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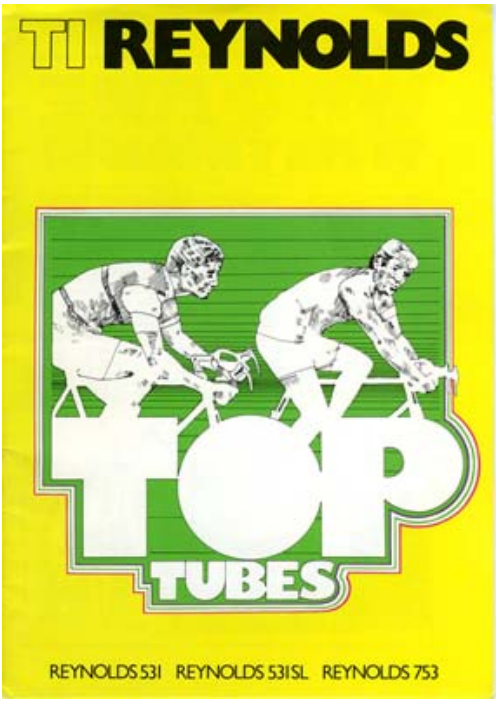

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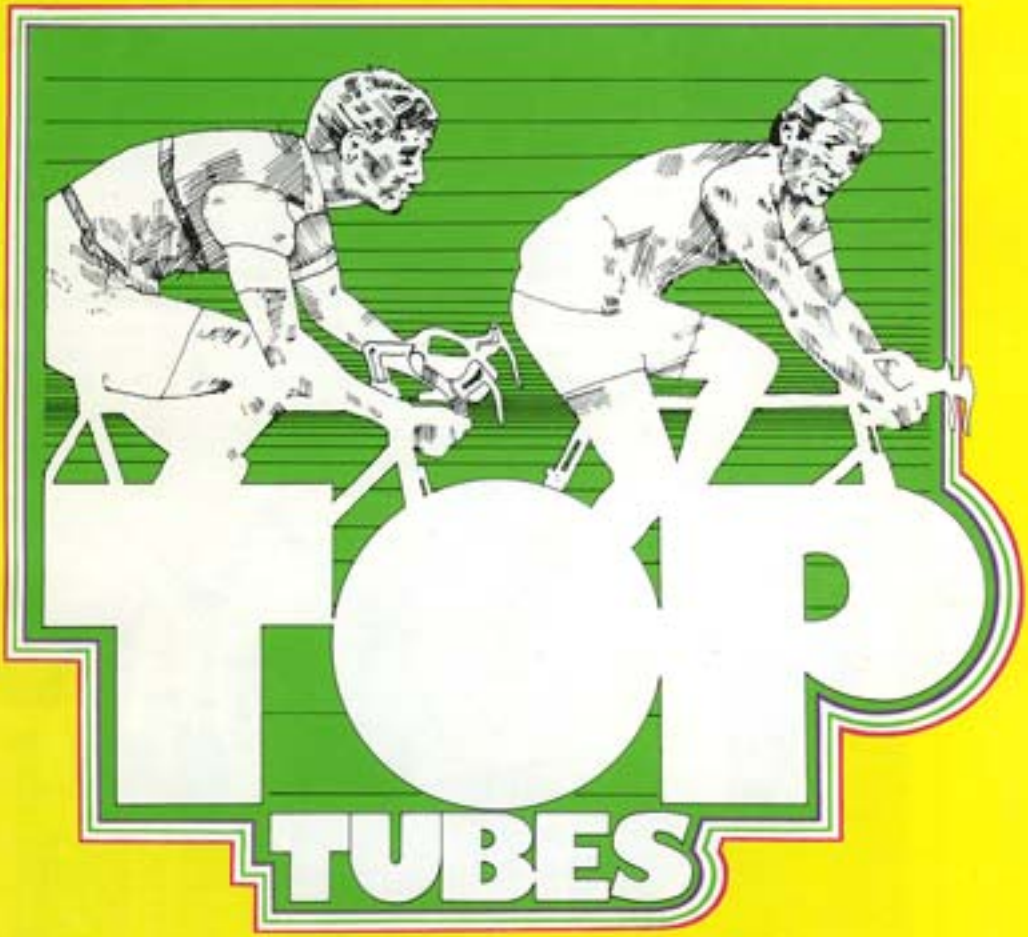
TI REYNOLDS



REYNOLDS 531 REYNOLDS 531 SL REYNOLDS 753

WHO ARE TI REYNOLDS?

