A Brief History of Plint Tribology Products

By George Plint

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Former Managing Director – Cameron Plint Tribology Ltd
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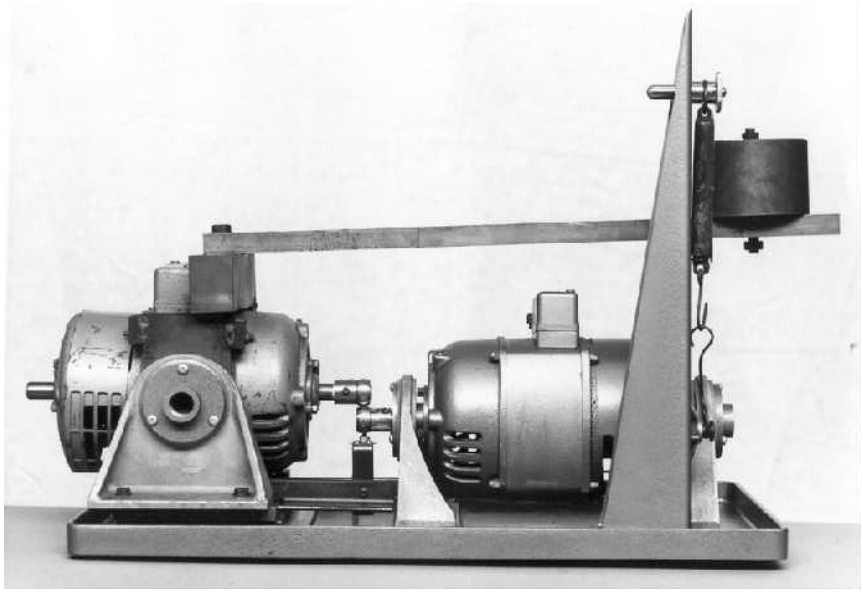
Plint's involvement with the design and manufacture of tribology test machines stretches back to the time before the word itself had been invented!

In the following pages, I hope to take you on a quick journey through the early days of Plint tribology test machines. You may note, perhaps with surprise and, in some cases, alarm, how many of the problems of forty years ago have not gone away!

Work on Traction in Elastohydrodynamic Contacts:

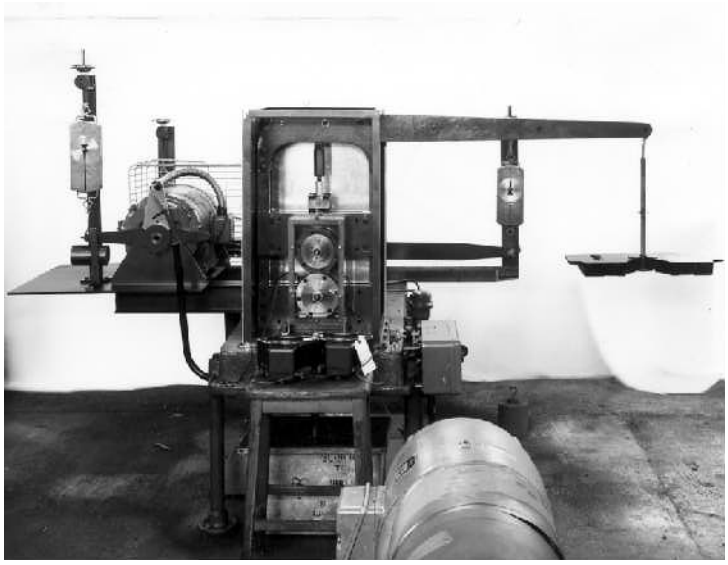
Plint and Partners Ltd was involved in the early development of the Perbury Gear, the original continuously variable toroidal transmission. In the 1960s, long before the advent of thyristor drives and frequency inverters, the Company produced a limited number of toroidal transmission units that were used in rolling mill applications.

Traction in elastohydrodynamic contacts, an essential feature of the toroidal transmission, was the subject of my father's 1967 PhD thesis. Two machines were built for research work, one capable of operating with crowned rollers of just 1 inch diameter, the other capable of accommodating rollers of up to 9 inches diameter.



