Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

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

Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

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.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union, *eight dollars and fifty cents a year*.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful pla es, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, o any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

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 19, 1893.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 920.

For the Week Ending August 19, 1893.

Price 10 cents. For sale by all newsdealers.

RAISING VESSELS BY MEANS OF AIR SACKS.

The Glenola, a two-masted schooner, which was sunk about six months ago in Great South Bay, N. Y., has been successfully raised by means of air sacks. Although the principle involved is old, Messrs. Grant Bros.' air sack system of raising vessels seems to be practically successful. Divers descended into the hold and adjusted huge canvas bags or sacks, which measured twenty by four and one-half feet. Each sack was connected by hose pipes to a powerful air pump, and gradually inflated by air. The gradual inflation of the bags with air slowly lifted the vessel to the surface. It required only about one hour to raise the Glenola after the work of adjusting the bags had been finished. The cost of raising vessels on this plan is quite small. In this case the expense was $1,500 to $2,000, and required the services of sixteen men. The system has been used successfully in Puget Sound in raising the Premier, an 800 ton vessel.

WATER POWER TRANSFORMED INTO LIGHT.

Among the notable industrial enterprises recently inaugurated in Mexico is the electric lighting of the city of Guadalajara. The plant utilizes the famous Juanacatlan waterfalls, which are situated about 18 miles from Guadalajara. The Thomson-Houston generators are actuated by Leffel turbines, the head of water being 58 feet. Three turbines of 550 horse power are used. The dynamos for arc lighting have a capacity each for 50 arc lights of 2,000 candle power. The current strength is 10 amperes, and consequently the maximum voltage is 2,500. The incandescent dynamo consumes about 750 horse power and yields approximately 350 amperes at 1,000 volts, or say 350 kilowatts. The voltage is increased from 1,000 to 5,000 volts by means of ten step-up transformers. They transform the energy of the dynamo at an efficiency of about 98 per cent, delivering to the line, therefore, 98 per cent of the energy supplied them and at five times the pressure. The high potential incandescent circuit is reduced to 1,000 volts by step-down transformers at Guadalajara, 17 miles away from the source of electricity.

The installation of the San Antonio Light and Power Company, of Pomona, California, possesses many features of interest. The current is carried twenty-eight miles under the enormous pressure of 10,000 volts. The generators are of the standard 120 kilowatt, 12 pole, 1,000 volt Westinghouse alternator, which delivers current at 7,200 alternations on being driven at 600 revolutions per minute. The generators are coupled direct to Pelton water wheels, the head being 395 feet. The 1,000 volt current is taken to the switchboard and from there to the bank of step-up transformers, from which the current is delivered under a pressure of 10,000 volts. One circuit is carried to Pomona, fifteen miles, and the other to San Bernardino, twenty-eight miles away. The wire used is No. 7 B. & S. hard-drawn, bare copper wire, and is carefully supported on poles by insulators specially designed for this plant. A potential of 9,500 volts is received in Pomona and 9,000 in San Bernardino. The potential on the city lines is maintained at 1,000 volts.

AERIAL NAVIGATION.

During recent sessions of the World's Congress Auxiliary at Chicago, a special branch of the department of engineering known as the aerial navigation conference afforded the occasion for a most interesting presentation of facts and comparison of views of the most experienced experimenters and the best equipped scientists who have given this subject their attention. The conference was organized and actively promoted by Mr. Octave Chanute, the eminent engineer, assisted by Prof. A. F. Zahm, of the Notre Dame University, of Indiana, and the reading of papers and discussions occupied four sessions.

At the outset it was manifest that there was a general indorsement of Mr. Chanute's views, that, difficult as was the problem of aerial navigation, there was still enough of promise in it to lead men, through patient and intelligent inquiry and research, to hope for ultimate good results. The mere purpose of carrying passengers and heavy loads of freight was dismissed as being quite impracticable, for it was not likely that the railway and the steamboat would ever be competed with successfully by air ships, however efficient they might be. But there were many and important uses for an air vessel that could be sailed and controlled at the will of man, as in cases of war and in the study of meteorology.

