(For the Scientific American.)

The Sun.—No. 2.

Sometimes only a few spots are observed on the sun, sometimes their number amounts to more than two hundred, and at other times the disk of the sun has been said to be spotless. M. Schmidt counted above two hundred single spots and points in a group visible on the 26th of April, 1846, and one hundred and eighty in a cluster seen in the previous August.—Scheiner never found the disk of the sun wholly clear from spots, excepting for a few days in December, 1624; at other times he saw twenty, thirty, and sometimes as many as fifty at a time. From this up to 1650, spots were common, but between the last date and 1670, a period of twenty years, only a few were observed. Since 1700 they have been almost constantly observed, though in greater abundance during some years than others. M. Schwabe, a German astronomer, has observed that there has been a periodical recurrence of the solar spots, at least, for several years. In 1828 they were very numerous; but they decreased gradually in number for the ensuing five years, up to 1833, at which date they reached a minimum. During the next four or five years they increased quite rapidly, arriving at their maximum again in 1837 or 1838 From this they decreased again up to 1843 or 1844; and then went on increasing. In 1848 they were very numerous. It has been calculated that their period between consecutive minima is a fraction above 11 years, or that nine mean periods occur in a century. The period between their minimum and maximum is variable, the mean being above five years. Whether this is the expression of a physical law or not, there appears to be a remarkable coincidence in their appearances.

The rotation of the sun appears to carry his spots, when visible, across his disk from his eastern to his western limb. Owing to the inclination of his axis, at different seasons of the year, the lines described by the spots in apparently moving over the sun's disk, have different inflections. In the beginning of December the spots apparently move in direct lines and a little downwards in passing from left to right over the disk. The axis of the sun is then inclined towards the right, its north pole being to the west of the apex or highest point of the disk, and the earth is situated in the plane of its equator. After this the lines described by the spots begin to be curved upwards, so that in the beginning of March they become considerably convex towards the upper part of the disk, or in other words, appear elliptical like the nearer semi-circumference of a circle somewhat inclined to the line of sight and having the eye below its plane. The north pole of the sun, in this case, is inclined from us; and we can perceive a portion of the sun beyond his south pole, which is removed a little into the visible hemisphere. In the first week of June, the spots appear to move in nearly direct lines, inclined upwards to the right. The axis of the sun is now inclined to the left, and its north pole is to the east of the highest point of the disk. Near the middle of the month of September, the lines described by the solar spots are inflected downwards, so as to be convex towards the lower part of the sun, or just the reverse of their position in March. About the first weeks of December and June, then, the plane of the solar equator passes through the earth; in March this plnne is above the earth, being thus from December to June, and in September and the adjacent months below her. When the earth is in this plane of the solar equator, it must be in the line in which this plane intersects the ecliptic; in other words, in the line of its nodes. The heliocentric places of the earth, when thus in the nodes of the sun's equator, are, according to late observations of Dr. Petersion, at Altona, 73° 29′ and 253° 29′ respectively; in the former it passes to the south and in the latter to the north of the solar equatorial plane. The sun's equator has the greatest latitude north in heliocentric longitude 163° 29′, and the greatest south latitude in the opposite longitude of 343° 29′.

Explanatory Note.—*Macula*, plural *maculæ*, latin, a spot; a spot on the skin or on the surface of the sun. *Facula*, plural, *faculæ*, latin, a small torch, a little light; a small bright spot on the sun. *Luculus*, plural, *luculi*, latin, from *luceo*, to shine; a brilliant speck. *Nucleus*, plural, *nuclei*, latin, a nut, the central part of a body, about which matter is collected; the interior of a solar spot within the bordering penumbra; the central body of a comet, within the envelope. *Penumbra*, latin, *pene*, almost, and *umbra*, a shadow; the partial shadow in eclipses; the less dark border of a solar spot.

Coal in Oregon.

Messrs. Editors.—I think, from a remark in one of the numbers of the Scientific American, you have not much faith that coal exists in this Pacific country, at least, to any extent, therefore I send you a few facts in regard to the Coos Bay Coal Mine.

Coos Bay is situated in Oregon, about 350 miles north of San Francisco, and 40 miles north of Port Oxford. Empire City, on Coos Bay, was first settled by Messrs. Northrup & Simonds about two years ago, and they have devoted much time and labor surveying the country to discover coal, and with this I send you a small piece, that you may see it is coal, and no mistake.

It burns free, much like the Cannel coal of England, and it is used by many steamers, mills, foundries, &c., and with entire satisfaction. This coal has met with some opposition from importers of coal from Atlantic States, as it can be sold for much less than imported coals; and there is no doubt but this mine will yet be able to supply San Francisco market. Messrs. Northrup & Simonds can land their coals in San Francisco for about $9 per tun.

