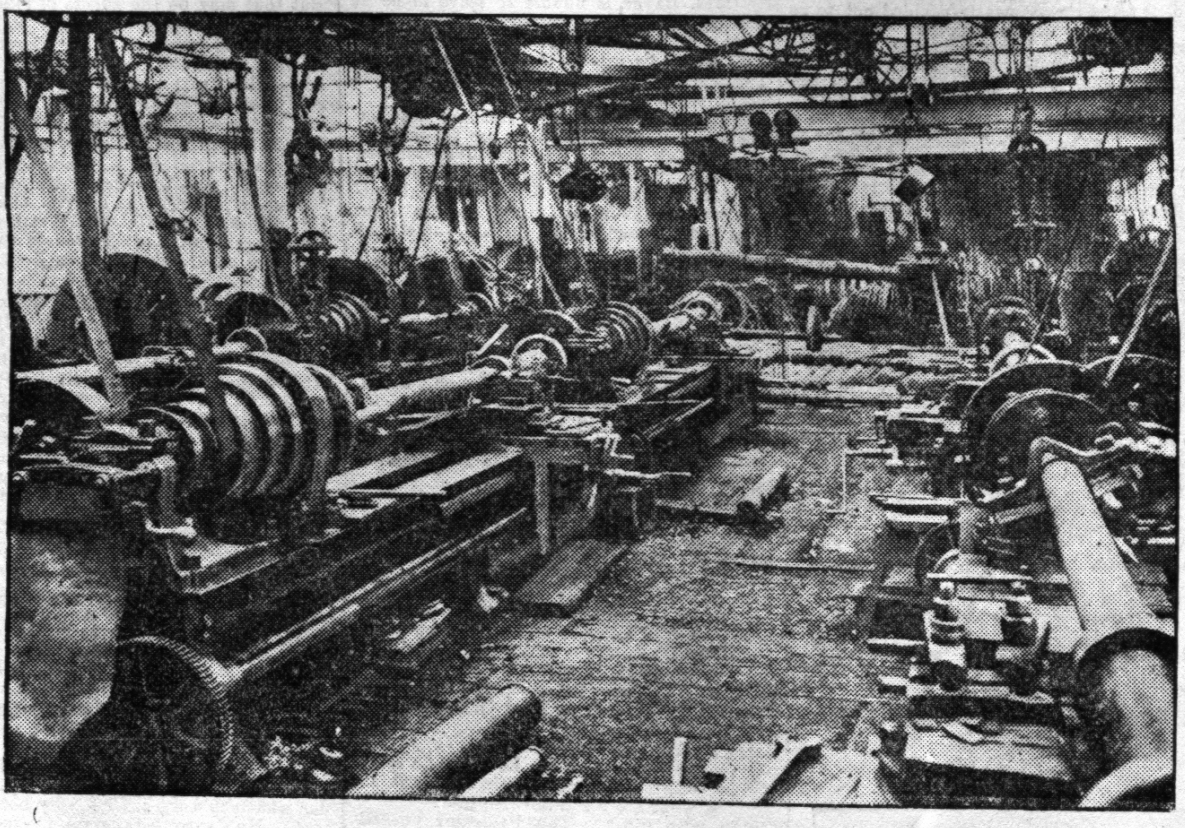
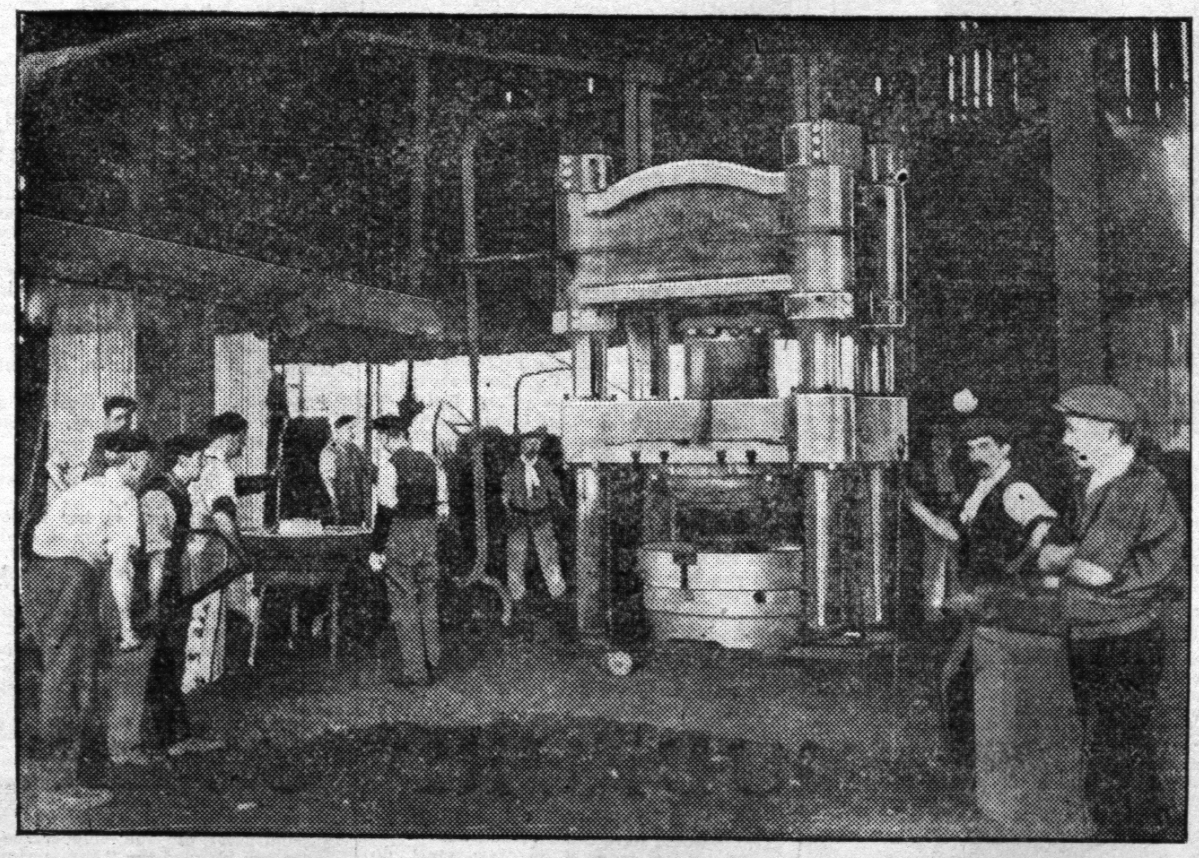
THE BRINSWORTH WORKS.



