

TRICYCLE ROLLER SKATE.

The readers of this paper will remember the publication in these columns several years ago of a description and the illustration of an invention similar to the one represented herewith. The former was the subject of a patent in this country, but we believe the invention was not introduced to any successful extent. Recently the invention has been taken up in England, and several of our London contemporaries have spoken of it as a speedy and practical mode of locomotion. A speed of twenty miles an hour on a macadamized level road has been claimed for it. The construction of the skates, and the mode of attaching them to the operator, as well as his position in the act of their use, are so clearly shown in the engraving as to render unnecessary any detailed description.

GIANT HERRINGS AND HERRING PIKES.

BY C. F. HOLDER

One of the most remarkable as well as beautiful fish found upon the coast of Southern Florida is the tarpon or megalops. It is comparatively rare, the individual from which the accompanying illustration was made being the only one found during seven years. This was at the extreme southern point of the reef. At rare intervals they are caught on the upper reef and near the mainland. Scientifically it is included in the *Clupeidae* family, that includes our common herrings and the genera *Sardinella*, *Pellona*, *Rogenia*, *Harengula*, *Konala*, *Pristigaster*, *Clupeonia*, *Spratella*, *Meletta*, *Alausa*, *Engraulis*, *Coilia*, *Odontognathus* or *Gnathobolus*, *Chatoessus*, *Amblogaster*, and *Clupeichthys*.

The appearance of the tarpon is magnificent in the extreme; the immense scales, coated with a secretion that is exact in its resemblance to silver, flash and glisten in the sunlight seemingly bathed in a silvery radiance. They much resemble the ordinary herring, having a long attenuated spine extending from the dorsal fin, and another from the ventral. But it is their great size, perhaps, that is their most striking feature, attaining as they do a maximum length of ten or twelve feet. In the accompanying cut the relative size of one about nine feet long is shown; but nothing save the lavish use of silver could convey an idea of its wondrous appearance.

They are generally harpooned, seldom taking the line, when they make gamy resistance.

Equally striking for their great size are the herring pikes (*Clupeosidae*). The butiriu of the West Indies, commonly known as banana fish, ten-pounder, and kakamby, is an interesting illustration; the *Studis*, however, is perhaps the most remarkable for its bulk. It was named by Sir Robert Schomburgk, and its skeleton is one of the most massive known among fishes. The scales are almost solid bone, sculptured in dendritic and mosaic shapes, portions of the skull presenting a similar appearance. Certain species of the genus are found in the Senegal and Niger rivers; the *Studis gigas*, however, is from South America. The hyoid bone is used as a file by the natives of those countries where the genus exists, and is often brought to Europe as a curiosity. The hyoid bones from the Amazon are named *Lingua de Paes*, and those from the Rio Negra de Para are called *Kuare*. As in the tarpon the scales are of great size and beauty. According to Schomburgk, the body is entirely covered with these large scales, round on their posterior edge, and the base of the dorsal and anal fins, thickened and muscular where they leave the line of the body, are scaled upward for two-thirds of their depth, or until the rays are given off with a separate dividing membrane; at their termination succeeds the small caudal extremity, with its very narrow web of rays continued round, appearing, in fact, as if the rayed part of the dorsal and anal fins had been continuous with it, and had formed one large broad extremity formed for powerful sculling. In color this fish is exceedingly brilliant; the head and dorsal part of the body are of a rich umber-brown, becoming paler as it reaches the central lateral line, and thence shading into a brilliant crimson lake, which occupies, also, the basal or scaled part of the dorsal and anal fins; each scale is darker at its base, and has a narrow line of deeper lake near its border. Near the caudal extremity the body and scaled part of the fins are blotched with dark umber-brown, the anal fin showing fourteen streaks of the same color in the direction of the rays. The pectoral and anal fins are gray, having the rays marked irregularly with dull blue. The membranous part of the dorsal, anal, and caudal fins is blackish-gray, the rays being reddish-brown. The

studis is particularly interesting on account of its manner of breathing; the air bladder, as with *Erythrimus*, serving directly as lungs subsidiary to the gills, the air being inhaled through a connecting passage between the throat and air bladder. By this means the fish could live for a long time out of water.