The one inch two roller machine

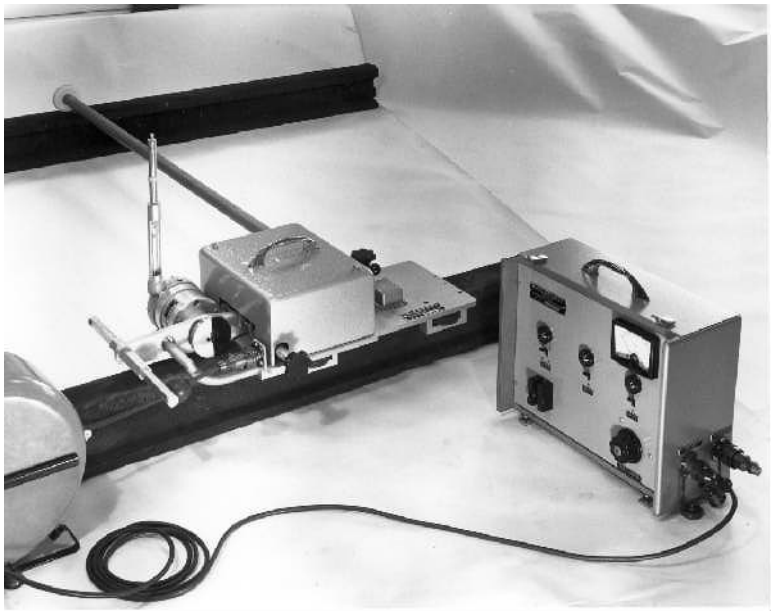
Looks to me as if that motor shaft has bent!



The nine inch two roller machine

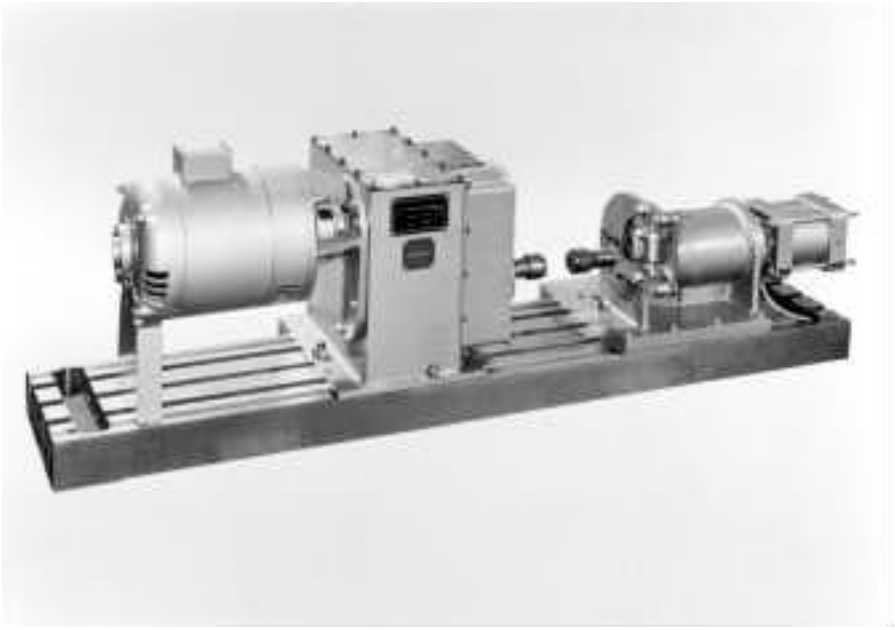
Railway Tribology:

Under the nationalised railway structure in the UK, research was performed at British Rail Research at Derby. Plint and Partners designed and built a number of test rigs for British Rail Research, some of which were offered back to the company following the privatisation of British Rail in 1997 and the effective closure of the Derby research facility. One, a fretting machine was collected as a museum piece, but another, a rail/wheel material fatigue rig was considered too heavy to move and was scrapped.