OLD WHEEL SHOP.



1500 TON WHEEL FORGING PRESS.

If ever there was a project mooted for a Tramway or a Railway in any part of the world it seems likely that Messrs. Baker's will be amongst the first to send in tenders for the wheels and axles of the rolling stock. They are up-to-date in every sense and ahead of it in more than one. The business has been a generation in building, but it is built. Baker's wheels run round the world. If you walk through their works you find a man here glutting a wheel that will rim over the arid plains of India, another there "knocking down" one which will spin through South American pampas; here is one turning an axle, which will run under a coach, when it is built, that may carry Manchurian mandarins, Japanese coolies, cattle ranch men from Texas, or sturdy grain farmers of the Amazon. North and South and East and West their manufactures go; they are carried across every ocean; they run in every land. The tramcar wheels made by one process alone amount to scores of thousands - and so well is the work done that out of all those thousands on thousands of wheels there have been but two cases of defective forging in the whole time they have been making them. Here are tramway wheels for Mexico, railway wheels for the latest Chinese railway development, others for the Indian State railways, others still for the "G.I.P." - initials which stand for the Great Indian Peninsular Railway. These light axles are for Monte Video, the heavier ones there for the Argentine. Look wherever you will the men engaged in these works are making stuff which will be sold to the foreigner - think of it - and ask how many of them would be employed if the "keep to your own market" theory were to be acted on all round. Messrs. Bakers climb over the tariffs of the world and hold their, own there - easily. They send wheels and axles to Russia, they send them to the United States, the country they find it most difficult to enter is - Canada - for the high tariff of the high tariff of the Canadian is meant to keep out Britisher as well as others. Amongst Continental nations France is the hardest one to do business with, not only on account of its tariffs, but because of the innate conservatism of French methods. The French people do all they can at home - they are not exactly, in their rate of progression in foreign trade, an example Britons need long to fellow.

However, this is no political article, nor the place to discuss Free Trade versus Protection. Suffice it to say that by dint of irrepressible energy, by inventive genius, by commercial as well as manufacturing insight and by the "It-is-dogged-as-does-it" sort of spirit, the Bakers have held their own in home and foreign markets, and are doing so to-day.

