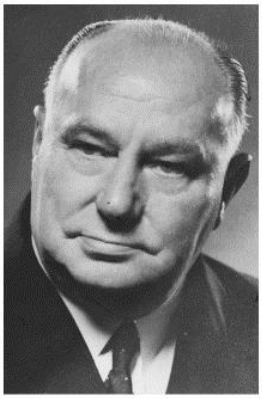
History of Cross, taken from an illustrated presentation by Rodney Cross

Descriptive notes written by Cyril James to accompany photographs based on the illustrated talk presented to the Vincent/HRD Owners Club on 17th September 2015.

No. 1.

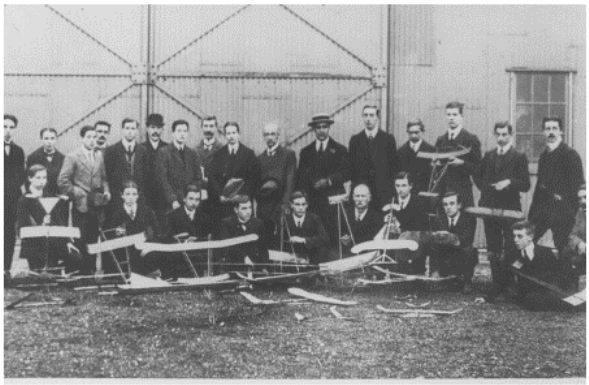


This is Roland Claude Cross (1895 – 1970) in his later years and this talk will provide an insight into his life from the early years as a schoolboy with a profound interest into everything mechanical to starting his own engineering company in 1924 and establishing Cross Manufacturing Company (1938) Limited in the year prior to the outbreak of the second World War. Roland Cross is probably best known for his design and development of the Cross Rotary Valve as an alternative to the poppet valve system for internal combustion engines.

No. 2.

The gentleman featured in this photograph is Henry Cross and with his wife Eliza they had eight children at the family home of 199 Wellsway in Bath. As you can see, Henry was a painter and with a wife and eight children to support not only would he paint a landscape but also decorate your parlour or front room. On occasions he would paint a shop front and do the sign writing. Roland was seventh of the eight children born to Henry and Eliza Cross and being next to the youngest he had older brothers and sister.

No. 3.



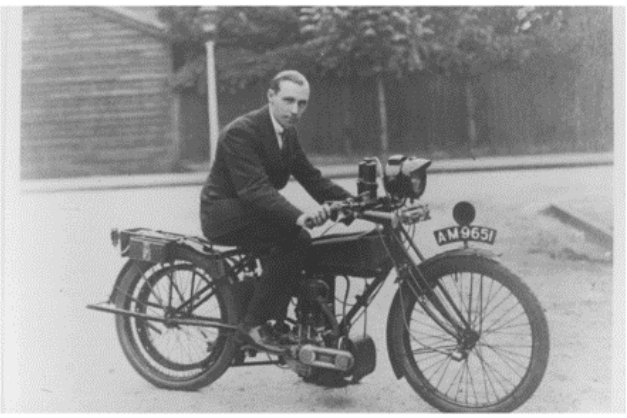
Here is a photograph of the Bath Model Aeroplane Club probably taken at Lansdown on the outskirts of Bath circa 1908. Members of the club vary in age considerably from school age to quite mature and the young Roland Cross is kneeling on the extreme left of the front row with his model aeroplane. Handwritten notes on the original photograph identify Horstmann as the young chap 2nd from the right in the front row. Very interesting to note that both Cross and Horstmann were names destined to be very much associated with engineering in Bath. Notably, a school age Roland Cross was to be appointed Secretary or Treasurer of the Bath Model Aeroplane Club. At one model aeroplane competition young Roland being accompanied by his sister won a cash prize and this prompted his sister to suggest using some of the money for a tram ride home. Roland was not to be persuaded saying they could walk home and he would then use the prize money to purchase new elastic rubber for the propeller of his model `plane.

Although not included in this particular talk we have in our museum, a Post Card given to Roland Cross by Bentfield "Benny" Charles Hucks, a very famous early pilot, when they met at Weston Super Mare in September 1911. I will speak more of this at the end of the presentation.

In 1909 aged 14 years Roland left school and was initially employed at Chesterman`s, a solicitors practice in Bath. A "respectable" job but, over a fairly short period of time the Partners at the firm realised that the legal profession was not where Roland wanted to be and that this young man was really an engineer in the making. Thereby was a problem, as in the days of the early 1900s your parents would be required to pay the employer or "Master" for an apprenticeship and with several children to support (although some had left home by this time) this would possibly stretch the family finances.

By a stroke of good fortune this difficulty was resolved as one of Roland`s older sisters had married a Church Minister and was living in Dumfries. The good fortune aspect was, in Scotland unlike England, apprenticeships were free. Roland was successful in securing an apprenticeship at the Arrol Johnston Motor Works in Dumfries where the early (pre-World War One) Arrol motor cars were designed and built. His enthusiasm and engineering ability did not go unnoticed and with a desire to return to the West Country it was Mr W.H. Hopkins, Chief Designer at Arrol Johnston who wrote in very complimentary terms to Frank Barnwell at the British & Colonial Aeroplane Company based at Filton in Bristol. This introduction resulted in Roland Cross becoming a member of the Design Team at Filton.

No. 4.

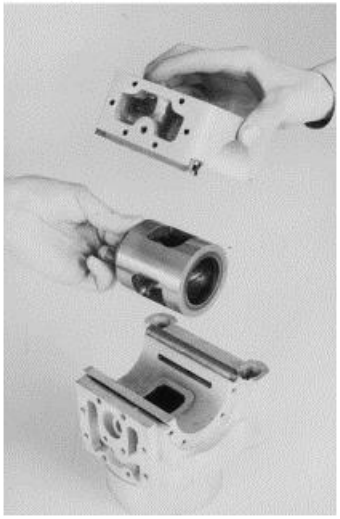


This photograph circa 1916 is of Roland Cross astride his 450cc Triumph side valve engine motorcycle used as his mode of transport from Bath to Filton each day. Being somewhat disillusioned with the engine performance and the road holding capabilities, modifications to both the engine and girder forks were very quickly designed, made and installed. The motorcycle engine and forks are exhibition items in our museum with the Roland Cross designed and manufactured hydraulic damping attachment to the forks being of considerable interest as too are the engine improvements.

No. 5.

A project to build a replica of the “Bristol” fighter used in the First World War was undertaken some years ago. When reviewing the original drawings as part of the project it was found that as a member of the Design Team at Filton it was Roland Cross who had designed the under-carriage, gun mountings and engine mountings and his name and signature was found to be on these original drawings. This is a photograph of the replica “Bristol” fighter in flight with the Roland Claude Cross designed undercarriage and machine gun mountings on the side of the `plane clearly visible.

No. 6.

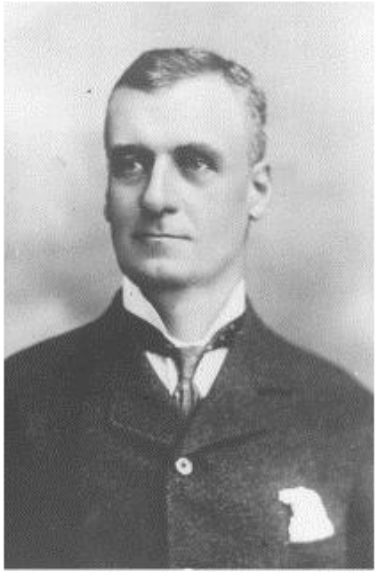


From the first design in 1922 this picture is of a later model Cross Rotary Valve. Chain driven from the main-shaft there are no push rods, poppet valves or valve springs. It proved to be extremely efficient and greatly increased the power of the engine. Roland Cross continued to develop his Rotary Valve engines for both motorcycles and motor cars until the 1950s. Characteristics of a Cross Rotary Valve engine were not limited to just an increase in power output, although that was clearly evident. It was the absence of conventional poppet valves and springs that facilitated a high revving capability with no risk of "valve bounce". Engine speeds of 7,500 rpm were easily achieved and road speeds of almost 100 mph being recorded from 500cc single cylinder engines in the mid-1930s. There will be more detailed information later in the talk.

No. 7.

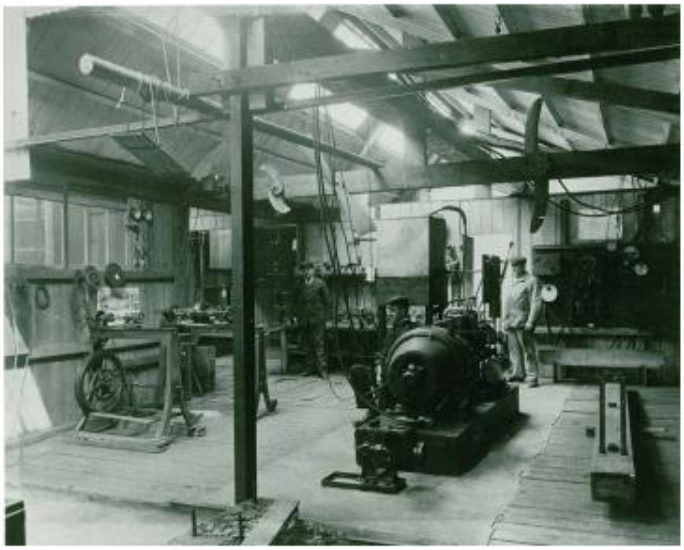
This is a photograph of the Patrick Alexander Building. It is now the museum on site at our Head Office & Works Office at Midford Road in Bath. Named after Patrick Young Alexander, the pioneer aeronaut who, in the late 1890s and early 1900s used the building as his workshop to construct his gas balloons. Roland Cross started his engineering business in this building in the 1920s.

No. 8.



A photograph of Patrick Alexander (1867 -1943) who benefitted from an inheritance upon the death of his father in 1890 of some £60,000, a considerable sum of money that would equate to some £5.96 million in 2016. Alexander used his inheritance to further his ideas and ambitions related to the development of his gas balloons. As time progressed more space was required and Patrick Alexander moved from his workshop at Midford Road in Bath to larger premises situated at The Mount, Batheaston, on the other side of the City.

Nos. 9 & 10.



Two photographs of the interior of Alexander`s workshop at The Mount and particular notice should be taken of the propellers suspended on the cross-beams, beautifully carved from presumably solid pieces of wood. One hundred years on the hand carved profile is very similar to what would be produced from a Computer Aided Design programme of today.

No. 11.

Taken in the garden at The Mount, Batheaston, this photograph shows a group of local Dignitaries assembled with Patrick Alexander and his gas balloon tethered and inflated just above the greenhouse. Many years later with some excavation work in progress a cast iron cylindrical object was unearthed. No, not a bomb or World War One shell but the redundant gas supply pipe specifically installed for Alexander to inflate his balloons with town (coal) gas.

No. 12.

The year is 1902 and the photograph is of Patrick Alexander and a group of important people assembled at Sydney Gardens in Bath. This was a historical occasion as the event was to celebrate the centenary of the very first “heavier than air” ascent by man in 1802. To the left of centre in the photograph wearing a straw boater hat is Patrick Alexander and in the very centre wearing the wide brimmed hat is Samuel Franklin Cody from America, famous for being the first man in1908 to pilot an aeroplane in this country. Second from the left in the picture with bowler hat and walking stick is Charlie Rolls who, with Frederick Henry Royce founded Rolls Royce. Pictured to the left of Patrick Alexander wearing a bowler hat is the President of the Royal Aeronautical Society, Baden Fletcher Smyth Baden-Powell, the brother of Robert Stephenson Smyth Baden- Powell, founder of the Boy Scout movement.