This company is mining about 100 tuns per day, and in a short time will take 300 or 400 tuns per day. The coal vein is from 6 to 9 feet thick, and it can be distinctly traced for a distance varying from 2 to 5 miles wide, and about 20 in length. There is a railroad from the mine to the landing, which is about one mile distant. They have worked into the mine 100 yards, at a slope of 3 feet in 100.—Vessels drawing from 10 to 13 feet of water can come to the landing and load at the rate of 200 tuns in 15 hours. Coos Bay affords a good harbor at all seasons of the year, but there is a bar at the entrance which makes the passage dangerous in stormy weather. These few facts were furnished me by the agent of Messrs. Northrup & Simonds, Mr. Silas Fuller, of San Francisco.

Charles Livingston.

San Francisco, May, 1856.

How to Obtain the Metal Aluminum.

The following method of obtaining the above-named metal is taken from a late lecture delivered in London, by Rev. J. Barlow, F.R.S., on the subject.:—

"Clay is a silicate of alumina; in fact, three-fourths by weight of a portion of pure clay are silica. Of this silica, one-half is oxygen, the other half is silicium, a substance altogether new in its properties; it is not affected by water or by air, and it can be kept in either; it has no luster, or any other resemblance to a metal; it is analogous to carbon.

Now, it is important to notice that, it was not from silica (the oxyd,) but from the fluoride and chloride of silicium that Berzelius obtained this substance. This fact, perhaps, instigated Wohler's successful attempt to decompose the *chloride* of aluminium (a fusible and volatile substance,) by the vapor of potassium, which has no effect on the oxyd of aluminium. But the production of the chloride of aluminium demands a concentration of chemical power. The hydrated chloride, resulting from the solution of alumina in hydro-chloric acid, on being evaporated, decomposes the last portions of the mother-liquor, and the operation ends by the re-production of alumina. This difficulty was surmounted by Œrsted: he caused the affinity of oxygen for carbon, and of aluminium for chlorine to act simultaneously, and under the most favorable circumstances, by chlorine gas being led over an intimate mixture of alumina and charcoal heated to redness in a porcelain tube. The anhydrous chloride was thus evolved in vapor, and condensed in a suitable receiver. The apparatus contrived by M. Deville for procuring this substance, was exhibited. Wohler's process of obtaining aluminium from its chloride is well known. The following modification of that process, devised by M. Deville, was shown in action.

A tube of Bohemian glass, 36 inches long, and about one inch in diameter, was placed on an empty combustion-furnace constructed for the purpose. Chloride of aluminium was introduced at one extremity of the tube; at the same extremity a current of dry hydrogen gas was made to enter the tube, and was sustained till the operation was finished. The chloride was now greatly warmed by pieces of hot charcoal, in order to drive off any hydrochloric acid it might contain; porcelain boats, filled with sodium, were inserted into the opposite extremity of the tube; the heat was augmented by fresh pieces of glowing charcoal until the vapor of the sodium decomposed that of the chloride of aluminium. Intense ignition usually attends this re-action. At length the aluminium was liberated in buttons, which were found in the boat adhering to a substance consisting of the mixed chlorides of aluminium and sodium. The boat was now transferred with its contents to a porcelain tube, through which hydrogen gas was passed. At a red heat, the double chloride was distilled into a receiving vessel, attached to the tube for the purpose; the buttons of aluminium were collected, washed with water, and subsequently fused together under a flux consisting of the double chloride.

Another method of obtaining aluminium from the chloride has been adopted with success. It is as follows:—

4·200 grammes of the double chloride of aluminium and sodium (*i.e.*, 2·800 grammes chloride of aluminium, and 1·400 grammes common salt,) 2·100 grammes of common salt, 2·100 grammes of cryolite, thoroughly dry, and carefully mixed together, are to be laid in alternate layers, with 840 grammes of sodium (cut into small pieces,) in a crucible lined with alumina—a layer of sodium should cover the bottom of the crucible. When the crucible is filled, a little powdered salt is to be sprinkled on its contents, and the crucible, fitted with a lid, is to be introduced into a furnace, heated to redness, and kept at that temperature until a re-action, whose occurrence and continuance is indicated by a peculiar and characteristic sound, shall have terminated. The contents of the crucible, having been stirred with a porcelain rod, while in their liquified state (this part of the operation is essential) are poured out on a surface of baked clay, or any other suitable material, the flux, &c., on one side, and the metal on the other.

