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. 641,732, 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.

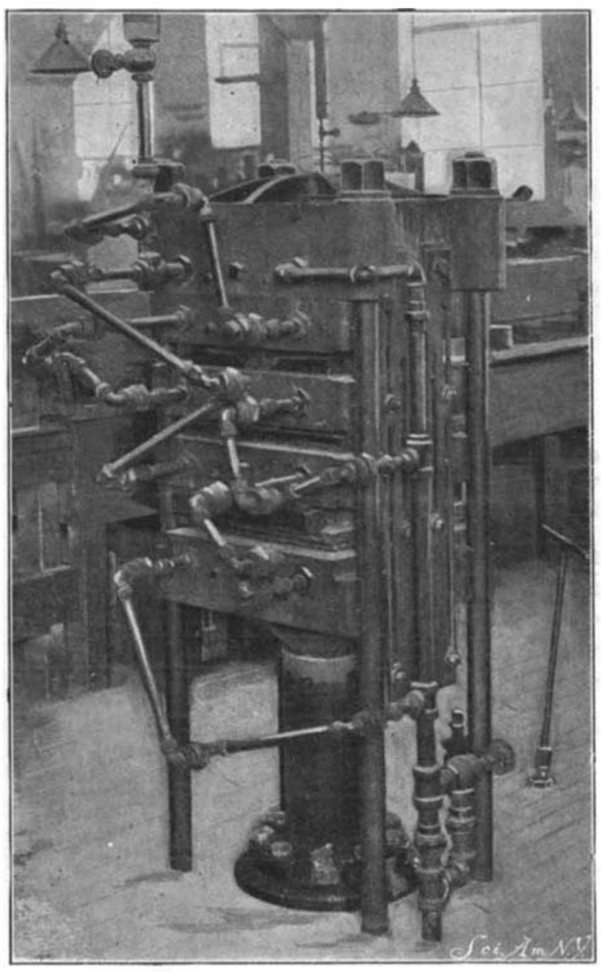
WASHING AND DRYING.—The first operation in the treatment of the crude rubber is the softening, which is accomplished by throwing it into hot water tanks, from which it is removed some hours later, cut up into small chunks, and thrown into the "washers," which are heavy machines having revolving corrugated 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.

Paris Exposition Notes.

The pavilion erected by the Swiss government occupies a central position in the Electrical Palace; it is of handsome construction and is arranged in several rooms, which give a considerable wall space; the main part of the exhibit consists in a series of large photographs and diagrams showing the principal Swiss hydraulic plants. These are shown by bromide enlargements of considerable size which permit the details of the dynamos and turbines to be clearly seen. In each case, a large water-color section shows the interior arrangement of the machines, conduits, gates, etc., and this is usually accompanied by diagrams of the electrical connections and circuits. Among the stations shown is the Kanderwerk plant on the lake of Thun, which has four alternators, together with the sub-stations in the city of Berne and the electric cars used on the traction system. The Rathausen station near Lucerne is shown, with the dynamos, transformers, and sub-stations. A number of photographs of the Jungfrau Railway show the line passing up the mountain, as well as the type of electric locomotives used.

The United States section in the Agricultural Palace contains a large and representative exhibit of American products; the façade of the section is designed in the style of the ancient Spanish missions of California. From the large central arch proceeds on each side a series of arcades, the roof being in red tiles. The interior contains exhibits of the leading American firms. Libby, McNeal & Libby have a large model of their packing house at Chicago, mounted on a platform about eight feet square. The windows are transparent, and the interior arrangements are shown, lighted by small incandescent lamps; the slaughter-house shows the cattle moving up an inclined plane, and a miniature train of stock cars moves back and forth. The engine house has three engines in motion, and the coal cars and coal elevator are shown, and the refrigerating cars, also in motion. Two electric motors underneath operate the moving parts. The same firm has a large case containing a model of the Ferris wheel in motion; the cars are replaced by glass platforms carrying canned goods, and the case contains an exhibit of lard, oils, canned and preserved meats, etc. Beside it Swift & Company have a large case containing hams, beef, lard, oils, bonemeal, etc.; and have also a fine model of a refrigerator car complete, about eight feet long, built in mahogany with glass sides. In the inside are represented carcasses, boxes of packed meats, etc. The exhibits of wheat and other cereals is especially noteworthy. The San Francisco Produce Exchange has two large cases with numerous samples of wheat, barley, and oats; the collective exhibit of the Oregon Railroad and the Portland Navigation Company shows different varieties of Club and Australian wheat and other samples, also photographs of wheat fields and implements. A number of other cases contain samples of wheat, oats, rye, and other grains from different parts of the Union. A number of cases in the rear have a collective exhibit of cereals of the United States, showing the new varieties produced by selection and hybridization. Near it is a case containing samples of maize flour, hominy, and grits of the Decatur Cereal Mills Company. Wheat flour in sacks is shown by the Alliance Milling Company, the Del Monte Mills, the Washburn & Crosby Company, and others. The corn exhibits are of interest; the collective exhibit of the Peoria Corn Exposition shows ears of red, yellow, and sweet corn in different varieties, and there is also a collective exhibit of corn from different parts of the country, occupying a number of large cases. Another part of the exhibit contains a large refrigerating case on the Chase cold blast system; it is of hexagonal form, and each of the six compartments contains a varied exhibit of cheese, butter in cans, lard, hams, sausages, etc. Near it the Armour Packing Company have two large cases showing canned meats, hams, lard, etc. The United States Department of Agriculture has a collection of maps, photographs, and statistics showing the number and distribution of dairy cows, creameries, and cheese factories in typical States and counties; the photographs show a number of dairy schools and other establishments. A large case contains the by-products of dairying, showing the economical use of casein, also albumen and similar products. Next to it are a number of cases containing different exhibits of condensed milk. Various collections of dairy utensils are to be seen; the Walker-Gordon laboratory is illustrated by apparatus and photographs. An interesting model is that of a creamery, which is placed on a platform about eight feet by ten. It shows a complete model creamery as operated in different parts of the country. The interior shows the different apparatus and appliances used, the ice house, etc. A number of tables contain dairy utensils, churns, cans, etc. A collection of milk testing instruments is shown, and an exhibit showing the component parts of cheese. The other parts of the section contain exhibits of fish, dried fruits, olive oil, wines, canned fruits, etc. The back part of the section contains a large collection of models of agricultural machines and implements, an extensive exhibit of tobacco, cotton, wool, grasses, fertilizers, etc. A three-story pavilion outside of the main building contains exhibits of agricultural machines and an American corn kitchen, where corn products are served to visitors.

