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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 357,

For the Week ending November 4, 1882.

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WELL WATER IN NEW YORK CITY.

The high cost and uncertain supply of Croton water have led to a great multiplication of artesian and driven wells in this city; and the large use of well waters has so affected the revenues of the Board of Public Works as to awaken an active opposition to the wells. The larger part of the water from the artesian and driven wells, certainly on New York Island, is used for cooling and washing purposes by brewers, in laundries and stables, and for steam making and other industrial purposes. To some extent it is used also for domestic purposes and in the manufacture of mineral waters and other beverages. This brings the wells under the jurisdiction of the Board of Health, which (at the instance, it is alleged, of the Board of Public Works, whose revenues are diminished, it is estimated, by $400,000 a year through the substitution of well water for Croton water) has ordered a general examination of the well waters of the city, with a view to condemning those wells whose water is found contaminated by sewage or otherwise.

The greater part of the driven wells in the city (including the lately annexed Westchester district) are said to have been sunk within the past three years. To a considerable extent such wells are sunk secretly, to escape examination and possible condemnation by the health officers. The number is put at 1,800, besides fifty artesian wells, and probably as many dug wells.

The work of testing the waters has been going on at the School of Mines during the past four months. Professor E. Waller, who has the work in charge, tells the *Tribune* that he has analyzed water from about fifty wells, and in most cases he finds it unfit for use. How large a proportion of the fifty wells were deep wells and how many were dug wells he does not say. Of the water examined he says:

"It is generally contaminated with organic substances and extraneous matter, such as appear in drainage, and has an excess of mineral ingredients. Some of these waters resemble tide water, and contain more solids than the ocean itself. The surface drainage gets in by percolating through the earth and running down the iron pipes. Much of this well water is highly charged with lime and magnesia salts, making it very 'hard' and highly indigestible. It also causes incrustations in boilers, inducing explosion. Hotels run it through Croton pipes at great peril, because it contains so much carbonic acid that it takes up lead, causing more or less poisoning. I found eleven tenement and flat houses where it was pumped up into lead tanks, the water undergoing such a change that it was unfit for use, whether for drinking, cooking, or bathing. Croton is not liable to this objection, except where it comes in contact with fresh lead surfaces. I have always recommended Croton as superior to well water. There are times when it is unpleasant, but it has never been injurious, though Professor A. R. Leeds, of the Stevens Institute, takes ground against me on this point. I found three-fourths of the wells in the Westchester district very bad, the water containing a large amount of drainage. Wells on the Harlem Flats contained of solid and extraneous matter 688 grains to the gallon; in West Fifty-sixth street, 56½ grains; in Grand street, near the East River, 50 grains; in the Westchester district, 7 grains (mostly drainage); in Broadway, near Wall street, 20¼ grains; in East Forty-eighth street, 22 grains; near Columbia College, 35⅝ grains. A well at the New York Hospital ran so heavily in iron and other minerals that it had to be abandoned. It destroyed all the pipes and vessels it came in contact with, and could not be made available for use even as waste water, except with great expense."

On the other hand, in defense of the water of driven wells, Mr. C. D. Corwin, who has put down a large number of them, says:

"When these wells are driven, a pure, soft water is guaranteed. Owners can employ an analytical chemist, and test the water, and refuse to accept the work until a suitable water is reached. Clay, through which the pipes pass, acts as a cement to arrest drainage. No incrustations result from the use of this water. A man engaged in the steam laundry business has just opened his boiler for public inspection, after a year's use, and finds it free from scaling and sediment."

The owners of the wells threatened are naturally ill-pleased with the action of the Health Department. It is probable that the matter will be carried to the courts, the argument of the well-owners being that in the majority of instances the water is not used for drinking purposes; that if impure, it is possible to obtain superior water by going deeper; that a large amount of money and numerous industries are involved, and that the Board of Health has been stimulated by the Board of Public Works, for the purpose of compelling the use of Croton water.

FIRE WITHOUT FUELS.

For the past decade or more an English inventor in India, Mr. W. Adams, of Bombay, has been trying to persuade men to make a larger use of direct sunshine in culinary and industrial operations, as a substitute for the solar forces stored in coal and wood. By his plan the use of expensive lenses and curved reflectors, as employed in France in solarengines, is shown to be unnecessary, since flat reflectors of common window glass, plain or silvered, properly arranged, are able to focus the sun's rays with sufficient exactness.

