SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York

FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York

TERMS TO SUBSCRIBERS.

One copy, one year, for the United States or Mexico $3.00
One copy, one year, for Canada 3.75
One copy, one year, to any foreign country, postage prepaid, 18s. 6d. 4.50

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845).....$3.00 a year
Scientific American Supplement (established 1876)..... 5.00 "
American Homes and Gardens ..... 3.00 "
Scientific American Export Edition (established 1878). ..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.

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

NEW YORK, SATURDAY, NOVEMBER 7, 1908.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

A PRECAUTION AGAINST WATER FAMINE.

With drinking water retailing at thirteen cents a gallon and farmers driving their cattle six and eight miles for water, the inhabitants of the Hudson valley, at least, will realize that those who have spoken of the possibilities of a water famine in New York city have not been crying "wolf" when there was no wolf. Thanks to the fact that the extraordinary rains of last winter filled all the reservoirs of the Croton watershed to overflowing, there was no immediate danger, in spite of the recent extraordinary drought, of a scarcity of water in this city. But had the past season chanced to be as dry as the present one, conditions would have been very different.

The average daily consumption of water in New York is 325,000,000 gallons daily, and it is increasing at the rate of about 15,000,000 each year. The average daily flow of the Croton River, from which New York gets its water, during the forty years in which observations have been taken, is 402,330,000 gallons; but during that time, in six different years, the average daily flow has been less than the present daily consumption. In 1872 it was 260 million gallons; in 1880, 205 million gallons; in 1883, 230 million gallons; in 1885, 295 million gallons; and about the same amount in 1892. Another dry year occurred in 1895, when the average daily flow was only 263 million gallons; or over 60 million gallons less than the present daily consumption. These dry years are, of course, offset by correspondingly wet years, and it is by building dams in the watershed and impounding the water, that the deficiencies of the dry years are compensated by drawing on the water thus stored to meet the city's demands.

During the past forty years the city has built successive dams on the various branches of the Croton River to meet the growing demand of New York for a larger reserve, until at the present time there are in the Croton watershed nine separate dams, with one under construction, which, together, will have a total storage capacity of 104 billion gallons. During the past winter, from the 6th of November to the 15th of March, all the reservoirs on the watershed were full and overflowing, and there was an overflow over the new Croton dam (located about 2 miles from the point where the Croton River empties into the Hudson), which continued uninterruptedly for eight months, during which time over 80 billion gallons of water ran to waste.

With a view to increasing the storage capacity in the watershed, the engineers of the Aqueduct Commission recently made a careful survey of the one remaining section of the watershed which has not as yet been fully developed and where a large amount of additional storage can be secured at a relatively low cost for the dam and accessory works. The site on the east branch of the Croton River above the present Sodom or East Branch reservoir, selected for the new dam, is decidedly favorable for cheap storage, the bottom being broad and flat, the sides steep and abrupt, and the closure of the valley requiring the construction of a comparatively short, low, earthen dam, which could be built in two seasons of work. The construction of this dam at a cost of about $3,250,000, would provide for an additional storage of 20 billion gallons of water.

Now the question may be asked, Why should an additional dam be built in the Croton watershed when we have under construction the great Catskill project which is designed to bring ultimately an additional daily supply of 500 million gallons into the city? The answer is that the most sanguine estimates, based upon the present rate of progress, place the period which will be required to render the new water supply available at about six years; while, judging from the obstacles which have been encountered in the survey for the great siphon below the Hudson River, the time may be easily two or three years more than that. Now taking the average daily increase in consumption during the next 7 years as 17 million gallons (a conservative estimate in view of the rapid growth of New York city), it will be seen that, before the Catskill supply is available, the average daily consumption will be 43 million gallons greater than the average daily flow of the Croton River during the past forty years; and it might well happen that two successive dry seasons, such as have occurred in the past, might find the city with empty reservoirs and a daily river flow that was less than the daily consumption.

As to the probability of the proposed dam becoming filled in any particular year, it can be said that the records of the past forty years, except during the time that was required for filling the new Croton reservoir on its completion, show that a very large amount of water ran to waste, every year, past the Croton dam, a quantity which has varied from 35 billion gallons to more than 200 billion gallons.

For the above reasons it seems to us that the securing of an additional supply of 20 billion gallons for the relatively low expenditure of $3,250,000 is a proposition which should commend itself to the authorities.

CARNEGIE MERIDIAN ASTROMETRY EXPEDITION.

Astronomers are very much interested in the meridian astrometry expedition, which has been sent out by the Carnegie Institution in charge of Prof. Boss of the Dudley Observatory.

The party sailed for Buenos Ayres a few days ago, where a temporary observatory is to be built in the Argentine Republic, at San Luis, on the edge of the Andean plateau. This locality has been selected on account of its clear, calm nights and the purity of its atmosphere.

This gigantic task of star measurement in the science of exact meridian astrometry consists of a series of observations of about 25,000 stars that have been frequently observed with precision in the southern heavens.

The Carnegie Institution hopes to reach an accuracy which has long been the problem of fundamental work in astronomy, that of making reciprocal observations on the same stars with the same instruments alternately used in two hemispheres. About 1,688 stars have already been catalogued, all from the north to the south pole of the heavens, and this work has resulted in interesting conclusions in reference to star streams, the solar motion in space, and other stellar problems.

The progressive conception of astronomical work by the Carnegie Institution is cognizant of the imperative need of further observations upon the stars of the far southern constellations.

