Correspondence.

Single-Rail Storage Battery Motor.

To the Editor of the SCIENTIFIC AMERICAN:

With reference to the instruction and description of the "Single-rail Storage-battery Motor" given in your issue of June 2, 1900, will you kindly allow me to state that for the rolling-stock shown and described therein, that is, with the wide tired road wheel on one side for balancing purposes, I hold Letters Patent No. 541,732, dated June 25, 1895, for the United States of America, and consequently the construction or use of such rolling-stock without my permission is, and would be, an infringement of my patent.

The difference between the two systems mentioned in the particulars furnished you by Mavor & Coulson, of Glasgow (who are, I have noted, the builders of the motor car shown in your illustration), as being employed in South America and India, respectively, is that while my patented system admits of trains, of trucks and passenger cars being worked by any kind of power, whether animal, steam, electricity, compressed air, or any other, the system used in South America requires every truck, whether it be full or empty, to be balanced by a man or animal of some description, and without such assistance no other power than animal, and that to every truck, can be utilized with it!

So far from either system being, as stated, "a form of the well-known Decauville system," that gentleman (Mr. Decauville) has had no more to do with its invention than Adam, as the system now in use in South America was invented and worked by me at Dibrugark, Upper Assam, India, so far back as 1881, and I abandoned it because of the impossibility of one or a pair of animals dealing with more than one truck, whether full or empty, at a time.

CHARLES EWING.

Adyar, Madras, India, July 11, 1900.

THE MANUFACTURE OF MECHANICAL RUBBER GOODS.

Less than two centuries ago rubber was known only to habitues of museums, and merely as a natural product having curious and interesting properties. To-day, seeing that it has worked something of a revolution in the industrial arts, and has so greatly promoted our manufacturing and commercial interests, it must be reckoned as an indispensable factor of our material progress. It has contributed so largely to many of the achievements of mechanical science that a world of interest naturally attaches to the different processes through which the crude rubber is passed, before it can be made available for engineering or mechanical uses.

Many and varied are the purely mechanical uses to which rubber is put. Contrary to a quite general but erroneous impression among persons unfamiliar with rubber manufacture, rubber is not melted but is moulded or pressed into a great number of different shapes, that are made flexible or inflexible according to the use for which they were designed. Belting and packing for machinery, all kinds of garden, fire, and suction hose, moulded and perforated doormats, tiling, etc., represent some of the common products in which rubber is the basis.

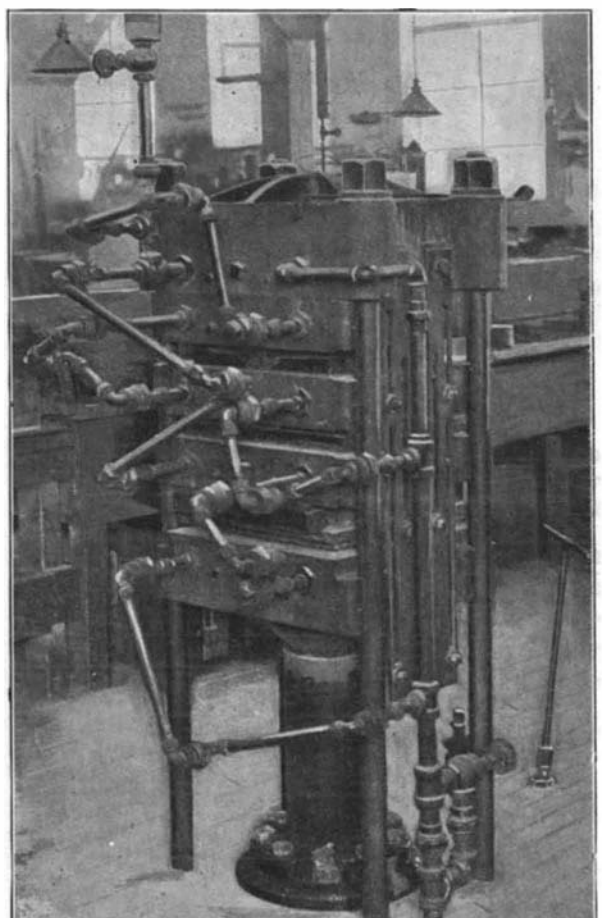
WASHING AND DRYING.—The first operation in the treatment of the crude rubber is the softening, which is accomplished by throwing it into hot water tanks, from which it is removed some hours later, cut up into small chunks, and thrown into the "washers," which are heavy machines having revolving corrugated steel rolls, which serve to crush and mangle the rubber passing between them, the sand and other impurities in the rubber being washed out by the small streams of water which play down upon it from a pipe above the washer, as indicated by the accompanying illustration of one of the washers. Sometimes the rubber contains a curious impurity in the shape of big brown rubber bugs, which have the interesting faculty of living for months in the recesses of the rubber "biscuit," without food and with little air.