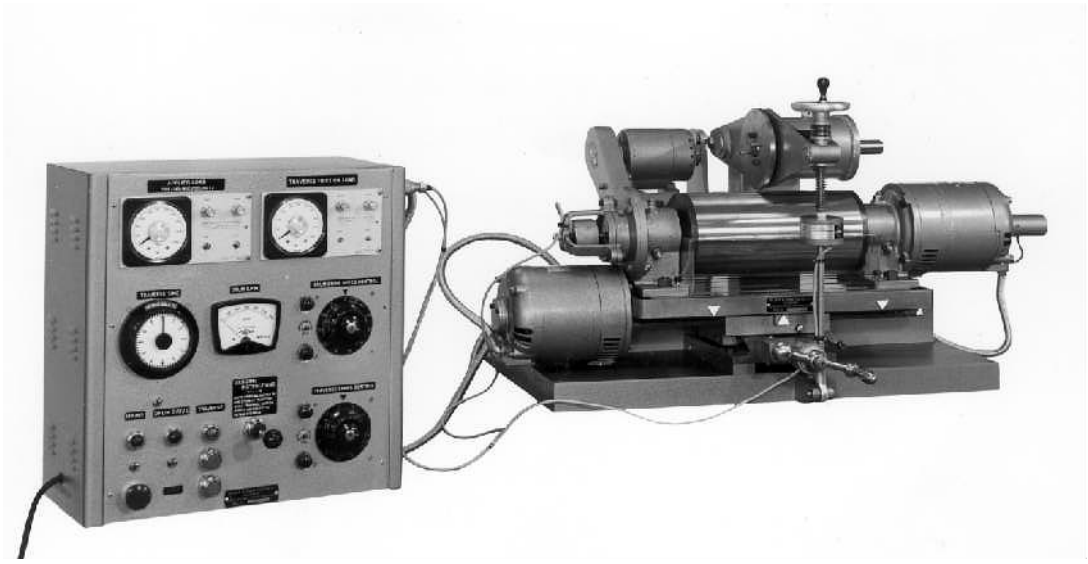
Portable rail friction test machine

This portable test machine measured traction between a small test wheel and the track surface. Thirty years on and the UK railway network is still plagued with the perennial problem of "leaves on the track".



Rotational fretting test machine

This unit was designed to investigate torsional fretting mechanisms and incorporated a complicated indexing gear system to ensure that the machine was not itself destroyed by fretting.

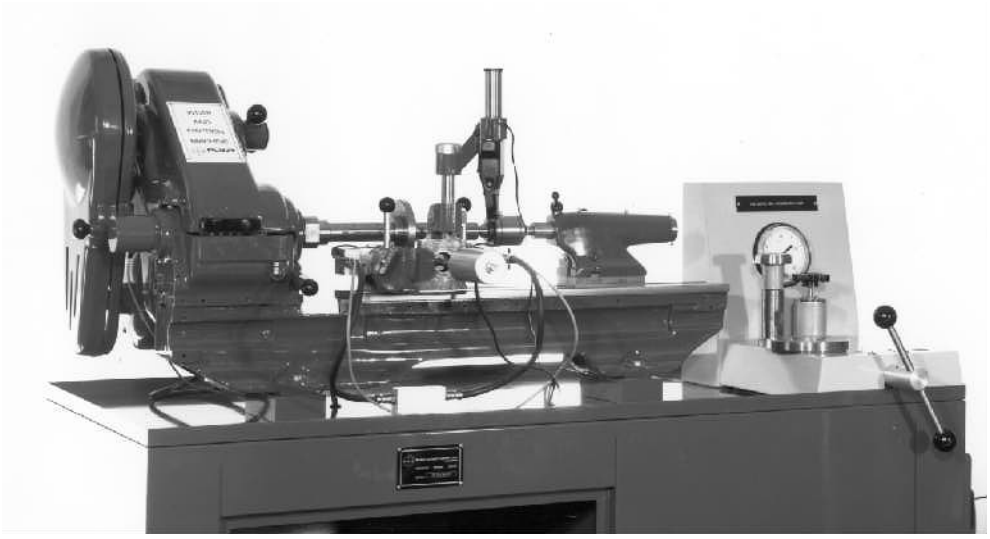


Rail/wheel rolling fatigue test rig

This was one that ended up on the scrap heap, which, in view of recent problems with fatigue failures, might have been a little premature. In the rig, a disc of wheel material is loaded against a drum of rail material. The drum is rotated and the disc is indexed axially backwards and forwards along the length of the drum, thus simulating travel along a length of rail.