For 80 years, one manufacturer has set standards in the production of cycle frame tubing to which all others have aspired. That manufacturer is TI Reynolds Limited, and this booklet tells the story of how the name Reynolds has become synonymous with the very finest cycle tubes in the world.

As a company we have been around since 1898, though there have been a couple of name changes along the way, the latest being when Reynolds Tube Company became TI Reynolds in 1977. Since 1928 the company has been a member of Tube Investments, and through them can employ all the group's technical, engineering and financial resources to ensure continuous product development to meet customers' changing requirements.

The Reynolds' reputation has been built on high quality tubing, not only for cycles, but for aircraft, motor vehicles, hydraulics and other applications. But the years have also brought diversification into other products: today, as well as tube, hollow extrusions for hydraulics and welded rings for gas turbine engines help to continue the quality tradition.

Our Tyseley factory employs 1000 people and is centred around Hay Hall, a thirteenth century manor house which retains its old-world attraction in the midst of a thriving, modern company.

WHY WE WROTE THIS BOOK

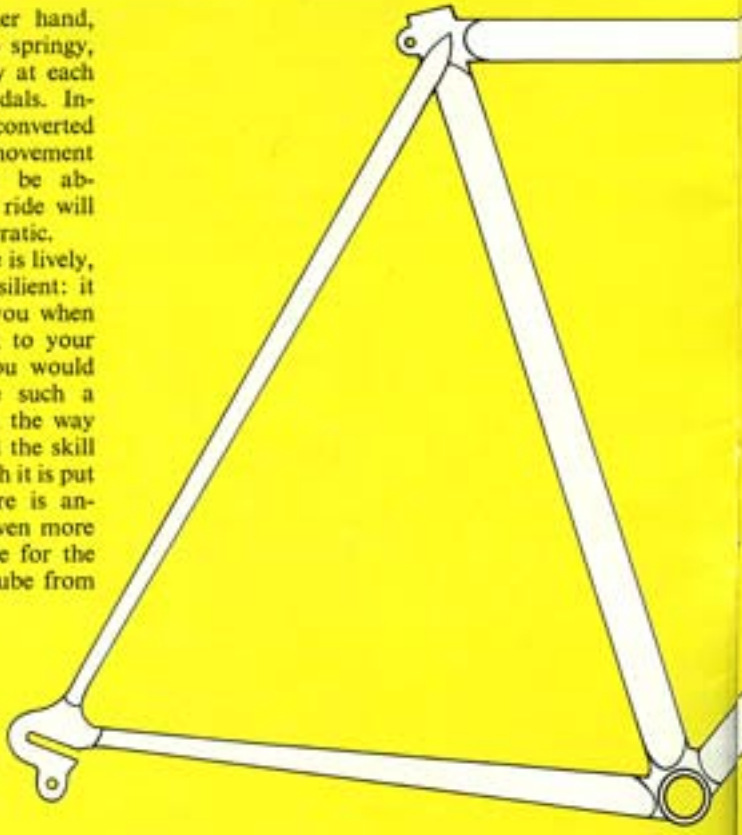
We are always being asked questions about Reynolds 531 and Reynolds 753, and thought it was time once more to set down the story of the world's best known lightweight cycle tube and its latest developments. The pages that follow tell this story; of how the name Reynolds has become synonymous with the very finest cycle tubes, and why Reynolds tube is the automatic choice for bicycles that consistently win the world's major races, including the Tour de France.

DO YOU TAKE YOUR FRAME FOR GRANTED?