Engineering Notes.

Strontianite or strontium carbonate can be purchased in Europe at $5 per ton for use in making fireworks.

In the waterworks at Coulouvrenier, near Geneva, a gigantic centrifugal pump has been installed. It lifts water 460 feet, and when running at full speed of 600 revolutions a minute absorbs 2,000 horse power. It is driven by two two-phase induction motors operated by electric currents from Chevres. The pump is arranged to give the necessary pressure to overcome the great head against which it works by a simple tandem arrangement of two centrifugal vanes. Injectors are provided to fill the casing with water, the pump being started up with closed valves. This gives the motors only the friction of the water in the wheel case to work against in starting. After they have attained full speed the valves are gradually opened. The pump delivers 5,000 gallons a minute.

A novel type of marine engine has been lately applied by Messrs. Hawthorne Leslie and Company to the Chilian training-boat "General Baguedano"; it is designed to give the maximum effect when the boat is propelled at full speed, with greater economy and power than is possible with the ordinary type of marine engine. It is built in a single unit, one-half of which can be used at a time. The engine is triple expansion, and has six cylinders acting each upon a crank of the main shaft. Two high-pressure cylinders, two intermediate and two low pressure are thus placed in line, the two like cylinders have their cranks at an angle of 180°, and the diameters thus formed divide the circumference into three equal parts, the cranks being found at 60° intervals around the shaft. The first high-pressure cylinder discharges into the first intermediate and first low-pressure cylinders, and the second set is arranged in the same manner; each of the low-pressure cylinders has a separate condenser. In this way two triple-expansion engines are obtained, and when it is desired to work at half the power it is only necessary to unbolt the crank heads of one set. This arrangement appears to work well in practice.

On the great Northern Railway of England the problem of automatic couplings has been ingeniously solved. As a foundation the automatic coupler of the Master Car Builders' Association of the United States has been taken, and this had been modified so that it is incorporated with the ordinary English hook and chain. When the coaches are to be coupled automatically, the couplings are so arranged as to be held rigidly in a horizontal position when they engage in the usual way common in the United States. If, however, the carriage is so fitted as to be incorporated with an ordinary train, the automatic coupler is allowed to hang vertically and the hook common to British carriages is exposed, and can be used with a shackle exactly in the usual manner. The side buffers are arranged so that they can be run back out of the way when not required, but if the hook and shackle are used they are brought forward and held extended by a half sleeve on the shanks; the usual play on the buffer springs being, of course, retained. Other English railways, namely, the Northeastern, the North-British and the Great Central, are also fitting their rolling stock with automatic couplers of the same description.