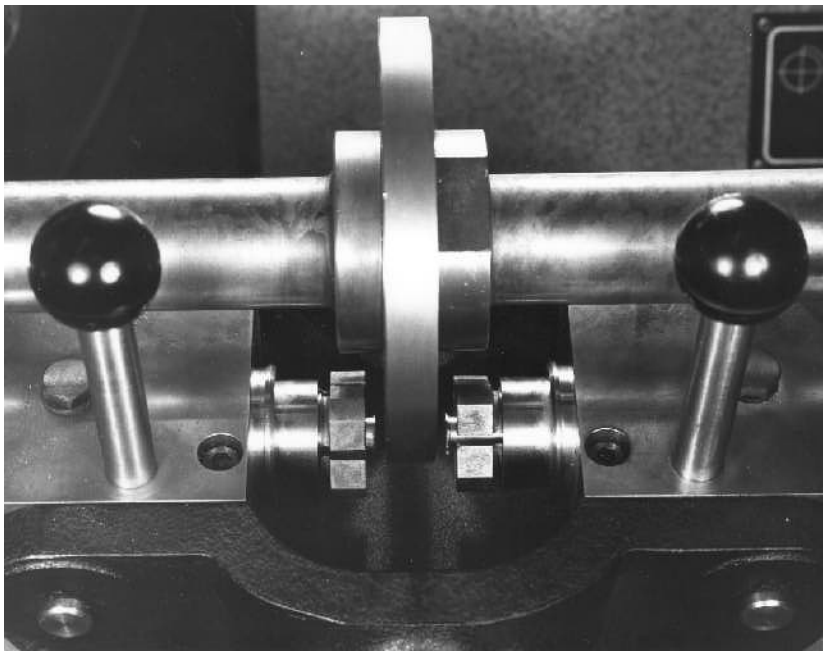
Plint's First Volume Product:

The Company's first volume production tribology test machine was its TE 97 Friction and Wear Test Machine. The design was conceived one afternoon by Dr Michael Plint and Professor Duncan Dowson.



The TE 97 Friction and Wear Test Machine

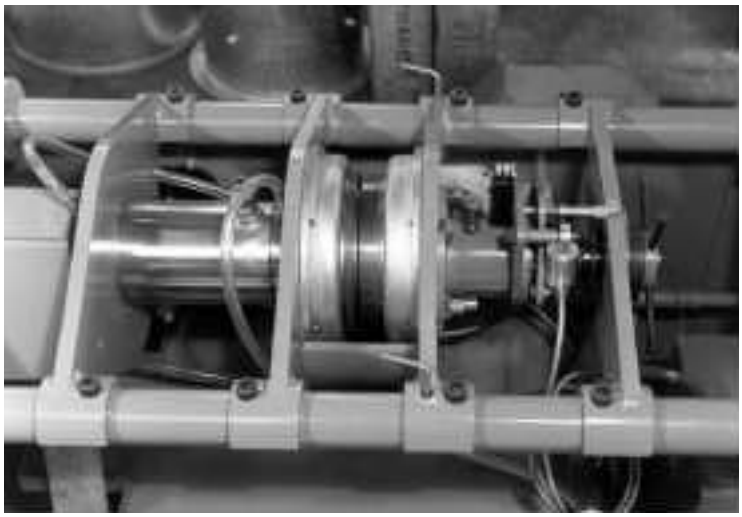
Based on a standard Myford lathe, more than two hundred of this simple but effective device were built, with most supplied to universities around the world. For many students in the 1960s, 70s and 80s, the TE 97 will have been their first introduction to tribological testing.



Close-up of the two pin on disc arrangement

Working Under Pressure:

