

THE MAKING OF AUTOMOBILE TIRES.—II.*

FROM RAW MATERIAL TO FINISHED PRODUCT.

BY SNOWDEN B. REDFIELD.

Concluded from Supplement No. 1767, page 314.

MOLDING AND VULCANIZING.

AFTER the beading has been put in and the edges tucked down and reinforced, the core is removed from the central arbor, and with its fabric and rubber covering is placed in a mold, as shown in Fig. 6. When the cover is placed on the mold over the core and the rubber fabric, the application of pressure to the two sides of the mold will squeeze the rubber fabric tightly and a pile is made of these molds in a hydraulic-press vulcanizer, as shown in Fig. 6. After the shelves have been filled with the molds, each containing an unvulcanized tire with its cast-iron core, the whole framework is allowed to drop down into a large cylinder, and by means of the hydraulic rams heavy pressure is put upon the molds.

While this pressure is being exerted, steam at about 275 deg. F. is blown into the vulcanizing vessel, and the action of the heat causes a chemical combination between the rubber and the sulphur and other chemicals of the vulcanizing material. Also the pressure of the mold makes the different layers of the tire fabric stick tightly together and knit into practically one fabric, while the rubber loses its sticky nature and becomes what we know as vulcanized rubber.

The process of vulcanization is not completed in these molds, for as yet the tires are not provided with the outer coating or tread. This tread is an extra thickness of rubber which is put around the running surface of the tire and which often carries small metal disks or rings, or corrugations and projections in the rubber such as are frequently seen on automobile tires. These treads are made from the thin strips of rubber gum which were first described as coming from the calender presses. They are laid together in layers while still unvulcanized, and by means of special molds they have the metallic parts incorporated in them, or the small rubber projections, corrugations and ridges are raised by means of a mold while this tread is being semi-vulcanized in a manner similar to the first process of vulcanization of the main tire, as described and illustrated in Fig. 6.

PUTTING ON THE TREAD.

In order to apply the semi-vulcanized treads to the semi-vulcanized tire a layer of rubber cement is applied to the outside of the semi-vulcanized tire, this cement being largely unvulcanized rubber in its make-up. The tread is then laid on the outside and bound to the tire by means of strips of cloth. It should be said first, however, that the cast-iron core which was in the casing of the tire during the process of vulcanizing in the hydraulic press is removed. Its place is taken in the tire casing by what is known as the air bag, which in reality is an inner tube which will hold air under

pressure. This wind bag holds the tire stiff and yet somewhat flexible, while around the circumference there is applied the strip of semi-vulcanized rubber forming the tread.

BANDAGING BY MACHINERY.

Fig. 7 shows the machine which is used to bind the

made practically into one piece. The action of the heat, of course, expands the air in the wind bag, and as all the stretch has been taken out of the wet bandage cloth, the expansion of the air in the wind bag puts a very heavy pressure on the rubber of the casing and tends strongly to knit the parts together;



FIG. 8.—MAKING THE INNER TUBES ENDLESS.

strip of cloth around the tire casing which contains in its interior the wind bag and around its circumference the tread which it is desired to cement and vulcanize to the main tire. The machine shown in Fig. 7, it will be seen, consists essentially of a gear wheel without any spokes or hub, it being carried and guided on its circumference by means of rollers in the frame of the machine. This spokeless gear wheel carries on its rim a wheel about 8 inches in diameter which has the cloth strips wound upon it not greatly unlike the long rolls of bandage used in a hospital, although, of course, it is not sticky. This bandage material is, however, wet when it is applied, and its application is accomplished by the rotation of the spokeless gear wheel carrying the reel round and round through the circular tire and at the same time, by means of vertical rollers which guide the tire, the latter is rotated on what would be the axis of the automobile wheel were it in place. In this way the cloth bandage is tightly laid on in a very wet condition.

The next step is to take this bandaged tire with its wind bag and tread to another steam tank where the vulcanization is completed and the tire and tread are

that is, to make one piece out of the main tire and its tread.