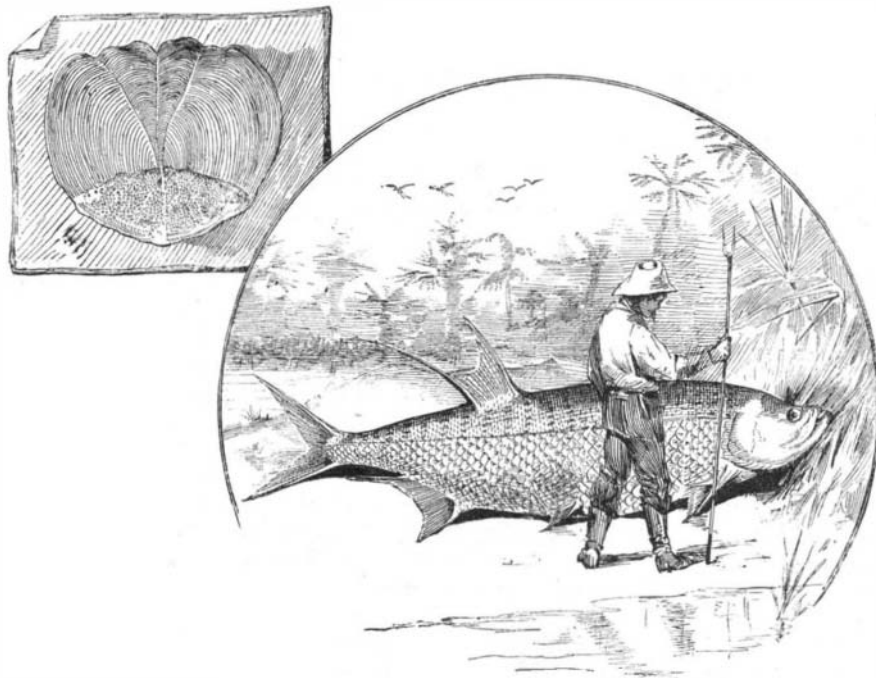
These fish are plentiful in the Rupununi, Rios Blancos, Negro, and Amazon. In the latter three rivers there are extensive fisheries for supplying the different towns, and great quantities are sent to Para, where it is preferred to the

fish salted on the North American coast, and commands a higher price. When fresh it is excellent, and the belly nearly all fat. They are taken generally with harpoons fastened on a long pole, which is thrown from the canoe, and to which is attached a long line to give the fish play, as they are so strong that they cannot be hauled in to be killed until they are weakened. This is generally performed with a club of hard wood, with which heavy strokes are inflicted upon the skull. The canoes which are used in these fisheries are sometimes very small, with only a fisherman and a boy to steer. After the fish is killed they sink the canoe,



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put it under the fish, and by shoving the canoe backward and forward, throw out as much water as allows it to float, the rest is bailed out with a calabash, and the fish is transported to the place of rendezvous; it is there skinned, and split to an inch thick the whole length of the fish, when a small quantity of salt is sprinkled over it, and it is put at once in the sun to dry, without being allowed to remain in the salt, as is generally done with other fish. In good weather it dries in three days, but it takes longer in the rainy season, when the fish then cured is not nearly so good or white. They are sometimes taken with the hook and line, baited with other fish. The intestines are short, form-



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ing only one flexure, which, together with the stomach, are entirely covered with fat. The liver is large, and not used for food, but would serve for oil, which it appears to contain in large quantities. In the stomach of one opened, several small fish and a quantity of mud were found. It has no air bag, but a curious process like the lungs of birds covers the spine inside, resembling the honeycombed inside of a bone. The roe is large, eggs small, and the membrane which contains them resembles in outward appearance the liver of a hog in size and shape. The young are protected

by the mother for some time after they leave the eggs, just as in the case of the lau-lau (*silurus*), and swim generally over her head. They delight in the *Kirahaghs*, as those inlets are called which many of the South American rivers form, and where the water is quite currentless. They are sometimes found in water scarcely so deep as to cover them, and the fishermen frequently attempt to drive them on shallow ground, where they fall an easy prey. They are more plentiful in the muddy than in the clear water. The Rupununi is the only river in British Guiana where they are to be found; and as during high floods this river is said to mingle its waters with those of the tributaries of the Rio Branco, they may have entered the latter river. They are occasionally carried by the flood during the inundations to the lower Essequibo, where it is known that they have been taken.