The work of dismantling an immense Corliss pumping engine is actively going on at Allentown, Pa. The pump, which was built in 1868, was constructed for the Lehigh Zinc Company, for the purpose of obtaining water from a mine. The cost of building and installing the engine was almost a million dollars. The difficulties of erection were rendered greater by the engine being placed near the mine shaft. The engine frame and bearings are bolted to solid cut-stone masonry 80 feet deep. Owing to the fact that the mining interest waned, it is decided to abandon the engine. It has not been operated for three years. At the time that its destruction was begun it was in excellent condition. Dynamite will be used to throw down the heavy walking-beams from their bearings, while blocks and tackle will prevent them from falling after the explosion. After that each one will be broken into suitable sizes for shipment. It is estimated that there are no less than 60 tons of brass alone in the bearings and fittings. The height of the engine from the surface of the foundation to the top of the walking-beam is at least 50 feet. The weight of the entire engine is estimated at 1,500 tons. The diameter of the steam cylinder was 110 feet and the stroke was 10 feet. The pump was intended to deliver 14,600 gallons of water per minute. There were two walking-beams mounted on the same shaft 10 feet apart. They were jointed at their heads by many rods 2 feet in diameter, to which the connecting rods were fastened. Each beam weighed 44 tons. The fly-wheels were two in number, one situated on each side of the steam cylinder, weighing 98 tons. Steam Engineering, from which we obtain our particulars, states that the fly-wheels were 30 feet in diameter.

Electrical Notes.

The public offices in Rangoon are to be provided with motors for punkah-pulling and also with electric lights.

London now has girl district messengers as well as boys. The girls range in age from sixteen to eighteen years and are said to be as efficient as the boys.

The Superintendent of the Pennsylvania Railroad has a telephone in his private car. Whenever he wishes to communicate with any place upon the line, the car is stopped and a lineman makes connection with the wires along the track.

Herr Stark considers that the disintegration of carbon filaments in incandescent lights and their deposit of carbon on the inner walls is due to vagrant currents between various parts of the carbon filaments which traverse the intervening gas as in a Crookes tube.

The new electric locomotive for the steepest portions of the Jungfrau Mountain Railway will be the most powerful electric rack-wheel locomotives ever constructed. The two motors will each have 125 horse-power, and will make 800 revolutions per minute driving the toothed wheels.

In the month of July occurred an interesting anniversary—the twentieth anniversary of the Edison incandescent lamp. It was in July, 1880, after twenty years of experimental work, that Edison gave the first public exhibition of his incandescent lamp in his laboratory at Menlo Park.

Sir Henry Irving is very fond of fine stage effects, and in "The Lyons Mail" he has introduced some remarkable electrical effects. Thus there is an electric light in the arm of a sofa, concealed from the audience, but illuminating a spot which could never have been reached in any other way.

Glass insulators through which the wire was run that carried the first message for the telegraph line from Baltimore to Washington were found a short time ago by a workman in the Document Room of the Senate. It was known that insulators were placed in the building by Prof. Morse, but their exact location was not known.

The first electrically equipped train on the Manhattan Elevated Railway, New York city, will probably run September 15. The engines and generators are being rapidly completed. A trial train is nearly finished and by next summer it is thought that the steam locomotives will be entirely dispensed with. The Second Avenue Railroad will be the first line to be equipped electrically. The total cost of making the change is said to be $12,000,000.

A new form of resistance for electric heating apparatus consists of a mixture of powdered nickel and white clay, 60 parts of the former and 40 parts of the latter, which is mixed with 6 per cent of water and compressed into the desired form under great pressure. Where the contact points occur the quantity of nickel powder is increased in order to diminish the resistance. The new material is said to be very solid and does not deteriorate under the action of heat.

Considerable interest is taken in the possibility of a high-efficiency incandescent lamp consuming 2½ Watts per candle or less. The General Electric Company has been able, with a special form of filament and by the use of a reflector that concentrates the light in one direction, to increase the practical efficiency of the incandescent lamp to less than 1½ Watts per candle per unit of light in useful direction. The lamp is of peculiar shape, being flattened. The filament is made in a four-coil spiral so as to give the maximum amount of light from the tip end of the lamp. The reflector lamps are backed with a special reflecting composition giving a highly polished mirror reflecting effect. The composition is durable and is not affected by the heat of the lamp.

In the construction of the Port of Bruges, all the machinery and apparatus is operated electrically, the power being furnished by a central station containing three Willans compound engines of 500 horse power, driving three dynamos at 500 volts. The electric distribution covers the whole extent of the future port, and thirty motors are used for the operation of the different machines, including four brick-making machines, circular and band saws, the machines of the boiler shop, those of the central repair shop, and the machines used in the construction, which include 3 large pumps, 5 mortar-mixers, a stone breaker, the windlass of the excavating conveyor, pile-drivers, 3 derrick cranes and 8 smaller cranes, besides numerous other machines. When the port is finished, current will be supplied for the motors of the rolling gates of the locks and for the revolving bridges. The four brick-making machines have a mean daily capacity of 160,000 and have reached 200,000; each is operated independently by a motor. The boiler shop carries on heavy work, such as the envelopes for great blocks of béton of 3,000 tons, for each of which 5,000 tons of plate and corner pieces are necessary. For the construction of the jetty, over 2,800 tons of steel will be used, in the form of uprights, timbers and cross-pieces; for the lock-gates, 700 tons of steel are used.