No. 13.

The year is now 2002 and to celebrate the bi-centenary and centenary of the first balloon flight in 1802 and the recognition in 1902 to mark 100 years of that flight, a party of important people assembled in Sydney Gardens, Bath to again make an ascent, but this time by hot-air balloon not a gas-balloon as was used by Patrick Alexander in 1902. With some trepidation Rodney approached Bath & North East

Somerset Council to suggest recognition of this important historical occasion with an ascent from Sydney Gardens, albeit fearing Health & Safety legislation or some obscure by-law might be a problem. By amazing coincidence the Parks Director was David Littlewood, a balloonist who not only granted permission but offered to pilot the balloon himself. The assembled party consists of (left to right), Mr Rodney Cross (Chairman, Cross Manufacturing Company), Russell Frears, Stuart Burroughs (Curator, Bath at Work Museum), John Wragg (Main Board Director, Rolls Royce), Peter Norris (President, Royal Aeronautical Society), Don Foster (M.P. for Bath), Cllr. Lorainne Morgan- Brinkhurst (Mayor of Bath) and David Littlewood (in the basket).

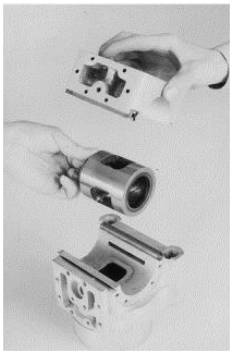
No. 14.

Taken in the early 1960`s this is a photograph is of the Patrick Alexander building used by Patrick as a workshop for the construction of his gas balloons to make ascents from Bath. The building was quite small for the purpose and this persuaded Patrick to look for larger premises at Batheaston on the other side of Bath. Used at the time of the photograph as the Tool Room it is now restored and preserved as the Company Museum.

No. 15.

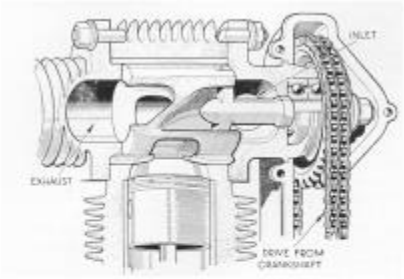
This is a recent photograph of the Patrick Alexander building in its restored condition as the Cross Manufacturing Company Museum.

No. 16.

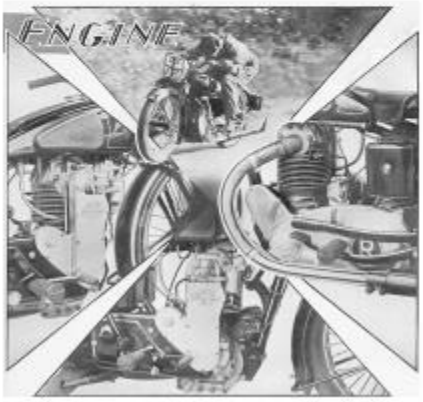


Roland Cross designed the ingenious and revolutionary Cross Rotary Valve as an alternative to the standard “poppet valve” arrangement. The photograph shows the base of the Rotary Valve assembly on top of the cylinder, the Rotary Valve with the ports clearly visible and the top section of the cylinder head. Documents preserved in the company archives record Cross Rotary Valve engines in 1934 running at 7,500 rpm at 10.5 to 1 compression ratio on low octane fuel and achieving nearly 100 mph.

No. 17.



The Company was established by Roland Cross in the 1930’s to develop his rotary valve engines.

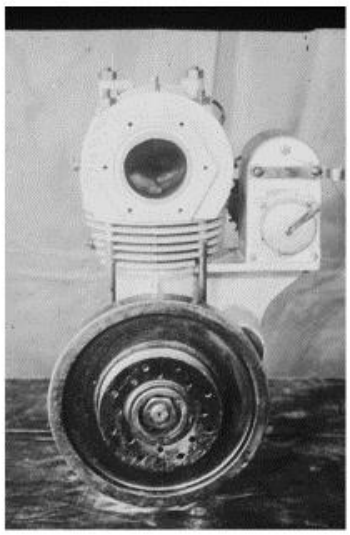


Conventional iron piston rings did not survive for long in his high revving engines so he developed a process for making rings from wire.

CROSS

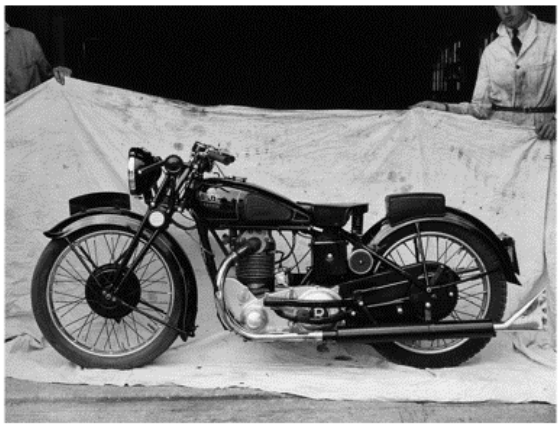
With the outstanding performance of Cross Rotary Valve engines, a problem emerged in that the conventional cast iron piston rings failed in the high revving powerful engines, damaging the aluminium liner-less cylinders and special pistons. This persuaded Roland Cross to develop a process for making piston rings from drawn high carbon steel wire. This process has been further developed over time for the manufacture of sealing rings and piston rings used in the aerospace, power generation and automotive industries of today. Unquestionably, the success of Cross Manufacturing Company is a result of this.

No. 18.



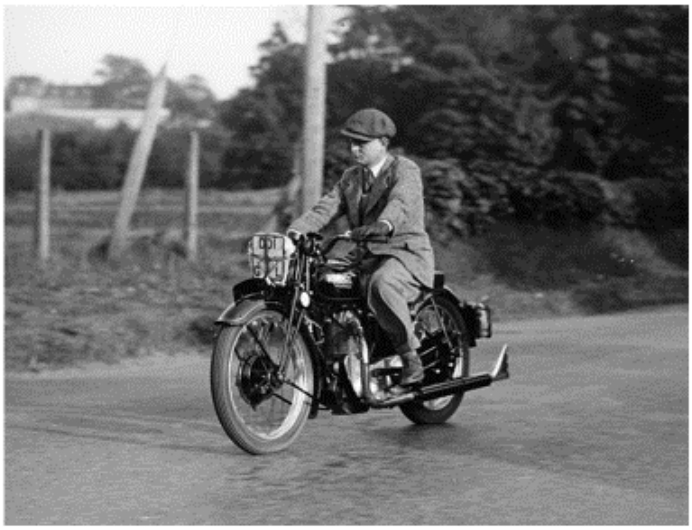
After harbouring the idea of a rotary valve alternative to the poppet valve engine system for some time Roland Cross built his first Cross Rotary Valve engine in 1922.This is a photograph of that very first engine which is now displayed in the Cross Museum.

No. 19.



In 1938 a Rudge Ulster motorcycle was purchased and, after removing the standard cylinder, cylinder head and piston, the bike was fitted with a 350cc Cross Rotary Valve arrangement. Henry Laird, the celebrated motorcycle Journalist and Correspondent writing for the “Motor Cycling” magazine, was sent to Bath by his Editor to meet Roland Cross and road test the machine. Henry Laird`s report was published in the “Motor Cycling” on 1st June 1938. Copies of the report are preserved in our company archives. Henry Laird was complimentary indeed commenting on the “quietness” and “smoothness” of the engine. A very creditable 87 mph maximum speed was recorded at 6,250 rpm and amazingly this was achieved using low grade petrol. Power output of 25 BHP was recorded from bench tests.

No. 20.



This photographs is of Henry Laird carrying out the road test of the Cross Rotary Valve powered Rudge Ulster probably during May 1938, subsequently to be published 1st June 1938 in the "Motor Cycling" magazine.

No. 21.

Henry Laird during May 1938 riding the Rudge Ulster with 350cc Cross Rotary Valve engine "head down – going hard" on his way to achieving the 87 mph maximum speed as recorded in his magazine report.

No. 22.

Taken outside of the Patrick Alexander building at Bath Works this photograph is of Frank Milsom and Roland Cross with GL 1722, an HRD/Cross 500cc Rotary Valve motorcycle. A I.O.M. TT rider living in Bath and wearing his racing leathers, Frank Milsom was Chief Tester for Roland Cross. The photograph can be accurately dated as 1934 with the machine as supplied and registered to Mr Roland Cross on 15th August of that year. Purchased from HRD as a Model P "rolling chassis" (frame, wheels, petrol tank, handlebars, saddle, etc.), from information provided by the late John Mellor of Vincent/HRD Owners Club, it was built by Ted Hampshire, known for producing their T.T. racing frames and "signed off" for delivery on 6th July 1934 by none other than Phil Irving himself. It was then fitted with a 500cc Cross Rotary Valve engine with drive through a Burman four speed foot-change gearbox. This motorcycle in its developed form mid-1930s was to achieve almost 100 mph at 7,500 rpm at 10.5 to 1 compression ratio. This motorcycle, of immense historical importance, remains in the ownership of Cross Manufacturing Company and is exhibited in the Company Museum.

No. 23.

Frank Milsom in racing leathers sitting astride the HRD/ 500cc Cross Rotary Valve.

No. 24.

Recognition indeed!! The HRD/Cross Rotary Valve – GL 1722 after being awarded the exhibit with “Most Technical Interest” at the 2008 Bristol Classic Bike Show. A very proud moment.

No. 25.

Bristol Classic Bike Show held at the Bath & West Showground, Shepton Mallet in February 2014. Another success!! The exhibit of “Most Technical Interest” in the show for the second occasion. The photograph shows Cyril James holding the prized award with colleague Ken Rees.

No. 26.

And again!! The HRD/Cross Rotary Valve display at the 2015 Bristol Classic Bike Show, Shepton Mallet, for the third time awarded “Most Technical Interest” exhibit in the show. To my knowledge no exhibit has ever been awarded this accolade on three occasions. Roland Cross would have been justifiably so proud.

No. 27.

Cyril James receiving the award on behalf of Cross Manufacturing Company at the Bristol Classic Bike Show 2015 from Stan Dibben, the 1953 World Championship sidecar passenger to Eric Oliver.

No. 28.