There are but few observatories in the southern hemisphere, therefore the astronomers of that hemisphere are in need of reinforcement.

In connection with this expedition it might be recalled that the astronomical world is in debt to an American astronomer, in a great measure, for all that is known of the southern heavens; for there stands in the Argentine Republic the Cordoba Observatory, a splendid national institution, due to the scientific genius and energy of Dr. Benjamin A. Gould, an eminent American astronomer, who resided there for fourteen years and made a vast number of valuable observations.

Prof. Lewis Boss, who is in charge of this great astronomical work, is splendidly equipped for the work, and the world will watch with eager interest the result of his five years' observation of southern stars.

DETECTION OF CARBON MONOXIDE IN THE AIR.

Poisoning by carbon monoxide is of frequent occurrence, for this gas is extremely poisonous and it is generated in many ways. The danger of poisoning is increased by the fact that the gas is colorless, odorless, and tasteless. Its toxic power is sixty times that of carbon dioxide. It is absorbed in appreciable quantities by the blood from an atmosphere containing it in the proportion of one part in 5,000. When air containing one part of carbon monoxide in 2,000 is inhaled, the blood absorbs as much carbon monoxide as oxygen, and death ensues.

The presence of carbon monoxide in considerable proportions may be detected by drawing some of the suspected air, with an aspirator, through a solution of silver nitrate. If the air contains much carbon monoxide the liquid soon assumes a grayish tint, due to the reduction of the nitrate to the metallic form. This method is only qualitative and not very sensitive, but it is very convenient for discovering leaks in furnace pipes and flues and in ascertaining whether the latter have been sufficiently ventilated to be safely opened for cleaning.

MM. Lévy and Pécoul have devised a method and apparatus by which as small a proportion of carbon monoxide as one part in 100,000 can be detected, and very small quantities can be determined quantitatively by persons entirely inexperienced in chemical manipulations. This method is based on the power of carbon monoxide to decompose iodic acid, with the liberation of iodine, which is betrayed by its color.

The apparatus, which is arranged compactly in a wooden case, comprises an aspirating bottle of known capacity, a test tube containing chemically pure anhydrous iodic acid (iodic anhydride, I_2O_5) and a long air tube, part of which is immersed in a water bath heated to 144 deg. F. by a small spirit lamp. The air first traverses the heated coil, then bubbles through the iodic acid, to which it gives a red tint of intensity proportional to the quantity of carbon monoxide, and finally reaches and fills the aspirator. At the end of the operation the proportion of carbon monoxide in the air can be estimated by comparing the liquid in the test tube with a color scale, in which each tint corresponds to a definite proportion of carbon monoxide. Still greater precision can be obtained by using a scale of colored liquids in sealed glass tubes.

Iodic acid is so sensitive to the action of carbon monoxide that this method is not suitable for air containing more than one part of carbon monoxide in 10,000. If the proportion is greater than this the suspected air must be diluted with pure air, in definite or indefinite proportions, according as a quantitative or only a qualitative analysis is desired.

As a prolonged exposure to an atmosphere containing even one part of carbon monoxide in 20,000 is injurious to health, tests of this character should be frequently made in all establishments in which there is danger of contamination of the air with this poisonous gas, all leaks should be promptly discovered and repaired, pipes should be thoroughly ventilated before they are entered for cleaning, men should not be compelled to remain long at posts where the air is unavoidably contaminated, all conduits which may contain carbon monoxide should be painted red, and workmen should be strictly forbidden to remain in their vicinity except when actually at work there.

THE FALLACY OF ARTIFICIAL FOOD.

In these days of concentrated foods prepared from natural sources—such as condensed and dried milk, concentrated albumen, beef extracts, etc., there seems to be a tendency to sacrifice the pleasures of the table to convenience, portability, and time saving; and the question might arise, Would it be possible for us to exist entirely on artificial food? According to Francis Marre, it appears to be improbable that this consummation, whether devoutly to be wished or not, will come into effect. The human stomach is not merely a chemical laboratory, but also a creature of habit, that calls for work. It demands a certain bulk of material, out of which the intestines can take the nourishing constituents, while rejecting the innutritious. As soon as the intestines are relieved of the necessity of seeking out the necessary and rejecting the unnecessary portions of food, the digestive function is suppressed. Further, certain bacteria must be introduced into the digestive tract, whose co-operation is absolutely necessary to proper assimilation of the food. Chemically-pure artificial foods would be free from all bacteria. The human system is accustomed to be nourished by various kinds of aliments, no one of which is alone sufficient to promote life. In order to imitate these constituents, the chemical foods would have to be prepared in an extraordinary degree of variety and complexity. Eating is not merely a matter of introducing into the system a certain weight of materials, which will develop a certain number of heat units. The reception and digestion of food must be accompanied by a certain degree of pleasure, in order to permit it to be properly assimilated. Experiments made with a dog show that the secretion of those stomachic juices which are necessary to the commencement of the digestive processes, ceases immediately, and remains absent during several hours, as soon as a feeling of displeasure is excited in the animal.

The twelve new torpedo boats under construction for the German navy are to be driven by steam turbines. According to Engineering, it is planned to try four different types of turbines. The three boats which the Vulcan yards near Stettin are constructing are to be equipped with turbines of the Curtis type. The four boats which the Schichau yards of Elbing and Danzig have undertaken to build, will have Melms and Pfenninger turbines. Of the five torpedo boats under construction at the Germania yards at Kiel, four are equipped with Parsons, and one with Zoelly turbines