It should have been said that during the first process of vulcanization in the cast-iron mold, shown in Fig. 6, the various letters, usually of a raised character, which appear on the side of a new automobile tire, are formed; their forming is, of course, due simply to the tendency of the rubber to expand into the spaces cut for the letters in the mold itself. These letters, and in fact any marks which may be put on the mold, come out in a very sharp, clear manner characteristic of molded rubber.

THE INNER TUBES.

This, then, practically describes the making of the outer casing of automobile tires. The inner tubes are very simply made and their production is at present almost entirely hand work. The rubber gum coming from the calender presses without fabric is cut into the proper width and the edges scarfed or chamfered. These edges are then overlapped upon each other and raw or unvulcanized rubber has a strong tendency to stick together; in fact, forming one piece of material when pressed tightly together. This pressing is done

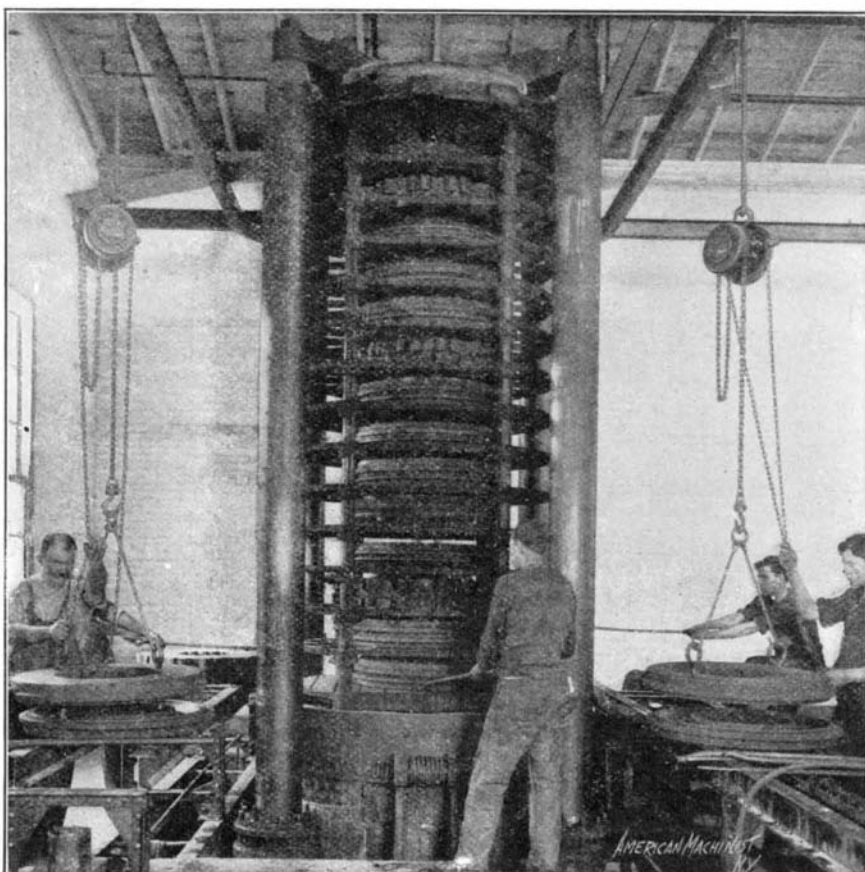


FIG. 6.—THE VULCANIZING PRESS AND MOLDS.