One telling fact on this point, and we leave it. On the day we visited the works there was in the large shops but one home order in the course of completion - the rest of the works was occupied entirely with foreign material, that is material intended for foreign parts.

About eight years ago electric traction began to replace the old horse and steam trams, and with commendable foresight the firm saw that if a durable wheel could be manufactured a very large quantity would be required. Under ordinary conditions the tyres under a rail-way coal wagon will have a life of about twenty years, and although a tramcar tyre is 25 per cent. thicker, it rarely has a life of more than 2 1/4 to 2 ½ The problem was very difficult, but it was solved. A long series of careful experiments as to the different qualities of different kinds of steel, the varying advantages or disadvantages of different forms of wheels was carried on, side by side with the active manufacturing that were being pushed forward.

The final result of an almost endless series of experiments and tests was that Messrs.. Baker were able to put on the market a wheel which though of much higher original cost than the American chilled cast-iron wheels then common, lasted much longer, wore better in every way, and effected a considerable saving when the whole wheel-life was takes into consideration.

For a time the traffic world looked very shyly on the new invention. First cost plays so large a part in all matters of this kind that it was not surprising that a highly priced article should find a difficulty in getting wholesale recognition, despite its excellence and its final claim on economy. However, the Bolton Corporation led the way it adopting it, little by little it made its may, and in a few years' time had so far won to favour that the chilled iron wheel then in common use had to take second place, and to-day Messrs. Baker's steel wheels hold their own in any market.

Everything must have a beginning somewhere, and the manufacture of wheels and axles is usually considered to commence with the forging of the centres. Wheels of the “disc,” “solid arm,” “cold spoke,” and “hot spoke” patterns were going through the shops at the time of our visit, and while to the lay mind “a wheel is a wheel,” it was evident to us that while the finished articles seemed pretty much alike, they were made by very different processes and machines.

While the spokes for the “hot” and “cold” spoke wheels are bought, all those for the “solid arm” wheels are made on the spot, and many are made from old iron railway tyres, such as were made 40 or 50 years ago. These iron tyres are put under a pair of shears, which cuts them - perfectly cold - into suitable lengths, which are “piled” and forged under a steam hammer into a couple of spokes - tough, sound, well-hammered stuff, that must be superior to most of the new iron

that is now made. Of course, steel has now taken the place of iron for tyres, and the supply of the latter is nearly exhausted, but these old tyres are often silent witnesses of the past. “G. and J. Brown,” “Northfield,” together with other names long since forgotten, are often stamped on this scrap material. The first operation is that of bending the spokes. These are supplied more or less straight, and are lifted into a hopper fixed to the furnace. One by one they are pushed into the end of a 'continuous furnace,' finally arriving at the furnace door at just the right temperature. From there they are lifted to a hydraulic press which bends them to shape, due allowance being made for contraction, etc., while cooling. The spokes are then taken to the bossing press - a fine powerful machine, capable of exerting a pressure of 1500 tons. The spokes are placed in a ring and the ends brought to a welding heat, the entire mass being rapidly swung under the press, and with a slow, silent motion welds the wheel into one solid mass. This makes a “hot spoke “ centre, for in “cold spoke “ centres the spokes are placed into position when cold, and a piece of white hot iron is pressed round the spoke ends.

In another part of the shop goes on the interesting process of making tramcar wheels in segments. A curved piece of steel is forced upon the single spoke by a hydraulic press, working at one hundred tons lateral pressure, with a down pressure of eighty tons to keep the metal in its shape. So well and effectually is the work done that it is impossible to distinguish where the weld has been made. This work is called “dabbing-on,” and it is to these wheels reference is made in the passage above which tells how, in the case of thousands on thousands of these wheels, only two instances of defective welding were found.

The next process is “glutting',” which again is done by hydraulic presses, designed and manufactured on the spot. They are wonderfully effective machines, and put on a pressure of 100 tons as quietly and easily as one would press an electric button.

So far the work has all been executed in the forge, a fine large building about half an acre, and presents a very lively scene with its many forge fires flaming and sending out showers of sparks in ally directions. These fires are blown by a steam turbine, which does away with belting. and shafts, etc. The air pipes are laid underground, and over 100 tons of air are compressed per hour.

The centres must be machined and fitted with the tyres and axles, and for this purpose they are brought over the stream, and also into another parish; the tyres and axles. of course, come from the KiInhurst works of the firm. It is quite impossible to go into full details of this process, since almost every type of wheel goes through a different series of operations. Naturally the machines are very heavy and exceedingly powerful, A five ton lathe is about the lightest that can possibly be need, while the majority weigh from 12 to 20 tons.

