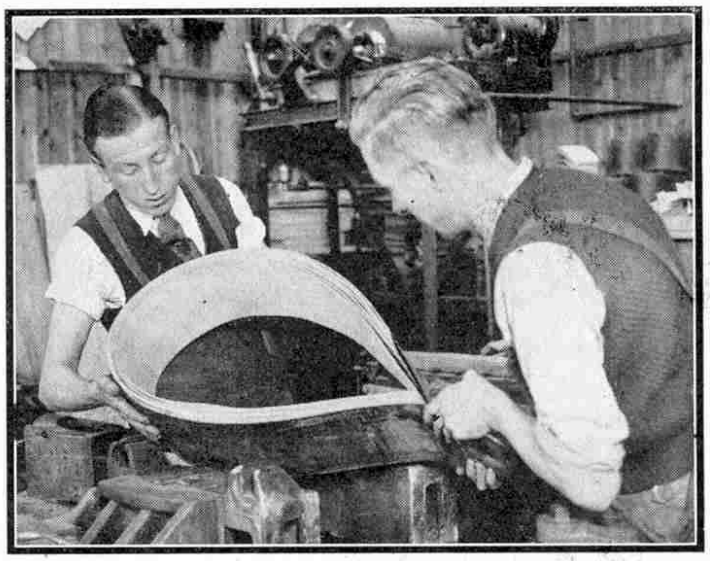
HOW THINGS ARE MADE:

Tennis Rackets In A Modern Factory

By H. Lethaby

I WANT you to imagine that with a number of other readers of the "*M.M.*" you are paying a visit to the Tennis Racket Factory of Goodwood Sports Ltd. in South East London. If you are interested in seeing the works of nature turned into the work of man I am sure you will not be disappointed by the result.

First of all I must tell you that until only a few years ago tennis rackets were made almost exclusively from English ash, and from beginning to end the processes were carried through entirely by hand. The trees were rent into sticks, each large enough to make into a tennis frame. These sticks were steamed in a large chest until they were saturated and pliable, after which they were bent to the required shape and left for some months to dry and season. At the end of that time the wires or clamps that had been holding them in shape were removed, and wedges cut roughly to shape were glued in position. Equally rough handles were then stuck on, and after the racket frames had been moulded or shaped by hand they were laboriously drilled to receive the gut, polished, strung and finally stamped with the maker's name and trade mark.

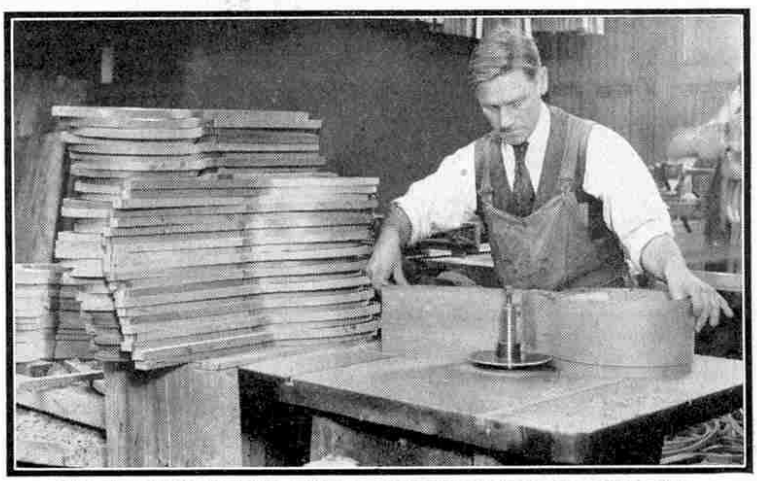


Bending and gluing strips of wood to form six tennis rackets, a process taking two minutes. The illustrations to this article are reproduced by courtesy of Goodwood Sports Ltd.

All this work took considerable time, so perhaps it was a blessing in disguise that tennis was not so popular in those days as it is now. Our grandfathers and great-grandfathers who made rackets in the old days would look on with much surprise, and probably with disapproval, if they could visit one of our modern factories. "Fancy!" one can almost hear them saying. "Using beech, sycamore, birch, walnut, lime, horse chestnut, maple, mahogany and all these other woods, when ash is the only one suitable for making into tennis rackets." If the ways of making rackets were the same now as then, they would be right, but in these modern times the steaming chest is seldom if ever used, nor is the long period of drying and seasoning necessary to-day.

