

beams and columns will permanently bend, so that riveted joints can be taken as introducing the breaking element into a structure made of the most ductile steel procurable. Meanwhile, if soft steel is used, it should be accessible for examination. Modern plumbing practice exposes all pipes for full access and inspection. Some similar system should be followed for the members of steel frames.

THE SNOWS OF MARS.

Among the most interesting observations of Mars during the recent opposition were those relating to the gradual disappearance of the snow cap surrounding its southern pole. The disappearance was due, of course, to the fact that it was summer in the southern hemisphere of Mars, and the polar snows melted more and more rapidly as the sun rose higher upon them. Yet, although the reason was plain, and because it was plain, one could not watch the process without experiencing a strange feeling that amounted almost to awe. It is quite easy to think dispassionately of the possibility that some things may go on in other worlds just as they do in this one as long as your eyes have not confirmed what is in your mind; but when, peering through a telescope, you actually behold such occurrences the effect is startling. It is like coming suddenly in broad daylight upon the scenery of a dream.

On the 1st of June the snow around the south pole of Mars was about 2,400 miles across. A snow cap of proportionate dimensions on the earth would, in the northern hemisphere, extend as far south as St. Petersburg, the southern point of Greenland, and Mount St. Elias, in Alaska. By the 1st of July the diameter of the snowy area had diminished to about 1,500 miles. On the 1st of August it was only 1,100 miles, and on the 31st of August, the date of the summer solstice in the southern hemisphere of Mars, the snow cap was but 500 miles across. But heat accumulates in a Martian summer after the sun has begun to decline, just as it does upon the earth, and accordingly the melting of the snows continued after the solstice was passed. At the end of September the diameter of the snow covered region was only about 350 miles, and at the opening of November it was less than 200 miles.

Now comes a curious fact. About the middle of October it was reported that the polar snow cap of Mars had vanished; some of the most powerful telescopes failed to reveal a trace of it! Yet it is not probable that it had actually entirely disappeared. The explanation of the apparent disappearance is no doubt to be found in the fact that as the snow area diminished it left the pole uncovered by receding to one side; for previous observations have shown that on Mars, as on the earth, what may be called the "pole of cold" does not correspond in location with the pole of the planet's axis. Schiaparelli's observations, in 1877 and 1879, showed that the center of the snow cap during its minimum in those years was displaced toward that side of the pole corresponding to an areographic longitude of about 40°. With the other side of the planet turned toward the earth the snow cap would have been invisible, being, so to speak, hidden behind the pole. This is apparently just what occurred in the middle of October last. The south pole was then free from ice and the center of the snowy region was displaced, as in 1877 and 1879, along the meridian of 40°. But it was the other side of the planet which was at that time presented toward the earth during the best hours for observation, and consequently no polar snow was seen; not because it had no existence, but because it was concealed.

It is probable, however, that at its minimum the snow cap was exceedingly small, perhaps less than 100 miles in diameter. No such rapid and extensive disappearance of snow and ice ever occurs upon the earth, although the advocates of an open polar sea may find encouragement in the fact that the uncovered south pole of Mars corresponds in color and general appearance with what are believed to be the water areas of that planet, while what remains of the snow cap in such circumstances rests, apparently, upon a mass of land, perhaps no more than an island, rising out of the polar ocean.

Owing to the larger eccentricity of its orbit, the extremes of temperature on Mars are greater than upon the earth, although the total amount of solar heat received by the planet is less than half as much as we get. But more important than these differences is the rarity of Mars' atmosphere, which has been so clearly demonstrated by the recent spectroscopic observations of Prof. Campbell. It may not be scientific, but it is certainly human to ask whether it is probable that beings resembling ourselves were included in the field of view of our telescopes last autumn, while we watched the southern snows of Mars sparkling to the sun and melting away at his ardent touch. If such beings are there, they must exist in an atmosphere less than one-quarter as extensive as the earth's.

—GARRETT P. SERVISS.

THE harvester invented by McCormick in 1831 has been so improved that it is said it will cut and bind an acre of grain in forty-five minutes.

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Motion of the Earth's Pole.

One of the most interesting questions in celestial mechanics was discussed at the recent meeting of the National Academy of Sciences at New Haven. It was the subject of a paper by Dr. S. C. Chandler, on the motion of the pole, which has been a special matter of investigation by the professor for several years. The observations thus far made, it is claimed, prove a latitude variation of 60 feet; that is, each parallel, instead of marking a fixed line on the earth's surface, indicates a line which shifts to this extent. From Lake of the Woods to Vancouver Island the forty-ninth parallel has been established as the boundary line between the United States and British America for a distance of more than 1,200 miles. Similarly the north line of New York, Vermont, and part of New Hampshire is the forty-fifth parallel for more than 250 miles. The shifting of these two boundary lines, consequently, brings alternately under the jurisdiction of the United States and Canada two strips of land 60 feet wide and 1,200 and 250 miles in length. Together they contain 11,000 acres, or enough land for one hundred good sized farms. This land was all on the Canadian side in April and May, 1890, and in May, 1891, and all on the United States side in November, 1890, and again in December, 1891.

