Electricity and haymaking

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Committee representative interviews the prisoners' elected representative privately, *not* in the presence of any officials; and there is, of course, a further check in the fact that the Swiss Government are the Protecting Power for British interests in the Axis countries, and the camps are, therefore, also visited from time to time by representatives of the Swiss Legation. A complication arose in consequence of numerous prisoners being drafted to work on farms. This difficulty is being got over, first by the appointment, by each of these small groups in the countryside, of similar representatives, and secondly, by strenuous efforts to provide smaller consignments to facilitate distribution to these outlying groups. While this system of supervision ensures that no receipts shall be signed under duress, other possibilities are eliminated by the compilation of reports on the prisoners' representatives' statements and by the forwarding, as much as possible, to the donors of photostatic copies of the receipts. Although this explanation should be, in itself, sufficient, I would add that I had a welcome opportunity of talking to a number of our escaped prisoners of war, who were, of course, also closely examined by my Military or Air Attachés, who sent their reports home. These reports alone were sufficient to establish that 1) the parcels received were absolutely indispensable to the maintenance of the prisoners' health, and 2) that there was no justification in any of the camps in question for the suspicions with which we are dealing.

We are not, it is true, allowed to send individual parcels from here: parcels, that is, addressed to particular prisoners by relatives or friends. This, I must repeat, is because men are often transferred from one camp to another; with consequent loss of time and difficulty in delivering a parcel to the addressee. Moreover, sending to *all* our prisoners and not to one favoured individual is in line with the British tradition of equality in all things and permits no prisoner to feel neglected or friendless. This I know you will understand.

ELECTRICITY AND HAYMAKING.

(*"The Electrician," September 25th*, 1942.)

Switzerland, neutral but surrounded by belligerent countries, has found that the importing of fodder and fuel has become very difficult. A special cultivation programme has been drawn up, under which it is hoped the country will become as self-supporting as possible.

A part of this plan is devoted to the creation of sufficient fodder to feed the cattle essential to the country's meat and dairy products. Here the most difficult problem is to get sufficient fodder rich in albumen, and which in normal times can be imported. Most countries are hoping to remedy this deficit by drying green fodder at home.

From Switzerland's viewpoint, however, the problem takes a peculiar form. Drying requires heat, and the present meagre imports of fuel hardly cover the requirements of the population for heating and cooking.

Technically speaking, says an article in the "Brown Boveri Review," drying grass and generating heat electrically are compatible processes, because the first is a summer process and the second can be carried out in summer most advantageously on account of the abundance of water power at that season.

The drying of grass by artificial heat seems a simple one, but is is too often difficult in practice because the process used must be an economical one.

The water content of grass is very high, a little under 20 per cent. of grass is dry substance, and from 100 kg. of grass 80 kg. or more of water must be drawn off. Tests with this amount of wet grass have shown that to achieve the final 20 kg. of dried grass some 95 kWh. of energy is required.

Not only has this heat to be generated, but it must be transmitted to the fodder without loosing too big a proportion of it.

Various means of drying grass had been experimented with prior to the war, but for various reasons none was entirely satisfactory and at the same time economical.

In 1936 Dr. R. Bernstein worked out a project for drying grass combined with heat recuperation.

The idea of using again the heat contained in the steam driven out of the dried product and which would otherwise be lost to atmosphere, by condensing it and thus making it do more drying work, is not a new one, in fact it is almost as old as the technology of drying itself. However, it had almost only been applied in vacuum cookers and apparatus used in manufacturing processes to evaporate solutions.

As the grass handled was in bulk, was very apt to clog openings and was very susceptible to temperature, it was impossible to use containers under vacuum or under pressure. Thus, atmospheric air had practically free ingress to the drying chamber. There thus formed a mixture of steam and air. There was not much difference in temperature between this vapour and the outer air, and the recuperation of the heat of evaporation contained in the vapour did not appear a profitable process and, at the best, the preheating of the incoming fresh air seemed a costly method of reducing the losses. The dimensions and capacity of a dryer depend essentially on the difference of temperature between the source of heat and the material treated. In the case of fuel firing this difference is some 100° C., while in the case of heating by the mixture of steam and air the difference could not be more than a few degrees.

Calculations and tests on the possibilities of heat transmission gave, however, a much more favourable result, in fact so encouraging a one that Colonel Ineichen, President of the Swiss Trieur Institution, imbued by the significance of the idea, and with the progressive support of the Swiss Federal Department of Economics, Section for Agriculture, got the financial backing necessary for an experiemental test on the basis of the design laid before him. Thus by systematic tests the basis was laid for designing an apparatus which promised to give satisfactory economic results. Here the matter rested until Brown Boveri took up the work from another angle. Having occasion to plan the electrification of existing grass-drying apparatus, they came to the conclusion that the amount of power it was necessary to expend made the process worthless from the economic point of view. Heat recuperation, on the other hand, offered the possibility of producing a promising electrical apparatus on condition that the whole drying process were carried out rationally.