After this glimpse of the past history of the sports trade, let us return to the present and commence our journey round the factory. First of all we find a yard full of huge logs of trees, waiting their turn to be cut up into thin strips. The thickest strips we cut in the factory are of 10 gauge, that is approximately $\frac{1}{8}$ in. in thickness; but fractional inch measurements are not precise enough in deciding the number of strips required to make into a racket, so we use millimetres and decimal fractions of millimetres in measurements. The frame of every tennis racket leaving the factory must measure within 1/10 of a millimetre of our standard gauge, which is 13.480 m.m. For instance, a nine-piece laminated racket would probably consist of four pieces of 13 gauge timber, each 2.337 m.m. in thickness, making a total of 9.348 m.m., and five of 21 gauge timber, each of .813 m.m., with a total thickness of 4.065 m.m. Thus the combined thickness will be 13.413 m.m., which is within the required limits of measurement.

It must not be supposed that these strips are only wide enough to make one racket at a time, and on entering the Gluing and Bending Room you will see a number of strips being glued together to form a block of six rackets, as shown in the upper illustration on this page. The machine that is used for this purpose turns out one of these blocks every two minutes all the year round. It will be realised that a very large number of people will be required to take up tennis if this glutton for work is to be kept in regular occupation!



A block of six rackets being cut into separate units by means of a circular saw.

It is hot work in this room, for in it we must always maintain a temperature of 80 deg. F., as otherwise the glue would chill and we should get rackets with bad or open joints. You will notice how the strips of wood go through a patent gluing machine before being placed on a steel strap, which assists the machine to pull them to the shape they will retain for the remainder of

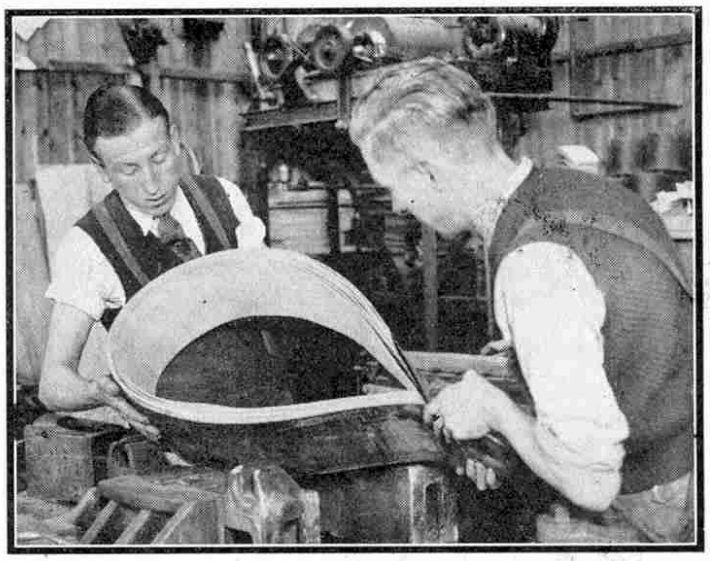
HOW THINGS ARE MADE:

Tennis Rackets In A Modern Factory

By H. Lethaby

I WANT you to imagine that with a number of other readers of the "*M.M.*" you are paying a visit to the Tennis Racket Factory of Goodwood Sports Ltd. in South East London. If you are interested in seeing the works of nature turned into the work of man I am sure you will not be disappointed by the result.

First of all I must tell you that until only a few years ago tennis rackets were made almost exclusively from English ash, and from beginning to end the processes were carried through entirely by hand. The trees were rent into sticks, each large enough to make into a tennis frame. These sticks were steamed in a large chest until they were saturated and pliable, after which they were bent to the required shape and left for some months to dry and season. At the end of that time the wires or clamps that had been holding them in shape were removed, and wedges cut roughly to shape were glued in position. Equally rough handles were then stuck on, and after the racket frames had been moulded or shaped by hand they were laboriously drilled to receive the gut, polished, strung and finally stamped with the maker's name and trade mark.

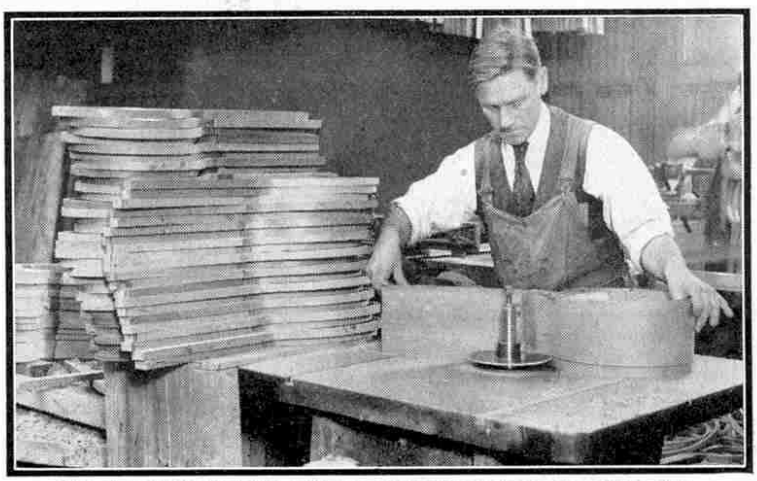


Bending and gluing strips of wood to form six tennis rackets, a process taking two minutes. The illustrations to this article are reproduced by courtesy of Goodwood Sports Ltd.