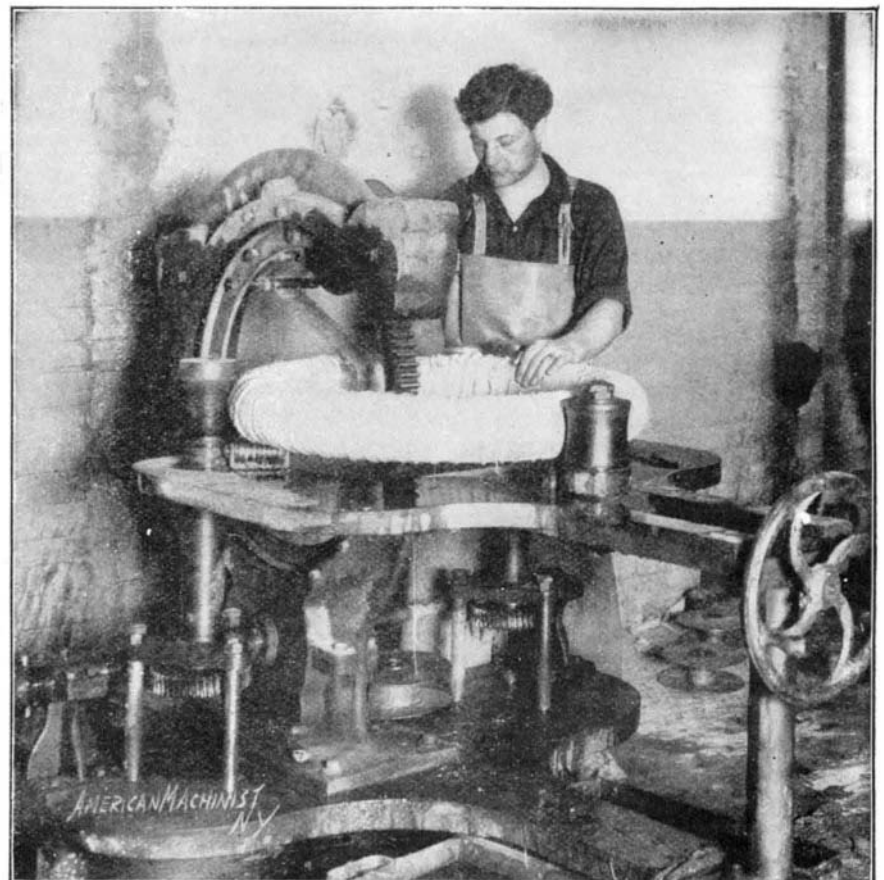


FIG. 7.—THE "BANDAGING" MACHINE.

by hand, a stick of lath being inside of the folded strip of rubber upon which to press the seam of the tube.

In this form, of course, the inner tube is a straight piece having two ends somewhat like a short length of thin rubber hose. In this condition it is slipped over long metal tubes or forms, and in order to facilitate sliding it over the tubes compressed air is applied to one end of the rubber tubing which tends, of course, to expand the latter and allows it to slip over the metal vulcanizing form or tube very easily. These long forms are then wrapped with cotton bandage cloth and put into vulcanizing tanks where, by the

application of heat by means of steam, the sulphur is again combined with the rubber gum, forming the well-known vulcanized rubber inner tube which is, however, still in the straight shape.

In order to make the tube endless a very ingenious device is used. Fig. 8 shows that the tubes have slipped over one of their ends a metallic sleeve. This sleeve is really double, and in the space between its inner and outer walls another sleeve fits very neatly. The rubber of the inner tube is folded down over the end of one of these short sections of metal tube, the surface of the rubber being treated with curing acid

to make it raw and easily cemented. Next, the other section of tube is slipped down into the first section, and by the application of compressed air the two sections are practically shot apart, causing the turned-back section of the rubber tubing to slide over the other end and lie flat upon it. By the application of rubber bands around the outside of the joined portion sufficient pressure is brought upon the parts to cause them to stick together. The metallic tubes are removed from the now endless rubber tube by sliding the rubber out through a groove which goes down one side of each one of the metal tubes.

A WATER BALLAST MOTOR ROLLER.