Which part of a bicycle do YOU think is the most important? Gears? Wheels? Cranks? Each is important, naturally, and each plays a part in the success (or otherwise!) of the whole machine. We think that perhaps the frame has the greatest claim, for it is this that governs the sort of 'ride' you get. If your frame is too rigid, it will transmit every bump on the road to your poor aching body. It will fight you on every bend, steepen every hill.

If, on the other hand, your frame is too springy, it will whip wildly at each thrust on the pedals. Instead of being converted into forward movement your energy will be absorbed, and your ride will be unstable and erratic.

The ideal frame is lively, responsive and resilient: it becomes part of you when you ride, reacting to your every move as you would wish. To achieve such a frame depends on the way it is designed, and the skill and care with which it is put together. But there is another – perhaps even more vital – prerequisite for the ideal frame: the tube from which it is made.

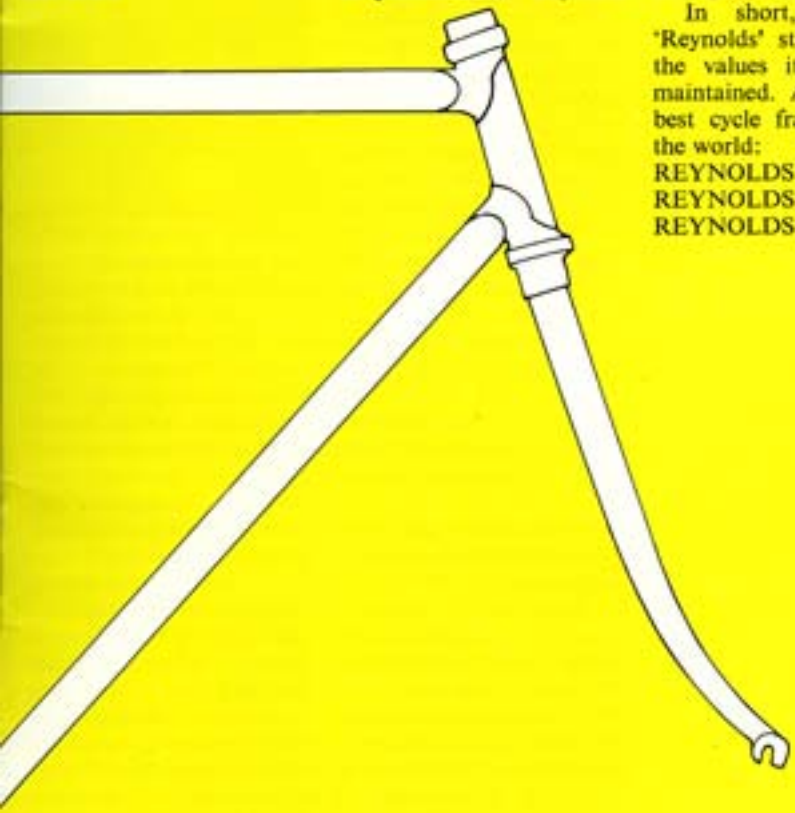


TI Reynolds — Top Tubemakers

The story really starts in 1897, when Alfred Milward Reynolds found a way of overcoming the problems of stress-point buckling that occur with the use of light gauge tube. The famous butting process – in which the thickness of the tube is increased at points of maximum stress without increasing tube diameter – was born.

It was in 1935 that the now famous Reynolds 531 was introduced, and along with Alfred Reynolds' butting process, this amazingly light yet strong tubing was probably the most significant development ever in the field of lightweight cycles. It did not take cyclists long to realise that the combination of the butting process and Reynolds 531 gave the ultimate in performance. 'Reynolds 531 Butted Frame Tubes, Forks and Stays' soon became a 'must' in the finest racing and touring machines the world over, and with Reynolds 753 (of which more later), they remain so today. TI Reynolds is still acknowledged as the world's foremost producer of top class precision cycle frame tubes, and today our commitment to the cause of cycling is as strong as ever.

