Correspondence.

The "Longest" Bicycle Ride.

To the Editor of the Scientific American:

Your article, "Two Thousand Miles on a Bicycle," in issue of August 1, gives Mr. Goodwin credit for the longest bicycle ride on record. Mr. Thos. Stevens, an Englishman, with a 50 inch Columbia, rode from Oakland, Cal., to Boston, Mass., 3,700 miles, in 103½ days, completing the trip August 4, 1884. *Outing*, the Boston publication, has made arrangements with the plucky rider to continue the trip around the world. Mr. Stevens left Liverpool May 2 on his ride across Europe and Asia, and on May 26 had arrived at Munich, Bavaria. He will remain at Constantinople until September 1, then complete tour soon as possible. The route will probably be through Syria, Persia, Afghanistan, Northern India, Upper Burmah, China, through Japan, and thence to San Francisco.

LON H. HUTCHISON.

Huntington, W. Va., Aug. 2, 1885.

Dynamic Momentum.

To the Editor of the Scientific American:

In answer to the exceptions taken by Mr. W. D. Evans to my article on Mechanical and Steam Engineering, I would say that Mr. Evans' figures are all correct, except the units of heat required to evaporate one pound of water into steam, which probably is a misprint; it should be 1,178 units, instead of 11,781 units. Mr. Evans should have carried his investigation a little further. The 108·2 units of heat contained in a pound of water above the boiling point, multiplied by the pounds of water the boiler contains, is the dynamical momentum, or value of force of explosion.

One cubic foot of water at ninety pounds steam pressure weighs about 58 pounds; this multiplied by 108·2 equals 6,275 units of heat; this multiplied by 772 foot pounds, equal to one unit of heat, is 4,844,300 foot pounds, contained in one cubic foot of water at the aforesaid pressure, dynamically equal to nearly two pounds of gunpowder.

I wish to say with Professor Tyndall that "my greatest desire is to know the truth, my greatest fear that I would believe a falsehood." I would not wish to exaggerate or mystify, or cause any relaxation of watchfulness on the part of the engineer in charge of a steam boiler. I would refer Mr. Evans to the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 289, 313, and 341, also to Thomas Box on Heat, all of which can be obtained of Messrs. Munn & Co.

J. K. WILLIAMSON.

Seattle, W. T., Aug. 7, 1885.

Balata.

In the *Journal of the Society of Arts* for November 20, 1863, a list of subjects for premiums was published, among which was one "For any new substance or compound which may be employed as a substitute for India-rubber or gutta-percha in the arts and manufactures."* This was responded to in the *Journal* for February 26 and March 4, 1864, a letter being published in the latter from Sir William Holmes, from British Guiana, advising the dispatch to the Society of a box containing samples of balata, both in the fluid or milky as well as in the dried or coagulated state. In the letter referred to, Sir William Holmes speaks of the small specimen which was exhibited in the International Exhibition of 1862, as attracting a considerable amount of attention, and further says, so far as he could judge, balata was not to be rivaled either by India-rubber or gutta-percha, possessing "much of the elasticity of the one and the ductility of the other, without the intractibility of India-rubber or the brittleness or friability of gutta-percha." Sir William Holmes further expressed a hope that balata would, ere long, be included as an important item among the exports of the colony. Notwithstanding that this was written so far back as 1864, little or nothing has been done since toward making balata a regular article of import; occasional notice has been drawn to it from time to time, and the subject as frequently allowed to drop. As a proof of the truth of Sir William Holmes' statement as to the ductility of balata, it may be mentioned that a sample of that exhibited in the Exhibition of 1862, and presented to the Kew Museum at the close of the Exhibition, is still in a fairly ductile state, and shows no such brittleness as is the case with gutta-percha.

In connection with this subject of the development of balata, Mr. G. S. Jenman, Government Botanist, and Superintendent of the Botanical Gardens in British Guiana, has just drawn up a very exhaustive report, the result of which, it is hoped, will be to bring the substance into a regular commercial channel.