Schomburgk was assured by the inhabitants of the Rio Negro that they have caught some fifteen feet long, and of twelve to thirteen arrobas (410 pounds) weight. A specimen, the skin of which is now in the British Museum, measured, when taken, eight feet one inch in length, and three feet seven inches in girth. The caudal fin was only five inches long and eight inches broad when extended.

Sir William Jardine gives the following account of the capture of these fishes:

"Partly to serve us for economical purposes, but more to satisfy our curiosity of witnessing the Indian manner of hunting the arapaima, this giant of the fresh water fishes, Irai-i, the Carib chieftain at Curassawaka, induced his men to afford us an opportunity. We selected a sunny day, when there was more chance that at the heat of noontide one of these fishes would rise to the surface. Our party was distributed in five small corials, and we proceeded toward the mouth of the small stream Curassawaka, where it enters the Rupununi. Here we remained stationary, one of the corials being put on the watch, and no length of time had elapsed when the signal was given that an arapaima was in sight. All hands were hushed as death. Irai-i and his brother-in-law, Dabaero, who were considered the strongest and best shots, went forward with their corial and approached the fish as nearly as possible, the rest following softly to be within arrow shot. There stood the sinewy Carib, Dabaero, his foot firmly resting upon the bow of the corial, his left hand grasping the large bow of tough *uamaru*, his right the long arrow, upward of six feet in length, and armed with a formidable iron point. His position, although forced to the unpracticed, developed the symmetric forms of his figure, unadorned as it was by any art. Only those who have witnessed the Indian's eye when the bow is strung and he approaches his intended victim, can have any idea of that expression and that fire by which it appears lighted. Irai-i had adopted a similar position, when the crack of the bow string told us that Dabaero had discharged his arrow, and the chief followed his example, but missed, his arrow floating on the water, while the other disappeared with the monster. The corials pulled into the middle of the stream, the eyes of the Indians directed to all points to detect the arrow-feather appearing. Their quick eye saw it above the water, although it was only for a moment; away went all the corials in full chase, and just as it appeared a second time, a second arrow was sent into the fish. All was now excitement, and the yells of the Indian, the rushing of waters, harrowed up by the quick stroke of the paddles, was one of the most enlivening scenes I ever witnessed. Away we went

where the experienced hunters expected to see the fish reappear, and scarcely made the tops of the arrows their appearance, when others flew from their strings and pierced the arapaima; down he went again, but the period he remained below the surface was much shorter than previously, a proof that he got fatigued, and when he reappeared he allowed the first corial to come so near that one of the Indians was enabled to give him a stroke with a cutlass; a few more arrows were discharged at him, and he became an easy prey. The question was now how to get him into a corial, as we estimated his length at least six to seven feet, and his weight not less than a hundred and fifty pounds. He was floated into comparatively shallow water, and when one of the corials was got under him, the Indians who were wading in the water shuffled the corial with the fish and water in it to and fro, until the water had got mostly out and the craft commenced to float again; the rest was bailed out, and under the huzza of our Indians, we returned with our prize to Curassawaka, highly delighted with our sport of hunting the arapaima."

CALIFORNIA WINE. — The *California Demokrat* says that, notwithstanding the large dimensions which wine culture has attained in California, the American resident of that State has failed as yet to take to wine drinking as a habit. The Napa Valley is filled with luxuriant vineyards, but foreigners remark with surprise that on entering the inns of that section of the State they not only look about in vain to see wine drinkers, but are not always sure of being able to get wine to drink themselves. Strong liquors are still the staple beverages. Grapes are not much in demand, even for table use.

Effects of Cold on Vegetables.

While artificial refrigeration is coming into extensive use for the preservation of meats, it is well known that cold, if too intense, is very injurious to vegetables. The farmer knows full well the necessity of protecting his potatoes and apples from frost; the shipper dreads the approach of weather that shall endanger his freight when in transport; the green-grocer rolls his barrels nearer the stove on a cold night; and the buyer carefully examines his purchase to see if they are not "frost-bitten."