In short, the name 'Reynolds' still stands for the values it has always maintained. And the very best cycle frame tubes in the world:
REYNOLDS 531
REYNOLDS 531 SL
REYNOLDS 753



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What is Reynolds 531?

'Reynolds 531' (say it five-three-one) is the name given to a very strong seamless steel tube. It was originally developed by Reynolds in 1935 especially for cycle frame tubes, and from that day to this has proved to be the most popular and successful cycle tube around. Such are its strength and lightweight characteristics that it has since been used in many high performance applications apart from cycle tube.

The name '531' originated during development of the new steel, when it was noticed that the ratio between certain constituents was approximately 5:3:1. These figures became the code for the new steel, and its registered trade mark when it came to be marketed.

Why does Reynolds 531 cycle tube have such a reputation?

Quite simply, because it has such significant advantages over other steels. Technically, Reynolds 531 is a manganese-molybdenum steel, one of a variety of specifications to which TI Reynolds manufacture. If any of these other steel specifications (which include chrome molybdenum) had been superior, then we would have used it for our cycle tube. But a manganese-molybdenum steel has one big advantage: the basic metallurgical fact that manganese has a greater effect on the work-hardenability of the steel than chromium. Manganese provides improved mechanical properties and higher ductility values, and greater retention of these properties after brazing than an equivalent chrome-molybdenum steel.

Technical facts – but their message is unequivocal: a stronger frame for the same weight, or a lighter frame for the same strength than one made with chrome-

GNS OF
CESS

molybdenum steel.

Is anyone ever likely to improve on the strength/weight ratio of Reynolds 531?

Someone already has – TI Reynolds! Like other manufacturers throughout the world, we have constantly sought a lighter, stronger tube for the more specialist cycle applications. In 1975, we found it – Reynolds 753.

But don't think that Reynolds 753 replaces Reynolds 531: rather, it complements it, and Reynolds 531 remains unsurpassed for the majority of applications. The walls of Reynolds 753 tubing are so thin that design of frame and choice of lugs are critical – and the finished frames are essentially intended for special purpose use.

Reynolds 753 is a seamless steel tube. Once again a manganese-molybdenum alloy, but having physical properties which make it fifty per cent stronger than even Reynolds 531. Frames made from this tubing are extremely light, and have considerably better torsional rigidity than frames in materials such as titanium, carbon fibre or aluminium alloy, and therefore they perform much more effectively.

And a new Reynolds 531:

Reynolds 531 Special Lightweight tube was also announced at the same time as Reynolds 753. Designated Reynolds 531SL these sets are designed for the very top grades of racing bicycles, having tube wall thicknesses less than standard, but not as thin as Reynolds 753.

New transfers or decals have been designed to distinguish these new additions from Reynolds 531, which is still the first choice for the kind of lightweight cycles that are generally available.

HO PUTTIN IN THE

Anyone thinking for the first time about tubing is immediately interested to know how the hole got there. Was an accurate hole taken and wrapped up in steel, or was a very strong hole pushed firmly through a steel bar? For lightweight machines, whether for touring or racing, a 'cold drawn seamless' tube is required. This starts life as a solid steel billet through which a hole is pierced, and which is then hot rolled into a 'hollow' or 'bloom' – already looking like a tube – which is then cold drawn down to the diameter and gauge required for our cycle frames.

Cold drawing takes place on drawbenches in a variety of sizes, where the tube with a mandrel inserted inside it is pulled through a die. As

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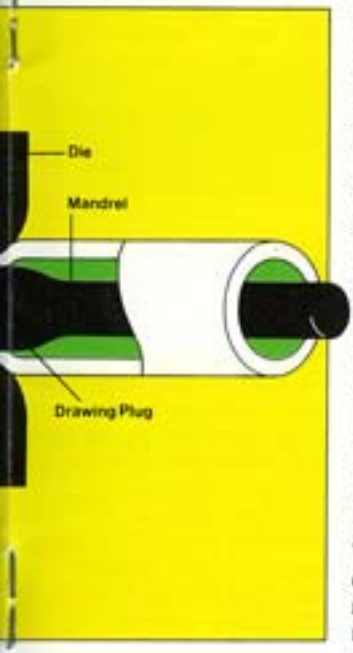


can be seen from the diagram, the metal is, in effect, squeezed between the die and the mandrel, thus reducing both diameter and wall thickness, and at the same time increasing the length. Several such 'passes' are necessary before the tube is the right diameter and gauge, accurate to within three thousandths of an inch, and having the required strength and physical properties.