The adhesive power of the raw rubber is such that a few minutes in the washers is sufficient to transform the rubber chunks into a continuous sheet of rubber, several feet long, and as wide as the washer rolls. These sheets, which are extremely rough, having somewhat the appearance of a Turkish towel, are allowed to dry, and are then crushed again between heavier steel rolls, the process being something like the kneading of bread dough. The power required to drive these machines depends upon the character of the rubber, varying from 20 to 40 horse power each.

THE MIXERS.—The grinders, mixers, or breakers, which are the names commonly given to the same type of machine in which the "compounding" is done, consist of two smooth hollow rolls, between which the rubber is thrown. The rolls are separated from one another by about half an inch, and, in turning, the rubber is drawn between them a little at a time until the whole mass is flattened out evenly, covering the roll nearest the operator like a blanket. From time to time the operator holds a knife against the roll, cutting through the rubber blanket as it turns; and as he cuts with one hand, making the incision run diagonally from side to side, he rolls up the severed portion with the other, until it becomes another good sized bundle, which he proceeds to throw again upon the rolls to be dragged through and crushed once more.

Under this kneading process, which at times, owing to the great cohesiveness of the raw rubber, requires a very large amount of power, the rubber becomes softer and is worked more easily. The rolls grow warm with the friction, in spite of the fact that cold water is sometimes kept flowing through them to reduce the temperature. When the proper amount of kneading has been done the operator begins the "compounding" process by sprinkling some of the material in his compound box into the rubber as the rolls turn. The black mass immediately assumes a streaky appearance, blending gradually, until the whole takes on a uniform grayish, reddish, or other tints, according to the use for which the compounded rubber product is intended.

As before stated, the rolls of these mixers are hollow, being provided with stuffing boxes on the ends, through which are passed water and steam pipes, so that the rolls may be heated or cooled to any desired temperature. Provision is made for relieving the rolls of condensed steam when heat is employed in the mixing process. The mixers, washers, and calenders are located directly over the shaft by which they are driven, and to which they are connected by gears arranged with friction clutches. It may be said that this is the general method of driving all the heavy machinery throughout rubber factories.



SMALL HYDRAULIC VULCANIZING PRESS.

THE CALENDERS.—After the kneading and compounding, the rubber is taken to the calenders, and under the pressure of four polished steel rolls, one above the other, it is rolled out into long sheets of any desired thickness to be used for various purposes, among which may be mentioned the interior lining of rubber hose, the exterior cover of rubber belting, packing, etc.

The calenders are also used to turn out various kinds of rubber cloth, which is made by crushing the soft rubber into the cotton duck or other fabric that is passed through the rolls at the same time with it. As in the case of the mixers the calenders, which often require 50 horse power for their operation, are driven by heavy gears, provided with powerful friction clutches. The calender rolls are hollow and are provided with both steam and water connections.

VULCANIZATION.—This process, which was Charles Goodyear's great discovery, the greatest known to the rubber industry, may briefly be described as a method of effecting a chemical change in the rubber through the application of heat (usually derived from steam), taking away the stickiness of the rubber and giving durability and wearing qualities it would not otherwise possess.

