A HUGE BUCKET DREDGER.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

In connection with the widening and deepening of the Suez Canal at Port Said, the authorities have recently increased their dredging fleet by a new vessel, which ranks as the largest bucket dredger afloat. This vessel, which is named the "Péluse," was built by Messrs. Lobnitz & Co. at their Renfrew yards on the Clyde, and is of similar design to the "Ptolemée, which they supplied to the canal company some two years ago. The new vessel, however, has been acquired for service in the Port Said roads, which are being deepened.

The "Péluse" has a deck length of 305 feet, with a molded breadth of 47 feet, and molded depth of 20 feet 2 inches. The deck is steel throughout, sheathed with teak, and there is a raised forecastle and poop. Propulsion is effected by means of independent twin-screw engines indicating 1,800 horse-power, with a separate dredging engine of 600 horse-power. The latter machinery is of the three-crank type placed on the main framing. Steam is supplied from three boilers each of 15 feet diameter by 10 feet 7½ inches in length.

A feature of the vessel is that all gearing has machine-cut teeth. The auxiliary machinery throughout is operated by hydraulic power. Separate condensing plant is fitted for all machinery. The Lobnitz patent hopper-door arrangements are used.

The dredger has been designed to work between the limits of 20 feet and 50 feet below water level. Owing to her large size she navigated from the Clyde to Port Said in working condition, being of seagoing design in the widest sense of the term. The craft is classed by Bureau Veritas in their highest class with special mark, owing to the arrangement of watertight bulkheads rendering her practically unsinkable in the event of collision.

Washing Fabrics by Electrolysis.

In certain processes of cloth finishing the operations of scouring and washing, after the material has been filled and bleached, require a long time, careful handling and a large supply of water. Moreover, through lack of practical means for recovering them, the oil and fatty acids or soap pass away with the waste wash-liquor, involving considerable loss. Often there are found in cloth traces of fatty acids or soaps which produce spots and stains when the cloth is being dyed. The fact that the cloth is kept for a long time under a rolling action when in the bath also entails considerable wear and a very noticeable loss in weight.

The invention of a Frenchman, J. M. J. Baurot of the city of Roubaix, France, who was granted United States letters patent, provides for the treatment of the cloth by an electric current, which is used for penetrating, reducing, and extracting the soapy film formed. Additional to this is the recovery of the fatty semi-solid magma resulting from the soapy matters extracted from the cloth.

The cloth after entering passes over a roller and between a set of electrodes. Leaving the electrolyte, the material passes between squeezing rollers and then through a tension device over idle rollers to the large rubber-covered squeezing roll.

The electrolytic vat is kept filled with the proper amount of carbonate of soda or potash solution by replenishing as the electrolyte is consumed. By the action of the electric current passing between the electrodes, every fiber of the cloth is acted upon and there is produced a more complete saponification on the textile where before was only a coarse soapy film. Incidentally by the attraction of the freed salts with the elimination of gelatinous matters, waste fibers, dust and other small impurities which are kept in the yarn or material of the cloth and carried away with the salts thus formed, the action of scouring is completed, and when the cloth reaches the first pair of squeezing rollers their compressing action removes and throws back into the vat the soapy matter already solidified in a film on the cloth.

When the first compartment of the squeezing machine becomes filled with the soapy sludge the surplus sludge is led into the electrolytic recovery vat. The pieces of cloth thus successively pass from the first compartment in the squeezing machine and then are submitted to a second scouring which absolutely insures the completion of the action. In this method there is no danger of incomplete scouring which has been the cause of many difficulties and annoyances in dyeing. Moreover method enables the time of scouring and washing to be shortened, for as a result of the facility with which the soapy matters are precipitated in the first compartment, the second compartment gets so little of such matters that the scouring of the cloth is effected well enough to allow the third compartment to be filled with a large supply of running water for washing. This is in most cases quite sufficient for the last rinsing of the cloth before being dyed.

The recovery of the fatty substances which compose most of the soapy wash-liquor led by the overflow from the first compartment of the squeezing machine is effected in the electrolytic vat connected to the dynamo. The alkaline salts are precipitated, the fatty acids depositing upon the surface of the electrode plates or rising to the surface of the liquor where they are easily removed. Such fatty acids still contain impurities which are removed by submitting them to the action of a press heated by steam, after which they come out clarified and pure enough to be either used again for making soap or sold to the trade. The treated magma gives out from 50 to 55 per cent in weight of fatty acids.

THE RECURRENCE OF ECLIPSES.

BY FREDERIC R. HONEY, TRINITY COLLEGE, HARTFORD, CONN.