Displaying an expression of absolute pleasure, this is Cyril riding the 500cc Cross Rotary Valve powered 1934 HRD on the perimeter road at Cross Manufacturing Company, Office &Works at Midford Road in Bath. The photographer on this occasion was Andy Westlake, a motorcycle journalist and historian, with the photographs included in his article written and published in The Classic Motor Cycle magazine in 2008. The article was entitled "The Cross Rotary Valve HRD is running again after 47 years – Cyril James back in the saddle". The title originated from Cyril as a 17 year old teenager in 1959 and keen motorcyclist being asked by Roland Cross to test-ride the works Royal Enfield 250cc Crusader. Des Cormack, after joining Cross Manufacturing Company in 1940 and working with Roland Cross as his engineer and engine technician, had reluctantly decide to further his career with CNC Ralphs, the "engineering side" of Clarks Shoes. This left the Company without a motorcycle road tester and Cyril, together with Bill Bolton, was invited to fill the vacancy. Work to further develop the Cross Rotary Valve engines had almost ceased and GL 1722, the 1934 HRD 500cc Cross Rotary Valve, was parked in one of the workshops unused. After completing many thousands of miles test riding 250cc Royal Enfield Crusader JGL 257, the thought of being allowed to ride GL 1722 the 1934 HRD/Cross Rotary Valve was prominent in Cyril`s mind. On requesting permission to ride the HRD/Cross Rotary Valve machine the response from Mr Cross was "My son, if you can start it, you can ride it". After a massive "kick-back" that removed the gusset strap from his motorcycle boot, Cyril did start the bike and rode out onto Midford Road and then along the A367. What an amazing experience to ride this bike which was powerful and yet quite docile and quiet (no valve gear noise) with enormous torque and so flexible. And, the year was 1961. From that date GL 1722 was returned to storage and only used as a "static exhibit" at shows and rallies until 2008 when Chris Hawkings, a Cross Manufacturing engineer and former motorcycle technician, was asked to do what was required to return the bike to "running order" again.

No. 29.

Les Martin sits astride the Rudge 500cc Cross Rotary Valve engine machine outside of the Patrick Alexander Building at the Midford Road works in Bath. This machine was designed and built by Roland Cross to compete in the 1935 Isle of Man T.T. Although an established road racer, Les Martin was not in the “top order” of T.T. riders and the engine of the bike in this photograph could not be completed and tested in time for shipping to the I.O.M. for the T.T. Another older 500cc Cross Rotary Valve bike was sent as a substitute together with a 250cc model. The 250cc bike, competing in the Lightweight Class, performed well in practice with Martin ahead of Paddy Johnston on the Cotton Works machine and Omobono Tenni on the works Moto-Guzzi. Unfortunately, Martin lost control and fell off injuring his knee and this resulted in Roland Cross having to hurriedly arrange for Alf Brewin to ride the 500cc Cross Rotary Valve bike in the Senior race. This bike (the replacement model) suffered engine problems and is recorded as DNF (“did not finish”).

No. 30.

This is the 500cc Cross Rotary Valve engine designed and produced for the 1935 Isle of Man T.T. It is now an exhibit in our museum.

No. 31.

The location is Branch Road at Hinton Charterhouse that links to village with the A36 Bath to Warminster Road. Really just a lane but fairly flat and quite straight it was a favourite location much used by Roland Cross for testing and demonstrations of his motorcycle and car engines. This photograph is of a Rudge Ulster based bike with a Cross Rotary Valve engine being ridden at high speed by Ted Cross (Roland`s nephew). In the mid 1930s not too much consideration to other traffic was necessary.

No. 32.

Much is known regarding the exceptional torque of a Cross Rotary Valve engine and to prove this the steep hills around the village of Southstoke were used to demonstrate not only hill climbing capability but the fact it could be achieved in a high gear.

No. 33.

Again, a photograph of the Rudge Ulster based bike with a Cross Rotary Valve engine of probably 500cc capacity being ridden up the hill at Southstoke. Carefully observe the photograph and you will clearly see the metal bars inserted across the road surface. This was to provide a system whereby horse transport could find “grip” on this exceptionally steep hill, but the Cross Rotary Valve powered bike climbs the gradient with ease and probably in third gear.

No. 34.

As previously mentioned, the Cross Rotary Valve engines were known for their torque and the ability to accelerate from low speeds in a high gear. To demonstrate this we have a picture of Roland Cross striding along Branch Road, Hinton Charterhouse at a brisk walking pace and his nephew Ted Cross riding GL 1722 the HRD/Cross 500cc bike in top gear. Look carefully at Ted`s left hand, he is not “slipping” the clutch.

No. 35.

Yet more evidence of the exceptional power of a Cross Rotary Valve engine as the rider almost reaches the top of the hill through Southstoke village. The motorcycle is again GL 1722 the HRD/Cross Rotary Valve. Who is the rider? We would like to know. Many motorcycle journalists or correspondents came to Bath to test and then write reports on the Roland Cross designed and developed engines, but this one we do not recognise. It has been suggested that it could be a young Phil Irving who was Design & Development Engineer at Vincent HRD in the 1930s and there is some logic in this as it was rumoured that Vincent HRD were considering using Cross engines for their machines during the mid1930s. Previously they had used Rudge engines before producing their own Vincent power units. The book "Black Smoke" by Phil Irving and published by Research Publications Pty. Ltd. of Surrey Hills, Victoria, Australia contains a photograph of Phil Irving M.B.E., C.Eng., F.I.Mech. Eng., M.S.A.E. (Aus.) and there is an amazing resemblance in the photograph taken of Phil Irving in later life to the rider in the 1930s photograph riding the HRD/Cross Rotary Valve machine at Southstoke.

No. 36.

Again, GL 1722, this time being ridden by Ted Cross and negotiating the sharp, steep corner at the top of the hill at Southstoke. Almost certainly in a high gear to once again demonstrate the exceptional torque of a Cross Rotary Valve engine. In the background is another motorcycle ready for demonstration and a group of onlookers to witness the performance of the Roland Cross engines. Could one of the group be Phil Irving? It is a distinct possibility, particularly with the Vincent/HRD and Cross connection.

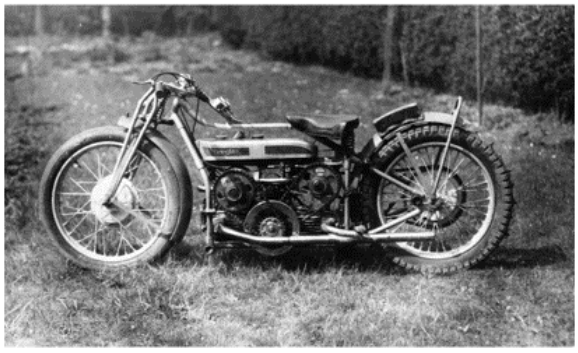
No. 37.

This picture has been taken at the same location in Southstoke but from a different angle and shows the rider (possibly Phil Irving) easily negotiating the sharp corner after completing the steep climb through the village. The car in the background is the vehicle in which Rodney Cross was taught to drive.

No. 38.

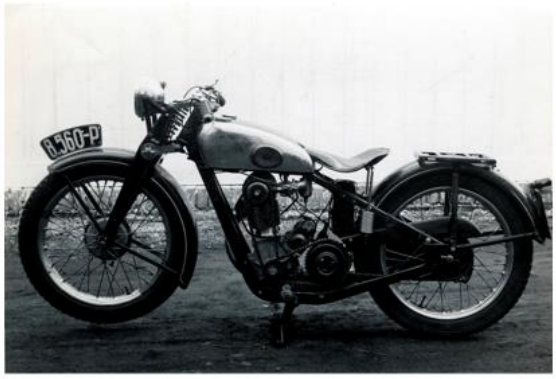
The 500cc Cross R.V. powered HRD machine with “two-up” rider and pillion at the top of the hill in another example of the pulling power of the Cross engine. With a little imagination one can almost hear the mellow but distinct exhaust note as the engine easily powers the bike and two passengers on this steep and tortuous hill.

No. 39.



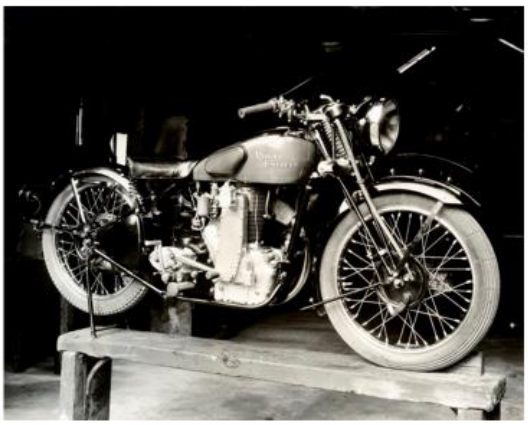
This photograph was in our archives, but with no accompanying details we were originally at a loss to identify the machine or how or why it was related to Roland Cross. That is until we were invited to present an illustrated talk to the Dorset Section of theVintage Motor Cycle Club at Pulham Village Hall a few years ago. On showing the photograph we mentioned our dilemma to which a member of the audience at Pulham responded saying “That is a Douglas SW5 Grass Track Bike”. We had struggled to identify any Roland Cross involvement or design and the engine certainly did not look like a Cross Rotary Valve design. From ongoing research it has been discovered that it is a “blown” or “supercharged” engine and with Douglas Motorcycles based at Kingswood just a few miles from Bath it seems most likely that Cross liner-less cylinder barrels, piston rings or pistons are part of the engine.

No. 40.



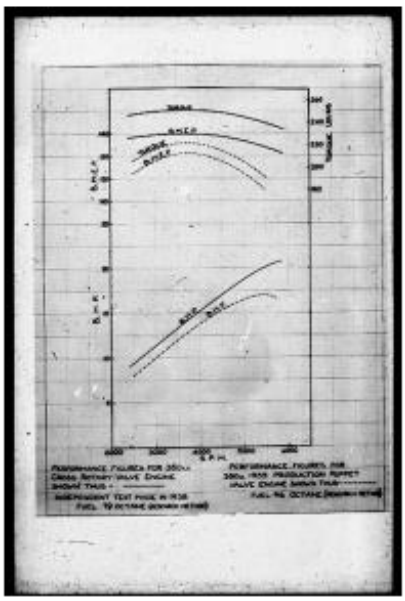
We cannot identify the make and model of this bike but, what we do know is that there is a most interesting story behind the photograph. This bike was owned by a gentleman from Czechoslovakia who commissioned Roland Cross to produce a Rotary Valve engine for the bike. The owner rode his bike overland from his home in Czechoslovakia to Bath where the engine was installed and then ridden home again. With the clouds of World War Two already beginning to form we have often wondered what became of the bike and Cross engine or more importantly the owner.

No. 41.



A Royal Enfield late 1930s model with a very pleasingly designed Cross Rotary Valve engine of possibly 350cc capacity. The photograph was taken outside of the Patrick Alexander building used by Roland Cross as his original workshop at Midford Road, Bath.

No. 42.



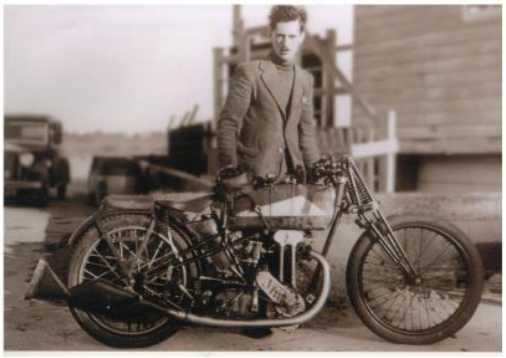
Throughout this illustrated talk the amazing torque characteristics of a Cross RotaryValve engine has been mentioned quite regularly. This graph recording the B.M.P.E. (Brake Mean Effective Pressure) shows the comparison with a conventional “poppet valve” engine.

No. 43.

This is motorcycle history. An aluminium linerless barrel of 250cc capacity complete with a special piston and piston rings designed and manufactured by Roland Cross for Eric Crudgington Fernihough in1935. This amazing story just has to be told!!