In a communication to the SCIENTIFIC AMERICAN of June 15, 1878, Mr. Adams describes at length his experiments, and figures several of the types of apparatus by which he utilizes the solar rays. By means of large batteries of comparatively inexpensive reflectors enough sunshine has been concentrated upon boilers to make steam quite rapidly; and in some experiments very high temperatures have been obtained. Mr. Adams' position is that batteries of plain reflectors are cheaper than furnaces, and sunshine vastly cheaper than coal, especially in tropical and other regions where coal is hard to get and the sky is clear of clouds for months at a time. The argument is good, and the practical tests of this sort of solar apparatus have been very promising if not conclusive. Yet for some cause no great progress appears to have been made in the utilization of sun heat in this manner.

In view of these familiar facts it is amusing if not surprising to read in a Washington paper—followed by a column or two of extravagant explanation and expectations—that "The Patent Office has just extended its official wing over one of the most remarkable discoveries of the present century, and one, it is safe to say, which will not only effect a revolution in the present methods of producing and applying heat, but seriously undermine the very structure upon which the at present generally received scientific notion of heat rests. . . . The whole invention simply consists of an arrangement whereby the rays of the sun are reflected from any number of mirrors upon a common focus."

The invention referred to is a complicated device for giving a battery of plane mirrors a motion with the sun (so that the sun's rays will always fall perpendicularly upon the adjustable surfaces of the mirrors), and for utilizing the heat concentrated at the focus of the converging rays. The invention embraces no new discovery; and if it revolutionizes either science or industry, Mr. W. Adams of Bombay will not be the only person surprised.

ANNULAR ECLIPSE OF THE SUN.

On the 10th of November there will be an annular eclipse of the sun, invisible in this country, but visible in the Southern Pacific Ocean. The path of the eclipse lies wholly in the Pacific Ocean, commencing a little east of the Island of Celebes, including several small islands in the vicinity, the southern part of New Guinea, the whole of New Caledonia, and a few small islands scattered along the route. The rest of the track is over a boundless waste of waters. To observers on these islands, and to those who chance to be on the ocean track at the time, the sun will present the appearance of a ring of dazzling light surrounding the moon's intervening disk. An annular eclipse ranks next to a total eclipse as a spectacle of surpassing beauty, though it is far from being as awe-inspiring or as important to the interests of science.

The difference between total and annular eclipses is easily comprehended. The positions and apparent magnitudes of the sun and moon are constantly varying. When, at new moon, the center of the moon happens to pass directly over the center of the sun; if, at the same time, the sun is at or near his greatest distance from the earth, and the moon is at or near her least distance from the earth, the apparent diameter of the moon will exceed that of the sun, and the sun will be entirely hidden from view. There will then be a total eclipse of the sun, visible to observers near the line joining the centers of the sun and moon. These conditions occurred on the 17th of May, when a total solar eclipse took place. The diameter of the sun at that time was 31′ 41·6″. The diameter of the moon was 31′ 43·8″, exceeding that of the sun 2·2″, sufficient to produce a total eclipse.

When, at new moon, the center of the moon happens to pass directly over the center of the sun; if, at the same time, the sun is at or near his least distance from the earth, and the moon is at or near her greatest distance from the earth, the apparent diameter of the moon will be less than that of the sun, and it is evident that the whole surface of the sun cannot be obscured. There will then be an annular eclipse—called so from the Latin word annulus, meaning a ring—which will be visible to observers near the line joining the centers of the sun and moon. Such a combination will occur on the 10th of November. The diameter of the sun will then be 32′ 24·2″. The diameter of the moon will be 30′ 6·6″, which is 2′ 17·6″ less than that of the sun. A narrow ring of light will therefore appear encircling the darkened center.

The present year numbers but two eclipses on its annals. There have been no eclipses of the moon, and the two solar eclipses are those to which we have referred. But the rare event of the transit of Venus, which will take place on the 6th of December, deserves to be numbered with the solar eclipses, for it is due to a similar cause. The planet obscures as much of the solar disk as she is capable of doing, when she passes like a black point over his disk. If she were as near as the moon she would cause an eclipse of the sun that would last long enough to be of great assistance in the solution of many vexed problems concerning solar physics.

If the eclipses of the year are few in quantity they make up for the deficiency in their excellent quality.

A total solar eclipse, an annular eclipse, and a transit of Venus are seldom the sole records on the annals of a single year. It is much to be regretted that the path of the coming annular eclipse falls upon a portion of the world where there will be few to look upon the superb spectacle when the moon hides the sun's face with the exception of a narrow ring of dazzling light.

DURING 1881 the British Patent Office received 5,751 applications, the largest number recorded for any year.