NEW ENGLISH THRASHING MACHINES.

We are indebted to *Engineering* for the annexed engravings of some new thrashing machines, invented and manufactured by Messrs. Ransomes, Sims, and Head, of the Orwell Works, Ipswich, England, and which recently attracted considerable attention at the Vienna Exposition. The construction of the various forms of the apparatus will be readily followed from the details in the illustrations.

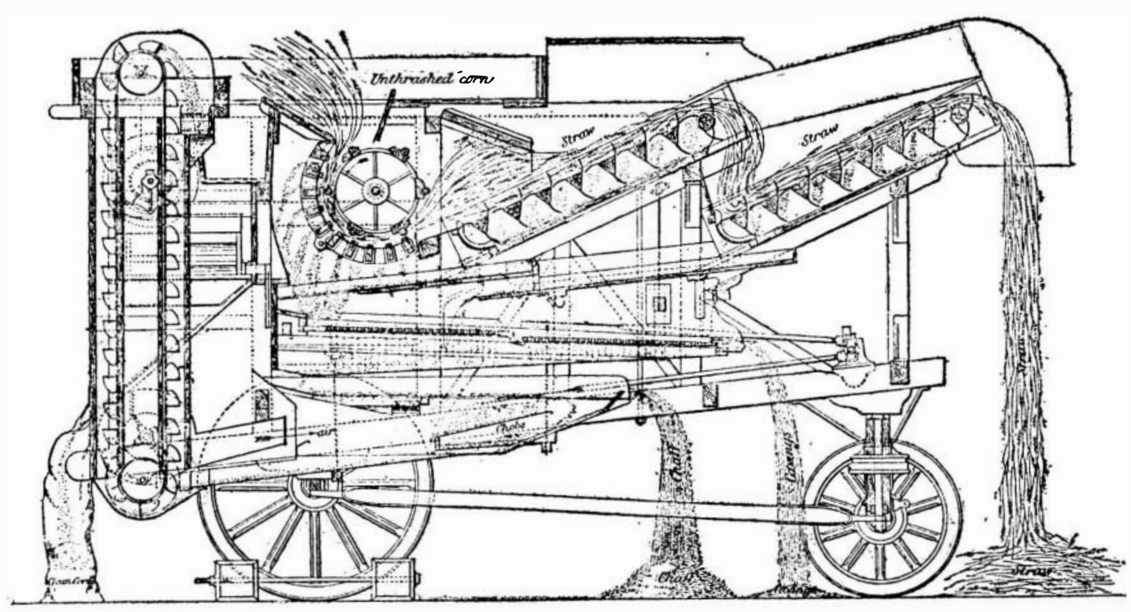


Fig. 1.—THRASHING MACHINES AT THE VIENNA EXPOSITION.

Fig. 1 is a quick delivering double blast implement, especially suitable for the large corn-growing districts of the West, and made of very great capacity. The sheaves are fed into the hopper as fast as they can be delivered (for a speed of 1,000 to 1,200 revolutions is the working rate), pass upon the drum, which is made very heavy and is fitted with the usual twisted beaters, and thence between it and the concave, which is made of malleable cast iron gratings, on to a wrought iron frame, the gratings being placed in sections, and secured so as to be easily removable. After being forced through the narrow space between the driver and the concave, and thus being relieved of the greater part of the grain, the sheaves pass out upon the first straw shaker, which extends from the concave with a considerable inclination upward, to about midway the machine, where they fall upon a second and similarly inclined series of shakers, placed at a lower level, and by these are carried to the delivery at the front end of the thrasher. The shakers consist of a number of short curved blades set on an endless band, a series of these being placed side by side, so as to occupy the whole width of the machine; and as the set of the blades is different in each row, the straw is seized by a very large number of points as it leaves the concave, and is so agitated that the grain is effectually removed.