Eric Fernihough was a very well known racing motorcyclist with a garage and an Excelsior motorcycle franchise near to Brooklands, the famous racing circuit. Fernihough, as well as being a successful racing motorcyclist, also had a seemingly insatiable desire to break records. In 1935 he decided to make an attempt on the 250ccWorld Motorcycle Speed Record from 500 kilometres to 10 hours at Brooklands circuit. Knowing of the successes and achievements of Roland Cross with his aluminium liner-less cylinders, special pistons and almost unbreakable piston rings produced from drawn wire, it was Fernihough who commissioned Roland Cross to design and manufacture a special cylinder, piston and rings. These components are pictured in this photograph and, having been removed from the engine for evaluation following the record breaking event, they are exhibits from our museum in Bath.

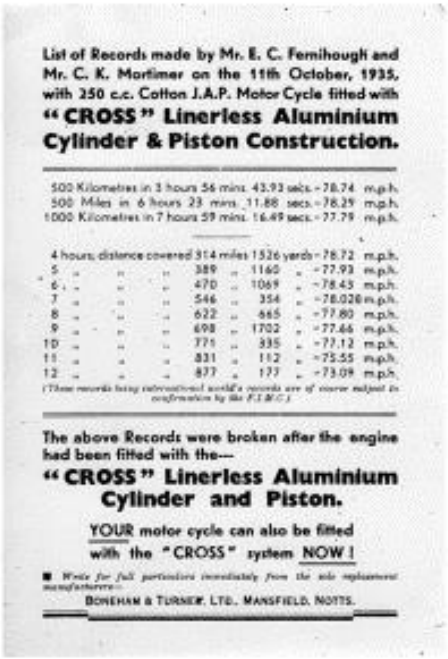
No. 44.



Eric Fernihough had a reputation for detail, precise planning and engine preparation. The record attempt was arranged for 11th October 1935 to commence at 8.00 am and, if successful, finish the 10 hours at 6.00 pm. The resident tyre expert at Brooklands affectionately known as “Dunlop Mac” had been consulted

and advised that although the concrete surface was known to prematurely wear tyres, they should last the distance. One of the finest motorcycle engine tuners of the day, Dick Chapman, was to prepare the 250cc JAP engine fitted with the special Cross barrel, piston and rings and this photograph shows Chapman with the Cotton/JAP machine just before the record attempt began at 8.00 am. Fernihough had persuaded Charles Mortimer, another well known Brooklands circuit competitor, to be his co-rider for the event with both men riding in 2 hour stints. A large capacity petrol tank had been expertly produced for the record attempt by Dick Chapman. It was questionable why Fernihough, having an Excelsior dealership, chose to use a Cotton motorcycle for the record attempt. One suggestion was that the Cotton frame had superior road holding characteristics but others suspected that Frank Willoughby Cotton probably owed Fernihough money for development work carried out for Cotton Motorcycles and the supply of the bike was some form of settlement.

No. 45.



List of Records made by Mr. E. C. Fernihough and Mr. C. K. Mortimer on the 11th October, 1935, with 250 c.c. Cotton J.A.P. Motor Cycle fitted with

"CROSS" Linerless Aluminium Cylinder & Piston Construction.

500 Kilometres in 3 hours 56 mins. 43.93 secs. = 78.74 m.p.h.
500 Miles in 6 hours 23 mins. 11.88 secs. = 78.29 m.p.h.
1000 Kilometres in 7 hours 59 mins. 16.49 secs. = 77.79 m.p.h.

4 hours distance covered	314 miles	1526 yards	= 78.72	m.p.h.
5 " " "	389 "	1160 "	= 77.93	m.p.h.
6 " " "	470 "	1069 "	= 78.43	m.p.h.
7 " " "	546 "	354 "	= 78.028	m.p.h.
8 " " "	622 "	665 "	= 77.80	m.p.h.
9 " " "	698 "	1702 "	= 77.66	m.p.h.
10 " " "	771 "	335 "	= 77.12	m.p.h.
11 " " "	831 "	112 "	= 75.55	m.p.h.
12 " " "	877 "	177 "	= 73.09	m.p.h.

(These records being international world's records are of course subject to confirmation by the F.I.M.C.)

The above Records were broken after the engine had been fitted with the—

"CROSS" Linerless Aluminium Cylinder and Piston.

YOUR motor cycle can also be fitted with the "CROSS" system NOW!

■ *Write for full particulars immediately from the sole replacement manufacturers—*

BONEHAM & TURNER, LTD., MANSFIELD, NOTTS.

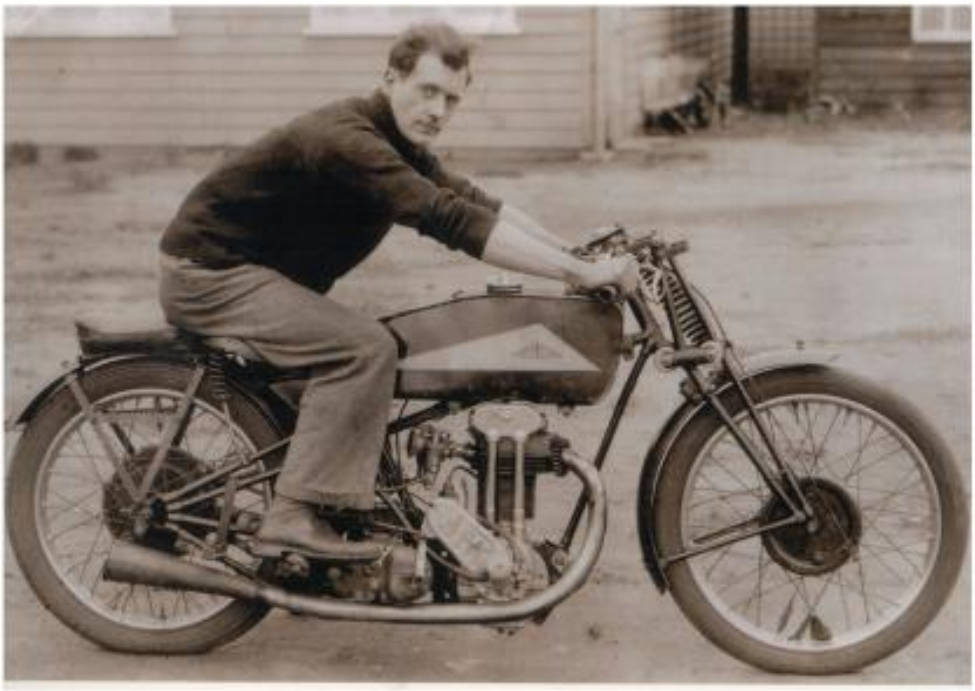
These are the details of the 12 World Records for a 250cc motorcycle made on 11th October 1935 at Brooklands.

The original plan was to make an attempt on the 500 kilometres to 10 hour record but, with the machine and the Roland Cross components performing so well after 10 hours with all World Records broken, Fernihough approached George Reynolds the ACU Official Timekeeper to ask permission to continue for further 2 hours. George Reynolds agreed but as time passed and daylight fading it was becoming increasingly difficult to see on the unlit Brooklands circuit. Frenihough had recently had an appendectomy and although a sponge rubber pad had been fitted to the petrol tank to protect the incision it was Mortimer who was to ride the last 2 hours session. Mortimer returned to the pit area to say the

failing light was making the ride dangerous and this resulted in Fernihough approaching George Reynolds to seek permission to allow his Railton sports car to be driven behind the bike to illuminate the track. This idea caused another problem as the Railton headlights created a shadow of the bike and rider onto the track.

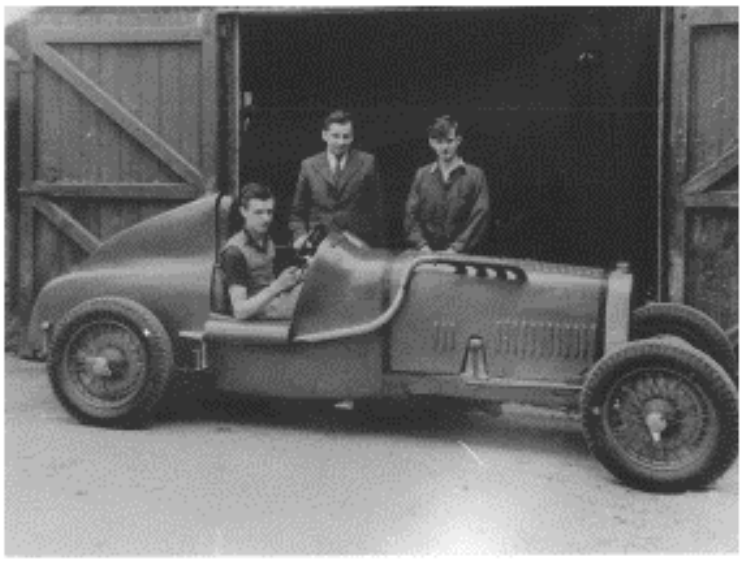
The second solution was for the Railton to be driven beside the bike to which George Reynolds agreed provided the front wheel of the car was always behind the front wheel spindle of the Cotton/JAP. This enabled an additional 2 hours to be completed and 12 World Records being made from 500 kilometres to 12 hours for a 250cc motorcycle. There is a further interesting "post script" to this story relating to rabbits being lured onto the track by the car headlights, being run-over by both the motorcycle and car to be then collected and sold by Fernihough to a local butcher. Very sadly Eric Crudgington Fernihough suffered fatal injuries whilst attempting to break another World record at Gyon, Hungary on 23rd April 1938. He is buried at East Cemetery, Bournemouth in Dorset.

No. 46.



In the time following the record breaking feat the bike was sold to David Whitworth, another T.T. rider, and this picture shows Whitworth astride his newly acquired Cotton/JAP. Astute enthusiasts will note that the cylinder is not the record breaking barrel but a parallel sided replacement for the one returned to Roland Cross for evaluation. As a motorcycle of immense historical interest there have been many attempts to trace the bike and, although it was once owned by Norman Webb a well known motorcycle enthusiast, the "trail" seems to have ended after it was sold to a Royal Air Force serviceman in Blackpool.

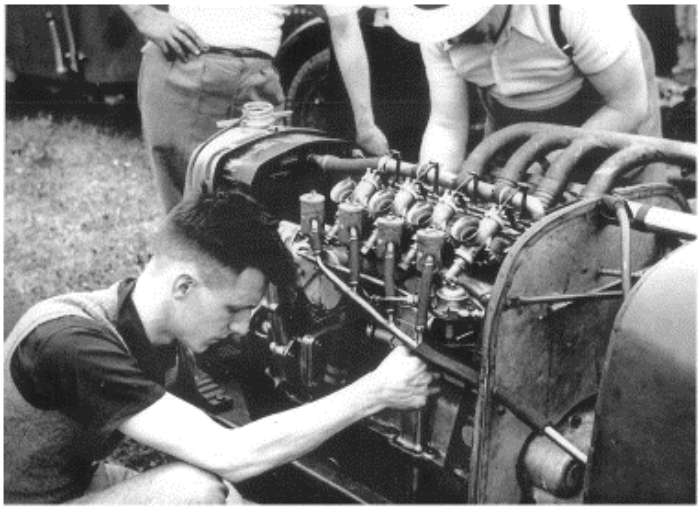
No. 47.



One should never be under the impression that Roland Cross only designed and built Cross Rotary Valve engines for motorcycles. This is a photograph the Halford Cross Rotary racing car. It is primarily an HRG, a company that produced sports cars pre-World War Two.