The variations in the intervals of time between the dates of full moons and of new moons might convey the impression that the moon is a very poor time-

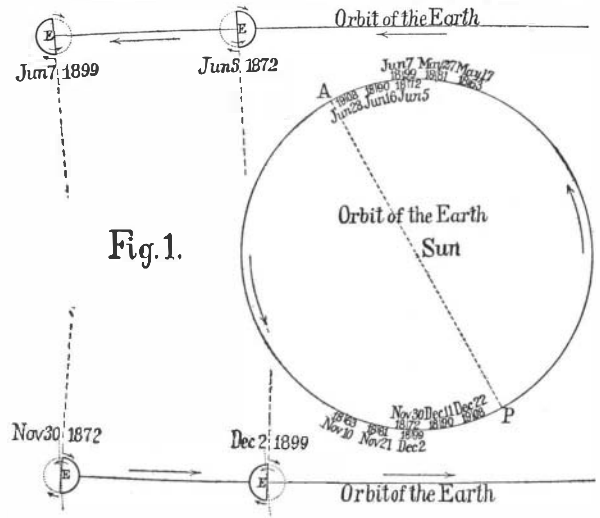
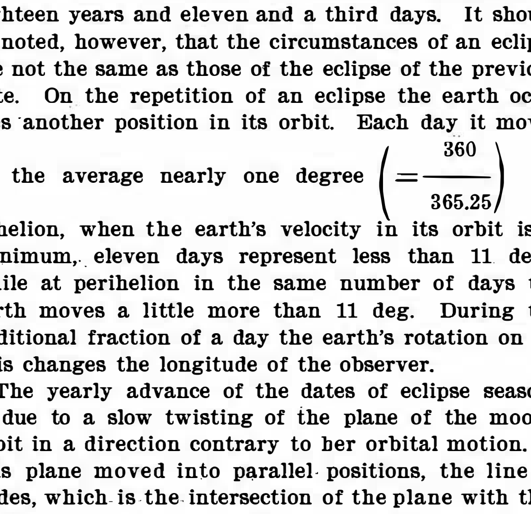


Diagram of Earth's Orbit, Illustrating Recurrence of Eclipses.

keeper. That the moon "comes to time" is demonstrated by the repetition of eclipses at intervals of eighteen years and eleven and a third days. It should be noted, however, that the circumstances of an eclipse are not the same as those of the eclipse of the previous date. On the repetition of an eclipse the earth occupies another position in its orbit. Each day it moves on the average nearly one degree $\left(=\frac{360}{365.25}\right)$ At aphelion, when the earth's velocity in its orbit is a minimum, eleven days represent less than 11 deg.; while at perihelion in the same number of days the earth moves a little more than 11 deg. During the additional fraction of a day the earth's rotation on its axis changes the longitude of the observer.

The yearly advance of the dates of eclipse seasons is due to a slow twisting of the plane of the moon's orbit in a direction contrary to her orbital motion. If this plane moved into parallel positions, the line of nodes, which is the intersection of the plane with that of the ecliptic, would come into line with the radius of the earth's orbit twice each year at opposite points. Thus the dates of eclipse seasons would not vary.

Fig. 1 represents the earth's orbit, whose axis is



Projection of Earth on a Plane Parallel to Its Axis and Perpendicular to Plane of Ecliptic.

THE RECURRENCE OF ECLIPSES.

A P; *A* and *P* being respectively aphelion and perihelion. A small part of the orbit for the months of June, November, and December is shown separately on a scale sufficiently enlarged to represent the moon's orbit, whose diameter is a little over one four-hundredth the diameter of the orbit of the earth. The position of the earth is shown for May 17, 1863, May 27, 1881, and June 7, 1899, the dates of solar eclipses when the moon was at the descending node. Nearly six months later in each year, when the moon was at the ascending node, the position of the earth is given for November 10, November 21, and December 2, the dates of solar eclipses. After an interval of nine years, when the line of nodes is turned about half way around and the moon is at the ascending node, there is an eclipse season. This is illustrated at the dates of solar eclipses June 5, 1872, June 16, 1890, and June 28, 1908; and also nearly six months later in each year, when the moon was at the descending node, and when the earth's position is indicated for November 30, December 11, and December 22. The limits of this page make it impossible to represent all the positions of the earth at these dates on the orbit drawn to the larger scale. The positions for June 5, 1872, and June 7, 1899, also those for November 30, 1872, and December 2, 1899, which are near together, have been selected in the illustration. The heavy full line represents that portion of the moon's orbit which is above, and the dotted line that which is below the plane of the ecliptic. The earth is at *E*; the moon's motion is in the direction of the arrow (within the orbit) and the direction of rotation of the line of nodes is indicated by the two arrows (without the orbit).

