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NEW YORK, SATURDAY, AUGUST 22, 1896.

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tions. Punching and Shearing.-By PAYSON BURLEIGH.-An article on the effects of manipulating steel and the results of fast and

THE RECENT HEAT WAVE.

The phenomenal heat wave which has recently passed over the Eastern States was marked by a long list of several additions to its history, additions which will fatalities to man and beast, and will be memorable in make the present epoch an important one if the probthe meteorological records as one of the longest and lem is ever to be solved. For of course if it prove inmost destructive visitations of the kind on record. The soluble and if it is relegated to the limbo of abandoned temperature readings of the United States Weather efforts, and to the realms of the impossible, the death Bureau in New York City, which cover a period of of the most successful human soarer, the flight of the twenty-six years, can show no parallel, for the month most successful mechanical soaring machine, the parof August, to the heat of the nine days from tial success and wreck of Maxim's apparatus and the August 4 to August 12 of the present year. It is true work of Andrée's balloon will be of little interest. But that in certain previous years the temperature for any if man does learn to fly by mechanical means, or even particular day of the nine may have been exceeded, but to float for an indefinite period by a balloon, then in such cases the rise of temperature has been tem- Lilienthal's death, the half mile flight of Langley's porary. The general average for these nine days has machine, and the other achievements will be a group of never been approached in any previous August. The notable occurrences. Slowly a tangible theory of soaring temperature readings are given below :

Date.	Temperature.	Exceeded in
ugust 4 	87 degrees. 89 '' 91 '' 92 '' 90 '' 91 '' 94 '' 94 ''	1873, 1881, 1888. 1881. 1881. Maximum. Maximum. 1888, 1892. 1894. Maximum. Maximum.

A

The readings of the New York City Bureau are taken from thermometers on the top of the Manhattan Life building, at an elevation of 298 feet above mean sea level. It is considered that this great elevation is favorable to a correct record of the passing heat waves, inasmuch as the instruments are free from the local variations which are caused by radiation and reflection from the pavements and walls of the city below. It is undeniable that the heat in the streets of the city and in its stores and offices has often risen many degrees higher than the official records, and a street temperature of from 97 to 103 degrees has been common on such days as the 8th, 11th and 12th instant.

To residents in some of the Western States, such, for instance, as Arizona, where from 110 to 115 in the shade is not uncommon, there may seem to be nothing phenomenal in these New York temperatures, and the terrible fatality which accompanies them will be a mystery. The fatalities are to be ascribed to the accompanying humidity of the atmosphere and to the fact that the victims are unaccustomed to, and quite unable to endure, a spell of heat of such long continuance. The air of Arizona, moreover, is extremely dry, and the evaporation from the body is proportionately rapid, bringing instant and continual relief to the system. In New York, during the recent hot waves, the humidity rose as high as 93 per cent, and the average humidity taken at 8 A. M. and at 8 P. M. was 73 per cent of full saturation. In accordance with the laws of evaporation, the perspiration from the body was proportionately sluggish, the overloaded atmosphere refusing to take up the moisture of the body, which condensed upon the skin and produced extreme discomfort; killing, either by prostration or by overheating, such as were not physically able to endure the continuous strain put upon the system.

That the fatalities were due to the duration of the heat is shown by the steady increase in the number of deaths and prostrations on successive days:

	Temp.	Deaths,	Prostrations.
August	5	8	29
	691	7	81
64	7	7	56
**	8	14	61
6 6	9 90 °	72	78
**	10 91	163	182
**	11 94	182	350
**	1292	177	467

The heat wrought terrible havoc among the horses employed in the city of New York, particularly among those employed on street car lines. It is estimated that some 1,500 in all perished.