One of the most interesting papers presented at the first session was that by Prof. Langley, secretary of the Smithsonian Institution, Washington, D. C. (read by Prof. George E. Curtis of the same institute), under the title of "The Internal Work of Moving Air." In this paper Prof. Langley recorded his observations during several years of soaring birds, such as the buzzards, from which he draws the conclusion that flying machines can be made to imitate this flight and to sail in the air when the latter is in movement as easily and with as evidently little effort as the soaring birds. It is worthy of note to find that in two other papers presented at the second session the same kind of studies were recorded and similar conclusions presented by observers in Europe and Africa, one being on "Gliding Flight," by J. Bretonniere, engineer and observer, Constantine, Algeria, and the other on "Theory of Soaring Flight," by Chevalier de Louvrie, engineer, of Combebigu, France. Other papers bearing relation to the above were presented, one on "Observations of Birds," by G. Crosland Taylor, F.R.G.S. and A.I.E.E., of Helsby, England; another by the same author on "Theories of Soaring and Sailing," and another by A. M. Wellington, editor of the *Engineering News*, of New York, on a "Theory of Sailing Flight."

In regard to the construction and propulsion of the future air ship, Dr. R. H. Thurston, director of Sibley College, Ithaca, N. Y., read a most interesting paper on "Materials of Aeronautic Engineering," in which he gave facts regarding the strength of metals, some of which were new even to the scientific men in his hearing. He showed that of all metals steel combined most strength with lightness, and was, therefore, better fitted for the construction of air vessels than any other.

The subject of kite flying was taken up, and the paper on "Experiments with Hexagon and Tailless Kites," by W. A. Eddy, experimenter, of Bayonne, N. J., illustrated by drawings on the blackboard, was a most interesting one. He had succeeded by his method in flying kites to a height of over 4,000 feet.

Papers on ballooning were read by Mr. C. E. Myers, aeronautical engineer, of Frankfort, N. Y. These were "Manufacturing Hydrogen Gas Balloons," "Natural Gas Balloon Ascensions," "Maneuvering of Balloons," and "Balloon Meteorology."

A paper on "Flotation *vs.* Aviation," by Prof. De Volson Wood, of Stevens Institute, Hoboken, N. J., in which the professor advocated a departure from the bird method in flying machines, provoked some discussion, in which the bird method was ably advocated.

Gen. W. Hutchinson, of the British army, Silverdale, England, submitted a published paper on "Design of Navigable Balloons." This was an old idea of Gen. Hutchinson's, and related to the employment of balloons in warfare.

One of the most interesting of the papers read at the conference was by Prof. Mark W. Harrington, but it had reference rather to the work of the government weather bureau than to the navigation of the air, and advocated the establishment of special balloon and kite stations for observational purposes.

Prof. A. F. Zahm, secretary of the conference, whose subject was "The Stability of Aeroplanes," presented descriptions of a variety of models with which he has experimented with a view to securing automatic equilibrium and steadiness of flying machines in all circumstances of wind and calm. He defined the aeroplane as the supporting surface of a flying machine as distinguished from the propelling surface, and stated as some of its requirements, (1) that it should, when launched in any manner, automatically head to the wind and move rapidly forward; (2) that when displaced or overturned it should promptly recover its position of equilibrium; and (3) that it should maintain a prescribed and uniform average position and course in the air, as a boat does in the water. The models described comprised various forms of gravity kites, dirigible parachutes and simple and compound aeroplanes.

Sweet Pickled Watermelon Rinds.

A writer in *Harper's Bazar* gives the following directions:

Peel the rinds with a sharp knife that will take off the green skin evenly. Trim off also every trace of the pink flesh of the fruit, because it is too juicy to make a firm, crisp pickle. Then cut the strips of rind into small pieces, two to three inches long, and placing them in a large earthen dish, sprinkle them lightly and evenly with salt. Cover the dish and let it stand overnight. In the morning drain off the water that will have formed, rinse the rinds in cold water, and cook them in a steamer until a broom splint will readily pierce them. Cooking the rinds by steam is an easy method, as they are less liable to burn than when cooked in the spiced vinegar. When the rinds are tender, take them out carefully with a skimmer and put them into a stone jar.

Take good cider vinegar for the basis of the pickle. Allow a pound of sugar to a pint of vinegar, and add also half an ounce of stick cinnamon broken into inch pieces, and a half teaspoonful each of whole cloves and blades of mace. The whole amount of vinegar, sugar, and spices used must, of course, depend on the quantity of rinds to be pickled, but a quart of vinegar is usually sufficient for the rinds of a medium sized melon. Boil the vinegar, sugar, and spices together vigorously half an hour, skimming off the froth, and pour the pickle boiling hot over the rinds. Press the rinds down under the pickle by means of an earthen plate or saucer, fasten the cover on, and tie a cloth over the whole These pickles will be ready for use in two weeks.