

on secondary-scrub burns, and this is particularly true in the case of hard fern, for the great mass of surface rhizomes and thread-like roots form a hard compact surface most readily dried out in the hot weather of summer. Autumn burning in a dry season seems to afford the only hope of combating this weed; and while it is recognized in the Whangamomona district that one cannot always rely on getting a dry season, yet it would seem wiser to miss a season or two than to attempt the burn at a time when the soil-surface is not dry. The autumn affords the greatest chance or success, not only in the burning but also in the establishment of grass on the burn.

The growing-point of the surface rhizomes of hard fern "feels" somewhat for the light, and it will not penetrate a densely shaded cover. As the rhizome grows forward in contact with the soil it sends down thin thread-like roots, and at the same time somewhat slender fronds into the air. Therefore, as in the case of a great many other weeds, in order to spread satisfactorily, the surface rhizome must contact the soil, else the new roots cannot develop. By constant grazing of the turf around the clumps of hard fern the grass is kept short, and hence light is allowed to penetrate freely to the young outspreading rhizome, which consequently keeps close to the ground and spreads, rooting as it goes (Fig. 20). There is also nothing above to hinder the upward growth of the young frond. If a fairly dense shade and competition with other plants is provided (as by a good growth of grass induced by spelling the pasture), then the rhizome tends to rise slightly off the ground so as to avoid penetrating the denser growth. When the rhizome thus loses contact with the soil-surface no roots are formed and its growth is inhibited, and what growth is formed is very liable to be destroyed by stock when these are once more turned on to the area.

From the foregoing, then, it would appear that control of hard fern centred about three practices: (1) Burning of the hard fern in autumn in a season sufficiently dry for a hot fire to be secured; (2) the sowing of these burns with suitable grass-seed; and (3) the spelling of the pasture to induce a good grass-growth about the hard-fern clumps. The spelling also enables a heavy stocking at any one period of the year when the fern is most injured by treading.

#### BRACKEN-FERN.

Bracken-fern has an element of very great weakness in that its frond is eaten by stock. The rhizome of bracken-fern is well below the soil-surface, usually 6 in. to 8 in. deep, but at times 1 ft. or even more on certain light sandy or pumice country. The rhizome is thick, and in it is stored an immense amount of reserve plant-food. In the early spring from this underground rhizome new fronds are formed, and these draw during the early period of their growth—that is, until they uncurl—on the food-reserve in the underground rhizome. The new fronds appear above ground as tender, brittle, curled structures, most susceptible to injury by grazing animals (Fig. 23). This curl stage is, without doubt, the weak point in the annual growth of the bracken-fern. Every frond broken off in the curl stage means a reduction in the vitality of the plant, and just as long as the process can be repeated each time new fronds appear the draw upon the