The relative positions of the earth's pole of figure and pole of rotation, it appears, have been changing with respect to each other continually, and the course has, since 1890, been in an entwined oval spiral. This Dr. Chandler has plotted, and has constructed a system of epicycles which he believes the two poles maintain with respect to each other. To put the algebraic expression in words is to say that there are two terms, one of which is an annual term, and is an elongated ellipse with a major axis of three-tenths of a second and a minor axis of eight-hundredths of a second, and the other term is a circle with a period of 428 days. These two motions superimposed give a curve, of which Dr. Chandler has made a diagram. The first three or four turns of the curve closely accord with the observations. In fact, as Dr. Chandler puts it, "theory gives latitude variations with greater accuracy than they can be determined by any individual series of observations." The curve has been continued according to the mathematic formula to the middle of 1895.

This movement of the pole is not to be confounded with the movements of precession and rotation which have long been known and carefully studied.

What is meant by the North Pole needs a little definition, for there are three north poles to the earth. One of these is the magnetic pole, where the compass needle points directly down. This was discovered and sailed over in 1831, and is situated in latitude 70, north of Hudson's Bay. Another is the geodetic pole, or pole of figure. On account of the flattening of the earth at the two frigid zones there are two points, one in each, which mark the ends of the shortest diameter of the globe, and these are the geodetic poles at the two ends of the axis of figure. The third is the astronomical pole, or pole of rotation. It has until recently been supposed to coincide with the pole of figure; but now it is known to be shifting, and the facts which Dr. Chandler has accumulated on this point afford about all the data of which we are thus far possessed.

When the variation in latitude was first suspected several years ago, two instruments were especially devised for its observation. They were made by Wanschaff, of Berlin. One of them was taken by Columbia College and the other by the Italian Royal Observatory of Capodimonte, near Naples. New York and Naples are in exactly the same latitude, and very nearly 90 degrees apart. They are, therefore, admirably situated to work together on this problem.

Through the liberality of President Low and others a special observatory was erected on the new college site at 116th Street and Amsterdam Avenue. Here observations have been conducted by Prof. John K. Rees, with the assistance of Dr. Harold Jacoby, Mr. J. T. Monell, and Mr. J. E. Davis. One or the other of these has been staying up and watching the stars every clear night since April, 1893. The plan of operation is such that very accurate results are obtained. Only stars which pass very near the zenith are observed.

The results of these observations, Prof. Rees says, will be worked out and announced in about three months. It is probable that the shape of the curve, as then determined, will, by its peculiarities, show what is causing it. At present, the causes are purely conjectural. Prof. Newcomb thinks that the shifting masses of ice and snow may be sufficient to cause it, and Prof. Scott, of Princeton, has suggested movements in the interior of the earth as the cause.

Dyed Chrysanthemums.

The practice of dyeing chrysanthemums to produce striking and unnatural color effects has become a very profitable part of the business of a fashionable florist. The pure white chrysanthemums are used for this purpose. They are colored by being submerged in different colored dyes and in many cases different colors are applied to different parts of the same flower. This work is usually done to order. If flowers are wanted to match the color of some particular dress or the drapery of a room, the customer generally brings to the florist a sample of the cloth to be matched. Chrysanthemums of any color of the rainbow can thus be prepared while you wait. Besides the plain colors, the flowers dyed half blue and half white and half orange and half black are very popular, and some curious combinations, such as the reproduction of a vivid Scotch plaid, are much in demand. This singular practice is said to have grown out of the "necessity" of providing blue and white and orange and black chrysanthemums for New York's annual Thanksgiving football game.

Huge Hail Stones.

Prof. Cleveland Abbe includes the following among his notes in the Monthly Weather Review for July: On June 3 a tornado passed northeastward through the counties of Harney, Grant, and Union, in eastern Oregon. The most novel feature attending the disturbance was the hail. It is stated that the formation was more in the nature of sheets of ice than simple hailstones. The sheets of ice averaged three to four inches square, and from three-fourths of an inch to one and a half inches in thickness. They had a smooth surface, and in falling gave the impression of a vast field or sheet of ice suspended in the atmosphere, and suddenly broken into fragments about the size of the palm of the hand. During the progress of the tornado at Long Creek a piano was taken up and carried about a hundred yards.

The Fauvel Process of Treating Gold Ores.

A new method for separating gold from its ores has recently been introduced in the mining districts of Wyoming. The crushed ore is heated to a state of incandescence and quenched in a bath of cold water. As each red hot particle falls into the water, enough steam is instantly generated to shatter it, and any glaze or film is therefore ruptured. The particles of gold are thus broken down to a remarkably fine state and are rendered very brittle. The gold is clean and shining and quite free from any coating of oxide. This method makes it unnecessary to crush the ore very finely, and in addition the output of the mine is greatly increased.

Extensive Marble Belt in Georgia.

The State Geologist of Georgia reports that a belt of marble, 60 or more miles in length, has been discovered in the northern part of the State. Some of the marble, it is said, is of a flesh color tinged with green and some is a light gray banded with black. It can be obtained in large sound blocks, and is susceptible of a high polish. The report, however, suggests that on account of the mountainous character of the region in which it lies it will be costly to quarry it. If the reports be well grounded, however, there will doubtless be plenty of capital and labor forthcoming to quarry it. Many of the newspapers of Georgia are confident that it will bring great wealth to the State.

A State Park in the Catskill Mountains.

The New York State Forest Commission has recently made provision for a State park of some 30,000 acres in the heart of the Catskill Mountains. It will be situated in a very beautiful region in the vicinity of Slide Mountain, the highest peak of the entire Catskill range. This is a very populous region and may readily be reached by the local railroad. The announcement will doubtless be received with great pleasure by the many thousands who make this region their summer home.