The loose wheat shaken out passes between the spaces in the shakers on to close trays, parallel to and immediately below them, and thence falls upon the large top riddle or "jog shoe," extending for about two thirds the length of the machine. This is suspended in the usual manner, and the grain falls through holes in its bottom to the lower riddle, the larger bodies being shaken off the front edge of the top one. The lower riddle is driven off the same crank as the upper one, exposed to the blast from the fan, and the chaff and other impurities are blown off, falling in the front of the machine, and, mixing with the large waste, shaken off the upper jog shoe. From the lower riddle the grain falls into the elevator box; the elevator, which is vertical and inclosed in a box outside the frame, lifts it nearly to the top of the machine and to a point just behind the drum and concave.

From the elevator the the grain, if very smutty so as to necessitate hand winnowing, is delivered directly to the sacks, but ordinarily it passes into a barley awner and chob cleaner, which consists of a conical drum, the inside of which is serrated; and the grain, being driven against these serrations, is effectually cleaned. From the cleaner the grain slides down an inclined plane to a sieve, the under side of which is exposed to a blast, which strikes the grain as it pours into a hopper. The latter is divided by a vertical plate, which is placed below the edge of the sieve, so that the cataract of grain would only just fall on one side if there were no blast; but the action of the fan is sufficient to throw out the dirt, light grains, chaff, etc., upon the other side of the plate, and effect a perfect division of the grain. A special feature may also be noted in the arrangement for discharging chaff at the front end of the machine, where it mixes at once with the ears, broken straw, etc.

Two other machines (not illustrated) are manufactured by the same firm, the object of which is rather perfect thrashing than quick work. The construction is essentially the same as above described; the straw shakers, however, being double, are provided with a puddler or transverse bar, which is armed with forks, and serves to distribute evenly the straw. The most novel feature is that the chaff can be delivered at the front instead of the back of the machine.

Messrs. Ransomes, Sims & Head have also recently exhibited machines of similar description, intended for use in countries where the straw is extremely hard and unfit for the consumption of cattle without being previously bruised and softened. One of these machines, shown in section in Fig. 2, can, when it is desired to deliver straight straw, be used as an ordinary thrasher, the crushing rollers in this case being covered up and the straw delivered in the usual way. But there are provided two drums of sheet iron with cast iron heads, with their spindles in long bearings in standard brackets. Both are driven off the main shaft, the upper one at a speed of 1,000, and the lower at 900, revolutions per minute. In the top drum, attached inside and projecting from the outer face, are three spiral rows of knives. The latter are straight and slightly tapering, with the edges sharpened on all their sides. They are grouped in pairs, each two blades being only so far apart as to permit a single blade of similar construction to pass between them. These single blades are attached to the concave in connection with which this drum works, like the main drum at the back of the machine. The straw, passing off the shakers between these knives, is effectually cut up into pieces of irregular size and form. Passing then upon the lower drum, it is still further bruised by the second set of knives; these latter, of which there are four rows attached in spirals around the bottom, are single and run between a double set of similar knives fixed in the concave, and these effectually complete the bruising operation. Connected with this machine is an independent apparatus for raising the chopped straw as it leaves the drum and depositing it away from the machine. This consists of an elevator on a separate carriage (Fig. 3), having at the lowest point a fan driven by the engine, and which communicates on the one side with the bruised straw delivery, and on the other with a long wrought iron tube, the length and angle of which may be varied at will. The tube is about 12 inches in diameter, and is connected at the bottom by a joint to the fan casing; and at the front end of the frame is a pair of light jibs, to which it is secured by a chain which passes over a winch, also mounted on the carriage, and by which the elevation of the discharge tube is regulated. The action of the fan drives the bruised straw through the pipe in a continuous stream.

In the fifth machine of the firm above named

Fig. 2.