Hermann Müller-Thurgau has been investigating the chemical changes that take place in the amylaceous constituents of different vegetables when they are exposed to a low temperature, such as the change of starch into sugar, which gives a sweet taste to frozen vegetables. At the very outset he made the astonishing discovery that the sweetening of the potatoes was in no way related to the freezing, but only to the changes of substance due to a low temperature. A further study of the subject revealed a whole series of hitherto unknown facts, a few of which we find given in the *Naturforscher*.

When potatoes are quickly frozen there is no noticeable formation of sugar; but, if they are allowed to freeze very slowly, there is an increase in the quantity of sugar. So far as the actual operation of freezing is concerned, there is no real difference between slow and rapid freezing; in both cases the temperature of the potato must sink to -3° C. (27° Fahr.), before ice begins to form. When congelation has actually begun, it proceeds (in the beginning, at least) very rapidly in both cases. The difference seems to depend chiefly upon the length of time that intervenes between the beginning of the experiment and the first ice formation. In slow freezing a considerable space of time elapses, during which the potatoes are cooled from 32° to 28° Fahr., without freezing, but in rapid freezing this interval is either lacking or very short. It must be this difference that enables slow freezing to produce a different effect from rapid freezing.

Potatoes are turned sweet not by freezing, but by being cooled for a long time to 32° Fahr.

Of the experiments which prove this assertion, only one need be mentioned, as an example. Potatoes that had been cooled to 28° or 30° Fahr. for two weeks, but not frozen, contained as much as 2 per cent of sugar at the end of that time. When frozen potatoes were exposed to the cold for a longer time than that the percentage of sugar did not increase.

The consumption (or respiration) of starch by the protoplasm takes place in two stages, that should be more carefully distinguished from each other than is usually done; first, the conversion of the starch into sugar, and then the destruction of the sugar by the respiration of the protoplasm. The first change is of a chemical nature, dependent upon the presence of a diastase or ferment; the latter is a vital process, chiefly dependent upon the vital energy of the protoplasm. Both changes may take place side by side, and at the same time in a cell which contains starch. They may also take place at different times and in different cells, *i. e.*, the sugar formed by the fermentation of starch in one cell may, under certain circumstances, be used up afterward for respiration in another cell.

Now, it is a fact that when potatoes are kept for a long time in a place where the temperature is 32° , the sugar accumulates in them in considerable quantity. In potatoes that were kept for thirty days in a thermostat at 32° Fahr., the amount of sugar was found to be as much as $2\frac{1}{2}$ per cent of the fresh substance, a quantity corresponding to about 12 per cent of the total amount of starch.

There are individual differences in potatoes of the same sort as regards getting sweet; for example, four potatoes that had been cooled to 32° for thirty-two days contained respectively 2.5, 2.4, 1.9, and 1.8 per cent of sugar. Yet in five hundred potatoes experimented on there were none that did not contain sugar.

At first the quantity of sugar increases slowly, afterward more rapidly; but when the quantity gets quite large it proceeds more slowly again. A large percentage of water in the potato is favorable to its getting sweet. The decrease in starch corresponds to the increase of sugar.

An accumulation of sugar at the expense of the starch was also observed in a few other parts of plants containing starch, if kept at 32° for a long time.

If the conditions above mentioned are really the cause of its getting sweet, we may assume that these relations would not suddenly change when we pass 32° Fahr., but that above this point, as the temperature rises, the accumulation of sugar would gradually decrease; and the consumption and production of sugar will approach each other until, at a certain definite temperature, they become equal, the sugar being consumed as fast as it is formed, so that no accumulation can occur. This logical deduction was confirmed by another series of experiments, of which the following may be taken as an example: A potato containing only a trace of sugar was cut in three similar pieces; one was kept at 32° Fahr. for thirty days, the second at 37.5° , and the third at 43° for the same length of time. At the end of the experiment, the first contained 2.54 per cent of sugar, the second 0.76 per cent, and the third 0.37 per cent. Potatoes taken in winter from a heap that was kept at about 46° to 50° generally contain perceptible quantities of sugar, while those kept in a warmer place contain none or mere traces of it.

Many parts of plants have a different quantitative compo-

sition, the proportions of sugar, starch, and albuminoids changing according to the temperature to which they have been exposed for some time before analysis. This may serve to explain the contradictory statements found in literature.