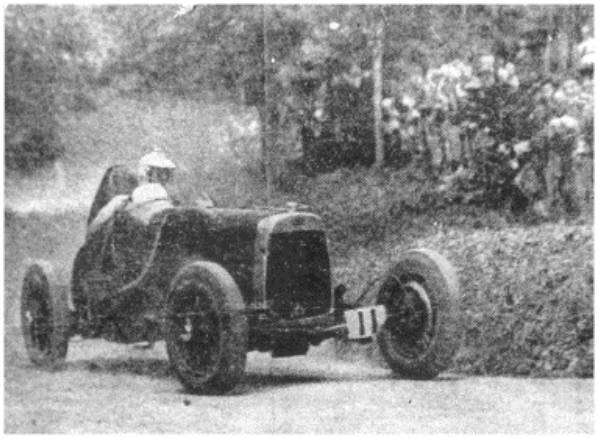
The “HRG” name was derived from the first letter of the surnames of the three Directors and owners of the company, Ted Halford, Guy Robins and Ron Godfrey. Ted Halford had a reputation as a “maverick” and not always in total unison with his fellow Directors. Keen to achieve racing success for HRG on the track and at hill climb events, Halford commissioned Roland Cross to design and build a 1.5 litre, 4 cylinder, all aluminium cylinder block with Cross Rotary Valve head to fit onto the Meadows “bottom end” usually used by HRG. Guy Robins and Ron Godfrey, as fellow Directors, were not in favour of the project so Ted Halford decided to finance it himself. Prevented from using the HRG name due to opposition to the project from his fellow Directors, the car was named the Halford/Cross Rotary. This photograph, taken in July1937, is of the finished car complete with the Cross engine. Ted Cross is at the wheel with senior draughtsman Albert Coles and apprentice William James (Jim) New standing behind.

No. 48.



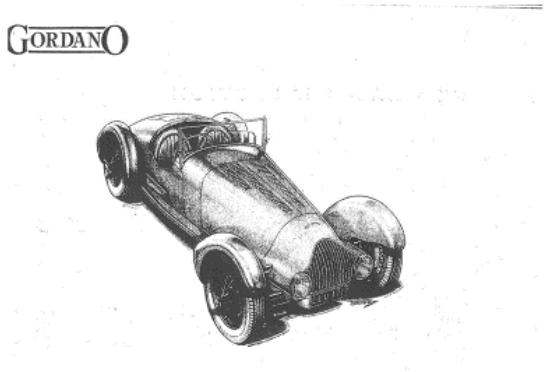
Here we have a picture of the Halford Cross Rotary being prepared for action, most probably at Backwell Hill Climb. Ted Cross is in the foreground making some adjustments with Roland Cross wearing a Panama hat and braces working on the other side of the engine.

No. 49.



This is a rather “fuzzy” photograph of the Halford Cross Rotary being driven at speed at Backwell Hill Climb. The driver is most likely to be Ted Halford himself as in our archives it is recorded that on one run the course record was broken with Ted Halford driving. Clearly, the revolutionary Cross R.V. engine performed well. We have verbal evidence that on one occasion it performed too well. On a visit to John Cross (Rodney`s cousin) a few years ago, John told of the car being “clocked” by police at Saltford whilst on its way to Backwell Hill Climb and a fine for exceeding the speed limit being issued.

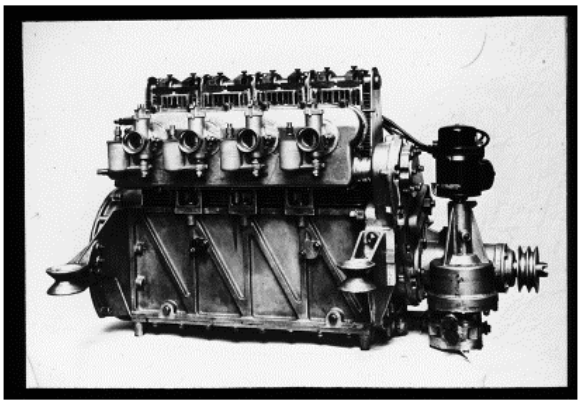
No. 50.



In the years of austerity following the Second World War the country was slowly recovering economically and Joe Fry, a gentleman of some financial ability as a descendant from the Fry`s Chocolate dynasty (sold many years previously to Cadbury`s), decided the time was right for the introduction of a sports car. With Richard "Bick" Bickerton as fellow Director, the Gordano Motor Company was formed at Alma Vale Road in Bristol. This picture is taken from the cover of the pre-sales brochure for the car. The year is 1948 and I am convinced you will agree it is a very attractive design. Roland Cross was well known and highly regarded by Joe Fry by way of the engines produced for the Freikaiserwagen which we will discuss later. As with the Halford/Cross Rotary, Roland was asked to design and build a 4 cylinder, 1.5 litre, all aluminium Cross Rotary Valve engine to power the car.

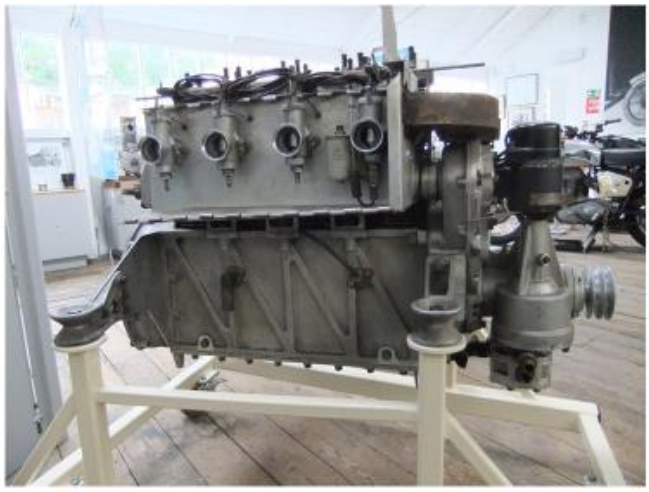
With engine design and build being a rather lengthy process, the two prototypes were fitted with "off the shelf" MG and Lea Francis engines. Unfortunately, we have no knowledge of these vehicles or whether they still exist.

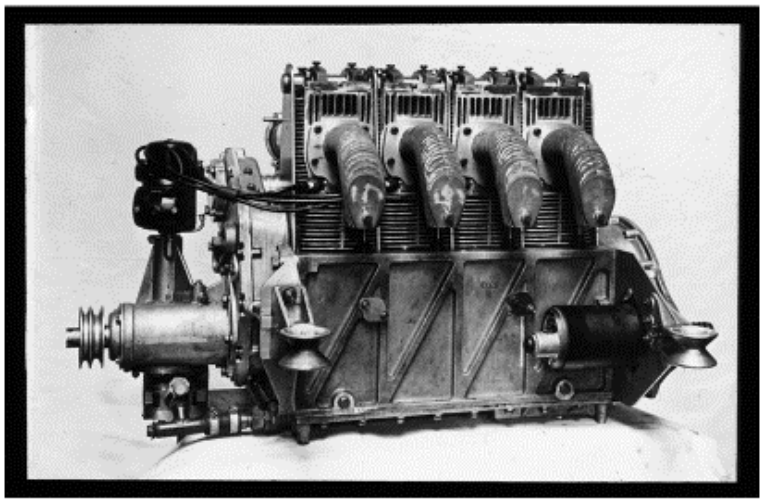
No. 51.



This is a picture of the Cross engine designed and built by Roland Cross for the Gordano Sports Car as received from Robin Parker in Cheshire.

Nos. 51, 52 & 53.

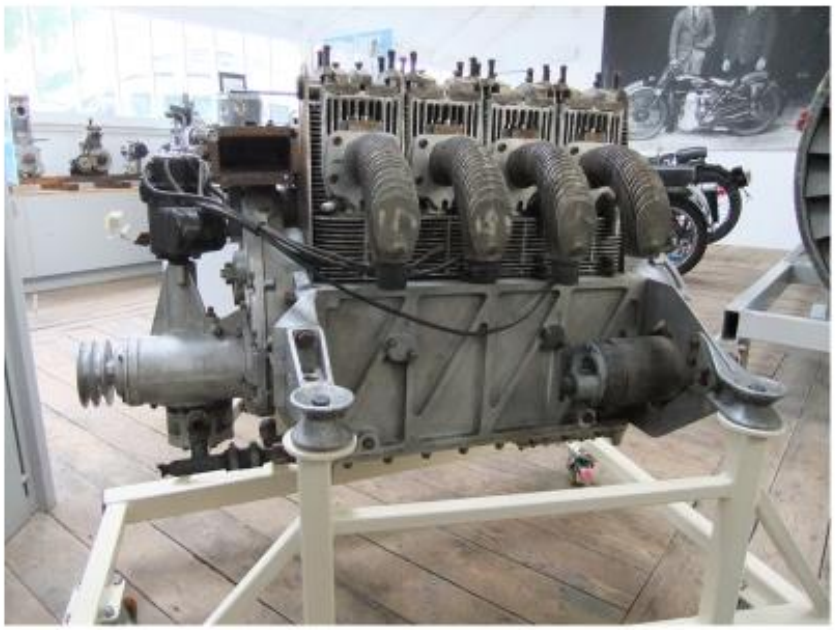




10

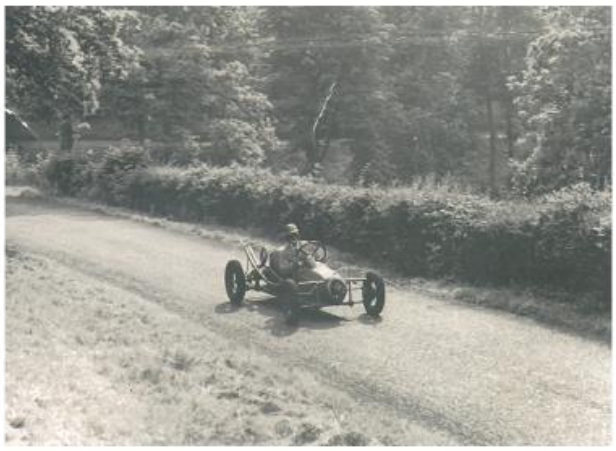
These photographs are all of the Cross Rotary Valve engine for the Gordano. Sadly, the engine was never finally completed, tested and installed into the Gordano Sports Car, as at Blandford Hill Climb in July1950, whilst driving the Freikaiserwagen, a mechanical problem with the steering caused an accident in which Joe Fry was fatally injured. Without his technical input and most likely, his financial contribution, the Gordano Motor Company ceased trading and the various engines and unused components were distributed between the other Directors.

No. 54.



At the Cross Manufacturing Company we had no knowledge of the engine or its existence, although we did have a file of paperwork preserved in our archive. A visit to our museum together with a conducted tour of the works was arranged for members of the GN Car Club. It was on this occasion that one of the club members, Philip Selwyn-Smith of Great Hinton near Trowbridge, approached Rodney to say “I know where your Gordano engine is”. Apparently, the engine had been taken by Richard Bickerton following closure of the Gordano Motor Company and stored in his garage. After his death some decades later his widow Mrs Bickerton, not knowing what to do with the engine, gave it to Mike Fowler an acquaintance who had visions of getting the engine to run and installed in a vehicle of unknown make. For various reasons this did not happen and the Cross engine was moved again, this time to Kelsall in Cheshire to be cared for by Mr Robin Parker. Subsequently, as a result of his conversation with Mr Selwyn-Smith, Rodney contacted Cyril to discuss the “find” and then spoke to Mr Parker where the offer was made to loan the engine to Cross Manufacturing Company and to permanently display it in our museum. Mr Parker would retain ownership of the engine on the understanding that we would clean and care for it and return it if asked. From telephone conversations between Cyril and Robin Parker at the time of making arrangements for its transportation from Kelsall to Bath it was revealed that in addition to the Cross engine there is also a Gordano Sports Car body shell in Mr Parker`s garage at Kelsall. Mr Parker is of advanced years and has no intention of using the Cross engine. Cyril recalls Mr Parker saying in one of their telephone conversations that with an engine and body shell available, Cross Manufacturing with their engineering ability could make a car.

