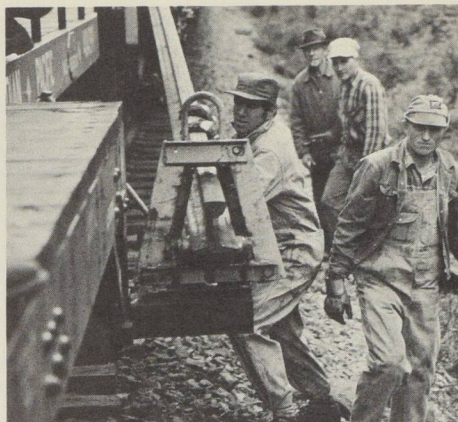
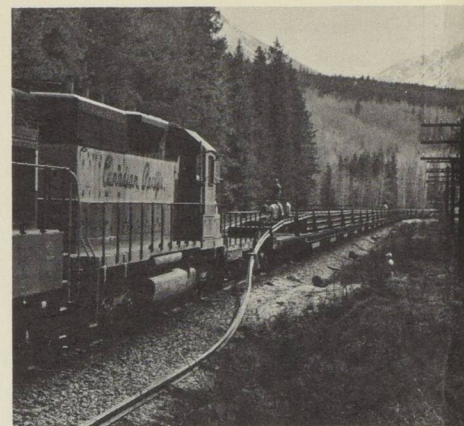


*Rail train snakes around curve below Spiral Tunnels near Field, B.C.  
Convoi de rails soudés près de Field en C.B.*



*Welded rail is unloaded from flat car through threaders.  
Du wagon en plate-forme, les rails soudés passent directement par un dispositif qui facilite leur pose.*



*With end of rail (out of photograph at left) anchored alongside track, engine moves forward, threading the rail onto the ground. Une fois le bout du rail ancré, la locomotive avance, et, grâce au dispositif, le rail est posé.*

(ranging over 200 degrees), the rail snaps or pulls apart in tension.

Research showed the answer to the problem of stress forces was to lay rail in a stress-free condition at the mean annual temperature existing in the area. In Canada this has been established to be about 65 degrees Fahrenheit and the procedure is now described as normalization.

Only short patches of welded rail have been laid to date under a technique that sees track laying crews anchoring the rail at one time and returning when the temperature is at a mean climatic temperature of 65 degrees Fahrenheit to release the rail anchors, let it move and re-anchor it permanently.

The cost of restressing the welded rail in such a manner is estimated at close to \$1,000 per mile by Mr. Wakely.

NRC has been associated with railway research for many years, mainly in connection with locomotives and rolling stock. In 1958, an NRC Associate Committee was formed with membership from the principal railways and NRC and a representative of the Association of American Railroads. As a result, NRC has started on a study of rail behavior.

Last fall, the CPR and the CNR jointly asked NRC to develop a technique for ensuring that welded rails could be reliably brought to the mean climatic temperature before being anchored.

The problem of heating the rails was given to A. J. Bachmeier, Head of

the Gas Dynamics Section of Mechanical Engineering. His section developed special high velocity propane gas burners. These burners, their velocities increased by air pressure of approximately one pound per square inch, are mounted under a hood in series of six pairs. These blast heat against the tracks as the unit moves over the rails at a set rate of 40 feet per minute.

A temperature measuring instrument, designed by C. A. M. Smith of the Instrument Section, is trailed behind at a distance of 15-20 feet (in time half a minute behind the burner) in order to measure rail temperature when it has been allowed to become partially stabilized.

### COOLING SYSTEM

T. R. Ringer's Low Temperature Laboratory was given the task of devising a means of cooling rails to the desired 65 degree temperature needed for anchoring.

A trough with a maximum possible length of 20 feet will be mounted over the rails. Ice from an icemaking car will feed into the trough and onto the rails as the trough slides along at the set rate of 40 feet per minute. The ice melts, turns into water and the latent heat of fusion is used to cool the rails.

Mr. Ringer said this technique will extend the period in which it is possible to anchor welded rails. Often there are only one to two hours per day in which the temperature is just right.

"In some instances, daily temperature fluctuations may make it necessary to use the heater during one part

of the day and the cooler during a later part of the same day", he said.

Initially, according to Mr. Bachmeier, it was considered that a system for heating or cooling rails would be functional only from April through October. However, preliminary tests conducted at the NRC railroad test facility in Ottawa last fall, and winter trials on a 40-mile stretch of welded track on the CPR line north of Toronto, showed that the heater functioned well even in extreme cold conditions and thus welded rail laying becomes practical on a year-round basis, he said.

Spring trials utilizing a 30-mile stretch of continuously welded rail were conducted in the CNR's Mountain Division west of Edmonton. The heater was used to normalize continuously welded rail laid at low temperatures.

Mr. Wakely, whose Track Maintenance Division worked with the Division of Mechanical Engineering on the winter trials north of Toronto, is enthusiastic about test results.

"The cost per mile for re-anchoring is close to \$1,000 while the cost of fuel for Mr. Bachmeier's burners is only in the neighborhood of \$50 per mile.

"If you also figure the cost of each bolted expansion joint to be about \$8 and that we have about 4,000 miles of mainline bolted rail track, then it's easy to see why we are enthusiastic.

"We are on a 15-20 year program to replace all bolted rail with welded rail. I doubt if you'll ever see bolted rail laid again except, perhaps, on branch lines", he said.