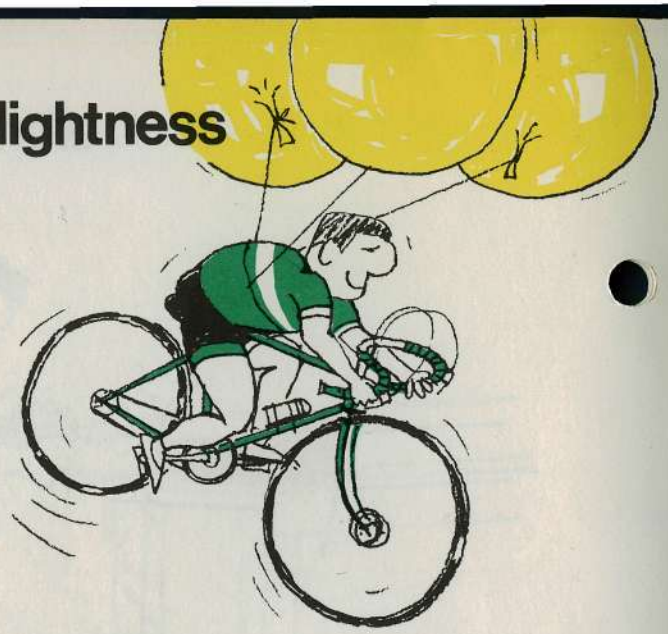
Adding more lightness



We cyclists are never satisfied ! Always looking for some way of cutting the weight of our bicycles in order to improve our times, or convert our energy into more miles or less minutes !

The search for lightness brings its own problems, however—a major one being a proneness of frames built of very thin-gauge tubing to buckle at the points of maximum stress—near the joints of the frame. This problem was a challenge to Alfred Milward Reynolds—then a young man working in his father's nail factory in Birmingham, and in the 1890's he succeeded in overcoming it by inventing the "butting" process, whereby the gauge of the tube is increased at the point of maximum stress, near the brazed joints, without increasing the outside diameter of the tube. This process was patented in 1897, and manufacture started in his father's works.

Although the machines used have progressed, the principle is still the same today. It involves putting a shaped mandrel inside the tube and passing both through a die, so that the tube is drawn down onto the mandrel. This gives the inside of the tube the shape of the mandrel, while maintaining a constant, though slightly reduced, outside diameter. But how to get the mandrel out ? No cyclist wants his machine built with solid bars inside his tubes ! This problem is solved by passing the tube between inclined rollers, which give it a spiral motion and cause it to "spring" sufficiently to enable the mandrel to be withdrawn.

Obviously, the thickness of the butted sections is more restricted in a double butted tube than in a single butt, but the process still allows for a thickness increase adequate for a cycle tube. A butted tube made of "Reynolds 531" may be as thin as 24 swg. (·022″) in the middle, increasing to 21 swg. (·032″) at each end.

"Reynolds Butted Tubes" proved so successful that in 1898 a separate Company was formed to make and market them. This was called "The Patent Butted Tube Company Limited", but the tubes were still sold as "Reynolds Butted Tubes" — so that it was almost inevitable that the name of the Company should eventually be changed to Reynolds Tube Company Limited—which name, of course, is so well-known today.

More lightness-more strength

Still we cyclists called for yet lighter and stronger machines ! The butted tube was ideal, mechanically, so further developments had to be in the metallurgical field—stronger steels to enable thinner gauge tubes to be used. First came Reynolds 'AA' Quality tubing—a high carbon content tubing with greater strength than the original 'A' quality. This was followed by Reynolds 'HM'—a high manganese steel, which at the time was the finest tube-making steel ever used in bicycles, enabling very light gauges to be used, while maintaining the strength of the frame and a high resistance to fatigue.

But even this was surpassed when "Reynolds 531" was developed. Not only was the all-round strength and resistance to fatigue higher in this new steel, but at correct brazing temperature its "crystal structure", unlike that of earlier tube steels, remained very little changed. This important factor ensured that the strength of the tubing would be maintained at the points of maximum stress where earlier tubes had so often been weakened by the heat of brazing.

A manganese-molybdenum alloy steel, Reynolds 531 (say it "five-three-one") proved so successful that it was soon used as the basis of several Standard Specifications for aircraft and engineering tubing. With minor modifications to its chemical specifications, it has continued unsurpassed for all purposes where strength with lightness and resistance to fatigue are required.

It did not take us cyclists long to realise that the combination of the Butting process with "Reynolds 531" would give the ultimate in strength with lightness for cycle frames, and soon "Reynolds 531 Butted Throughout" became a "must" in the specifications of the finest racing and touring bicycles all over the world.