Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

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

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy. one year, postage included..... **$3 20**
One copy, six months, postage included..... **1 60**

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly; every number contains 16 octavo pages, with handsome cover. uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter.

Address MUNN & CO., 37 Park Row, N. Y.

☞ Subscriptions received and single copies of either paper sold by all the news agents.

Publishers' Notice to Mail Subscribers.

Mail subscribers will observe on the printed address of each paper the time for which they have prepaid. Before the time indicated expires, to insure a continuity of numbers, subscribers should remit for another year. For the convenience of the mail clerks, they will please also state when their subscriptions expire.

New subscriptions will be entered from the time the order is received; but the back numbers of either the SCIENTIFIC AMERICAN or the SCIENTIFIC AMERICAN SUPPLEMENT will be sent from January when desired. In this case, the subscription will date from the commencement of the volume, and the latter will be complete for preservation or binding.

VOL. XXXVI., No. 23. [NEW SERIES.] *Thirty-second Year.*

NEW YORK, SATURDAY, JUNE 9, 1877.

Contents.

(Illustrated articles are marked with an asterisk.)

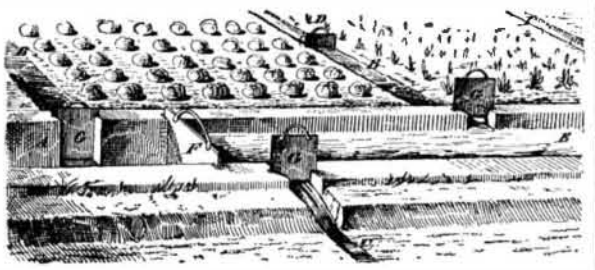
TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT,
No. 75,
For the Week ending June 9, 1877.

SEWAGE IRRIGATION ON A SMALL SCALE.

It is now generally conceded that the application of sewage to purposes of irrigation is the only process which fully meets all the requirements attaching to the disposal of that material. It is the only one which, while it purifies the sewage, efficiently realizes the highest profits, and may be carried on without creating any nuisance or detriment to the health of the neighboring inhabitants. This is the opinion expressed by Dr. Wilson in his recent admirable work on "Hygiene," and it is fully corroborated by the very extensive review of the whole subject of the disposal of sewage which is embodied in that model official document, the Report of the State Board of Health of Massachusetts for 1876. The conditions under which the sewage of a village may thus be turned to agricultural profit, and at the same time the pollution of streams be prevented and a public source of disease removed, are by no means complicated; while the advantages which actual experiment has shown to be secured are so great as to render the matter one which may be strongly commended to the careful attention of village authorities and farmers throughout the country.

The simpler the details of the work, the better; and in this view it is recommended that for villages the application should be by surface carriers, in lieu of underground piping. Land which has been worked in ridge and furrow will require leveling, that is, the soil should be stripped and the ground be broken up, so as to bury the surface even. The English Rivers' Pollution Committee state that main carriers should be laid in nearly level lines, so as to command the area below; and secondary carriers, from half a chain to a chain apart, should contour the entire surface. The main carriers may be covered in, having valves or sluice boards, of an inexpensive and simple kind, to retain or let out sewage as required. These carriers should be of brick or earthenware pipes, in size proportioned to the volume of sewage to be distributed. Conduits below 18 inches in diameter may be made most cheaply of earthenware pipes; brickwork may be cheaper for conduits of larger cross sections. Small carriers may be formed of small agricultural tiles, but jointed and laid only three parts in the soil, so that one tile or more can be removed temporarily at any point to allow of surface overflowing. All ordinary conduits may be open trenches, readily formed by hand labor or by the plow.

In the first place, the land must be prepared so that the beds shall have a slope varying from 1 in 50 to 1 in 150. If not loose and porous, the ground must be underdrained. The sewage must be delivered (by pumping if necessary) at the highest point on the irrigated area, whence it is distributed by gravitation. The annexed diagram exhibits the



arrangement usually adopted where only the main carrier is of brickwork or pipe and the branching carriers mere trenches. A is the main conduit, dammed at various points by gates, as shown at F. By opening the gates, G, any trench, B, C, etc., may be made to distribute the sewage over any part of the field; and the flow is limited by placing the dam, D, at any desired point. The sewage flows uniformly over the surface of the land, each plot being irrigated for a few hours at a time, and once in every three to twelve days, as is necessary: grass, for instance, may be treated much oftener than vegetables.

The amount of land necessary depends somewhat upon the character of the soil and the climate. The English Rivers' Pollution Committee prefer one acre for the sewage of every 150 people. The Earl of Warwick, however, who has one of the most successful sewage farms in England, has one acre of land for every 50 people. In England, Scotland, and France, no difficulty has been found in irrigating through the winter. In our northern climate, where the ground often freezes to considerable depth, the results, it might be expected, would not be so uniformly successful; but judging from experiments made at Berlin, where the soil sometimes freezes to a depth of three feet, there is reason to believe that irrigation is well accomplished the year round.