The accumulation of sugar is not entirely attributable to the respiration being less at 32° than at 68° ; the conversion of starch into sugar is also greater at low temperatures. A few figures selected from these investigations will show that.

At 68° Fahr. a kilo of potatoes exhale about 0.36 gramme of carbonic acid, while at 32° they give out only 0.12, a difference of 0.24 gramme. In a month this difference would amount to 7.2 grammes, or 0.72 per cent of the weight of the potato. If the production of sugar were the same in both cases, this difference would correspond to the sugar left in the potato. But it only takes 5 parts of sugar to make 7.2 parts of carbonic acid; hence this difference in respiration would only increase the amount of sugar to the extent of 0.5 per cent, whereas it is generally more than 2 per cent.

The conversion of starch into sugar is accomplished by a diastatic ferment. Numerous observations justify the assumption that this ferment accumulates by long exposure to cold, and hence is more active. The conversion of starch at first increases (owing to the increase of the ferment), and is therefore more energetic than at a higher temperature; afterward, the change of starch into sugar gradually diminishes, owing to the accumulation of sugar. At higher temperatures the changes that take place in the protoplasm are of such a nature that either less ferment is formed, or, what is also quite probable, the ferment is drawn into the rapid decomposition, so that only small quantities are present in a unit of time.

If potatoes which have become sweet at 32° are exposed to a higher temperature, the sugar rapidly disappears. (Does it?) One experiment of this series may serve to show this. A potato in which the sugar had increased up to $2\frac{1}{2}$ per cent by thirty-two days' exposure to a temperature of 32° Fahr., contained only 0.4 per cent of sugar after being kept at 68° for six days.

The respiration of these sweetened potatoes when exposed to a higher temperature, say 68° , is far more energetic than that of potatoes which are not sweet. This rapid respiratory process soon consumes the supply of sugar, and then the respiration sinks to the normal.

The intensity of respiration in potatoes is dependent on the efficiency and activity of the diastatic ferment. At low temperature this produces (as seen above) more sugar than is necessary to cover the loss of protoplasm by respiration. Hence, the accumulated sugar exerts an effect on the amount of respiration, although only a limited one. A potato that was warmed for a long time to 68° and then cooled to 32° , at first exhibited but a slight amount of respiration. After a few days it increased. Within this time the ferment produced a large store of sugar, which had a favorable effect on the respiration.

The relations are different at higher temperatures; for example, at 68° . At this temperature the protoplasm is excited to such activity that it is able to respire all the sugar that is being formed, and could consume a considerably larger quantity if placed at its disposal. The respiration is in fact limited and regulated by the quantity of sugar that the ferment produces for it.

Hence the amount of respiration is different at the same temperatures just according as they have been kept for a long time in a cold place or a warm one. Eudiometric experiments made with leaves that contain starch also agree to a certain extent in this respect. Hereafter, in determining the amount of respiration it will be necessary to take into account what temperatures prevailed before the experiment.

Müller-Thurgau bases the following practical considerations upon these scientific conclusions:

Potatoes may undergo the following changes, according to the degree of cold and its duration: They may be neither sweet nor frozen (not cooled below 29° Fahr., and that only for a short time); or frozen but not sweet (when rapidly chilled to 27°); or sweet but not frozen (when cooled to 29° or 41° for a long time); or both sweet and frozen (when the temperature sinks slowly to below 27°).

Potatoes which have turned sweet have still a considerable nutritive value, and can be made eatable by allowing the sugar to evaporate by keeping them for several days in a warm kitchen. Finally, these sweet potatoes are capable of germination, as shown by careful experiments.

Boy Inventors.

The *Christian Advocate* justly considers that a boy's elders are guilty of a foolish act when they snub him because he says or does something which they don't understand. A boy's personality is entitled to as much respect as a man's, so long as he behaves himself. In the following anecdotes wise and foolish elders are exhibited—one class respecting, and the other despising a boy.

Some of the most important inventions have been the work of boys. The invention of the valve motion to the steam engine was made by a mere boy.

Newcomen's engine was in a very incomplete condition, from the fact that there was no way to open or close the valves, except by means of levers operated by hand.

He set up a large engine at one of the mines, and a boy, Humphrey Potter, was hired to work these valve-levers;

although this is not hard work, yet it required his constant attention.