Rigorous quality control takes place at all stages of manufacture, with frequent checks of both physical properties and tolerances. This ensures that only tubes complying with the high requirements of the Reynolds 531, Reynolds 531SL or Reynolds 753 specifications are accepted for further processing.

IT'S

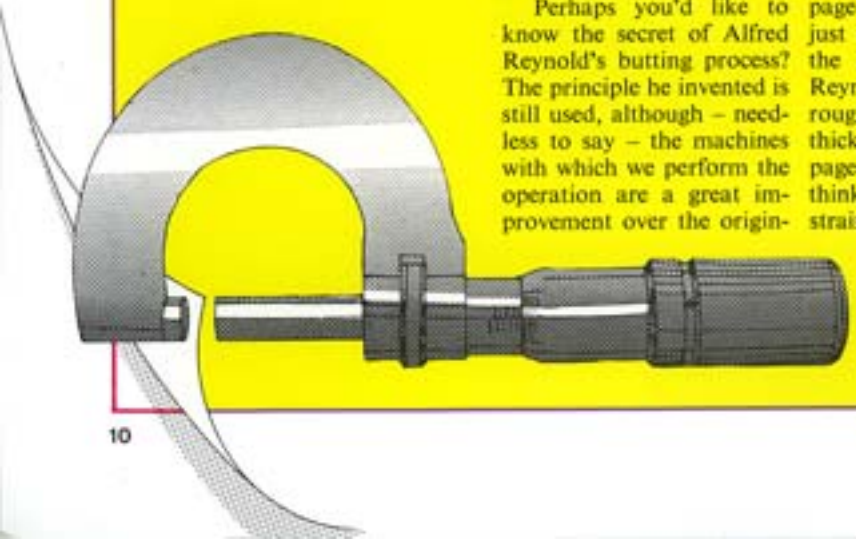
We have already read how Alfred Reynolds made his name – and the name of the company – with the famous 'butting' process. This overcame the problems of making lightweight bicycles with thin-walled tubes that buckled at stress points, by locally thickening the walls of the tube without altering the outside diameter. This thicker portion is known as the 'butt', and the tube becomes a 'single-butted' tube if it's thickened at one end only, and a 'double-butted' tube if it's thickened at both ends (see diagrams). Single-butted tubes are used for jobs such as seat tubes or steerers, and double-butted tubes for top and down tubes.

Perhaps you'd like to know the secret of Alfred Reynold's butting process? The principle he invented is still used, although – needless to say – the machines with which we perform the operation are a great improvement over the originals. In theory, butting is very simple. It involves putting a shaped mandrel inside the tube, and passing both through a die, so that the tube is pressed down onto the mandrel, which imparts its shape to the inside of the tube, but leaves the outside a constant, although slightly reduced diameter.

Example

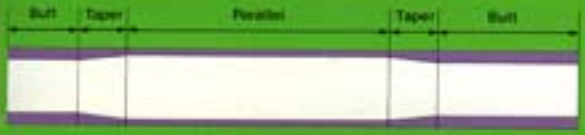
This chart illustrates how the wall thickness varies between the middle and butted end of a double-butted top tube.

Just how thick is this? To give you some idea, each page of this booklet is just over 0.1mm thick. So the centre portion of a Reynolds 753 top tube is roughly equivalent to the thickness of only three pages. Quite impressive, we think you'll agree, for the strains it has to take!

