

ART. LIX.—*Note on the supposed Fire-drill found in the Cave at Moa-bone Point, Sumner.*

By Captain F. W. HUTTON, F.R.S., Curator of the Canterbury Museum.

[*Read before the Philosophical Institute of Canterbury, 4th October, 1893.*]

IN the list of objects found in the Moa-bone Point Cave Sir J. von Haast has recorded "apparatus for lighting fire by circular motion, made of pukatea (*Atherosperma novæ-zealandiæ*)."^{*} Now, it is well known that the Maoris, like all the other Polynesians, used to obtain fire by rubbing a pointed piece of wood longitudinally on another flat piece, a method employed, I believe, by no other race of men. The fire-drill—which was used throughout America, in Africa, in the Indian Archipelago, and even in Australia—was quite unknown to the Maoris and to the Polynesians; consequently Sir Julius von Haast's statement that the moa-hunters of the Sumner Cave used it is of great importance, although he does not seem to have recognised its bearing on the origin of the moa-hunters, for he makes no other allusion to it.

This so-called fire-drill is in the Canterbury Museum, and I cannot understand what induced Dr. Haast to give it such a name. Neither of the two pieces of wood shows any signs of charring—as the rubbing-sticks do—so that the idea that they formed a fire-drill must have been inferred from their shape.

The supposed drill is about 6in. long, the handle portion squared, and about $\frac{1}{3}$ in. thick on each side. Towards the other end it expands to more than $\frac{1}{2}$ in. in breadth, but remaining $\frac{1}{3}$ in. in thickness. At one corner of the expanded end there is a conical point which forms the "drill." The squared handle, and the point not being in the centre, are both against the supposition that the instrument was intended to be used with circular motion, and it is much more probable that the stick was intended for rubbing.

The other piece of wood is flat, rather more than $\frac{1}{2}$ in. broad, by $\frac{1}{4}$ in. thick, and is now about $2\frac{1}{2}$ in. long; but, as it has been broken at both ends, it may have been much longer. In the middle line, and at about one-third the length from one end, a roughly-circular hole has been cut completely through

^{*} Haast: "Researches in Sumner Moa-cave," Trans. N.Z. Inst., vol. vii., p. 83.

the wood. This hole has been cut with a blunt instrument, and not drilled. The inside is quite rough, and no attempt has been made to smooth it. I cannot think that the hole would have been cut through the wood if it had been meant to catch the dust rubbed off by a fire-drill; and unless this were done no fire would be obtained. It seems to me that this piece of wood is part of a whare, and that the hole is simply for a flax lashing. However this may be, I am quite confident that neither of these pieces of wood was meant for a fire-drill, and that the rubbing apparatus found in the same cave was the only means by which the moa-hunters obtained fire.

ART. LX.—*The Disposal of Sewage by Application to the Soil (Sewage Farming).*

By Dr. CHAPPLE.

[*Read before the Wellington Philosophical Society, 28th June, 1893.*]

No subject in preventive medicine has attracted more attention or excited greater interest of recent years than the efficient disposal of sewage. And such a statement in the domain of science embodies the promise of great developments—developments which have been abundantly realised—in this important branch of public hygiene. Facts and experiences have been accumulated from the numerous disposal-works in England and Scotland, and theories have been elaborated in laboratories, schools, and congresses, all tending to place the whole subject on a sound scientific basis.

The purification of sewage by the soil is a chemico-biological process; the working of a sewage farm, a sanito-agricultural process.

The term "soil" in its widest sense includes the superficial layer of the earth's surface, and its properties, of course, vary vastly. But all soils are common in this: that they contain air, bacteria, and organic matter in varying proportions. Air is most abundant in loose sand and friable loam, while organic matter and bacteria are to be found most largely in rich loamy soil. The bacteria of the soil are most numerous near the surface, and exist in diminishing numbers to a depth of 3ft. or 4ft. Their constant function under ordinary circumstances is to disintegrate the particles of soil and of organic material for the supply of plants with nutriment. These miniature tillers of the soil require an abundance of both air and organic