From the technical point of view, the task was the following one :— To obtain a sufficient amount of the steam and air mixture, resulting from the electrical heating of the grass and to get this mixture in the best composition into as small a volume as possible, then to transmit as much as was feasible of the heat contained in the mixture to another part of the material being dried this also in as small a space as possible. This problem was solved by means of two drying chests which are strongly ventilated and in a special way, through which the goods being gradually dried are passed successively, being caried on several superimposed endless sieve belts. The latter are so designed that adherence of material to the driving organs does not occur. This used to be feared, as it affected the working and life of the belts. The thermal exchange processes are brought about by new and automatic devices of simple design.

A first trial apparatus was built in the first half of 1940. It was run and tested during several months. The apparatus has an uncovered travelling belt on which it is easy to distribute the fresh grass loosely and evenly, a fan set with air ducts, and the sectioned drying chests from which the dried grass is taken from below. The first tests carried out on the rather primitive apparatus as regards heat insulation and the preparation of the air and steam mixture proved that the saving in heat was greater than in any former apparatus for the same purpose, with a remarkably high quality of the dried grass.

A test carried out in August, 1940, with 333 kg. of grass containing 81.5 per cent. moisture resulted in a final production of 67 kg. of dried grass for an energy consumption of 200 kWh.

In the subsequent period, the experimental apparatus was subjected to more than 30 continuous service tests, in which a variety of working conditions were reproduced, such as might be expected in practice, or as were required to study the working of the apparatus. The mechanical part of the apparatus proved satisfactorily reliable after some alterations. The delicate parts such as the heat exchanger in which the vapour is condensed and the electric air heater could be kept perfectly clean and the cleaning of the drying chamber proved as practicable as in any other drying apparatus.

Further, attendance on the drying machine and adjustment of the drying process itself did not present any more difficulties than were encountered in other drying apparatus, and, as could be expected, the well-known advantages of electricity as regards cleanliness and facility of control showed up here to the full..

THE FURKA-OBERALP RAILWAY.

(“*Modern Transport*,” *17th October*, 1942.)

Switzerland contains a number of noteworthy narrow-gauge railways which can be accurately described as trunk lines, and most remarkable of these is the system formed by the independent Rhætian, Bernina, Furka-Oberalp and Visp-Zermatt Railways, which provides a long east-to-west link between the Cantons of Grisons and Valais. Geographically, the system is most interesting, for it connects the upper reaches of the Rhine, the Rhône, the Inn belonging to the Danubian system, and the Paduan rivers flowing to the Adriatic.

It was not until 1926 that the opening of the recently electrified Furka-Oberalp Railway between Brigue and Disentis closed the last gap between the Rhenish system of the Rhætian Railway and the upper valley of the Rhône. In 1930, the gap between it and the Visp-Zermatt Railway was closed and there was established unbroken communication by metre-gauge railway between the towns of the Rhætian Alps and Zermatt in the shadow of the Matterhorn. The total distance from Landquart on the Rhine to Zermatt viâ this route is just under 133 miles, of which $60\frac{1}{4}$ miles is contributed by the Furka-Oberalp Railway. Between Chur and Landquart, the route runs parallel to the Swiss Federal Railways, while the short metre-gauge line of the Schöllenen Railway connects the Furka-Oberalp at Andermatt with the Federal St. Gotthard line at Göschenen. The Furka-Oberalp Railway had a chequered early history ; work was begun on it in 1910, and it was opened from Brigue to Gletsch in 1915. Operations were then suspended and for years the line remained unfinished. Construction had been started at strategic points and for a while Andermatt had a tragi-comic example of a railway station and yard, complete with a running shed containing one steam locomotive, isolated from all other railways and with its approach tracks petering out into an Alpine wilderness at each end. The marooned engine had been transported to the spot in paris and there erected, for use in pushing forward construction of the line in both directions. The Schöllenen line was not yet built.

In 1923 the company went bankrupt. The completed section was put up for auction, and bought for S.fr.1,250,000 by a syndicate headed by Mr. A. Marguerat, director of the Visp-Zermatt Railway. Work on the unfinished line was then prosecuted with great energy, and, as we have remarked, was completed between Brigue and Disentis three years later. It included a tunnel on the Furka Pass, 1.21 miles long, at an altitude of 7,100 ft. above ordnance datum. A bridge over the Steffenbach gorge was twice wrecked by avalanches, after which a movable bridge was installed at this point, the structure being dismantled in winter when there was no through service over the mountain section between Oberwald and Sedrun, near Disentis, except on the short stretch between Andermatt and Nätschen on the Oberalp Pass, kept running for winter sports traffic. Eleven sections were equipped with Abt rack rails, the total rack-equipped route mileage being $19\frac{3}{4}$ miles. There is a ruling gradient of 1 in 9, and other interesting physical features include the remarkable spiral ascent near Griengiols. Gletsch station takes its name from the adjacent Rhône glacier, and east of this the line crosses the Furka and Oberalp Passes into the valley of the Vorder Rhein.