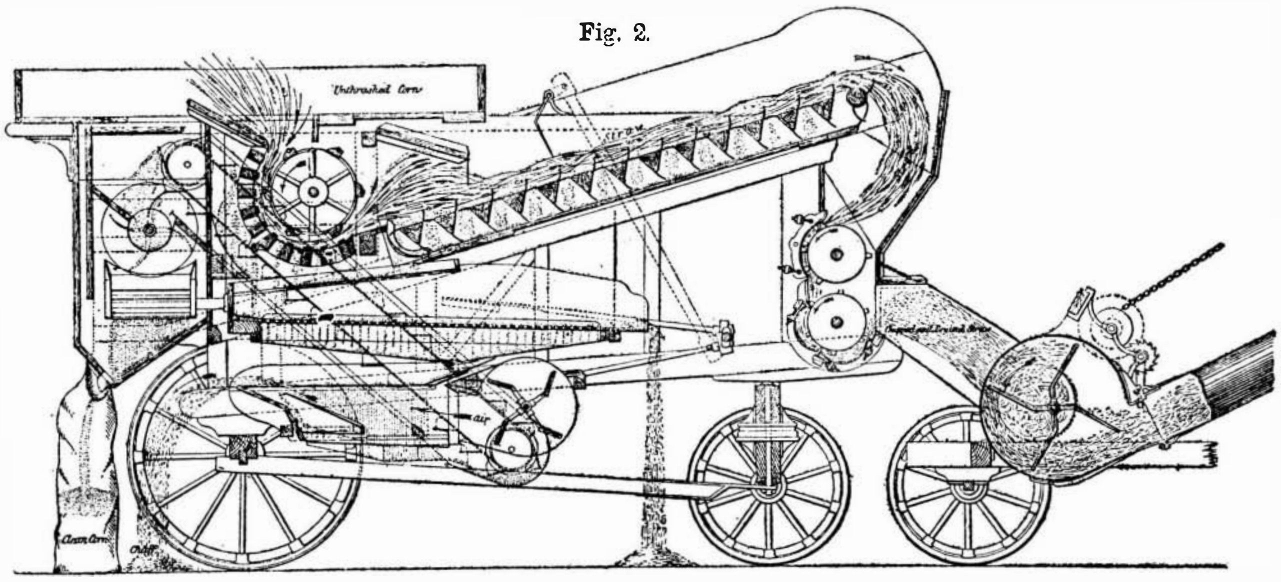


Fig. 3.