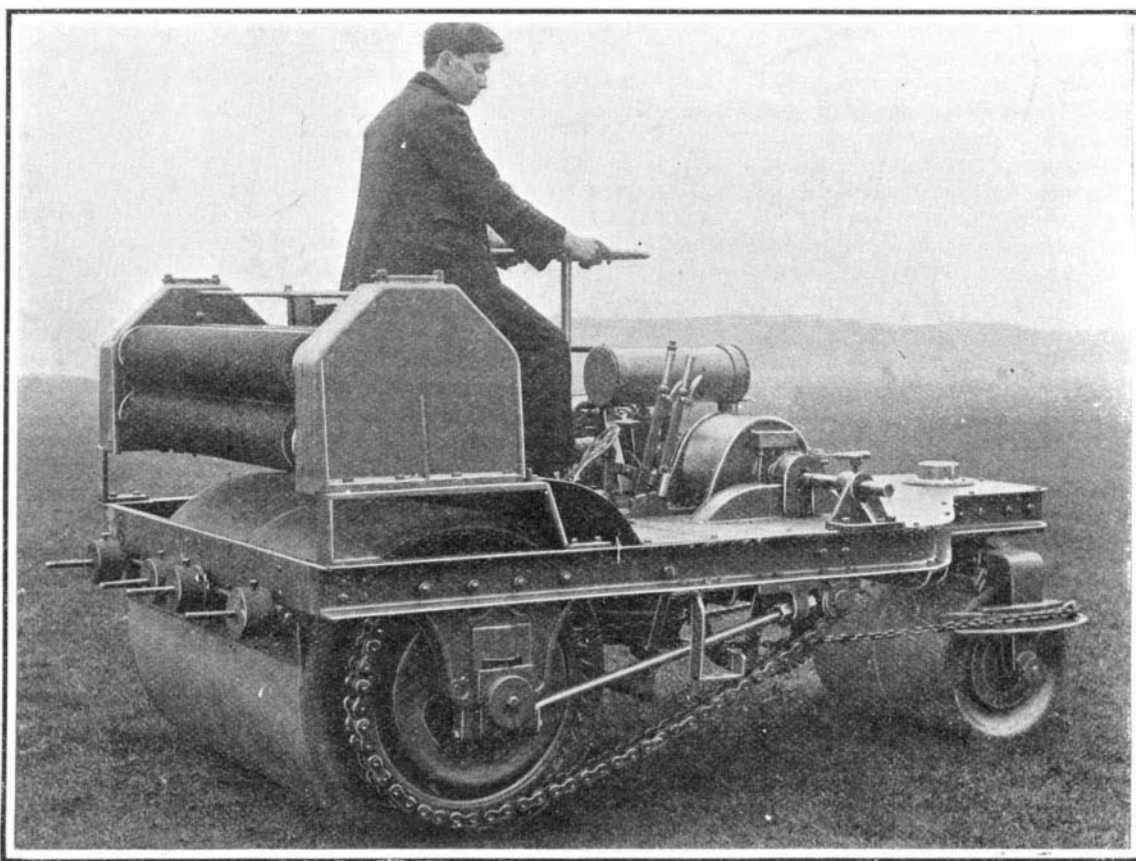
A NEW ENGLISH INVENTION.

BY FRANK C. PERKINS.

THE accompanying illustration shows the construction and method of operation of a novel motor roller provided with water ballast as constructed at Petersburg, England, and utilized for rolling race courses and training grounds, as at the jockey club at Newmarket. It is also employed at parks, golf links, and cricket grounds in Great Britain, as well as for road making with granite, tarmacadam, and asphalt.

This English water ballast motor roller is provided with a double-cylinder engine of 14-horse-power capacity and a kerosene carbureter. The motor is easily started with a few drops of gasoline. It is provided with a low-tension magneto, and also battery and coil in addition for ignition. The roller when loaded with water weighs about six tons, and is largely used in India as well as by some of the other colonial governments, also on several race courses in Japan.