The heat wave was marked by an unusually steady barometer, the highest readings on the instrument in the SCIENTIFIC AMERICAN office being 30:03 inches, and the lowest 29.85, a variation for the nine days of only lem. This advance is in the construction of the coneighteen-hundredths of an inch. This will account for taining envelope or gas bag. All that has made balloon the absence of cooling breezes, which contributed work so very unsatisfactory is the leakage and diffusion largely to the oppressive humidity of the atmosphere. | of the gas. The fact that a balloon cannot be driven The fatalities accompanying this spell of hot weather in any desired direction is a trouble less in degree than bring to mind the similar scourge-it is nothing lessthat visited Australia during the early part of the present year, when for two weeks the temperature never carrying of a quantity of ballast, which is discharged fell below 90 degrees in the shade, and in some localities from time to time as the buoyancy diminishes. The rose as high as 122 degrees. The Australian heat differed from this in New York in the fact that it was accompanied, and largely caused, by a strong wind from the interior, which was intensely dry and hot and caused ing. the drying up of rivers and streams, burning up the crops and killing the cattle in the fields. As in the East- may exist in the gas bag. ern States, people were sunstruck and horses dropped in the streets

ARTIFICIAL FLIGHT.

The problem of artificial flight has recently received has been evolved. The support given to an aeroplane in horizontal motion through air has been experimentally tested and has proved surprisingly great. The fact that air currents constantly vary in velocity gives the quality of internal energy to the air in reference to a body suspended in it, which energy it appears might be adequate to support a body whose inertia enables it to utilize these changes in wind velocity for its own support. Again, an upward component of winds has been recognized, which by a parachutelike action would go to arrest the descent of an aeroplane, and help to support it.

Working on these bases, it appears that a soaring bird, with exquisite balancing, presents a surface of wing to the air which blows against it with varying velocity. The inertia of the bird's mass preventing it from yielding to the frequent changes acts like a kite string to hold it relatively fixed in face of the wind pressure or of portions thereof. These fractional portions of the wind, acting on the inclined plane formed by the under sur face of the wings, would uniformly operate to push it up against the force of gravity.

Lilienthal, enamored of the problem, found that it involved as its most difficult part the question of safe alighting. Flying for a limited distance proved comparatively simple. Starting from his elevated platform, he performed many flights and soared for considerable distances. The erratic nature of the flights, sometimes involving a rise in the air, showed how great were the reserve powers in a heavy body moving on aeroplanes powers which human ingenuity seemed unable to fully utilize. The instant changes in direction to which a moving aeroplane is subject, and its dependence for action on motion, actual or relative, make it an exceedingly difficult engine to manipulate. This fact led to many accidents to Lilienthal, and finally to his death. It

required an intrepid experimenter to trust himself to the support of the air. Accident after accident went to prove the difficulty of operation, and the aeroplane inflicted many an injury before it claimed its victim.

The mere fact that so very few have dared to personally experiment in a tificial flight goes to prove its danger. Any number of performers can be found to essay such feats as walking on ropes or wires over abysses or at great heights, or who will dive from a height of many feet into water tanks for the delectation of audiences, but soaring through the air has been tried by very few.

The peculiar stability of the support given by the air under certain conditions is very strikingly shown by the failure to support when the conditions are changed. A kite floats peacefully in a high wind until its string parts, when it floats helplessly away. A boomerang follows its curiously definite path as long as it rotates rapidly. As the rotation fails, its flight loses life and it drops more or less directly to earth, according to the extent to which its rotation persists. The soaring bird, when shot, parts with its equilibrium and falls helpless. When man, supported by aeroplanes, his powers reinforced, if need be, by an engine, can maintain certain unknown, or nearly unknown, conditions, he will have achieved the desired end. But the conditions are so little understood as to be virtually unknown, and the possibility of disposing of them is, of course, uncertain.

In ballooning proper there is room for one advance which, once made, would seriously modify the probthe impossibility of maintaining its buoyancy. A balloon has to be made of extra capacity to admit of the entire area of the cloth envelope must be pictured as full of pores, through which the contents are constantly escaping, and through which air is more slowly enter-This action takes place independent of any pressure, owing to the buoyancy of its contents, which With a really impervious envelope a balloon could be kept afloat indefinitely. Its flotation could be regu-It is probably more than a coincidence that heat waves : lated by pumping gas out of the envelope into cylinders of unprecedented power and duration should have under pressure or by admitting it from such cylinders visited the three continents of Australia, America, and into the envelope. The clumsy sand bag would no longer be required, and the drag rope would prove am-

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Europe in the same year; and science has yet to discover the influences which determine their coming and ple to regulate the height of flight. gi going.

The most serious attempt at advanced ballooning is