No. 55.



Previously in this talk, the Freikaiserwagen has been mentioned and this is a photograph of Joe Fry driving the car at Prescott Hill Climb in Gloucestershire. From the twin exhaust pipes it is clear that the engine is a Blackburne vee twin of 1100cc capacity. Originally the car designed and built by cousins Joe and David Fry and was powered by a 500cc Cross Rotary Valve engine and it is listed as taking part in the 500cc supporting race at the British Grand Prix of 1948. Few of the cars seemed to perform well in this event as most were powered by motorcycle engines, and this was the case with the Cross Rotary valve engine. Many suffered overheating problems as the driver was seated in front of the engine affecting the air-flow to cool the unit. As a hill climb car run over short distances the overheating problems diminished. The Freikaiserwagen using a 500cc Cross Rotary Valve and subsequently a JAP engine and ably driven by Joe Fry was very successful but, in a quest for more power, the 500cc JAP engine was removed and replaced by a 1100cc Blackburne vee twin as a power plant. Yet again, the expertise and ability of Roland Cross was called upon to design and manufacture aluminium liner-less cylinders, special pistons and piston rings for the Blackburne Vee Twin engine. The car was almost untouchable for hill climb speed with course records in its class at Boness, Shelsley Walsh and Wetherby. At Wetherby a very creditable result was recorded being only 0.45 of a second behind the fastest time of the day set by a Bugatti of **3.3 litre!!** Tragically, a horrific accident occurred whilst Joe Fry was driving the Freikaiserwagen at Blandford Hill Climb in August 1950 and Joe did not survive the accident. After claiming the life of her husband in the tragic accident at Blandford it was on the instructions of his widow Mrs Pat Fry that the Freikaisewagen was destroyed. Ironically, the Blackburne engine survived and by an amazing coincidence its eventual owner Steve Lister, living in Derbyshire, advertised in “The Radial” the magazine of the Rudge Owners Club seeking two front wheels from a Rudge motorcycle. This was for a project to build a replica Freikaiserwagen with the blessing and approval of the now very elderly Mrs Pat Allen, (formerly Fry) who had re-married following her husband`s untimely death. The advertisement was seen by none other than Des Cormack, a Rudge Ulster owner and one time employee of Roland Cross. Des had joined Cross Manufacturing Company in 1940 and had worked closely with Roland Cross on so many of his engines designed and built until leaving in the Company in 1959. Des Cormack, in carrying out a huge amount of development and engine build work on the Cross engines for the Freikaiserwagen, Gordano, the various motorcycles and cars, possessed extensive knowledge that is

unsurpassed by anyone living today. Realising the importance of the advertisement, Des immediately contacted Cyril who, with Rodney`s approval, telephoned Steve Lister at his home in Derbyshire to make the make him aware of the Cross Manufacturing Company interest.

It was as a result of this conversation that information regarding a “Freikaiserwagen Reunion” emerged with Rodney, Cyril and Ken Rees being invited to the evening event held at The Compass Inn, Tormarton. Steve Lister also attended from Derbyshire and brought with him the original Cross aluminium liner-less cylinders from the Blackburne vee twin of 1950. It was quite nostalgic to see them displayed that evening on the dinner table no less.

No. 56.

Roland Cross was a Member of the Institution of Mechanical Engineers and, as a result of this and too, in recognition of his knowledge, expertise, design and development of the Cross Rotary Valve, he was elected Chairman of the Automobile Division of the Institution in 1957. Copies of his Chairman`s Address to the Members are stored in the company archives and make interesting reading indeed. In the late 1950s the distinct advantages of an aluminium liner-less cylinder together with piston rings manufactured by the very special “Cross” process were well known and development of these items continued. For testing purposes, single cylinder motorcycle engines were favoured, as with all developments of this nature, there will inevitably be a failure at some stage. Clearly, a mechanical disaster involving a 4 cylinder car engine would be a huge financial cost. Various motorcycles had been purchased and used for the development of the Cross Rotary Valve Engines during the 1930s and 40s and this trend continued. In this photograph a Cross 250cc aluminium liner-less cylinder is shown together with a very special piston and piston rings designed by Roland Cross for fitting to a Royal Enfield Crusader engine.

No. 57.

In this photograph is JGL 257 with engineer and part-time motorcycle road tester Bill Bolton. The bike was purchased from Royal Enfield in 1959 and over a two year period until 1961 was ridden extensively by Bill and Cyril James to evaluate the many cylinder, piston and piston ring designs. Performance with some assemblies tested was quite outstanding. The bike as pictured would have been fitted with components similar to those shown in the previous photograph. JGL 257 clocked up a huge mileage as a road test machine, so much so that the cycle parts were completely worn out and the bike was scrapped, although the engine survives in the store room within our museum.

Nos. 58 & 59.

Two photographs of OGL 54 a Royal Enfield 250cc Crusader Sports 1963 model. Again purchased new from the Royal Enfield factory at Redditch although there is some documentary evidence that it was delivered via the Royal Enfield works at Westwood, Bradford on Avon. Bought as a road test machine and, as its predecessor JGL 257, it covered a considerable mileage almost always being ridden at high speed, as and when road traffic conditions allowed.

There was no limit of 60 mph on “A” roads and 70 mph on dual-carriageways and motorways in those days. The photographs were taken in our museum at Midford Road in Bath.

No. 60.

Evidence to support the considerable mileage referred to in the previous pictures with well over 78,000 miles recorded on the milometer.

No. 61.

In this photograph there is a wider view of our museum and it shows three motorcycles on display in the building with some of the many pistons complete with piston rings used for the Royal Enfield engine projects. At the top right hand side of the photograph is a 250cc Cotton Cougar Scrambler with a Roland Cross designed aluminium liner-less barrel and very special piston. The piston had a spiral piston "ring" or coil but I will talk more about this later. At the top of the photograph is the HRD/Cross 500cc Rotary Valve motorcycle GL 1722 as previously spoken about.

No. 62.

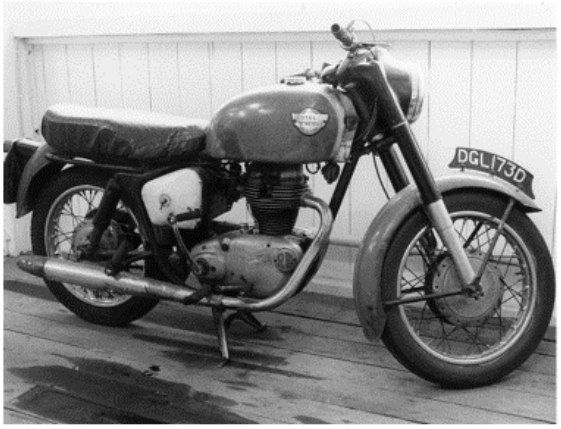
Royal Enfield 250cc Crusader Performance Results.

Piston No.	Max Speed.	Midford.	Standing Start.	500 m.
158	86 mph	52 mph		
159	87 mph	53 mph		
164	88 mph	55 mph	67 mph	
165	84 mph			
166	89 mph	59 mph	68 mph	
169	88 mph	53 mph	68 mph	
170	88 mph	58 mph		
173	86 mph	54 mph		
174	85 mph	52 mph		78 mph
176	85 mph	54 mph		
179	88 mph	55 mph		
181	85 mph	54/55 mph		79 mph
183	75 mph			
184	84 mph			
186	90 mph	54 mph	(helical triangular)	77 mph
188				
191	87 mph	52 mph	75 mph	
195	84 mph	54 mph		
197	89 mph	55 mph	78 mph	
	90 mph	57 mph		
200	88 mph	50 mph	76 mph	
202	92 mph	56 mph	79 mph	

Cross Manufacturing Company (1938) Limited, Midford Road, Bath. BA2 5RR.

The engine developments of Roland Cross almost always resulted in increased power output and with the Cross Rotary Valve, much greater torque. This is a chart recording the speeds achieved with a Cross developed engine installed in the 250cc Crusader Sports OGL 54. In its "off the shelf" form the maximum speed achieved on road test was 78 mph. As you can see from the details displayed 92 mph was recorded with one particular Roland Cross barrel, piston and rings.

No. 63.



Another Royal Enfield Crusader DGL 173D, the third 250cc road test machine bought from Royal Enfield for experimental purposes in the 1950s and 60s. This is a 1966 model and again as clearly visible from its condition, it has been subjected to many miles of hard ridden road testing. The Cross aluminium liner-less barrels were usually cast as replicas of the standard as-supplied components but the weight differential compared to the cast-iron original is enormous. In the past many people have asked us why we used Royal Enfield bikes as road test machines. Well, why not? But, there is another reason.

I have spoken previously about Roland Cross in 1957 being Chairman of the Automobile Division of the Institution of Mechanical Engineers. In 1958 the new Chairman was Tony Wilson-Jones, Chief Engineer at Royal Enfield. It is fairly certain that Mr Cross and Mr Wilson-Jones were M.I.Mech E. colleagues and friends making Royal Enfield the obvious choice.

No. 64.

The days of Royal Enfield motorcycles being produced in this country are long gone but the machines are still manufactured in India. This is a bike belonging to Ken Rees and it looks almost identical to a Bullet model of 1960s UK manufacture.

No. 65.

I briefly mentioned the Cotton/Cross Cougar Scrambler and this is the quite special aluminium liner-less barrel and piston with the coil arrangement piston "ring". Note the exhaust flange manifold with four threaded holes to accept the Allen cap-screws that attach the exhaust pipe. This is a very easy way in which to recognise a Cotton/Cross Cougar from the standard Villiers 34A competition engine.

No. 66.

During the 1950s and 60s most two-stroke motorcycle manufacturers were using Villiers engines. Whether that was Francis Barnett, James, Greeves, Ambassador, Sun, Cotton, etc., etc. They were all using standard Villiers engines for road bikes and "off the shelf" competition engines too. The competition engines for trials and scrambles use would then be "fettled" in various ways to achieve the maximum power output. Each manufacturer would be desperate for their bike to "cross the line first" and make the headlines in the Motor Cycling, Motor Cycle News or The Motor Cycle, media productions of the day. In 1961 an approach was made to Roland Cross by the people from E. Cotton Motorcycles based in Gloucester. Only some 40 miles from Bath, the Directors and engineers at Cotton Motorcycles in Gloucester were well aware of the achievements of Roland Cross and this resulted in Mr

Pat Onions, the Works Director, visiting Bath to plead with Mr Cross to design something to convert a Villiers engine that would “give them the edge” over the other manufacturers. The result of this request was the barrel, piston and spiral “ring” in the previous photograph. Was it successful? It most certainly was. In this picture is Bryan “Badger” Goss, the Cotton Works scrambler, riding the resulting 250cc Cotton/Cross Cougar. “Badger” Goss was known for his fearless riding style and the Cross developed engine was “quick”, very quick indeed. Success was immediate with “firsts” at various scrambles venues around the country.

No. 67.