The title of the report is "Balata and the Balata Industry, Forest Laws," etc., and it commences with a very interesting description of the bullet tree region, including its inhabitants, character of the vegetation, etc. Coming to the immediate subject of the report, Mr. Jenman describes the bullet tree, from the bark of which balata is obtained, as a large forest tree ranging from Jamaica and Trinidad to Venezuela and Guiana. He refers it to *Mimusops balata*, and says: "The vernacular name appears to be applied to two species or sub-species which are united by Grisebach, in his 'Flora of the British West Indies.' Young plants of *Mimusops globosa*, of Jamaica and Trinidad, growing in the Gardens, seem to be distinct from the Guiana type. The tree grows to a height of 120 feet, and has a large, spreading head. The trunk is nearly cylindrical. The bark is about half an inch thick, with deep parallel fissures an inch or so apart. The hard, reddish-colored wood is one of the densest in the colony, and is used for all sorts of purposes where great strength and durability are required. The tree is more plentiful in both the eastern and western part of this colony than in the intermediate region. From the east bank of the Berbice River to the Corentyn is the region of its greatest plentifulness in the colony, but its distribution extends still eastward beyond the Corentyn into Dutch Guiana, where a grant of several hundred thousand acres has recently been acquired by an American firm for collecting balata. The trees are more plentiful in this region in the depths of the forest than near the rivers, hence the creeks form arteries to the balata grounds. Several of the creeks on both sides of the Canje are instances of this. The wood cutters of this district regard the tree as inexhaustible; in the interior of the forest it exists in profusion and abundance, and lies beyond the reach of the balata collectors as they at present conduct their operations. As the trees near at hand become exhausted, they will no doubt alter their habits, and make clearings as drying places in the heart of the forest; but now they are under the obligation of returning to the settlements on the creeks with the milk they have collected to dry. Under this necessity, they can at most only penetrate about two days' journey, but, so far as they have explored, they report there is no diminution in the abundance of the trees. The forest at this depth, of course, has never been touched by woodcutters, as, for convenience in getting their timber out, they have to confine their operations to the banks of the river and creeks, rarely going in more than a mile or two." Regarding the character and value of balata, Mr. Jenman says its strength is very great; and as it does not stretch under tension, for special appliances, such as bands for machinery, it is unequaled. It has recently been pronounced by an American firm of manufacturers as "the best gum in the world."

Dr. Hugo Muller, F.R.S., in a report on the substance says: "It seems that balata is by no means neglected, and in fact it would find ready purchasers if more of it came to the market; as it is, the supply is very limited, and generally it comes only once a year. It commands a higher price than gutta-percha, and this in itself is a proof of its usefulness. It is used almost in all cases in which gutta-percha is used, but, on account of its higher price, only for superior purposes. It seems that balata is treated by the manufacturers simply as a superior kind of gutta-percha, and, therefore, its name disappears when manufactured. Nevertheless, balata is distinctly different from gutta-percha, and this is especially manifested in some of its physical characters; for instance, it is somewhat softer at ordinary temperatures, and not so rigid in the cold.

"In one respect balata shows a very marked and important difference from gutta-percha, and that is its behavior under the influence of the atmosphere; while gutta-percha, when exposed to light and air, soon becomes altered on the surface, and changed into a brittle resinous substance, into which the whole of the mass is gradually converted in the course of time, balata, on the other hand, is but slowly acted upon under these circumstances. The electrical insulating quality of balata is said to be quite equal to that of gutta-percha."

Mr. Jenman says that the collecting of balata is an open and recognized business, is carried on only in Berbice, but he proceeds to show that the greater part of that so collected is not obtained from trees on government grants, but surreptitiously from crown lands; and Mr. Jenman further says that much damage is done to the crown lands by the depredations of collectors, and "that it is desirable, in the interest of the colony, till effective rules are devised for the protection of the forest and the preservation of this valuable wood, that the trade should be discontinued."

The life of the balata collectors is a very hard one. The ground they have to traverse is generally very wet and swampy. In many cases the traveler sinks at every step up to his knees, and this continues for miles, and water often has to be waded through up to the armpits. When the collecting ground is not too far distant, women sometimes accompany the men, and cook or assist in laying out the calabashes, and collecting the milk, while the men fell and ring the trees. The collectors connected with a grant sell the milk they collect to the agent on the grant, and never dry it themselves. The price for pure milk is four shillings per gallon, or occasionally a dollar, and for clean, well dried balata, one shilling per pound. Considering the circumstances of the people who follow it, balata collecting, if pursued with industry, is a paying business. The calling pays better, while the season lasts, than the best mechanical trade; with fair weather, a man can earn from one to five dollars a day at it, and an exceptionally expert collector has been known to make twenty dollars in three days.