As he was working the levers, he saw that parts of the engine moved in the right direction, and at the same time he had to open or close the valves.

He procured a strong cord, and made one end fast to the proper part of the engine, and the other end to the valve-lever; and the boy then had the satisfaction of seeing the engine move with perfect regularity of motion.

A short time after the foreman came around and saw the boy playing marbles at the door. Looking at the engine he saw the ingenuity of the boy, and also the advantage of so great an invention. The idea suggested by the boy's inventive genius was put in a practical form, and made the steam engine an automatic working machine.

The power loom is the invention of a farmer's boy who had never seen or heard of such a thing.

He whittled one out with his jackknife, and after he had got it all done, he, with great enthusiasm, showed it to his father, who at once kicked it to pieces, saying he would have no boy about him that would spend his time on such foolish things.

The boy was sent to a blacksmith to learn a trade, and his master took a lively interest in him. He made a loom of what was left of the one his father had broken up, and showed it to his master.

The blacksmith saw he had no common boy as an apprentice, and that the invention was a valuable one. He had a loom constructed under the supervision of the boy. It worked to their perfect satisfaction, and the blacksmith furnished the means to manufacture the looms, and the boy received half the profits.

In about a year the blacksmith wrote to the boy's father that he should bring with him a wealthy gentleman who was the inventor of the celebrated power loom.

You may be able to judge of the astonishment at the old home when his son was presented to him as the inventor, who told him that the loom was the same as the model that he had kicked to pieces but a year ago.

Our Patent Office shows many ingenious and useful inventions made by minors and women, and the above list of important inventions made by boys might be largely increased did space permit.

Electric Lights on the Pennsylvania Railroad.

A test of electric lamps in car lighting has just been made on the Pennsylvania Railroad between Jersey City and Newark, N. J. The car was lighted by seven incandescent lamps of the Edison make, fed from thirty Faure accumulators, which were placed in two boxes underneath the car, one on each side. The cells were a part of the number brought over from Europe on the steamship Labrador last spring. Each cell was $11\frac{3}{4}$ inches long, $5\frac{1}{4}$ inches broad, and 11 inches deep. They were charged in five hours by a small Edison dynamo.

The boxes in which they were placed are 7 feet 6 inches in length and 16 inches wide. From a switch in the closet of the cars the lights can be turned on or extinguished, while each lamp is provided with a switch socket, so that it can be used independently of the other lamps. The wires pass from the batteries along the sides of the cars, crossing over to each other where the lamps are placed.

The lamps in the car gave a steady light of 12 candle power, and when the train was going at full speed did not flicker in the least. When half the lights were turned out there was no appreciable difference in the total light of the car, except that it was softer and more pleasant to read by. The heat from the lamps was about one-fifth of the amount produced by gas. The electricity stored in the accumulators under the car is sufficient to keep all the lights running for sixteen hours, without recharging. The car on the Pennsylvania road is the first that has been lighted in this country, and the light has been in use about two weeks, and has proved satisfactory. It is lighted on the same principle as on the Pullman limited express between London and Brighton, England, where it has been in use for several months.

Distribution of Wool.

About twenty-five per cent of the entire production of domestic wool during the census year 1880, came from two States, Ohio and California, the former with 25,000,000 pounds, and the latter with 17,000,000 pounds; in 1870 the product of the former was 20,000,000, and of the latter 11,000,000 pounds. The next States in the order of importance as woolgrowers in 1880, were Michigan, with 12,000,000; New York with 9,000,000; Pennsylvania with 8,000,000; Missouri with 7,000,000, and Wisconsin with 7,000,000. Texas produces nearly as much as the latter State; in 1870 it produced only 1,250,000 pounds. The total product of the Union in 1880 was 155,000,000 pounds, clipped from 35,000,000 sheep.

Canning Grain.

A new method of storing grain is proposed, in air-tight cylinders or bins of sheet iron, to be sealed after a partial exhaustion of the air. It is said that wheat, flour, and bread, so stored for seven months, have been found in excellent condition (as might have been expected), and that taking into account the security of the grain against dampness, fermentation, attacks of insects and large vermin, fire and other risks, when sealed up in a partial vacuum, the new plan is more economical than ordinary storage in a granary.