With a reputation of fearlessness, Bryan Goss can be seen here in this photograph taken by Gordon Francis a freelance motorcycle journalist/photographer “airborne” at speed. Success of the Cross engine can be measured by the results of the Somerset Grand National Scramble in 1961 held at Westbury Farm. The 250cc Cotton/Cross Cougar ridden by Bryan “Badger” Goss “swept the board” by winning all five races from 250cc to the Unlimited Invitation on that day.

Even the 500cc Metisse machines of the Rickman brothers were unable to compete with the Cotton/Cross. Sadly, the success was not to continue and the project was terminated by Cotton Motorcycles. The reasons for this rather sudden cancellation of what was clearly a very successful engine project was, and still is, somewhat unclear. A few years ago at the annual Cotton Owners Club Rally held at the Folk Museum in Gloucester some subtle and cautious questions were put to one or two former employees of the E. Cotton Motorcycles factory in the city. We were very interested to know and understand the story behind the abrupt closure on the project. The various answers we were given, all quite logical, made some sense of the situation more than five decades ago and the considered opinion of the people spoken to generally held the same view. The Roland Cross aluminium liner-less barrel together the special piston and very innovative and unusual spiral (coil) piston ring was undoubtedly a successful conversion to the

Villiers engine well proven by the racing achievements of the Cotton/Cross Cougar in the hands of "Badger" Goss. The Villiers 34A competition engine had been in production for some years and a new and more powerful version called the "Starmaker" was to be introduced to the market by Villiers imminently. The launch of the new engine would be comprehensively publicised and virtually all British two-stroke engine motorcycle manufacturers would be expected to use it in both competition and road-going bikes. Villiers position as the primary two-stroke motorcycle engine manufacturer would be maintained and secure. The success of the Cross Manufacturing Company conversion of the soon to be replaced Villiers 34A engine was a detraction and something that Villiers most certainly did not want. We only have some verbal opinions of a few involved at the time, but seemingly, Villiers may have "suggested" to Cotton Motorcycles that their continued association with Cross and further development of the Cougar engine project would not be in their best interest. Clearly, Cotton Motorcycles were completely reliant on
Villiers for the continued supply of engines for their other models. Could it be that the people at Villiers "leaned" on Cotton to abandon the project? Possibly, and perhaps we will never know the whole story but, it all makes sense. We do know that Roland Cross was quite understandably very upset at what was for him a very unsatisfactory end to a most successful engine development project.

Some 10 years ago at a Cotton Owners Club reunion Cyril James met Bryan "Badger" Goss the former Cotton Works scrambler and a very interesting conversation and exchange of information took place. Yes, the Cross engine was powerful and very "quick", as "Badger" described it. It was most certainly a winning design with huge potential but interestingly the engineers at Cotton refused to reveal the technical details to Bryan Goss as it was such a closely guarded secret. His job as Works rider was, apparently to ride it and win, not to be concerned about the engineering aspects.

No. 68.

In this photograph are two of our young lady engineers, Kirsty Threadingham on the left and Evonne Bambury on the right, as they exhibit some of the larger diameter sealing and piston rings produced for the aerospace and power generation industries. But we must return to the post war years to provide an insight into the progression from Cross Rotary Valve engines to the aircraft and eventually aerospace industry seals of today. I have spoken at length about Roland Cross, his achievements as a schoolboy, as a young man and his progression to an extremely talented, innovative, skilled and hugely respected engineer and onto him founding the Cross Manufacturing Company. In the mid to late 1930s Roland Cross continued with the design and development work for his rotary valve engines with the projects being financed by income gained from his services as a Consultant Design & Development Engineer.

In 1938 prior to the outbreak of World War Two he was visited by Government officials that with the probability of war with Germany a very real threat his design expertise and manufacturing capacity would be required for the war effort. Responding by saying he was not a "manufacturing engineer" the advice offered was that with the dark clouds of war forming that this **would** be his role **without question** for the next few years. There were to be difficult but rewarding times ahead.

Although a photograph is not included in this particular talk, we have a Bristol Centaurus engine as an exhibit in our museum and I will take just a moment to provide you with some very interesting history regarding this engine.

Towards the end of the second World War the Bristol Centaurus an 18 cylinder two-row sleeve-valve engine came into service. Used for the Hawker Sea Fury and the Airspeed Ambassador airliner it was a powerful 3,000 hp engine also later to be used as the eight engines to power the ill fated project the Bristol Brabazon. Although very much respected, this engine had a reputation for consuming large quantities of oil.

Approached by the Bristol Aeroplane Company as engine manufacturers Roland Cross was asked to try and resolve the problem of this excessive oil consumption. After investigating the design and identifying the problem, Roland believed the solution to the problem was a sleeve contracting ring. Having accepted the proposed sleeve contracting ring design, BAC produced Drawing No. FB 191469 and production of the rings commenced. The effect of the Roland Cross designed ring was immediate with oil consumption on both Centaurus and Hercules engines drastically reduced and efficiency improved.

With production of FB 191469 continuing into the early 1960s some 300,000 sleeve contracting rings were made and Cross Manufacturing Company was firmly established as sealing ring designers and manufacturers to the aircraft industry.

Before the end of the second World War the aircraft industry was to see enormous advances in engine design with Frank Whittle working on his turbo-jet project since 1936. The situation was much the same in Germany with the Messerschmitt Me 262 entering service with the Luftwaffe in 1944 although too late to affect the outcome of the war. About the same time the Gloster Meteor became operational with the RAF. This resulted in an industry requirement for seals made from heat-resisting alloys to supersede the materials used for piston engine aircraft.

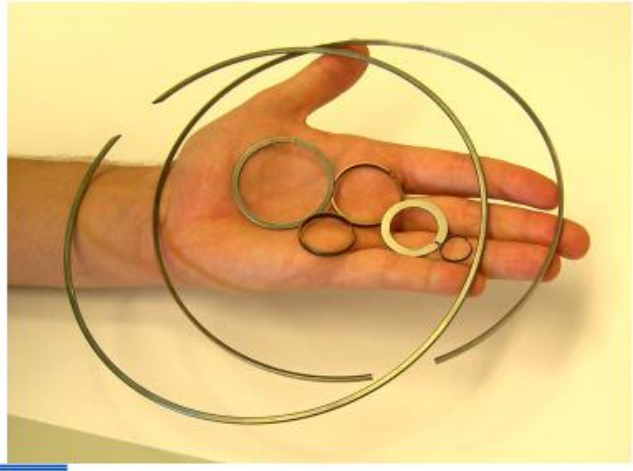
Using the same processes developed by Roland Cross to produce piston rings for his motorcycle and motor car engines, the special alloy wire could be rolled to size and shape without too many problems, but the coiling operation was quite different. Initially, hot winding as traditionally employed for carbon steels produced disastrous results, but with perseverance we developed processes that did work. The large diameter rings being displayed in this photograph are components we produce from exotic heat-resisting alloys and made using production processes that are unique to Cross Manufacturing Company. We are currently producing piston rings for Siemens, our long standing German customer, made from Stellite, a Cobalt/ Chrome alloy, with Siemens building coal-fired electricity producing power stations for the Chinese. These huge piston rings are 6 feet in diameter.

No. 69.

Diesel engines have steadily replaced their petrol powered alternatives in cars, vans, trucks, buses and earthmovers and are now becoming available for motorcycles too. It is unlikely that any of the modern diesel engines would not have a turbo, but it is a well known fact that the turbo of a diesel engine will run hot, very hot. Therefore, the turbo manufacturers require a piston ring for the shaft seal that will withstand the very high temperatures involved.

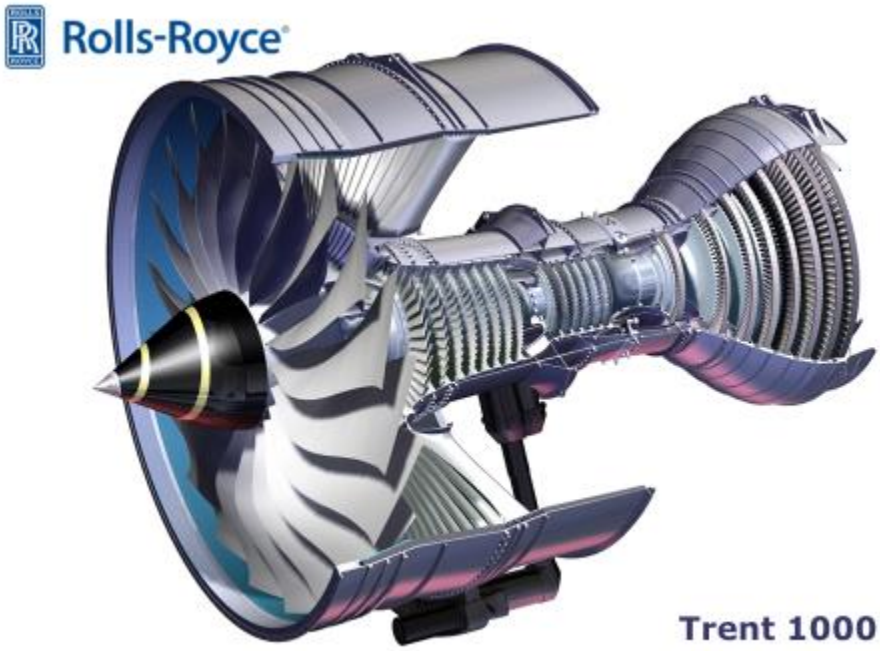
The ideal material for these piston rings is the same heat-resisting alloy used for the gas turbine (jet) engine seals and this has enabled us to secure a considerable section of this market. Last year the people at our Devizes factory produced 84 million turbo piston rings sold all over the world including the USA, Japan and into China. It is extremely satisfying for us to sell into China when everyone else is seemingly buying from them.

No. 70.



In this photograph are some examples of our smaller sealing rings and piston rings.

No. 71.



This is a picture of the very successful and much respected Rolls Royce Trent 1000 turbo-fan engine used to power the Boeing 787 Dreamliner. We are pleased to say there are a considerable number of Cross sealing rings used in this engine.

No. 72.

This is a “computer produced” image of the Boeing 787 Dreamliner with the Rolls Royce Trent 1000 as the launch engine. Initially, Boeing decided there would be a sole supplier of engines to power their new Dreamliner but, under pressure from potential customers, Boeing relented and the Dreamliner can be supplied with either the R.R. Trent 1000 or G.E. nx-18 engines.

No. 73.

The huge Airbus A380 “super-jumbo” with Rolls Royce Trent 900 engines. Again, I am pleased to say that Cross Manufacturing Company has been entrusted with the supply of numerous seals for this engine, primarily produced from exotic heat resisting alloys. This is “our business” and hopefully you will allow me to say “we do it very well”. I have spoken about the sealing rings we produce in large quantities for civil aircraft engines but, the design and manufacture of seals for military aircraft is also an

important part of our business too and Rolls Royce RB 199 engines for the Tornado a multi-role combat aircraft has a number of Cross seals. So too, does the EJ 200 engine manufactured by Rolls Royce to power the BAe Typhoon.

No.74.

This picture is of the very popular and successful Snecma CFM56 engine. Widely used as the power plant for over half of the commercial aircraft over the last ten years we are pleased to be manufacturers of sealing rings made from Waspaloy, a nickel/chrome heat-resisting alloy, for this engine. Waspaloy has an advantage in that it is capable of resisting higher temperatures than Alloy 25. Alloy 25, a cobalt/chrome alloy that is heat, corrosion and wear resisting in addition to being non-magnetic, has been one of the most popular alloys we have been asked to use for gas turbine engine sealing rings. We first started to use this alloy about 40 years ago and it presented considerable difficulties for us. Traditionally, we had used production processes for retaining rings, circlips and sealing rings not dissimilar to those developed by Roland Cross in the 1930s to manufacture piston rings from high carbon steel wire for his very special motorcycle and motor car engines.