The table gives the dates of some eclipses of the sun between the years 1863 and 1908. It is divided into two parts, viz., those which occurred when the moon was at the ascending and descending nodes respectively. By this arrangement it is easy to see at a glance the effect of a complete rotation of a line of nodes, which occurs at intervals of eighteen years and eleven days, whether the date be that of an eclipse when the moon was at one node or the other.

An annular eclipse of the sun occurred on June 5, 1872, on June 16, 1890, and again on June 28, 1908, when the moon was at the ascending node. Fig. 2 is a projection of the earth on a plane which is parallel to its axis, and perpendicular to the plane of the ecliptic. In this projection the position of an observer to whom the central eclipse was visible at noon at a date prior to June 21 is on the visible hemisphere. Subsequent to that date the position is on the invisible hemisphere. The parallel and the position of the meridian of Greenwich are shown for each of the dates. G_1 and O_1 are the positions of Greenwich and the observer for June 5, 1872; G_2 and O_2 the positions for June 16, 1890. In both cases the observer was east of Greenwich and on the visible hemisphere. G_3 and O_3 show the positions on June 28, 1908, on the invisible hemisphere. At the latter date the observer was west of Greenwich. The path of this eclipse was illustrated in an article by the writer in the SCIENTIFIC AMERICAN for May 16, 1908. (The annular eclipse of the sun in June, 1908.) The latitude of the observer for each date is shown by the parallel; and the arrow indicates the direction in which the eclipse is seen. To avoid confusion, all unnecessary parallels and meridians are omitted. A dash line represents the meridian of Greenwich on the invisible hemisphere.

It should be noted that when five leap years are included in the cycle, the period is eighteen years and ten days; and that it is eighteen years and twelve days when only three leap years are included. The date is advanced one day when an eclipse and its repetition occur near the close and the beginning of a day. The length of the period expressed in days is 6,585.32.

ECLIPSES OF THE SUN.

	Moon at Ascending Node.		
Annular,	Nov. 10, 1863	Nov. 21, 1881	Dec. 2, 1899
Annular,	Oct. 30, 1864	Nov. 10, 1882	Nov. 21, 1900
Annular,	Oct. 19, 1865	Oct. 30, 1883	Nov. 10, 1901
Partial,	Oct. 8, 1866	Oct. 18, 1884	Oct. 30, 1902
Total,	Aug. 29, 1867	Sept. 8, 1885	Sept. 20, 1903
Total,	Aug. 17, 1868	Aug. 29, 1886	Sept. 9, 1904
Total,	Aug. 7, 1869	Aug. 18, 1887	Aug. 30, 1905
Partial,	July 27, 1870	Aug. 7, 1888	Aug. 19, 1906
Partial,	June 28, 1870	July 8, 1888	July 21, 1906
Annular,	June 17, 1871	June 27, 1889	July 10, 1907
Annular,	June 5, 1872	June 16, 1890	June 28, 1908
	Moon at Descending Node.		
Partial,	May 17, 1863	May 27, 1881	June 7, 1899
Total,	May *5, 1864	May 16, 1882	May 28, 1900
Total,	Apr. 25, 1865	May 6, 1883	May 17, 1901
Partial,	Apr. 14, 1866	Apr. 25, 1884	May 7, 1902
Partial,	Mar. 16, 1866	Mar. 26, 1884	Apr. 8, 1902
Annular,	Mar. 5, 1867	Mar. 16, 1885	Mar. 28, 1903
Annular,	Feb. 23, 1868	Mar. 5, 1886	Mar. 16, 1904
Annular,	Feb. 11, 1869	Feb. 22, 1887	Mar. 5, 1905
Partial,	Jan. 31, 1870	Feb. 11, 1888	Feb. 22, 1906
Total,	Dec. 22, 1870	Jan. 1, 1889	Jan. 13, 1907
Total,	Dec. 11, 1871	Dec. 22, 1889	Jan. 3, 1908
Annular,	Nov. 30, 1872	Dec. *11, 1890	Dec. *22, 1908

* Central eclipse.

The Jones Airship Disaster.

Charles O. Jones's airship "Boomerang," familiar to New Yorkers by reason of its frequent ascensions from the Hudson River Palisades, dropped 500 feet to the ground at Portland, Me., on September 2. Jones was killed. In some inexplicable manner the outer varnished envelope of the gas bag was ignited. Realizing his danger, Jones opened the gas-valve in order to alight. The escaping gas caught fire; the cords by which the framework was suspended were severed, and the aeronaut plunged to his death.

The "Boomerang" was built by Jones at Hammondsport. Unskillfully designed, low-powered, and clumsy in its construction, it was often unmanageable even in comparatively light winds. The airship was 105 feet long, 21 feet in diameter, and had a gas-capacity of 25,000 cubic feet.