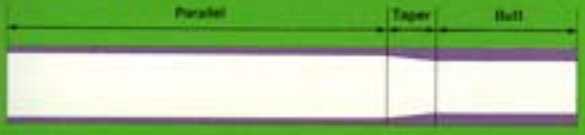


BETTER BUTTED

DOUBLE BUTTED



SINGLE BUTTED



Diagrams exaggerated for clarity

TYPICAL TOP TUBES

	Butted Ends	Centre Tube
Reynolds 531	21 swg (0.8mm)	24 swg (0.56mm)
Reynolds 531SL	22 swg (0.7mm)	24 swg (0.56mm)
Reynolds 753	22 swg (0.7mm)	28 swg (0.38mm)

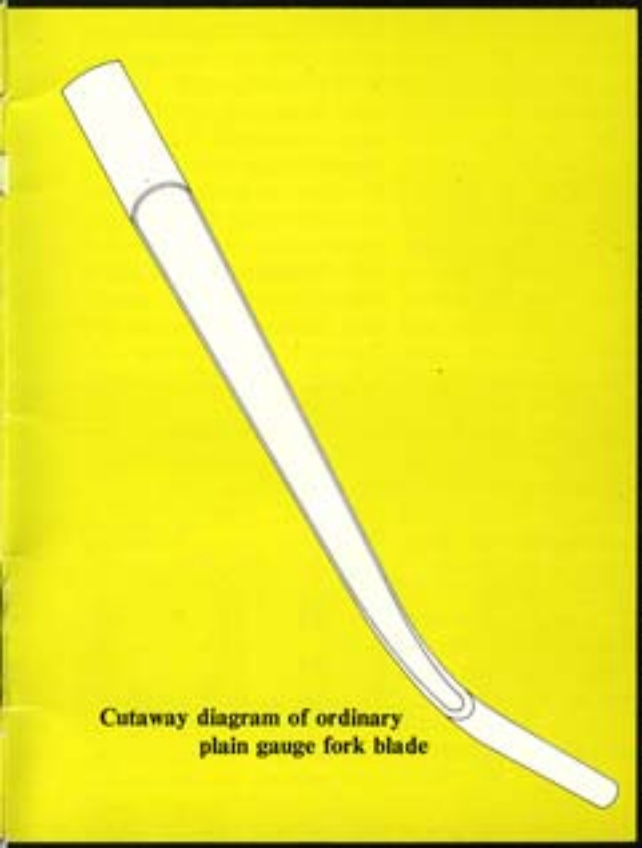
SMOOTH &E

Modern road surfaces are generally good – but even so, if front forks were rigid it would be a very uncomfortable ride, and use up so much energy absorbing vibration that mileages would tumble and times would stretch alarmingly. So the front fork blades are curved to a carefully planned 'rake' to provide resilience to smooth out some of the road-roughness.

This is where Problem No. 1 crops up. The weakest point in a cycle tube is at the brazed joint, so we need the top of the fork blade to be rigid, which means using an adequate thickness for the tube wall. This leads to Problem No. 2. When a tube is tapered, quite naturally the wall thickens up as the diameter decreases. So we now have a typical fork blade where the top is thick enough to give rigidity, but the bottom

Cutaway diagram of Reynolds taper gauge fork blade

EFFORTLESS



Cutaway diagram of ordinary plain gauge fork blade

is thicker than the top, which partly defeats the effect of the rake and kills a lot of the resilience.

What can be done about this? Some cycle manufacturers use a lighter gauge fork blade to give the resilience, and put a liner in the top for rigidity. But by far the best solution is Reynolds' taper-gauge fork blades. These start as a Single Butted Tube, with the butted end to give strength at the crown and a long, gradual reduction of gauge to the other end. The lighter end is then tapered, and even though the tapering process increases the wall thickness of the tube along the length of the taper it does not become thicker than at the Butt (see diagram). Result: a fork-blade that's strong and rigid at the crown, but with all the resilience you require.

REYNOLDS TRANSFERS

Marks of Distinction

In Britain they're transfers. In America, decals. The French know them as 'decalques'. Call them what you will, the message they proclaim is the same worldwide: a cycle frame incorporating the very finest tubes available.

