Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger-line on gauge.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
W. Br. of Susquehanna.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Lock Haven, Pa.	63	10	1.0	1,2	0.3	16-23	0.6	0.7
Williamsport, Pa.	35	20	2.4	4	1.0	30	1.5	1.4
Juniata River.								
Huntingdon, Pa.	80	24	3.5	1,21	3.0	11-20, 22-24, 26-30	3.1	0.5
Sacramento River.								
Redbluff, Cal	241	23	2.9	21	1.0	14-18, 27-30	1.6	1.9
Sacramento, Cal	70	25	19.6	1	13.9	30	16.0	5.7

Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Willamette River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Eugene, Oreg	149	10	4.4	27	2.6	12-14	3.2	1.8
Albany, Oreg	99	20	4.3	28	2.6	12-14	3.2	1.7
Salem, Oreg	69	20	4.2	28	2.6	10-16	3.2	1.6
Portland, Oreg	10	15	22.8	1,2	15.0	19,26-30	17.9	7.8

*Distance to the Gulf of Mexico. †Record for 29 days. ‡Record for 19 days.

SPECIAL CONTRIBUTIONS.

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By HERMAN W. SMITH, Librarian, Weather Bureau.

Argentine Republic.—Los Cereales y Oleaginosos Trillados en la Provincia de Buenos Aires en la Cosecha de 1895-1896. La Plata, 1896, 4to. lxxxiii, 64 pp. 13 chs.

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Die Direction, 6 pp.
Carl Stechert, 41 pp.
E. Engelenburg, 51 pp.

Italy.—Agamennone, G. Il Tromometro Fotografico. Modena, 1897. 8 vo. 17 pp.

Agamennone, G. Vitesse de Propagation du Tremblement de Terre d'Amed (Asie M.) du 16 avril 1896. Modena, 1897. 8 vo. 20 pp.

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TEMPERATURE AND RAINFALL AT MERSIVAN, TURKEY.

The following table of monthly and annual means gives the results of observations made under the direction of J. J. Manissadjian, Professor of Physical Science, Anatolia College, Merzifun (Mersivan or Marsovan), Turkey in Asia. The location of the observatory is: Latitude 40° 50′ N., longitude 35° 40′ E. The temperatures were observed at 8 a. m., 1:15 p. m., and 6:30 p. m., besides the daily maximum and minimum. No details are given as to the method followed in combining these observations so as to obtain daily and monthly mean temperatures. Owing to the high mountains north and east of the station, the climate must be quite local in its characteristics.

Month.	Mean temperature.						Extreme temperatures. Maxima.		Extreme temperatures. Minima.		Total rainfall.			
	1892.	1893.	1894.	1895.	1896.	Mean.	Temperature.	Date.	Temperature.	Date.	1895.	1896.	1897.	Mean.
	° C.	° C.	° C.	° C.	° C.	° C.	° C.		° C.		mm.	mm.	mm.	mm.
Jan.	2.2	2.1	0.5	6.5	0.6	2.4	22.5	30, '95	—14	31, '93	.....	10.1	24.1	17.1
Feb.	2.7	—1.1	0.2	6.4	0.5	1.7	19	14, '95	—19	10, '93	.....	3.9	26.7	15.3
March	8.2	4.7	5.4	6.5	5.5	6.1	22	22, '96	— 6	24, '93	.....	31.0	24.4	27.7
April	9.0	5.0	11.2	10.6	9.3	9.0	25	30, '96	— 6	3, '93	.....	37.3	56.4	46.8
May	13.5	16.2	17.8	13.6	15.5	15.3	32.5	28, '95	+ 2	1, '95	.....	93.8	91.2	92.5
June	18.8	19.6	20.3	19.1	20.3	19.4	35	12, '96	7.5	1, '95	44.2	70.7	.....	57.4
July	20.0	23.0	21.9	23.5	22.8	22.2	34	9, '95	3.0	3, '92	.....	32.2	.....	32.2
August	20.4	21.8	22.0	22.9	24.5	22.3	37.5	6, '95	9.5	30, '95	21.6	10.1	.....	15.8
Sept.	18.1	17.4	17.2	16.3	20.4	17.9	32.5	8, '94	2.5	24, '95	40.4	59.8	.....	50.1
Oct.	16.9	14.7	16.9	15.8	17.4	16.3	31	26, '92	1	27, '93	40.9	8.8	.....	24.8
Nov.	7.2	11.3	6.7	9.3	8.9	8.6	26	7, '93	— 5.5	28, '92	6.8	47.9	.....	27.4
Dec.	5.1	4.1	3.5	5.2	4.8	4.6	20	2, '96	— 9	3, '96	13.5	19.4	.....	16.4
Means	11.7	11.9	12.0	13.2	12.6	12.3	.....	....	......	....	.....	427.0	.....	424.5

