

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.

(Established 1845.)

One copy, one year, for the U. S., Canada or Mexico. \$3 00
One copy, six months, for the U. S., Canada or Mexico. 1 50
One copy, one year, to any foreign country belonging to Postal Union 4 00

The Scientific American Supplement

(Established 1876.)

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, for the U. S., Canada or Mexico. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Building Edition of Scientific American.

(Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders and all who contemplate building this work is invaluable.

Export Edition of the Scientific American

(Established 1878)

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 100 pages, profusely illustrated. It is the finest scientific industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. \$3.00 a year, post paid to any part of the world. Single copies, 25 cents.

MUNN & CO., Publishers, 361 Broadway, New York.

The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO. Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, AUGUST 22, 1896.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as 'Ammunition hoists battleship', 'Indiana', 'Baths, thermal, Lamalou', etc., with corresponding page numbers.

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 1077.

For the Week Ending August 22, 1896.

Price 10 cents. For sale by all newsdealers.

Table listing contents of the supplement by page number, including sections like 'BIOLOGY', 'CYCLING', 'ELECTRICAL ENGINEERING', etc.

THE RECENT HEAT WAVE.

The phenomenal heat wave which has recently passed over the Eastern States was marked by a long list of fatalities to man and beast, and will be memorable in the meteorological records as one of the longest and most destructive visitations of the kind on record.

Table with columns: Date, Temperature, Exceeded in. Shows temperatures from August 4th to 12th, with values like 87, 89, 91, 92, 90, 91, 94, 92 degrees.

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.

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.

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:

Table with columns: Temp., Deaths, Prostrations. Shows increasing numbers from August 5th to 12th.

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 eighteen-hundredths of an inch.

The fatalities accompanying this spell of hot weather bring to mind the similar scourge—it is nothing less—that visited Australia during the early part of the present year, when for two weeks the temperature never fell below 90 degrees in the shade, and in some localities rose as high as 122 degrees.

It is probably more than a coincidence that heat waves of unprecedented power and duration should have visited the three continents of Australia, America, and Europe in the same year; and science has yet to discover the influences which determine their coming and going.

ARTIFICIAL FLIGHT.

The problem of artificial flight has recently received several additions to its history, additions which will make the present epoch an important one if the problem is ever to be solved. For of course if it prove insoluble and if it is relegated to the limbo of abandoned efforts, and to the realms of the impossible, the death of the most successful human soarer, the flight of the most successful mechanical soaring machine, the partial success and wreck of Maxim's apparatus and the work of Andrée's balloon will be of little interest.

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.

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.

The mere fact that so very few have dared to personally experiment in artificial 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.

In ballooning proper there is room for one advance which, once made, would seriously modify the problem. This advance is in the construction of the containing envelope or gas bag. All that has made balloon work so very unsatisfactory is the leakage and diffusion of the gas. The fact that a balloon cannot be driven in any desired direction is a trouble less in degree than the impossibility of maintaining its buoyancy.

With a really impervious envelope a balloon could be kept afloat indefinitely. Its flotation could be regulated by pumping gas out of the envelope into cylinders under pressure or by admitting it from such cylinders into the envelope. The clumsy sand bag would no longer be required, and the drag rope would prove ample to regulate the height of flight.

The most serious attempt at advanced ballooning is