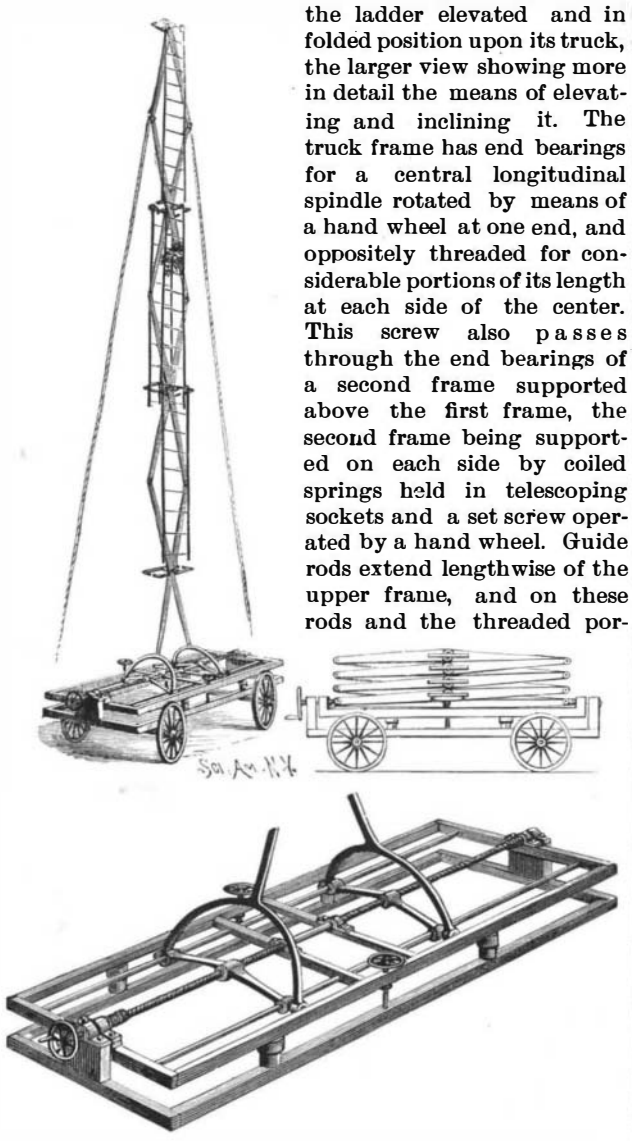
AN IMPROVED FIRE LADDER.

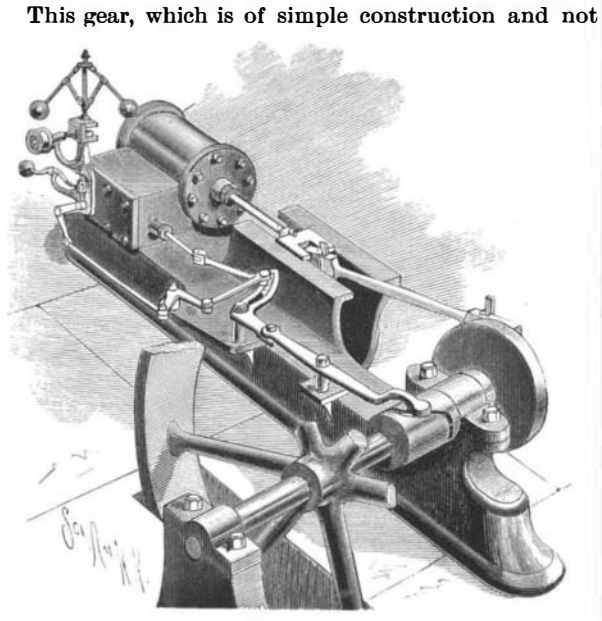
A fire ladder which may be conveniently folded upon a truck and readily elevated to a considerable height, while being adjustable to various inclinations as desired, has been patented by Mr. David B. McHenry, of Grenada, Miss. The illustration shows the ladder elevated and in folded position upon its truck, the larger view showing more in detail the means of elevating and inclining it. The truck frame has end bearings for a central longitudinal spindle rotated by means of a hand wheel at one end, and oppositely threaded for considerable portions of its length at each side of the center. This screw also passes through the end bearings of a second frame supported above the first frame, the second frame being supported on each side by coiled springs held in telescoping sockets and a set screw operated by a hand wheel. Guide rods extend lengthwise of the upper frame, and on these rods and the threaded portions of the central spindle travel two cross bars or bridges having threaded sockets engaging the threads of the spindle. To the outer ends of these cross bars are pivotally connected the arched lower members of a set of lazy tongs, and the pivots of these lazy tongs are formed with T-shaped extensions, between the ends of which ladder sections may be hung by means of hooks. By turning the hand wheel at the end of the frame, the revolution of the central spindle causes the cross bars to which the lazy tongs are pivoted to travel toward each other, and as the lazy tongs are thus gradually extended the ladder sections are hung in place, the apparatus being steadied by guy ropes when it reaches the elevated position. When the lazy tongs are again let down to folded position, the ladder sections are successively removed. To give the ladder an inclination transversely to the truck, the side screws are turned, thus tilting the upper frame. A single or double set of lazy tongs may be employed to support the ladder sections, and the weight is designed to be supported almost entirely by the guide rods, so that there shall be no undue strain on the central threaded spindle. The truck is preferably made with a crane neck. A modified form of this ladder may be used for domestic purposes, and by painters, decorators, etc.