All this work took considerable time, so perhaps it was a blessing in disguise that tennis was not so popular in those days as it is now. Our grandfathers and great-grandfathers who made rackets in the old days would look on with much surprise, and probably with disapproval, if they could visit one of our modern factories. "Fancy!" one can almost hear them saying. "Using beech, sycamore, birch, walnut, lime, horse chestnut, maple, mahogany and all these other woods, when ash is the only one suitable for making into tennis rackets." If the ways of making rackets were the same now as then, they would be right, but in these modern times the steaming chest is seldom if ever used, nor is the long period of drying and seasoning necessary to-day.

After this glimpse of the past history of the sports trade, let us return to the present and commence our journey round the factory. First of all we find a yard full of huge logs of trees, waiting their turn to be cut up into thin strips. The thickest strips we cut in the factory are of 10 gauge, that is approximately $\frac{1}{8}$ in. in thickness; but fractional inch measurements are not precise enough in deciding the number of strips required to make into a racket, so we use millimetres and decimal fractions of millimetres in measurements. The frame of every tennis racket leaving the factory must measure within 1/10 of a millimetre of our standard gauge, which is 13.480 m.m. For instance, a nine-piece laminated racket would probably consist of four pieces of 13 gauge timber, each 2.337 m.m. in thickness, making a total of 9.348 m.m., and five of 21 gauge timber, each of .813 m.m., with a total thickness of 4.065 m.m. Thus the combined thickness will be 13.413 m.m., which is within the required limits of measurement.

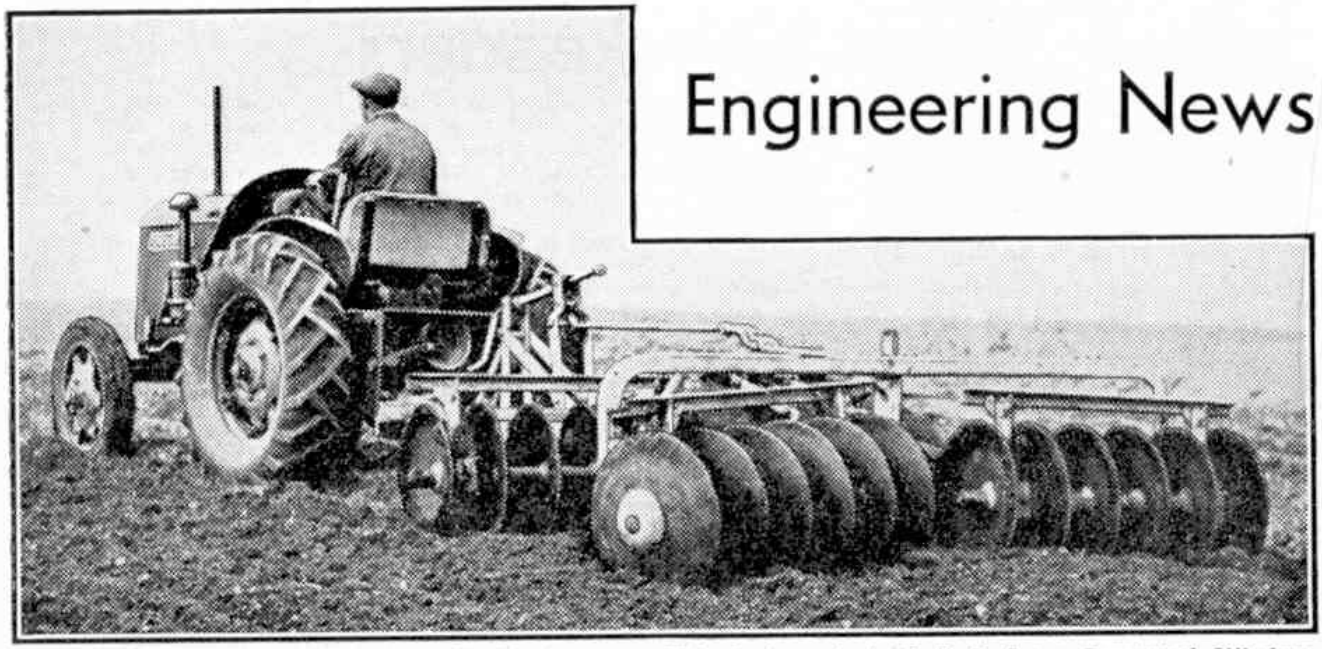
It must not be supposed that these strips are only wide enough to make one racket at a time, and on entering the Gluing and Bending Room you will see a number of strips being glued together to form a block of six rackets, as shown in the upper illustration on this page. The machine that is used for this purpose turns out one of these blocks every two minutes all the year round. It will be realised that a very large number of people will be required to take up tennis if this glutton for work is to be kept in regular occupation!