In the experiment just described, the cryolite chiefly fulfills the office of a flux. But, twelve months since, Dr. Percy obtained aluminium directly from this mineral. Cryolite is a fluoride of aluminium and of sodium. Dr. Percy found that layers of this substance, minutely pulverized, and heated with sodium in the manner described in the last experiment, yielded aluminium. Cryolite is found only in Greenland."

Electricity the Cause of Waterspouts.—A New Theory.

Two violent currents of air meeting at an angle cause a vortex, and form a hollow vertical whirling tube, sucking up within its folds heavy objects, and carrying them, sometimes, to a great hight. On a minor scale, these may be observed on a dry, windy day, in the shape of dust-whirls, on any public road. Heretofore, waterspouts have been attributed to such a cause—two intense angular currents of air meeting, and forming a huge vortex on the face of the ocean, lifting up the waters, as it were, by a huge hollow screw of wind, thus forming the waterspout.

Dr. M. F. Bonzono, of the U. S. Mint, New Orleans, goes deeper into the subject, and presents the following new theory of the cause of waterspouts, and he backs it up with good arguments:—

"From the conductor of an electrical machine suspended by a wire, or chain, a small metallic ball, (one of wood covered with tinfoil,) and under the ball place a rather wide metallic basin, containing some oil of turpentine, at the distance of about three-quarters of an inch. If the handle of the machine be now turned slowly, the liquid of the basin will begin to move in different directions, and form whirlpools. As the electricity on the conductor accumulates, the troubled liquid will elevate itself in the center, and, at last, become attached to the ball. Draw off the electricity from the conductor to let the liquid resume its position: a portion of the turpentine remains attached to the ball. Turn the handle again very slowly, and observe the few drops adhering to the ball assume a conical shape, with the apex downwards, while the liquid under assumes also a conical shape, the apex upwards, until both meet. As the liquid does not accumulate on the ball, there must necessarily be as great a current downwards as upwards, giving the column of liquid a rapid circular motion, which continues until the electricity from the conductor is nearly all discharged, silently, or until it is discharged by a spark descending into the liquid. The same phenomena takes place with oil or water. Using the latter liquid, the ball must be brought much nearer, or a greater quantity of electricity is necessary to raise it.

Those who have had occasion to observe the sublime phenomenon of a waterspout, will at once perceive, in this experiment, a faithful miniature representation of the gradual formation, progress, and breaking up of that grand phenomenon.

If, in this experiment, we let the ball swing to and fro, the little waterspout will travel over its miniature sea, carrying its whirlpools along with it. When it breaks up, a portion of the liquid, and with it anything it may contain, remains attached to the ball. The fish, seeds, leaves, &c., that have fallen to the earth in rain squalls, may have owed their elevation in the clouds to the same cause that attaches a few drops of the liquid, with its particles of impurities, to the ball.

It is well known that waterspouts generally form on hot summer days in southern climates, and in so-called dead calms. They never form on windy days, nor in rainy weather. If, in our experiment, we blow upon the surface of the liquid, the discharge of electricity from the ball will be so much facilitated as to prevent the elevation of the liquid entirely, or, at least, to retard it very much. By holding a pointed conductor near the liquid, the elevation of it is entirely prevented. It seems not a forced deduction that lightning rods, and not the firing of cannon, are the proper safeguards against the formation and disastrous effects of waterspouts. When we contemplate the effects of electrical attraction on liquids, our attention is naturally drawn to its effects with regard to gases, and especially atmospheric air. The non-conducting air will, like other fluids, be attracted, electrified, and repelled, to seek its dissimilar electricity, giving rise to currents and counter-currents, and at the electrical machine to the phenomenon known as the electrical wind, whilst by the operation of the grand electrical machine of the clouds, it produces those fearful and destructive currents known as whirlwinds and tornadoes.

The table lands of Mexico are never wetted by rain, and but very sparingly by dew. It is in these elevated and dry regions that whirlwinds are most frequent. Waterspouts and whirlwinds seem to be the lightning rods that nature constructs to afford to the electricity of the clouds a passage to the earth."

California Fisheries.

The Monterey (Cal.) *Sentinel*, says:—"It is a matter of great wonder why more has not been done to open out the mine of wealth which nature has of old established in the fisheries of California and the North Pacific. Probably there is not in the whole world a coast so abounding in productive fisheries as that of our State, Oregon, and Washington. Sardines, mackerel, codfish, and salmon are not found in any part of earth's shores, as numerous as they are hereaway. In summer and fall they arrive in our bay in such shoals as to astonish the stranger."

A Great Tailor's Shop.

M. Godillot, in Paris, employs sixty-six sewing machines, kept in motion by a steam engine of nine horse power, and which sewed all the overcoats for the Crimean army. Besides the machine, one thousand women and girls are constantly engaged in sewing.