"Buzz Bomb" jet
Keeps Rails Clear

A refined version of the pulse jet engine that powered Germany's infamous V-1 "Buzz Bomb" (so-named for the erratic roar it produced in flight) is serving as the heart of an experimental heater that National Research Council of Canada engineers hope will end the problem of railway track switch failure due to ice and snow blockage.

Engineers with NRC's Low Temperature Laboratory are currently conducting field trials of a no-moving-parts forced convection thermal heater. It employs a pulse jet combustion burner as the primary nozzle of an air injection pump. The heater is capable of delivering over 1,000 cubic feet per minute of air at 190 to 225 degrees Fahrenheit with a fuel consumption of two gallons per hour of propane.

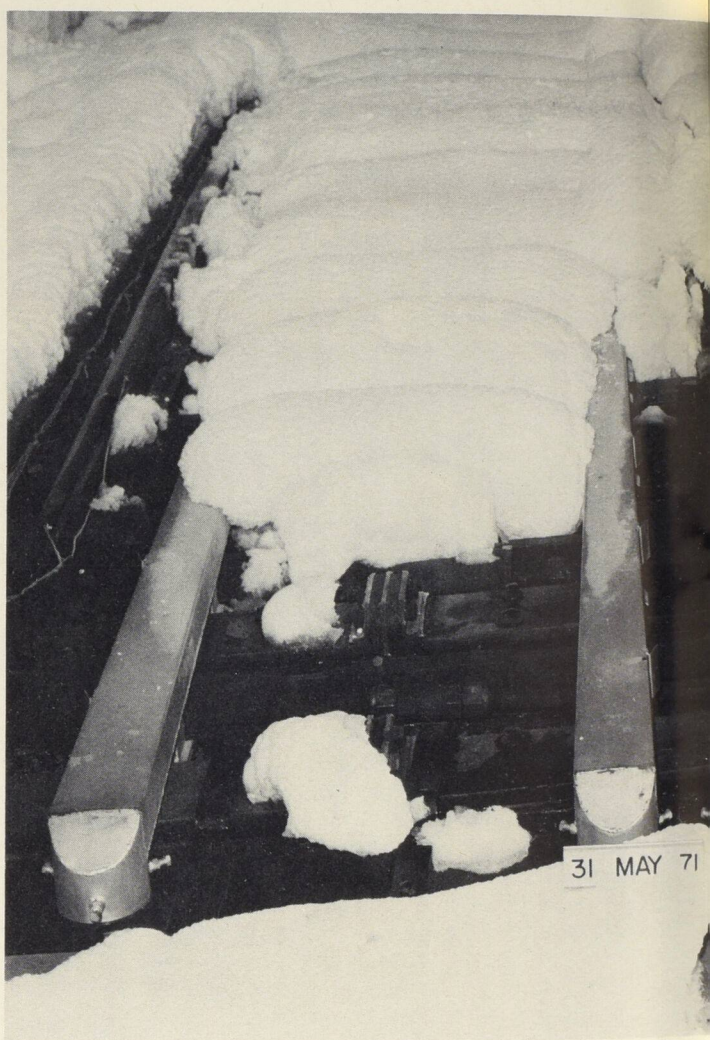
There's nothing new about the use of combustion heaters to vaporize snow and ice from switch points. The first recorded use of heaters was in 1890 when the New York and London urban transit systems put them into service. Heaters in use in this country today generally have been developed for winter climates much more moderate than that of Canada and for that reason have been less than successful in operation.

In the early and more leisurely days of Canadian railroading manual cleaning of switches was the accepted practice. Automation and the elimination of many divisional points in the 1950s drastically reduced the manpower supply along Canadian railway lines. With the introduction of remotely-operated power switches and the concept of centralized traffic control, automatic protection of switches from snow and ice became essential. A variety of heating devices were put into service with indifferent success.

In the 1960s it was found that thermal protective equipment was a mounting problem and Canada's railways turned to the National Research Council for assistance.

The NRC has a system of Associate Committees operating as a coordinating mechanism in the various fields of science. National in scope, each acts as an autonomous unit. Members serve without salary and are drawn from government, university and industrial organizations. Each committee brings to bear knowledge and experience on scientific and technical aspects of current problems of general or regional interest. It was the Subcommittee on Climatic Problems, one of several subcommittees within the Associate Committee on Railway Problems, which undertook to initiate a research program on track switch maintenance problems.

Development of the NRC pulse jet heater began in the winter of 1966-67 when NRC made an initial study of available switch heaters and found none satisfactory. The most effective then available was an oil-fired hot air forced convection heater with an output of less than 200,000 British thermal units (BTU) per hour. The fuel pump, circulating fan, ignition transformer and control system required almost two kilowatts of electrical energy. Much of the trackage in Canada passes through thinly-populated areas where the only power available is that needed for signal and switch operation. Such heaters could not be used in these locations.



Man-made snow covers track switch undergoing tests in NRC's cold chamber. ● Aiguillage couvert de neige artificielle dans la chambre froide du CNRC.

In order to study the problem under controlled conditions, a Canadian Pacific Railway mainline 22-foot switch was installed in the 50-foot cold chamber of the Low Temperature Laboratory. In this chamber temperatures lower than minus 65 degrees Fahrenheit can be obtained with wind speeds up to 40 miles per hour. Snow is manufactured with a set of water atomizing nozzles.

Switch heaters are affected by rate of snow fall, ambient temperatures and wind velocity. While snow fall rates of three inches per hour have been recorded, a long duration storm with a snowfall rate of one inch per hour is usually considered as severe. Heavy snowfalls rarely occur below about zero degrees Fahrenheit.

A test condition of snowfall at one inch per hour with a wind velocity of 15 to 20 miles per hour and an