of tons of oil have been lost from an inability to direct it into reservoirs, which are frequently not even prepared before the need of them arises. Some fountains are intermittent, and play from one to two or three hours at a time, and then cease for a day or so. These are the most convenient, as they give plenty of time to arrange for collecting the oil. In some cases the action has to be started by withdrawing a few scoops of oil from the bore, and thus disturbing the subterranean equilibrium.

Continuous fountains sooner or later become intermittent, and then, like the latter, settle down into ordinary wells, from which the oil must be raised by the usual methods. The jet sent out of a bore-pipe appears urged forward by a rapid succession of pulsations; but periods of quiet may be noted, during which the fountain seems to gather up its strength for an extra energetic effort. The height of the jet varies with the intensity of the pulsations. A continuous fountain may yield over thirty-three hundred tons of oil, and require the labor of a hundred men to collect and store it in reservoirs. The daily yield would be worth five hundred dollars, the cost of labor being from seventy-five to a hundred dollars.

The condition of the oil is such, that, when no longer forced out by internal agencies, it must be removed from the bores by means of scoops: hence the bore-holes have to be large, usually sixteen inches in diameter, and, having to be maintained at that diameter throughout, must be lined with bore-pipes. The cost of these bore-pipes is a serious item, in a well of six hundred feet in depth costing twenty-five hundred dollars, while the expense of sinking the bore amounts to about five thousand dollars.

The owners of allotments are free to sink their bore-holes where they like: hence they are mostly sunk along the boundaries of the plots, and not at the points which the lay of the strata would indicate to be the most advantageous. The reason for this is, that each proprietor considers, that by sinking a bore near his neighbor's plot, if he succeed, he will get his own oil and a good deal of his neighbor's also. His neighbor is actuated by the same motives: hence the allotments have the appearance of fortified places, being surrounded by works, and unoccupied over the greater portion of their inner areas. Naturally, if a bore be exceptionally successful, a large number of additional ones are at once driven, and the yield of each is in consequence reduced.

The mean produce of the one hundred wells now in action is given at thirty-two tons per well per day, from March to November. The average cost of production is about twelve dollars per ton, nearly five per cent of which is due to the scarcity of water.

A commission appointed by the government reports that a pipe-line from Baku to Batoum on the Black Sea is indispensable for the higher development of this industry, as at present not one-half of the valuable products are obtainable. The commission, however, thinks that the undertaking should be left to private enterprise. The Transcaucasian railway will in a measure aid in the transportation.

RATIO OF INCREASE OF HEIGHT TO INCREASE OF BULK IN THE CHILD.

SOME remarkable observations, we learn from the *Lancet*, have been recently made by the Rev. Malling Hansen, principal of the Danish institution for the deaf and dumb, on the progressive increase in height and weight of children, one hundred and thirty of whom were under his charge. Of these, seventy-two were boys and fifty-eight girls, and they were weighed in batches of twenty, four times daily, — in the morning, before dinner, after dinner, and at bed-time. Each child was measured once a day. The weighings and measurements extended over a period of three years, and the results showed that the increase in the bulk and height of the body does not proceed at a uniform rate throughout the year. Three distinct periods, with some minor variations, were observed. In regard to bulk, the maximum period extends from August until December; the period of equipoise lasts from December until about the middle of April; and then follows the minimum period until August. In regard to height, the maximum period corresponds to the minimum period of increase in bulk. In September and October a child grows only a fifth of what it did in June and July. So it appears that during the autumn and the beginning of winter the child accumulates bulk, but the height is stationary. In the early summer, on the other hand, the bulk remains nearly unchanged, but the vital force and nourishment are expended to the benefit of height. When the body works for bulk, there is rest for growth, and *vice versa*. Mr. Hansen has observed a similar ratio of increase of bulk to increase of height in trees. In regard to the minor variations observed, it is probable that they are dependent, in part at least, upon the external temperature; so that, when this runs up, there is marked increase in weight, while a diminution of weight occurs with a fall of temperature.