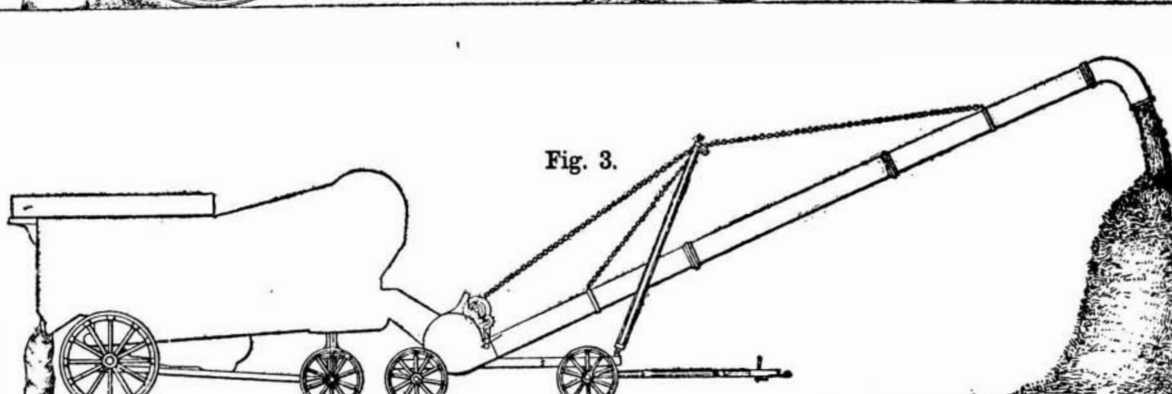
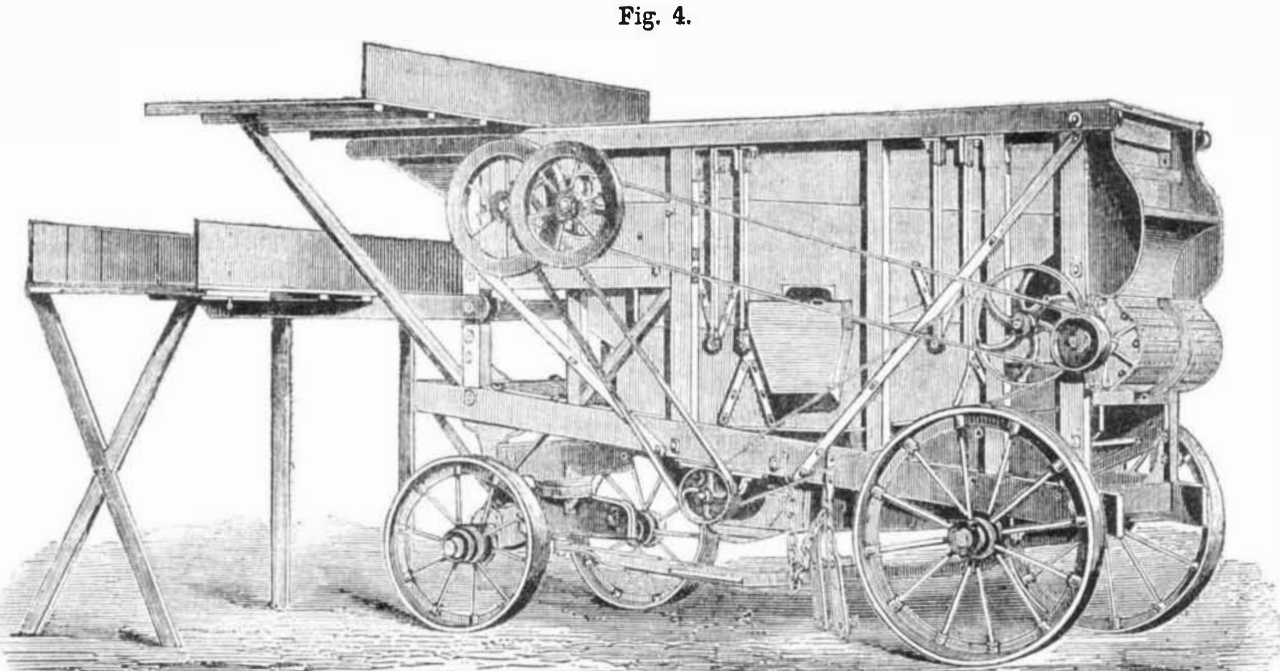


Fig. 4.



(represented in perspective in Fig. 4), the action is such as to cut and bruise the straw and, at the same time, extract the grain. The relative position of the two cylinders is horizontal, instead of vertical. The grain passes to a stepped riddle, from which the chopped and bruised straw falls to a second one, and travels forward towards the front end of the machine, dropping the grain still contained in it until (by the time it has reached the end, where there is a third roller for further bruising the straw, if desired) all the grain has been separated, and has fallen in the system of riddles beneath, where it is exposed to the action of the blast, and is treated as in an ordinary machine.

Correspondence.

The Relative Attraction of the Earth and the Sun.

To the Editor of the Scientific American:

A correspondent suggests, on page 68 of your current volume, the construction of scales, of the capacity of several tons and of the utmost possible delicacy, in order to decide whether really the solar attraction causes, under the equator, a difference in weight at midday and midnight, and if so, to ascertain whether astronomers have not miscalculated the relative masses of the sun and the earth. This suggestion calls for a few remarks.

In the first place, most delicate scales are not those of great capacity, but those of comparatively small size. As the weight of any piece of machinery or structure in general increases as the cubes of the dimensions, very large scales have a great deal of their own weight to carry, which of course interferes with their relative sensitiveness. The proposition to make a scale of 10 tuns capacity, able to show a difference of some 24 lbs. more or less, suggests a delicacy of only 24 in 20,000, or $\frac{1}{833}$rd part, and when weighing to within drams, a delicacy of one ten-thousandth part, of the load. It is doubtful if large scales could be made of such sensitiveness: while, on the other hand, the superior kinds of large sized chemical scales easily indicate differences in weight of a one millionth part of the load. Therefore, in place of taking 10 tuns, we must rather make the experiment with 100 grammes, and may then easily find the difference to within a milligramme, which is the hundred-thousandth part of the load.