The effluent water from sewage farms is often so pure as not to reveal any evidence of contamination to the chemist; and it has been freely used for drinking purposes without bad effects. The following data relative to the utilization of the sewage of the Augusta (Maine) State Asylum will serve to show how the system may be put in practice on a small scale, and the results it secures. In this case, the sewage passes by gravitation into large tanks where it is mixed with a quantity of absorbents (straw, leaves, muck, etc.). The solid parts are from time to time carted on to the land, and the liquid passes off, often quite clear and sparkling, to be used on the land for irrigation. A portion flows over a few acres, from which three crops of fine hay were cut in 1875. Another part is used for hose irrigation of the vegetable garden, care being taken not to sprinkle the leaves. A third part is carried to different sections of the farm and distributed from a vehicle which acts on the principle of an ordinary street watering cart, though different in principle. Seven thousand gallons of sewage are disposed of in this way daily, and the results are as follows: What was formerly a nuisance has become inoffensive. The hay crop on the land irrigated by gravitation had increased sixfold, and increase is also noted in other crops. The system pays for itself through the greater value of the crops raised (labor, however, being that of patients, costs nothing); and irrigation was efficiently carried on during the coldest weather. In such cases as the above, and generally in all where the sewage of a comparatively small number of people is to be disposed of, the subsoil method of irrigation may likewise be advantageously used. By this system the sewage is carried to a safe distance from the houses in tight pipes, and is then distributed in open jointed pipes about one foot below the surface of the ground. Subsoil drains are placed at a depth of four feet to carry off the purified liquids. Colonel G. E. Waring some time ago described in the *Atlantic Monthly* his application of this system to the removal and utilization of a country house as follows: "The house drainage is discharged into a tightly connected and thoroughly ventilated tank. Its outlet pipe, starting from a point one foot below the surface of the water, and about two feet below the capstone, passes out near the surface of the ground, and is continued by a cemented vitrified pipe to a point about 25 feet further away. Here it connects with a system of open jointed drain tiles, consisting of one main 50 feet long and eight lateral drains, six feet (the writer has since stated that half this distance is better) apart, and each about 20 feet long. These drains underlie a part of the lawn and are only about 10 inches below the surface." The slope from one extreme of the system to the other is only 15 inches. The pipes require cleaning about once a year.

PREVALENT MANIAS.

The blue glass mania has had its day. The bar rooms are removing their signs of "cocktails in blue glass," and the cerulean goblets, wherein those seductive and presumably sun-strengthened beverages were dispensed, may be purchased for small sums from the cheap china vendors on our sidewalks. We notice a diminution in the sheets of blue glass hung in windows of private dwellings, "signs," some one calls them, "to inform the public of the gullibility of the inmates;" and in fact the only evidence at hand which exhibits any vitality of the now rapidly collapsing blue glass mania is the production of a cheap variety of note paper, called the "Pleasonton," because the pasteboard box in which it is contained has a blue glass lid. The General can doubtless explain the efficacy of the glass in this connection. Blue glass, therefore, has had its run, its inventor has earned his notoriety, and also the thanks of the glass dealers, who have reaped a fine pecuniary harvest.

Two new manias are at hand, to wit, the celery cure and metallo-therapy. "Celery is the greatest food in the world for the nerves," says one of our contemporaries; and the information is traveling the length and breadth of the land. It is fashionable nowadays to call every ailment that flesh is heir to a nervous disease; and where our ancestors would have resorted to such homely remedies as a hot drink and simple cathartics, the present practice demands chloral, and bromides, and quinine, and strychnine, and phosphates, and rare chemicals without number. Of course celery is pleasanter to take than most drugs; and now that it is brought forward as a new nervine, plenty of people will use it. As it can do no harm, and, indeed, may actually work good by checking the too prevalent consumption of "nervous specifics," the mania is rather a benefit than otherwise, and should be encouraged. Wild celery or smallage is known to possess some narcotic effect, and is reputed as unhealthy. As regards the medicinal properties of cultivated celery, there are no utilizations of them in the United States Pharmacopœia; but as celery (*apium graveolens*) belongs to the same family as the parsley (*apium petroselinum*), it is probable that it would yield apiin and apiol, as such substances are obtained from the latter. Apiol acts as a tonic, similar in its effects upon the system to quinia.

The other mania, metallo-therapy, to which we have already briefly alluded, is perfectly harmless, and at present is confined to France. *Les Mondes*, of recent date, reports another "astonishing cure"—a child four years old this time, almost dead with meningitis. The metallo-therapy inventor enveloped the infant—there is no Children's Protective Society in France—in plates of iron and copper from head to foot. Half of the body was covered with one metal, half with the other, in order "that both metals might have an equal chance of doing good." In eight hours, the child revived; in six days, it was out of danger; in a month, it was well. Manufacturers of iron and copper plate may now consult with blue glass makers as to how to advertise this.

SAFETY VALVE TESTS.

In September, 1875, a Special Committee of the United States Board of Supervising Inspectors of Steam Vessels made a series of experiments to determine the proper proportions for safety valves and to test the relative merits of such valves as were furnished by manufacturers. Their report has just been published by the Government; and as it contains considerable information that will not be generally accessible, we propose to furnish a synopsis to our readers that shall embody the most important points determined by the Committee. As nearly all the prominent safety valves in the market were submitted to test, this report is useful in showing what is still required to produce the ideal safety valve. It is scarcely necessary to say that a perfect safety