Hydraulic presses of various styles and sizes are used for vulcanizing the moulded goods, belting, packing, treads, etc., the largest ones being used in the manufacture of belting and packing. For the vulcanization of the smaller moulded rubber goods small hydraulic presses having several platens are used, it thus being possible to vulcanize goods in several moulds at one time. Steam connections to each of the hollow platens are made in the manner indicated by the accompanying illustration by a type of movable, steam-tight, universal connection which permits the platens to be raised and lowered without shutting off the steam. One of the large presses, 25 feet long and 50 inches wide, weighing about 40 tons, is shown in the accompanying illustrations. The top and bottom plates are hollow and are heated by steam to a temperature that may be varied as desired. Thermometers are placed on the sides of these plates, so that the temperature may be kept constantly uniform. This is accomplished by means of inlet and outlet valves in the steam pipes. Under the lower plate are the hydraulic rams by which the plates are brought together, a pressure of 400 pounds being used to raise the plate, until it comes into contact with the goods, when the pressure is increased to 2,000 pounds per square inch and maintained there during the vulcanizing process. The pressure on the rams is maintained by high and low pressure pumps of 2,000 and 400 pounds pressure respectively. The pressure on the high pressure pump is kept at 2,000 pounds by means of patent regulators and also by an accumulator, which is a long cylinder standing on end, with a 6-inch ram in the top end of it, this ram being weighted so as to maintain a pressure of 2,000 pounds, and serving to secure a uniform pressure at all times throughout the entire system and preventing pounding in the pump itself.

On the left hand end of the press is located a hydraulic stretcher by which the stretch in the belts is taken out when they are being vulcanized. The stretcher consists of a set of very heavy clamps, to the end of which are connected two hydraulic rams, working under a pressure of 2,000 pounds per square inch.

In the manufacture of belting the cotton duck, which forms the main part of the belt, after having passed through the calenders and having rubber pressed through it, is rolled out on a table, say 125 feet long, and cut up into strips just the width of belt it is desired to make. The strips are then placed one over the other, as many ply as desired, and lastly a thin sheet of pure rubber is put on. The belt is then rolled up and is ready to go to the press to be vulcanized, the belt being finished after the latter process. Two of the largest rubber belts ever made are shown in one of the accompanying illustrations.

In the manufacture of hose a rubber tube is first slipped over an iron mandril, say 50 feet in length, and around this tube is wrapped a strip of duck, which is made wide enough to go around the mandril as many times as may be necessary to secure hose of the required number of plys. Outside of this duck there is then rolled a thin cover of pure rubber. The whole is then wrapped tightly with strips of cloth and put into a vulcanizer to be "cured." The vulcanizer for this work consists of a wrought iron tube, which can be closed at the ends, so that steam may be turned in until the desired temperature is reached. When the hose comes out of the vulcanizer it is slipped off from the iron mandril by means of compressed air, which is blown between the mandril and the hose until it is entirely loose, when it can be readily drawn off. It is then rolled up in coils ready for shipment.

In making the cotton-covered rubber-lined hose, which is used for fire department purposes, a somewhat different process is employed. A rubber tube is made by taking a long strip of pure rubber and turning it over to bring the edges together and cementing the seam. This tube is drawn through the hollow woven circular fabric; the ends are then slipped over hollow cones, to which they are clamped tightly. Steam is then admitted through the hollow cone, pressing the rubber tube into the cotton fabric, the heat of the steam vulcanizing it at the same time.

In the manufacture of suction hose, a large section of which is shown in one of the accompanying illustrations, round iron is coiled spirally in the machine shop, slipped over the mandril upon which the hose is to be made, and the spiral coil is then embodied in the hose itself, which is made up of woven fabric in combination with the rubber, somewhat in the manner indicated above in making the smaller hose.

Another interesting illustration is that showing a pile of rubber dredging sleeves, probably the largest ever manufactured, being 33 inches in diameter and seven feet in length. The sleeves are used for the purpose of forming flexible connections between the pontoons that support the piping through which dredged material is discharged.

The next issue of the SCIENTIFIC AMERICAN will contain an illustrated article, descriptive of the native methods of gathering and curing the crude rubber.

IT has been suggested that it would be well for legations in barbarous regions to have a wireless telegraphic apparatus, as communication could not then be interrupted by hostile forces.