SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

47 LAFAYETTE PLACE, NEW YORK.

SUBSCRIPTIONS.—United States and Canada.....$3.50 a year.
Great Britain and Europe..... 4.50 a year.
Science Club-rates for the United States and Canada (in one remittance):

1 subscription	1 year	.....	$ 3.50
2 "	1 year	.....	6.00
3 "	1 year	.....	8.00
4 "	1 year	.....	10.00

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VOL. XIII. NEW YORK, MAY 17, 1889. No. 328.

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THE OPPONENTS OF VACCINATION in England have of late been more active than ever; and, as a result of their activity, a royal commissioner has been appointed, whose duty it shall be to make a full investigation of the whole subject, and submit a report thereon. Friends of vaccination should welcome such an inquiry, as the method stands upon such a firm foundation of facts as to be able to stand the most searching examination. If it has not accomplished all that is claimed for it, the failure is due to insufficient or inefficient performance of the operation; and the sooner such abuse of it is made public, the better. It is a rather remarkable coincidence that just at this time events should transpire at Sheffield, England, which show the value of vaccination. Small-pox has recently been very prevalent in that city. In a population of about 320,000 there have been 6,088 cases of the disease, of which number 590 proved fatal. Dr. Barry, who has made a report to the Local Government Board, finds that the attack-rate of the vaccinated children under ten was 5 in a thousand; of the unvaccinated of the same age, 101 in a thousand. The death-rates for the same classes were respectively .09 and 44. In every hundred-thousand of those twice vaccinated, there were eight deaths; once vaccinated, 100 deaths; and unvaccinated, 5,100 deaths.

SOAPING GEYSERS.[1]

AT the Buffalo meeting, October, 1888, Dr. Raymond presented a paper entitled "Soaping Geysers," in which he called attention to the use of soap by tourists to cause eruptions of several of the well-known geysers in the Yellowstone Park. Incorporated in this paper appears a communication received from me, written from camp in the park, in reply to some inquiries on the subject. The letter discussed somewhat briefly the means employed by visitors to the park to hasten the eruptions from hot-springs and reservoirs of hot water, which remain dormant for days, or even weeks or months, at a temperature near the boiling-point, without any display of geyser-action. As the paper has called forth considerable comment, I desire to elucidate one or two points in relation to the temperature of the springs, and to answer some inquiries about the composition of the thermal waters.

In the summer of 1885, a Chinaman, employed as a laundryman for the accommodation of the tourists at the Upper Geyser Basin, accidentally discovered, much to his amazement, that soap thrown into the spring from which he was accustomed to draw his supply of water produced an eruption in every way similar to the actual workings of a geyser. Tourists with limited time at their command, who had travelled thousands of miles to look upon the wonders of the Yellowstone, soon fell into the way of coaxing the laundryman's spring into action, to partly compensate them for their sore disappointment in witnessing the periodical eruptions of Old Faithful. Successful attempts upon this spring soon led to various endeavors to accelerate action in the dormant and more famous geysers. In a short time, so popular became the desire to stimulate geysers in this way, that the park authorities were compelled to enforce rigidly the rule against throwing objects of any kind into the springs.

In connection with a thorough investigation of the thermal waters of the Yellowstone Park and the phenomena of the geysers, I undertook a number of experiments to ascertain the action of soap upon the waters, and to determine, if possible, those physical conditions of various pools and reservoirs which permitted the hastening of an eruption by the employment of any artificial methods. This investigation, conducted from time to time, as opportunity offered, throughout the field-season of 1885, included experiments upon the geysers and hot-springs of the Upper, Lower, and Norris Geyser Basins. The results proved, beyond all question, that geyser-action could be forced in a number of ways, but most conveniently by the application of soap. The greater part of the more powerful geysers undergo no perceptible change with a moderate use of soap, although several of them may, under favorable physical conditions, be thrown at times into violent agitation. In most of the experiments, Lewis's concentrated lye, put up in half-pound cans for laundry purposes, was employed. Each package furnished a strong alkali, equivalent to several bars of soap. In this form, alkali is more easily handled than in bars of soap, more especially where it is required to produce a viscous fluid in the larger reservoirs; and, in conducting a series of experiments for comparative purposes, it seemed best, in most instances, to employ the same agent to bring about the desired results.

Old Faithful, the model geyser of the park, exhibits such marked regularity in its workings, that attempts to hasten its action appear futile. The interval between eruptions is about 65 minutes, and rarely exceeds the extreme limits of 57 and 72 minutes. After an eruption of Old Faithful, the reservoir fills up gradually; the water steadily increases in temperature; and conditions favorable to another eruption are produced under circumstances precisely similar to those which have brought about the displays for the past eighteen years, or as far back as we have authentic records. The few experiments which have been made upon Old Faithful are insufficient to afford any results bearing on the question; but it seems probable that soon after the water attains the necessary temperature an eruption takes place.

Of all the powerful geysers in the park, the Bee-Hive offers the most favorable conditions for producing an eruption by artificial means, all the more striking because the natural displays are so fitful that they cannot be predicted with any degree of certainty.

[1] Abstract of a paper read before the American Institute of Mining Engineers, New York meeting, February, 1889, by Arnold Hague.