Temperature extremes: Maximum, 37.5°, August 6, 1895; minimum, —19°, February 10, 1893.

WHIRLING ALTO-STRATUS.

By Mr. ALEXANDER G. MCADIE, Local Forecast Official (dated March 15, 1897).

Accompanying this are two photographs (see attached plate) of a whirling alto-stratus cloud which appeared over San Francisco on February 20, 1897, at 12 m. (seventy-fifth meridian time?). About thirty seconds elapsed between the two photographs. It is thought that the whirling motion is apparent. A fluid color screen and Seed plate were used. Rain had fallen in the twelve hours preceding the time of photographing this cloud at San Francisco and generally throughout California. In the clearing weather which temporarily followed heavy frost occurred. One hour previous to the time of taking these photographs the sky was free of clouds, excepting a few alto-strati passing from northwest to southeast. The wind was north, the pressure rising rapidly (0.08 in two hours), and in the valleys back of San Francisco the skies were clear. Clouds, mostly of the cumulus formation, were in sight. Two hundred and fifty miles south of San Francisco rain was falling; temperature 42°, and farther south it was even colder.

Two hours after taking the photographs the sky at San Francisco was again cloudy, the barometer falling rapidly, and rain reported 15 miles to the north. In the San Joaquin Valley at this time heavy cumulus clouds were moving rapidly from the northwest. Through southern California and Arizona it was overcast and raining. Five hours later there had been light rain at San Francisco, snow in Nevada, and dense cumulus clouds resting on the mountains, rain falling generally in California, and strong westerly winds in southern California. Killing frosts were reported generally in California at the next morning's observations after these photographs were taken.

THE PROBLEM OF THE KITE.[1]

By Mr. ALEXANDER G. McADIE, Local Forecast Official (dated December, 1896).

There are two general classes of bodies which traverse or navigate the air; first, there are those which float or soar, without any apparent expenditure of energy; and second, those which swim or force a way through the atmosphere. Flying machines, birds when using their wings, and all aerodromes or air runners belong to the second class, expending energy in their flight. Balloons when drifting, kites, aeroplanes, and soaring birds belong to the first class. It is therefore, with the kite, as an inert body wholly immersed in air, and not rising or falling because of any acquired or inherent energy of its own that we shall have to deal, in this paper. Indeed, the more general way of treating this subject is to consider the kite as a disturbing factor in air motion. The atmosphere is a mechanical mixture of certain gases. As a whole, it is subject to certain forces and is in motion. Into this fluid, with all its varying stresses, we introduce a disturbing mobile plane. We are to investigate the forces acting in the vicinity of this plane surface. We shall have to consider the pressure of the wind upon both kite and kite line at every point, the restraining pull of the kite line, the attraction of gravity upon kite and line, the peculiar resultant forces which sometimes make a kite with a given initial velocity rise apparently without wind pressure and in opposition to gravity, and, finally, the friction of the air upon the kite surface. The form of the surface exposed must be discussed and the relative value of different presentations of area to wind, whether steady or gusty, given. Almost all the kites in popular use to-day have plane and regular surfaces. We have the plane malay kites and modifications, combination planes with dihedral angles, and cellular or Hargrave kites. Curved areas have not yet come into general use, although unquestionably possessing certain advantages.