The instruments used in collecting the milk are an ax for felling the trees, a cutlass for making the channels in the bark to cause the milk to flow, and two or three gourds in which to collect the milk. The collector commences operations by chipping a piece of the bark from the selected tree, and if the milk runs well, he quickly shaves the moss and rough bark from the side he intends to tap, then, stooping down with his back to the front of the tree, but on one side of it, he cuts from the base of the tree obliquely upward toward himself, in the bark, a narrow channel, then moving round the other side, a similar one. These grooves are generally about eighteen inches long; they form an acute angle at the base, just below which a niche is cut in the bark and is slightly lifted with the end of the cutlass, and a calabash inserted by the rim under it. Occasionally a piece of palm or maranta leaf is inserted under the bark, and the calabash is placed on the ground, the leaf conducting the milk into it. The channels are then quickly cut upward parallel to each other on the opposite sides, about ten inches apart, the operator continuing them as far as he can reach, which is about eight feet from the ground. The milk trickles from cut to cut down this zigzag line into the calabash beneath. The best collectors cut the bark with much neatness and precision, and do not injure the trees; but little care is usually taken, and the wood is injured with every stroke of the cutlass, the result being that numerous trees are killed, and left standing. Large trees are always tapped on the opposite sides, careful collectors leaving the intervening spaces for subsequent years. It takes from five to ten minutes to cut the channels in each tree, and the milk runs from forty to sixty minutes; at first it forms a little rivulet, but after about twenty or thirty minutes, it only drips. After a little use, the gourds become so coated on the inside with dry balata that they have to be occasionally soaked in water, when it peels off freely, leaving them perfectly clean again. The yield of a tree varies according to circumstances. If favorable, a tree fifteen inches to twenty inches in diameter, bled eight feet high, will yield three pints of milk. Trees are often felled, and then tapped by ringing the bark in parallel transverse lines, at intervals about a foot apart.

To dry the milk, it is poured into shallow wooden trays, the insides of which are previously rubbed over with oil, soap, or grease, to prevent the balata sticking, and the substance is exposed to as much air as possible, and sometimes to the sun. In fine weather it takes two or three days to dry, and in wet weather a week or more; when it is sufficiently dry to be removed from the boxes, the sheet is thrown over a line or bar, to drip, and become hard.

A good deal of foreign matter is found in the milk, and Mr. Jenman says adulteration is systematically carried on, and the agents have at all times to be on their guard against it.

The report concludes with a consideration of the damage done to the forests, and some remarks on their better conservation.

* In a paper on "Gutta-percha in Surinam," Professor Bleekrode described balata as the product of a tree named by him *Sapota Mulleri*.—*Journal*, vol. v., p. 625, Oct. 9, 1857. See also vol. viii., p. 713, and vol. xxxii., p. 14.

Forcite Powder.

Among the explosives now in the American market is forcite powder, which is rapidly winning a name for itself among the older powders, and is battling for popular recognition in its claims for a front rank in efficiency and economy.

This new powder is very similar to explosive gelatine, the most powerful agent known among the explosives; it was invented by K. J. Sundstrom, a Swede, and patented in this country in 1881. It is a pasty or plastic gelatinized nitro-glycerine compound, and is composed of cellulose and niter and nitro-glycerine.

Its advantages as an explosive are stated as follows: It is five times *less* sensitive to shock than dynamite, and is that much safer; its semi-solid state permits it to be used with ease under any and all conditions; like explosive gelative, it is impervious to water, and is thus valuable for military, naval, and submarine work; it is claimed to be, on the basis of volume, 25 to 50 per cent stronger than dynamite, and its cost of manufacture is about the same as dynamite.

In support of these claims for the new powder we notice, says *Engineering News*, that Gen. Henry L. Abbot, in an official report upon the test of this powder, says that taking dynamite No. 1 as a standard, and giving it a value of 100, the forcite, with 95 per cent equals an intensity of 133; with 75 per cent, it equals 124; and with 40 per cent strength it equals an intensity of 95. In a personal letter to the manufacturers of the forcite, published with the report, Gen. Abbot also says: "Your explosive is the strongest to be had in our market, and must therefore be a prominent candidate for adoption in our torpedo service in place of dynamite No. 1."