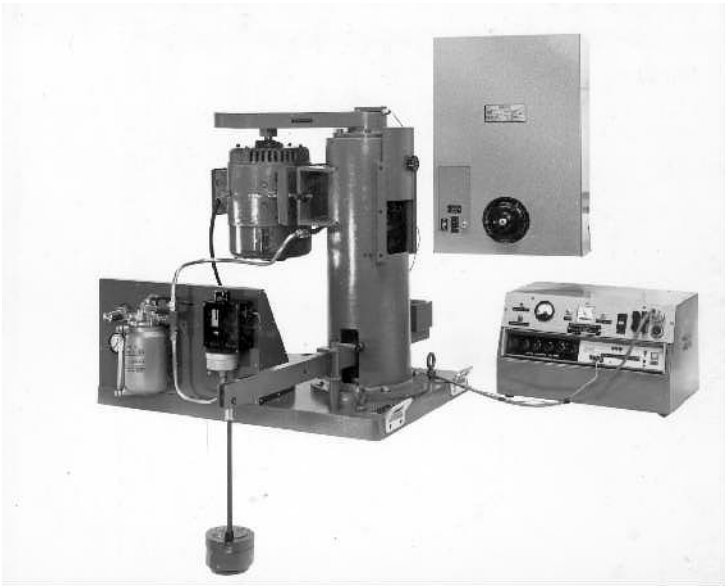
Designing new test machines is always challenging and, with the best will in the world, it is not always possible to get the design "right first time"! I was once accosted by a retired tribologist who claimed "Your father once nearly killed me with a test rig he'd designed"! I think it was probably this high-pressure seal test machine and the potential fatality was as a result of a pressure plug blowing out.



High-pressure seal test machine

High Speed Rolling Fatigue:

The prototype for what became the TE 82 High Speed Rolling Four Ball Machine was designed for Doug Scott at the National Engineering Laboratory at East Kilbride. The original unit was designed to run at 30,000 rpm with an axial load of 3 kN. Following earlier experiences with pressurised test rigs, this high-speed unit was designed with half inch armour.

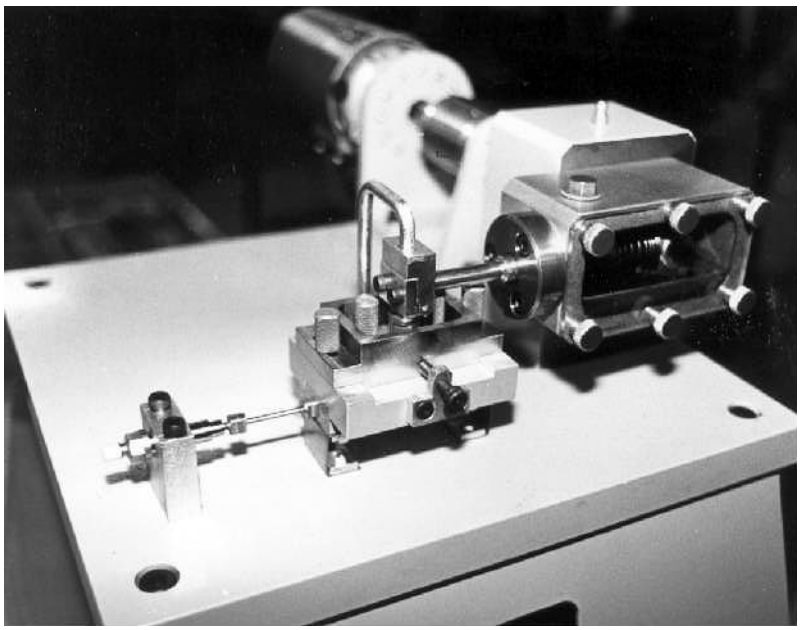


Original 30,000 rpm high speed rolling four ball machine

Arguments About Reciprocating Rigs:

The formation of Cameron-Plint Tribology Ltd in 1982 brought together two rather strong personalities. Everyone will remember Alastair Cameron with a combination of affection and awe – he tended not to suffer fools! My father, on the other hand, will be remembered by some if his employees by one defining statement: "I may have faults, but being wrong is not one of them"!

My role as the founding general manager and then managing director of Cameron-Plint Tribology was frequently that of peacekeeper. The arguments between Cameron and Plint Senior were evident during the design of the original reciprocating rig, my father arguing for a mechanical drive and Alastair arguing in favour of the electromagnetic solution used at Imperial College.



An early prototype for the "short stroke" TE 77

In the end of course, and long after Cameron and Plint had gone their separate ways, we ended up with the TE 77 High Frequency Friction Machine with a mechanical drive, for long strokes and higher loads and the TE 70 Micro Friction Machine with an electromagnetic drive for short strokes and light loads. And of course, much later on we then had to complete the picture by producing our servo hydraulic DN 44 and DN 55 Fretting Test Machines!

George Plint
12 July 2002