Our mobile body, whatever its form may be, is introduced into air either when the flow is continuous, the so-called steady wind, or when the flow is intermittent, the energy being spent in variable pulses. Indeed the problem of the kite may be likened to that of a plane free to move in every direction, immersed in a reservoir of flowing water which is further disturbed by a number of dashers out of step. Aside from the difference in specific gravity, the plane will have an upward motion due to the component of steady flow and the effect of the countercurrent. It is, perhaps, well to emphasize the fact that a plane or a kite will worm its way upward when the inclination of the axis changes responsively to aerial puffs and pulsations. (See Professor. Langley's two memoirs, viz, Experiments in Aerodynamics, and, The Internal Work of the Wind).

Everyone who has flown kites is familiar with the fact that it is easier to get the kites into the upper air when the lower air comes in rapid puffs than when the air moves uniformly, the velocity, as indicated by a Robinson anemometer, being the same in both cases. An anemo-cinemograph would have given us a record whence the relative gustiness (for want of a better term) could have been shown. It is well known that the Robinson anemometer smooths out this factor. As an illustration of the fact that a kite can be raised higher in what appears to be a wind of less velocity, we cite the case of some kites flown on August 20, 1896. At about 11 a. m. the velocity of the wind was 12 miles per hour at the surface, and the kites were decidedly higher than at 3 p. m., when the wind at the surface was 16 miles per hour. It must also be pointed out that one of the great advantages of flying kites in tandem arises from the changed inclination of the wind to the planes. An example will, perhaps, bring this out more plainly.

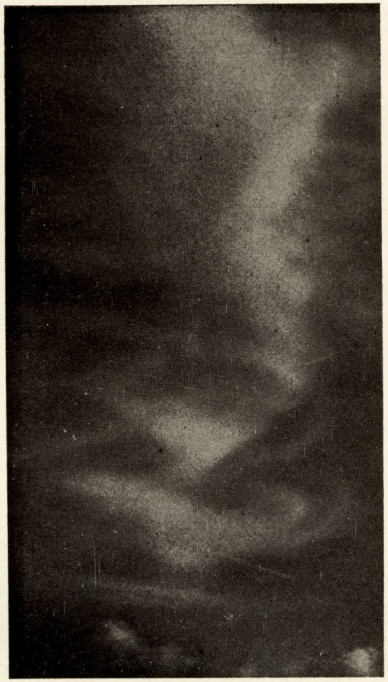
On August 28, 1896, two cellular kites were flown in tandem at ———. The following table gives the principal data obtained:

Length of kite wire.		Angle.	Elevation.		Changes.	
Feet.	Meters.		Feet.	Meters.	Length.	Height.
		° ′			*Meters.*	*Meters.*
6,656	1,998	32 45	3,640	1,109	....	....
6,021	1,835	35	3,450	1,052	−163	−57
5,640	1,719	39 30	3,550	1,082	−116	+30
5,190	1,582	44	3,600	1,097	−137	+15
4,623	1,409	48	3,450	1,082	−173	−15
4,114	1,253	54	3,300	1,006	−156	−76
3,860	1,176	57	3,230	984	− 74	−22
3,682	1,122	59	3,185	970	− 54	−14

From the above it appears that while the line was being pulled in evenly the kite descended 57 meters for the first 163 meters of line, or fell nearly 1 meter for every 3 meters of line. But 500 feet lower in the air we get a fall of 14 meters for 54 meters of line. But note that after the first fall the kite, owing to the pull along the line, gains in elevation, and this gain was probably independent of any change in wind direction and velocity, although, as we shall see further on, the lower kites did indicate wind currents different from those above. The experiment is of course imperfect, in that we were not able to measure the wind pressure at the different altitudes. The wind velocity at the ground at the time the highest elevation was made (4:10 p. m.) showed no appreciable change.

The first of the forces acting in kite work is the *tension* of the string or line, or, as it is generally called, the *pull*. And we see in the above illustration how increasing the tension along the line results in an increased elevation, provided the pressure of the wind on the surface of the kite and the force

[1] In accordance with the policy of publishing the views of all who have written on the theory of the kite, the Editor, in the last number of the MONTHLY WEATHER REVIEW, presented a rather lengthy memoir by Prof. C. F. Marvin. In continuation of the same subject he submits the following extracts from a memoir by Mr. Alexander G. McAdie. As Mr. McAdie's memoir embraced other matters than the strictly mechanical theory, these extracts may seem disconnected but they are believed to express fully the views presented by him.



WHIRLING ALTO-STRATUS

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