In addition to the water circulating tank, a smaller tank is provided for carrying water to keep the surface of the front and back rollers wet when rolling tar macadam, so that this material or asphalt will not stick to the rollers. Water pipes are fitted to the car to sprinkle each of the rollers. It is stated that this arrangement has been found to work very satisfactorily, and to give excellent results for street work. The roller is 3 feet in diameter and 4½ feet wide, and weighs about 4 tons, and is provided with gearing giving two speeds. When running on the slow speed, it is claimed it will climb a hill with a gradient of 1 in 7. As to efficiency and economy of operation, it is maintained that the engine consumes on an average from 1/3 to 1/2 gallon of fuel per hour.



AN ENGLISH WATER BALLAST MOTOR ROLLER.

THE PRESERVATION OF ROADS.

TAR AS APPLIED TO SURFACE TREATMENT.

BY HERVEY J. SKINNER.

THE problem of preserving the surface of roads and highways and the prevention of dust has been given attention by highway engineers for many years, but not until the year 1905 was the question seriously considered in the United States. The increasing use of automobiles and motor vehicles about this time introduced a new condition to be considered in the building and preservation of roads. Reports from various parts of the United States, England, France and wherever the use of motor vehicles had become common showed that the automobile was exerting an extremely destructive effect upon road surfaces.

The macadam road has especially been subjected to this destructive action since it is the form of construction most commonly adopted for modern thoroughfares. The binder or fine material upon the surface of the road is removed by the constant passage of automobiles, thus exposing the larger stones, which become loose and which are either left on the surface or in windrows along the sides of the road. The roughened surface presents greater resistance to traction and allows water to percolate to the foundation of the road, thereby seriously injuring the whole structure.

Up to this time the macadam form of construction had been very satisfactory for the character of traffic for which it was designed, namely, that of iron-tired horse vehicles. In a perfectly constructed macadam road, the rock used is so adapted to the kind and

amount of traffic that the fine material worn off from the rock replaces that which is removed by atmospheric agencies. Under ordinary conditions it has been possible to maintain a hard and smooth surface at a moderate expense.

The advent of the automobile has changed very materially the character of the traffic. The action of the rubber tires is very different from that of iron tires, and practically no dust is worn off to replace that removed by ordinary wear. The great tractive force or shear exerted by the driving wheels of motor vehicles is the main cause of this injurious effect. It has been demonstrated by a series of experiments in which separate speedometers were connected to the front and rear wheels of automobiles that there is a very appreciable amount of slipping of the driving wheels on the surface of the road. This slipping effect throws into the air large quantities of the fine surface material, which is caught by the air currents generated by the car body and subsequently removed from the road by the wind.

Aside from the disintegrating action on the road, the dust raised by automobiles is a menace to health and a source of great discomfort to those living near much-traveled highways, especially in residential sections. Another consideration of importance is the damage to property, and instances are recorded where country estates have been disposed of far below their value, and farms and orchards abandoned owing to the dust nuisance.

The increasing number of automobiles each year emphasizes their importance as a factor to be taken into consideration, and consequently highway engineers have given careful study to the necessity of making a change in the present practice of road construction, as well as evolving some method of preserving the surface of the enormous mileage of roads already built.

The increased cost of maintenance resulting from these changed conditions has resulted in a search for some method of surfacing other than that commonly used on macadam roads. Various materials have been proposed and used, some of which are temporary in their nature and are simply intended as dust preventives. Others are more permanent in character and are advantageous in actually binding the surface of the road together, thus becoming an integral part of the structure. Of this latter class, crude oil and tar are the most important, and numerous preparations of these materials have been used with varying degree of success.

Coal tar has been employed in road building for many years. Tar macadam roadways were constructed in Nottingham, England, as early as the year 1840, although under rather crude conditions. Coal-tar pavements have been tried in various parts of the United States, but as a rule the results have not been satisfactory, asphalt being found superior as a paving material. In more recent years, tar macadam roads have been quite successful, and this form of construction is now used to a considerable extent.

* Read before the American Gas Institute.