Although our long established wire rolling process produced excellent results we very quickly realised that Alloy 25, as a heat-resisting alloy, could not be "wound" or "coiled" by the existing hot winding method. Over time a new system of "cold-coiling" the rolled wire was developed and this together with a very innovative "ring & plug" high temperature heat forming method was developed resulting in us successfully being able to manufacture a precision, high temperature sealing ring. With gas turbine aircraft engines becoming ever more powerful, higher temperatures are evident in the engine and therefore sealing rings capable of operating in these conditions are required. Waspaloy as a nickel/chrome heat-resisting alloy has a temperature advantage over and above Alloy 25.

No. 75.

Piston Rings and Brush Seals supplied to ALSTOM Power for major power station projects
e.g. *Cairo North (Egypt), Liddell 2 & 3 (Australia), Vasilikos (Cyprus), Muskogee (US), Longannet (UK), Tutuka (South Africa), Duvha (South Africa), Nordjylland (Denmark), Sual (Philippines)*

Not everything we make is for the aerospace industry. In addition to seals produced for the aerospace industry we design and manufacture piston rings and brush seals used for power generation. Turbine generators for the production of electricity throughout the world use Cross piston rings and this picture is of a turbine generator made by ALSTOM Power. The size of the generator and in turn the piston ring dimensions are shown in comparison to the man overseeing the assembly. At present we are producing huge piston rings from wrought Stellite (Alloy 25) that are 6 feet (1.83 metres) in diameter for our German customer Siemens who in turn have been contracted to build electricity generating power stations in China. On completion we ship the piston rings to Siemens, based in Shanghai. Originally, we were expecting to produce about 18 piston rings for nine turbine generators (2 rings per generator) but, at the last count we have made well over two hundred. We are not complaining!!

No. 76.

This photograph is of our Head Office building at Midford Road in Bath, although it does not show the Works or manufacturing departments which are to the left and at a slightly lower level, generally unseen from the road. It is here within the works complex that our museum (photograph No.15) is located. The museum is the building where in1924 Roland Cross started his business as a Consultant Design & Development Engineer and although a private museum visitors are welcome by prior appointment.

No. 77.

In the early 1960s with his business becoming ever more successful and busy, Roland Cross needed more space to expand and increase workspace and office capacity. There was little scope for this at Midford Road at that time so, being forced to look elsewhere the redundant Wiltshire Bacon Factory at Bath Road in Devizes was available and bought. Work was transferred from the Bath site and production commenced.

Orders and quantities increased and an extension was built, but the site at Bath Road, Devizes although serving its purpose, was never really ideal and further extension was not possible so, when land became available from the M.O.D. following the closure of Hopton Barracks a parcel of land was purchased for future development. This is a photograph of the new factory built at Hopton Industrial Estate, London Road, Devizes.

No.78.

The situation was somewhat similar at Midford Road in Bath and when additional land eventually became available in the mid-1970s new workshops were built in the now former Union Quarry and on the adjacent Emery Brothers (Builders) site. A few years ago we were aware that the factory owned by Mr Grist at Hopton Industrial Estate might be available upon his retirement and being ideally situated on the opposite side of the road to our existing factory this was an opportunity for us to secure the additional workspace so desperately required. With the factory purchased and converted within a very short timescale this was to become our Devizes South Site at pictured here.

No. 79.

We are fortunate in the fact that employees stay at Cross Manufacturing Company for some time and it is not unusual for some to complete the whole of their working career with us. This is a photograph of Albert Coles receiving his Mayor`s Medal from Cllr.Tony Rhymes and his wife for 50 years of service with the Company. Albert Coles joined Roland Cross in 1936 as a Draughtsman to do six weeks work designing some cylinders and stayed for 53 years before taking “early retirement” when he was 80 years

old. Albert Coles became General Manager of the Company and was hugely respected by all. He also possessed a huge encyclopaedic knowledge of almost all of the engines and other components designed by Roland Cross.

No. 80.

As we have seen in the previous photograph Bath City Council (as it was then) had a system for presenting a Mayor`s Medal to employees who had spent 50 years with one employer. Devizes Town Council were persuaded to do the same and this photograph shows Mr Ralph Flower a Director responsible for our Devizes Works being presented with his medal by the Mayor of Devizes. An interesting snippet of information relating to Ralph records that in 1942 he came to Roland Cross to ask for an apprenticeship and having been successful in his application was due to commence work on leaving school. That night the Germans bombed his school in Bath completely destroying it so, being unable to return to continue his studies he commenced his apprenticeship early.

No. 81.

Another Mayor`s Medal presentation event, this time at the Guildhall in Bath with the honours being carried out by the Mayor and her Consort. Pictured from left to right are: Jim Bowen, who continued to complete over 60 years with Cross Manufacturing, Mrs Jean Bowen, Tony Blanchard, Mrs Diane Blanchard, Mr Rodney Cross (Chairman), Mr Ralph Flower (Director) The Mayor, Mayor`s Consort, Mr Paul Tozer (Financial Director), Paul Blanchard.

No. 82.

In recognition of 40 years of continuous service with the company medals were presented by the Mayor of Bath, Cllr. Carol Paradise seated at the front with Mr Rodney Cross (Chairman) and behind from left to right, Mrs Jean Ledger receiving on behalf of her husband Michael Ledger, Cyril James, Roy Nurse, Ted Newman, Roy Broom, Colin Daws and Jim Towells.

No. 83.

This photograph pictures sealing rings produced from Waspaloy a Nickel/Chrome heat resisting alloy and destined for Snecma in France for their CMF 56 engine. Featured in the photograph are, from left to right, long service Directors and employees Roy Broom, Mr Rodney Cross (Chairman) Colin Daws, Mr Paul Tozer (Financial Director) and Clive Garlington (Works Manager).

No. 84.

As a company we have been very fortunate in that the vast majority of our loyal staff stay with us for many years, some for their entire working career and with others continuing on a part-time basis well into their “retirement” years. But, the future of Cross Manufacturing Company lies with the younger generation and these two photographs picture the young people from our Bath and Devizes sites who will ensure the continued success and wellbeing of the company in the years ahead.

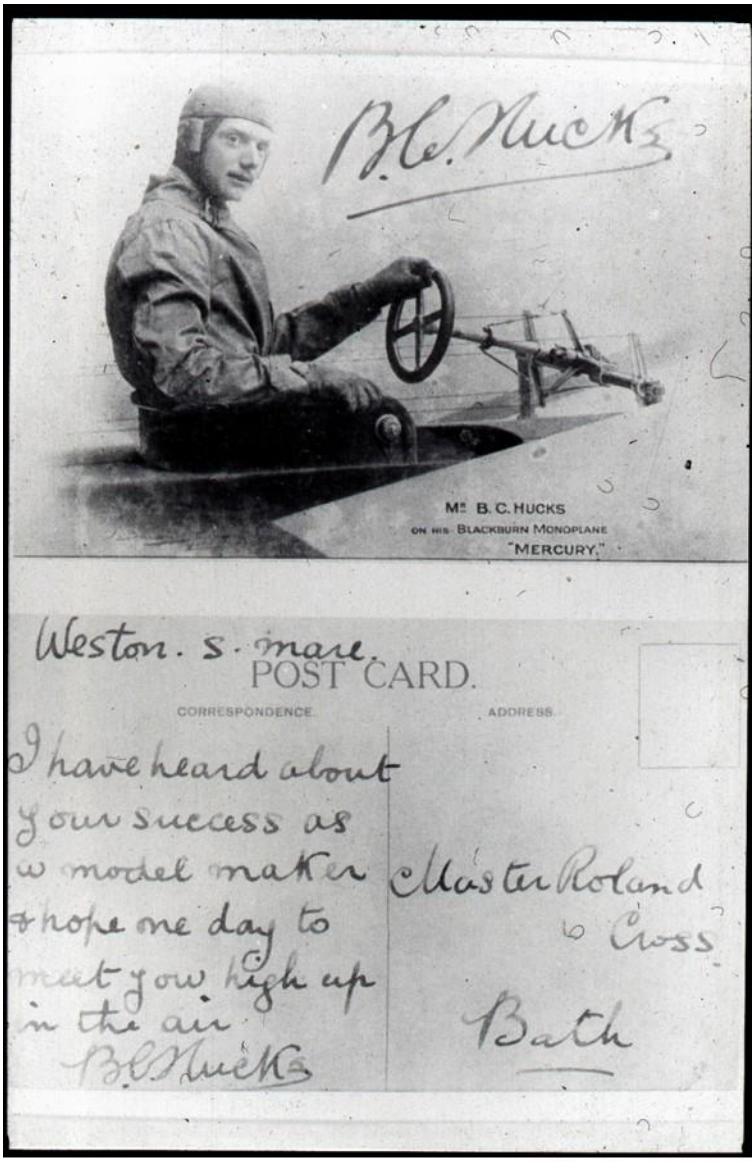
Addendum to photograph No.3.

Bentfield Charles Hucks - b. 1884, d. 1918 - was given his name from the place of his birth, Bentfield End in Essex. Bentfield "Benny" Hucks was famous as a pilot during the very earliest days of aeroplane flight. A test pilot working for Blackburn Aircraft (founded by Robert Blackburn in 1908), "Benny" Hucks, in late August 1911, piloted his Blackburn Mercury Two monoplane to Weston Super Mare, landing in Mayleds Field off Locking Road.

This would not have been the first time the people of Weston had witnessed an aeroplane in their town as Samuel Franklyn Cody, the first person to fly an aeroplane in this country, in 1908 had attracted huge crowds as he landed his bi-plane on the beach on 3rd August 1911. (The tide was "out", it usually is at W.S.M.).

After landing his Blackburn Mercury Two just outside of the town, Benny Hucks stayed in Weston for a week and on 1st September 1911 became the first aviator to cross the Bristol Channel from Weston Super Mare to Cardiff and back. Taking off very early at 5.10 am Hucks soon completed the round trip and was back in Weston again 40 minutes later.

During his stay in the town Benny Hucks did further demonstrations and, very much a celebrity, charged the gathering public one shilling (5p) to get up close to the aeroplane and talk to him. The Post Card in our museum with Hucks seated in his plane and written by him reads: "Weston S. Mare. Master Roland Cross, Bath. I have heard about your success as a model maker and hope one day to meet you high up in the air". It is signed "B.C. Hucks". Roland Cross would have been 15 years old at this time. There has been some mention of young Roland meeting Benny Hucks in Bath and this may have been so but, with the Post Card clearly entitled Weston S. Mare, it is logical that Roland travelled or was taken by his parent(s) or an older sibling to Weston Super Mare, paid his shilling, met and was personally given the signed card by Benny Hucks. Again, an important piece of history.


B.C. Hucks
Mr B. C. HUCKS
ON HIS BLACKBURN MONOPLANE
"MERCURY."
Weston. s. mare.
POST CARD.
CORRESPONDENCE
ADDRESS
I have heard about
your success as
a model maker
& hope one day to
meet you high up
in the air
B.C. Hucks
Master Roland
Cross
Bath

END