechanical looking locomotive made is the English, with its straight lines and few bends or curves. It looks so simple and straightforward, and as if everything came fair in its proper place without having to be turned aside to get out of the way of something else. In French locomotive construction there is less uniformity than in any other I have as yet seen, and it seems quite clear that it is in a state of transition. At present, for example, you can find almost every form of connecting rod that can be found in the present or past practice of engine building, but at the same time the old patterns predominate. In link motions there are more old styles than new, and in valve gears a feature I never saw in any engine practice, and which I reserve until I have had a better opportunity of examining it.

The workmanship both for fit and finish on the French locomotives is very good, better, much better, than in either American practice. How much of the work is hardened in the case of steel, or casehardened in the case of iron, I have not as yet learned, but from the importance of this point I will look into it. There is not much cast iron work about these locomotives. I notice some steel wheels with solid webs, after the American style, and some wooden wheels on a locomotive truck, but wooden wheels have not found favor for locomotives either in England or France. All passenger carriages on English railways have wooden wheels (the Mansell pattern), and there is no doubt they are cheap, wear well, ride easy, and are easy upon the permanent way.

There are one or two locomotives here with very odd looking square smoke stacks, that are so large at the base as to create the suspicion that there might be a feed water heater inside them, but more of this anon. There is quite a large exhibit of French railway carriages and one or two dummies for street railways, but as this part of the exhibit is not quite complete, it may be reserved for the present. JOSHUA ROSE.

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