But it must not be forgotten that the ordinary scales cannot be used for such an experiment, as the diminished gravitation will act equally on both sides, and the equilibrium, when once established, will not be disturbed by any change in the amount of gravitative attraction. In order to ascertain the latter, we must counteract gravitation by other forces, for instance, those of springs; and if we suspend a weight by a proper system of springs (spiral springs would be best) and notice the different amounts of extension, under different conditions but at the same temperature, we may arrive at some kind of measurement of the changes in the attraction of gravity. Such an arrangement was many years ago proposed by Sir John Herschel in order to practically verify the existence of the increased gravitative action when nearing the terrestrial poles; he did not, however, propose to use it as an instrument of measure, but as a simple rough indicator; for mathematics applied to mechanics give all the data for calculating these amounts to any desired degree of accuracy. It is so with the subject in question; the difference in the amount of solar attraction on terrestrial bodies under the equator at midday or midnight has not only been settled, but, being the cause of one of the great tidal waves (the other wave being due to the moon), has been submitted to a series of rigorous calculations and observations. The result of these calculations, combined with some other considerations, has been that we have already come to the conviction that the mass of the sun, as thus far adopted, has been overrated nearly one tenth, and its distance one twenty-eighth part; and that therefore all our astronomical tables have to be reduced by these two coefficients, except the table of the elements of the moon, which is correct. The reason that this has not been done already is that there is still a slight uncertainty in these coefficients of correction, which will be definitely settled this very year by the observations on the transit of Venus, by which we shall be able to accomplish a full and precise settlement of this important question, and ascertain the distance of the sun, and consequently its mass, with an accuracy far surpassing anything which could possibly be accomplished by experiments on gravitation, which, at the very best, can demonstrate nothing more than the reality of the changes in the solar attraction, but not, with any available degree of accuracy, the amounts of the same. P. H. VANDER WEYDE.

New York city.

Towers and Spires.

To the Editor of the Scientific American:

There is an admirable illustration in your paper of January 24, showing the hight of some of the most famous structures in the world, in comparison with the iron tower which it is proposed to erect at Philadelphia as a centennial monument. It has occurred to me, however, that your readers might infer from the picture, or from the description of it, that the spire of Cologne cathedral has already reached its projected hight of 501 or 507 feet. The fact is that it has risen (or rather they have risen, for there are to be two of these lofty steeples at the west front of the church) only a little above the ridge pole of the edifice, which is about 250 feet high. The only completed spire is a slender iron one at the junction of the nave and transepts. I do not know the exact hight of this light and graceful pinnacle, but it cannot much exceed a hundred feet above the roof. The other spires, which are marvels of Gothic grandeur and beauty, are slowly working upward, and it may be many years yet before they attain their stately perfection. I saw them in 1868 and again in 1872, and the progress made in the interim was apparently but slight.

I may add that there are several very lofty spires that do not appear in your picture. The hight of the central spire of Rouen cathedral is a little greater than that of Strasbourg, being 482 feet, according to good authorities. It is an ugly affair of iron lattice work, built a few years ago to replace the ancient wooden steeple, burned in 1822. It forms a fearful contrast to the beautiful old towers of the west front, of which, by the way, there is an excellent picture in Blackburn's "Normandy Picturesque," lately reprinted by Osgood & Co. The author remarks: "The central spire in the background is really of cast iron, and stands out, it is fair to say, much more sharply and painfully against the sky, than in our illustration; * * * our artist evidently could not bring himself to copy with literal truth this disfiguring element in the building."