A block of six rackets being cut into separate units by means of a circular saw.

It is hot work in this room, for in it we must always maintain a temperature of 80 deg. F., as otherwise the glue would chill and we should get rackets with bad or open joints. You will notice how the strips of wood go through a patent gluing machine before being placed on a steel strap, which assists the machine to pull them to the shape they will retain for the remainder of

Engineering News



A "David Brown" Tractor at work with disc harrows. This photograph, by C. F. F. Snow, Braywood, Windsor, was awarded a consolation prize in the 6th seasonal Photographic Contest organised by David Brown Tractors Ltd., Huddersfield, by courtesy of whom it is reproduced. Details of a further Photographic Contest are given on page 230.

Reclaiming Metal Dust

The hard school of war has taught us the vital need for making the utmost use of all raw materials, and salvage is playing a very important part in this. One of the firms that even in pre-war days possessed a widespread salvage scheme was the Ford Motor Co. Ltd. At their works at Dagenham every possible use is made of every scrap of waste, and very effective schemes for reclaiming this have been worked out.

A particularly interesting part of the Ford factory is what is known as the sintering house, the special purpose of which is to reclaim such materials as metal borings and filings from the machine and other shops, and iron ore dust. In their original form these are too fine to be used in the blast furnace, because the fierce draught of air through this would immediately blow them out. In the sintering house therefore they are made into a heavy sinter or clinker, which can be used effectively in the blast furnace. The waste metals to be reclaimed are fed from hoppers on to a grate that is similar to the chain grate stoker of a boiler. As they travel over the grate they are roasted by means of gas jets, and combine with coke breeze to form a mass of clinker. When cold this is broken into pieces of a size suitable for handling, and heavy enough not to be blown out of the furnace by the hot air blast.

Even the very fine ore dust in the blast furnace gases can be reclaimed in this manner. The furnace is water cooled, and the cooling water is used also to cleanse the blast furnace gases. After it is used for this purpose the water contains a high percentage of solid matter. To reclaim this it is drawn off into a large circular tank with a conical base, where the solid matter is allowed to settle, so that large slowly rotating blades can sweep it into a pipe. Through this it is pumped to a suction filter, where the water is taken out. The remaining sludge can be roasted in the sintering plant. Every day three tons of solids are reclaimed by this means.

Sand is another valuable material that is recovered at Dagenham for further use. Many tons of it are used in the foundry in making the moulds into which molten metal is poured. After use it is collected by means of a belt conveyor running beneath the moulding machines, and passed through magnetic separators for the removal of "tramp" iron, small particles that cling to it when the castings are removed from the moulds. The clean sand is then carried to the mixing units and hoppers that feed the new sand on to conveyors, while the metal particles removed in the separator make up some of the minute scrap treated in the sintering plant.

At the Dagenham works there is a special salvage department, the duty of which is to devise ways and means of making savings. Every scrap of wood, rubber, metal, cloth or leather is saved, no matter how small. Even scraps of paper discarded by workmen are reclaimed and baled for repulping.

A New Type of Rock Crusher

Many types of rock and gravel crusher have been described from time to time in the "*M.M.*" In practically all of these the material is made to pass between heavy jaws, one of which is movable and works backward and forward against the other in order to break up the rock and stone. Hardened steel alloys are used in making the heavy jaws of these breakers, which have to bear enormous strains.

Now an entirely new form of crusher has been introduced in the United States for making sand and fine gravel. It is called the impact breaker, and the stones or gravel used are broken down by simply throwing them at high speed against breaker plates. These are made of manganese steel, and the broken material is carried forward to a screen where it can be graded. The new machine has a very high output, but maintenance costs are high as the breaker plates need to be renewed daily.

Soldering Made Easy

A neat wire soldering unit for giving strong and electrically efficient connections has been brought into use in America. It is called the jigger. Each unit contains a sufficient quantity of solder and flux, packed in a waterproof casing of inflammable material. The wires to be joined with its aid are thrust into it, and the casing is ignited. This gives sufficient heat to melt the solder and cause it to flow over the ends of the wires, and the burned casing then drops off, leaving a cleanly soldered joint. With the jigger wires can be permanently connected more easily and quickly than with a soldering iron.