The transport of wheels from one machine to another was a very serious affair, but a railway suspended up aloft and running all over the works has enabled this operation to be better dealt with. A couple of men take a pair of wheels and axles, weighing 26cwt., from a machine, run it across from one shop to another; and fit it in a lathe in a couple of minutes. A couple of very powerful lathes for “roughing out” axles were seen in operation, and the way in which three tools ripped off almost red hot turnings was wonderful. Some very fine tyre boring and wheel boring lathes were inspected. These are the latest and most powerful machines yet made for these purposes.

Messrs. Baker make a rolled steel disc wheel, which has never been made in this country before. The main idea is not their own, but the application of it to this particular wheel and to this particular manner of making it is entirely their own invention, and, of course, is not a matter they care to “give away” to every curious person who may wish to know it.

On some of the rolled steel disc wheels we saw (they were intended for the Indian State Railways) there is a shoulder of about five inches wide. Between this shoulder and the rim there is placed, to give an additional elasticity and strength to the wheel, a stout rim of Indian teak. This teak has to be forced between the rim of the disc and the tyre. It is a hard, close - frained wood, and any further compression of it seems out of the question. But by dint of a sloping, cast-iron ring and a pressure of some 300 tons, the wood is forced in. It is a “needs must when the devil drives” sort of process, and when in position between disk and tyre the wood it occupies less space by from five-sixteenths to quarter of an inch than it did before the application of this irresistible force. It really seems impossible to do it, but Messrs. Baker's men effect this sort of thing and seem to think nothing about it. It is quite conceivable that under special stress of circumstances they could perform that reputedly unthinkable feat of putting a quart into a pint pot.
The process known as “knocking down”. (it has nothing to do with pugilism) is performed by a small and rapidly moving hammer. This was, we were told, an invention of Mr. William Gittus, a well-known man in Barnsley and Doncaster and other places hereabouts years ago. He used an old Oliver for it: Messrs. Baker's were the firm to improve upon it, and were the first to use this effective method of hammering down the rim and

finally making all taut" as the sailors would say, between the wheel and its tyre.

Of one kind of tyres alone, tram-car tyres, the firm turns out more than 25,000 a year, and this fact alone will give some idea of the large and important business they are doing. Hydraulic appliances are to be seen all over the premises, and one wonders how some of the work could be done without them. Their work is so uniform and so steady that it is 11 unlikely that any other agency could do it I quite so well. We saw a wheel forced gently on an axle with a pressure of 75 tons. It seemed as if it were fixed there for ever. But something was wrong with that wheel or with that axle - in any case they were not judged to be suited to each other. The machine was set to work once more and, by a pressure of 80 tons, the wheel was forced just as gently off again. A common, every-day operation to those engaged in it - but a very wonderful and suggestive one all the same.

There arose, naturally, the question of water. If Messrs. J. Baker and Co. were customers of the town they were very important customers. But no. Their water supply is got from a well - a very dirty-looking and uninviting supply it is. But amongst other miracles they work here is a purification of water. By some chemical treatment which need not be explained, Mr. Henry Baker and Mr. Kershaw, of the Rotherham' Sewerage Department, have turned the muddy coin-pound they get from the well into water, which so far' as looks are concerned, is much clearer than that the people of Rotherham were drinking eight or nine months ago. The cost of this treatment is from 3/4d. to a 1d. per 1000, and Mr. Kershaw and Mr. Baker may be congratulated from the firm's point of view very heartily when it is considered that 5000 gallons an hour are used. and that if the firm had to pay for the water at the Rotherham Corporation's prices, as they would have to do were not this made usable, it would mean an expenditure of many hundred pounds per year.

The turning and fitting shops are busy places, filled with all the latest appliances, lathes, boring machines, overhead tramway, etc., and other matters. The large orders of so many different kinds of materials necessitate big stocks being kept on hand, and there is a surprising acreage occupied by finished goods, all waiting the orders for despatch. Nothing in this business is made "on spec." There is not a pair of wheels on the premises, in a sense, which is not "spoken for," but even with this proviso in mind, it is astonishing to see the sum of material lying there - money, of course - but money in a bulky and inconvenient form.

This is another Rotherham firm whose relations with its employees are of the best. Little differences there are, of course, just as there are spots on the sun; but serious and important disputes are entirely unknown.