Another of the loftiest spires of Europe, and a really fine one, is in Bruges, in Belgium. It is the steeple of the venerable church of Notre Dame, which dates back to the 12th century. The spire, properly so called, was rebuilt a few years since, the original one having begun to lean and threatening to fall. Its hight is given by Baedeker, in the first edition of his "Belgium and Holland," as 442 English feet; but in the second edition (1870) it is put at 468 feet. I have seen it elsewhere stated as 450 feet. Taking the most moderate of these figures, it is certainly one of the two or three tallest steeples in Europe or the world. It looks taller than the Strasbourg spire, probably because there are no very high buildings near it. Like many of the Belgian steeples, it is built of brick, and, though it lacks the profusion of Gothic ornament that makes the Strasbourg spire so beautiful, it is remarkably graceful in its outlines, and altogether one of the most admirable structures of the kind that I have seen. The chancel is the one that contains the tombs of Charles the Bold and his daughter Mary, world-renowned as works of monumental art.

The highest spire in Great Britain is that of Salisbury cathedral, commonly put at just 400 feet; but the tallest erections of any kind are two chimneys in Glasgow, which are respectively 450 and 468 feet in hight. R.

Application of Dr. Vogel's Recent Discovery in Photography.

To the Editor of the Scientific American:

The interest which you and some of your readers take in photography may render the following worthy of note:

Dr. Vogel has discovered that a sensitive collodion film of iodide of silver, when covered with some coloring matter which obstructs certain rays of light and does not interfere with other rays, becomes sensitive to those other rays, that is, those rays which are obstructed act photographically upon that film, just in proportion as they are obstructed. If the yellow rays are stopped, then the film becomes sensitive to yellow light, and yellow objects, which have heretofore been considered non-actinic, can thus be photographed as easily as blue objects have been. If this be so, then it is one of the most important discoveries that have been made in photography since the discovery of that art. It will enable us to depict objects of all colors, the inability to do which has been a great stumbling block in the way of photography. I need not mention the numerous ways in which it may be applied: suffice it to say that heretofore only one of the four primary colors has been considered to be actinic, that is, the blue. As to the theory of the above, you are well aware that there are two theories regarding the action of light on the sensitive film, one called the chemical, the other the physical theory. In the first, it is claimed that the reduction of the silver is done while the light is acting upon the film. In the second, it is claimed that a tremulous or vibratory motion is communicated to the film by the vibrations of light; and that when the developing solution is applied, the reduction takes place. In either case, it is the vibration of the light that does the work. The reason why iodide of silver is more sensitive to the blue ray is, it is thought, that the wave length of that ray coincides more nearly with the size of the particles of the iodide of silver, thereby disturbing or tearing them apart more. If a sensitized iodide of silver film be held before white light, it will be seen that the only color apparent is the orange; and that blue objects appear black when viewed through it, showing that the blue rays are all obstructed. That film is therefore sensitive to blue light. Again, suppose we give that film a blue color, then the orange or yellow rays are stopped. As action and reaction are equal, the amount of resistance exerted by the film is equal to the amount of light stopped; and the ray which is then most obstructed has the greatest action on the film. Taking this view of the matter, it seems to me quite reasonable that any ray may be made actinic. D. C. C.

New York city.

The Railways of Great Britain.

The leading features of the railway system of the United Kingdom, at the end of 1872, may be thus summarized: A total sum of $2,845,236,730 had been expended on 15,814 miles of railway, or nearly $180,000 per mile. There were 10,933 locomotive engines, or about 1 to every $\frac{2}{3}$ of a mile; and 337,899 vehicles, or about $21\frac{1}{3}$ per mile, besides the wagons of traders and companies other than railway companies. By the running of trains for 190,920,719 miles, $256,520,570 were received during the year, of which $128,261,915 were expended in working and maintenance, and $128,258,655 remained as net profit, so that as nearly as possible one half the gross receipts were expended in earning them. There were 422,874,822 passenger journeys, besides 272,342 season ticket holders; and 179,302,121 tuns of goods and minerals were conveyed. The average rate of dividend on ordinary capital was 5·14 per cent, and upon the total capital 4·95 per cent, including $164,507,380 of ordinary capital, part of $212,913,135 of total capital, which received no interest or dividend. The average cost of working each train was 64·64 cents, per mile, and the average receipt from each train was 129·12 cents per mile; so that the average net profit from each train was 4·58 cents per mile; while the total cost of working was $8,110 per mile, and $16,220 per mile was received.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations of the following notes (which are approximate only) and for most of the observations, I am indebted to students. M.M.