Why are there so many types of transfer? Simply because of the differing demands of even the most discerning cyclists: a competitor in the devastating Tour de France, for example, will not want the same frame characteristics as a cyclist touring America. Reynolds supply the appropriate tube for these varying needs, and the transfer on the finished frame – in effect, its hallmark – indicates the choice and combination of component tubes, and hence the type of work for which the cycle has been designed.

How do I get a Reynolds transfer?

Only by buying a cycle built with Reynolds Cycle tube – genuine Reynolds transfers cannot be bought. They are issued by TI Reynolds from their Birmingham, England headquarters direct to bicycle manufacturers and frame set stockists. The number of transfers supplied is strictly controlled to conform with the number of tube sets. Any offered for sale separately are forgeries.

In certain circumstances it is possible to obtain replacement transfers directly from TI Reynolds, for well-authenticated repainting jobs. To ensure that transfers are applied only to genuine Reynolds 531 or Reynolds 753 frames, it is necessary to quote frame number, together with a guarantee from the manufacturer that the frame was built from Reynolds' tube. This traditional policy of strict control is designed to protect cyclist, dealer and bicycle manufacturer. As well as the long and proud reputation of TI Reynolds for supplying the very finest cycle tubes in the world.

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1 & 2. Probably the best known bicycle transfers in the world! A bicycle with either is a real thoroughbred, built with REYNOLDS 531 BUTTED frame tubes, BUTTED steerer, TAPER-GAUGE fork blades and plain gauge head tube and stays.

3. This is a special version of the top REYNOLDS 531 transfer, designed for a specific market. It bears exactly the same significance as the normal English and French versions.

4 & 5. These are used only in conjunction with the three top-grade REYNOLDS 531 transfers, as appropriate.

6. The top tube, seat tube and down tube of a bicycle with this transfer are REYNOLDS 531 BUTTED tubes, with a plain gauge REYNOLDS 531 head tube. Stays and fork blades may not be of Reynolds' manufacture.

7. The top tube, seat tube and down tube of a bicycle with this transfer are REYNOLDS 531 BUTTED tubes. Head tube, stays and fork blades may not be of Reynolds' manufacture.

8 & 9. BUTTED frame tubes and steerer, TAPER-GAUGE fork blades, plain gauge head tube and stays, all made from very light gauge REYNOLDS 531 SPECIAL LIGHTWEIGHT tube. ('EL' is an abbreviation for 'Extra Lēger' – the French equivalent of 'Special Lightweight').

10 & 11. Used only in conjunction with the 'Special Lightweight' frame transfer and applied to the REYNOLDS 531 SPECIAL LIGHTWEIGHT fork blades.

12 & 13. These transfers show that REYNOLDS 753 tube is used throughout – BUTTED for frame tubes,

TAPER-GAUGE fork blades and plain-gauge head tube, steerer and stays.

14 & 15. These are used only in conjunction with REYNOLDS 753 frame transfers, and are applied to the REYNOLDS 753 TAPER-GAUGE fork blades near the crown.

16. Not often seen these days, this transfer indicates that the frame tubes, forks and stays are manufactured from REYNOLDS 531, but *not* from butted tubing.

17. Even scarcer, this transfer shows that the top tube, seat tube and down tube are of REYNOLDS 531, but *not* butted tubing. Head tube, stays and fork blades may not be of Reynolds' manufacture.

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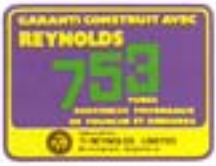

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We hope that these notes will have given you a deeper appreciation of those unsung, uncomplaining, but so essential parts of a bicycle, the frame, forks and stays. And perhaps when that distinctive REYNOLDS transfer catches your eye you will remember all the skill, craftsmanship, and devotion to the cause of cycling which lie behind it.

Reynolds 531: Only we can make it.

TI REYNOLDS

TI Reynolds Limited, P.O. Box 232, Hay Hall, Redfern Road, Tyseley, Birmingham, England. B11 2BG.

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