Mr. Hansen's observations are undoubtedly of considerable importance. Similar ones have been

made by Dr. W. R. Miller, surgeon to the West Riding convict prison. Dr. Miller experimented on about four thousand prisoners for thirteen years, and obtained results that differ sensibly from those of Mr. Hansen; for he found that the season of maximum increase in weight in adults is from April to August, and the period of minimum increase in adults from September to March. Dr. Miller found the body became heavier in summer, and lighter in winter; and he attributes the loss of weight to the more active excretion of carbonic-acid gas in the colder months.

DIFFERENT PHYSIOLOGICAL SENSES FOR HEAT AND COLD.

IN connection with the researches of Professor Hall and Dr. Donaldson of Johns Hopkins university, recently given in *Mind*, it will be of interest to state that Mr. A. Herzen has lately published in the *Archiv für physiologie*[1] the results of a series of experiments showing that the physiological sense of cold is different from that of heat. His attention was first directed to the subject by a simple incident, the verification of which may be readily made by any observer. Awakening one night, he found one of his arms lying without the bed-clothes, 'alseep;' in touching it with the other hand, he perceived a distinct sensibility to warmth, while that of touch was gone. Bringing his arm, however, in contact with cold substances, he was surprised to find no sensation.

Pursuing the subject further, he produced artificially this condition of semi-paralysis by the compression of nerve-trunks, and by experimentation discovered that the sensibility to cold remained a short time after tactile impressions had disappeared, and that the sensibility to warmth remained much longer, but not quite as long as the power of detecting pain; also that the impressions of warmth require more time for transmission to the brain than those of cold, bearing, in fact, the same relations to each other as the sense of pain does to that of cold. These results were further supplemented by observations on a person with complete and permanent tactile anaesthesia of the legs, but in whom the sense of pain remained normal. The subject was able to distinguish quite well the differences in temperature between 150° F. and 81° F., which was the normal temperature of the surface of the leg. Below the latter temperature, however, no sensation was produced, not even by the contact of ice on the inner side of the thigh. Other cases showed the same peculiarities, in which, with the disappearance of tactile sensibility, the susceptibility to cold was also lost, while that to warmth yet remained.

Vivisection experiments upon cats and dogs lead the author to the following conclusions: 1. The so-called sense of heat and cold is composed in reality of two senses quite independent both anatomically and physiologically; 2. Observations on healthy and diseased subjects show that the sensations of heat and cold are transmitted through different nerves, by different routes, and to different brain-centres; 3. The gyrus sigmoideus contains the centre (or the centripetal branches leading thereto) of touch and cold perceptions; 4. These sense-perceptions are transmitted through the posterior columns of the spinal cord, while those of the senses of pain and warmth are conveyed through the gray substance.

Although the senses of cold and touch on the one hand, and heat and pain on the other, seem to be more nearly related, yet one cannot unite them, or consider the different perceptibilities of heat and cold mere modifications of those of touch and heat. The researches of Blix and others have demonstrated the existence of separated, isolated, irregularly distributed points upon the body, of which one may be only sensible to cold, another to warmth, and a third to touch. Doubtless most persons have noticed the different degrees of susceptibility of different parts of the body to heat and cold: the author points out striking examples of such.

[1] *Ueber die spaltung des temperatursinnes in zwei gesonderte sinne*, xxxviii. p. 93, December, 1885.

RAINFALL IN SOUTH AFRICA.[1]

LITTLE has been known until recently on the subject of rainfall in South Africa, taken broadly over the whole country, although observers have for many years been keeping records at isolated stations. There has been for many years a meteorological commission in existence at Cape Town; and in the report for 1883 an interesting table was published, giving the means, monthly and yearly, at all stations where records have been kept for at least five years, with the altitude above sea-level, and the latitude and longitude for each station.

From these data Mr. Tripp has prepared a map of South Africa, with the idea of showing the distribution of the total yearly rainfall. The curves divide the area into districts, where the mean yearly rainfall is—

(1) Under 5 inches.
(2) From 5 " to 10 inches.
(3) " 10 " " 20 "
(4) " 20 " " 30 "
(5) Above 30 "

There are doubtless, particularly along the moun-

[1] Abstract of an article by William B. Tripp, in *Symons's meteorological magazine.*