Positions of Planets for February, 1874.

Mercury.

On the 1st Mercury rises at 7h. 24m. A. M., and sets at 4h. 58m. P. M. On the 28th, Mercury rises at 7h. 26m. A. M., and sets at 7h. 18m. P. M.

It should be looked for after sunset during the latter part of the month, as it reaches its greatest angular distance from the sun on the 2d of March.

Venus.

Venus rises on the 1st at 7h. 6m. A. M., and sets at 4h. 42m. P. M. On the 28th it rises at 6h. 50m. A. M., and sets at 5h. 48m. P. M.

Venus is very unfavorably situated for observation throughout the month; it passes the meridian very nearly with the sun, and its apparent diameter is very small.

Mars.

Mars rises on the 1st about 9 A. M., and sets before 9 P. M. On the 28th it rises about 8 A. M., and sets before 9 P.M.

It will be seen that it is above the horizon during the day time, and can be seen only for a few hours after sunset.

Jupiter.

Jupiter is coming into better and better position. It rises on the 1st at 9h. 15m. P. M., and sets at 9h. 25m. A. M. On the 28th it rises at 7h. 16m. P. M., and sets at 7h. 30m. on the morning following.

The various changes of the moons of Jupiter can be seen with a small telescope. On the 17th, (according to the *American Nautical Almanac*) the largest of these satellites will pass between the planet and the earth, and seem to traverse the disk of Jupiter. A powerful telescope will show it projected upon the planet's disk for several hours in the evening, while to glasses of low power Jupiter will appear to have but three moons.

The same phenomenon can be seen on the 24th, but at a later hour of the night, and again on the 3d of March, as this satellite revolves around Jupiter in about 7 days.

Saturn.

Saturn is above the horizon in the day time, rising at 6h. 59m. A.M. on the 1st, and setting at 4h. 35m. P. M., while on the 28th it rises at 5h. 20m. A. M., and sets at 3h. 5m. P. M. It will be seen that it is useless to attempt to make observations upon this planet.

Uranus.

On the 1st Uranus rises at 4h. 44m. P. M., and sets at 7h. 9m. A. M. On the 28th it rises at 2h. 52m. P. M., and sets at 5h. 16m. A. M. of the next morning. As its northern declination is about 19°, it attains an altitude of about 67° when on the meridian, which it passes at midnight on the 31st of January, and near midnight during the first half of the month. It is among the stars of *Cancer*, can be readily found with a telescope of moderate power, and will be known from a star by its showing a measurable disk.

Neptune.

Neptune can be seen well only by means of a powerful telescope at any time, and at present is not well situated. It comes to meridian on the 1st at 4h. 51m. P. M. and on the 28th at 3h. 7m. P. M.

Barometer and Thermometer.

The meteorological journal from December 14 to January 17 gives the highest barometer, January 17, 30·48, the lowest barometer, December 28, 29·33; the highest thermometer, January 4, at 2 P. M., 52°; the lowest thermometer, January 17, at 7 A. M., −1·5°.

Amount of Rain.

The snow and rain which fell between the morning and evening of December 19 amounted to 0·27 inches.

The rain which fell between the morning and evening of January 2 amounted to 0·3 inches.

The rain which fell between the afternoon of January 5 and the evening of January 7 amounted to 3·2 inches.

Auroras were seen on the evenings of January 15, 16, and 17.

Sun Spots.

The record extends from December 17 to January 19, inclusive, observations being omitted during the holidays on account of the absence of the observer. The clear days of the remaining time were the 15th and 17th of December, the 9th, 10th, 17th, and 19th of January. Spots have been small and generally few. Those of the 9th and 10th were identical in appearance, their positions only differing by the motion of the sun on its axis. On January 19, eleven were scattered over the disk, eight being in pairs, the remaining three solitary. Some of these were identical with those of the 17th. Faculæ have been unusually scarce.