McHENRY'S FIRE LADDER.

AN AUTOMATICALLY OPERATING VALVE GEAR.

This gear, which is of simple construction and not liable to get out of order, is designed to automatically increase or decrease the travel of the valve, to admit more or less steam to the cylinder according to the varying load. It is an improvement for which a patent has been recently granted Mr. Pascal J. Langlais, of Rhinelander, Wis. On the drive shaft of the engine is a cam wheel having in its periphery a groove in which travels a friction roller on one end of a lever fulcrumed on the frame of the engine, while the other end of the lever engages a slot in one arm of a bell-crank lever fulcrumed on a bracket. The other arm of the latter lever is segmental, and has a slot in which slides a block pivotally connected by a link with the stem of the slide valve. This block is also pivotally connected by a link with another bell crank lever, and the latter lever is pivotally connected by a link with a third bell crank lever connected by a rod with the stem of the governor. The latter connection is such as to permit the stem to turn without turning the rod, as the latter moves up and down with the governor stem, and the rod has a slot engaged by the inner end of a weighted lever fulcrumed on the governor frame. The arrangement is such that the position in the segmental slot of the block connected with the valve stem is controlled by the governor, the block being moved nearer to or away from the fulcrum point of the lever with increase or decrease of speed, whereby the travel of the valve will be regulated to decrease or increase the amount of steam admitted to the cylinder, the operation being automatically effected as the load on the engine varies.



LANGLAIS' VALVE GEAR.

Scientific Slaughtering.

Very few people have any idea what rigid economy is practiced at the great slaughtering plants. Scientific men are constantly cudgeling their brains to devise valuable chemical properties and new compounds in materials heretofore wasted or imperfectly utilized, says the *Drovers' Journal.*

The cross roads butcher who kills a few animals a week, throwing away a large part of the offal, must make a large profit on the meat sold, but modern utilization of by-products makes it so the slaughterer who does business on a large scale could much better afford to sell the meat without profit than to waste what the old-fashioned small butcher could not utilize.

The packing business as at present carried on utilizes a great number of products which were formerly allowed to go to waste. For instance, the stomachs of hogs, instead of being sent to the rendering tanks, are now used for the manufacture of pepsin. Pigs' feet, cattle feet, hide clippings and the pith of horns, as well as some of the bones, are used for the manufacture of glue. The paunches of the cattle are cleaned and made into tripe. The choicer parts of the fat from cattle are utilized for the manufacture of oleo oil, which is a constituent of butterine, and for stearine. Large quantities of the best of the leaf lard are also used for the manufacture of what is known as "neutral," also a constituent of butterine. The intestines are used for sausage casings; the bladders are used to pack putty in; the undigested food in the cattle stomachs is pressed and used for fuel; the long ends of the tails of cattle are sold to mattress makers, the horns and hoofs are carefully preserved and sold to the manufacturers of combs, buttons, etc. Many of the large white hoofs go to China, where they are made into jewelry. All of the blood is carefully preserved, coagulated by cooking with steam, then pressed and dried and sold to fertilizer manufacturers. All of the scrap from rendering operations is carefully preserved and dried and sold for fertilizers. Bones are dried and either ground into bone meal or used for the manufacture of bone charcoal, which is afterward utilized for refining sugar and in some other refining processes.

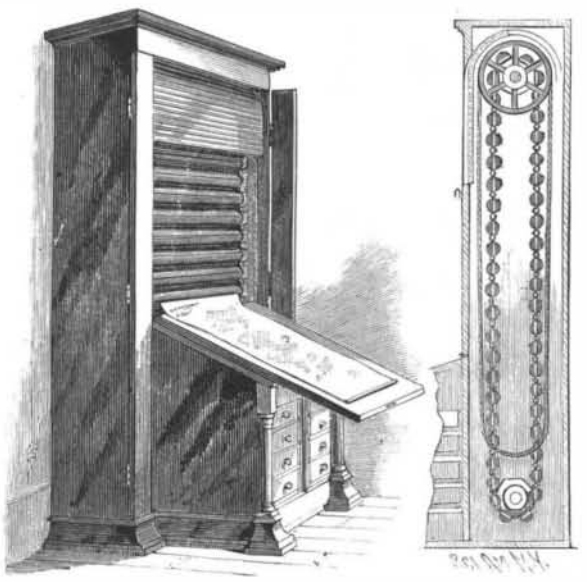
The Value of the Scientific American.

An old subscriber, who is a farmer in Michigan, in renewing his subscriptions to the SCIENTIFIC AMERICAN and SUPPLEMENT for the present year, writes as follows:

"This makes twenty-eight years' continuous subscription to the SCIENTIFIC AMERICAN. How is that for a mossback farmer? It has made electric engineers of both of my sons—one in the employ of O—— Company, New York City, and one of the G—— E—— Company, now at Helena, Mont. Both are graduates of Michigan University. I attribute a large share of their success to their reading the SCIENTIFIC AMERICAN."

AN IMPROVED EXHIBITING APPARATUS.

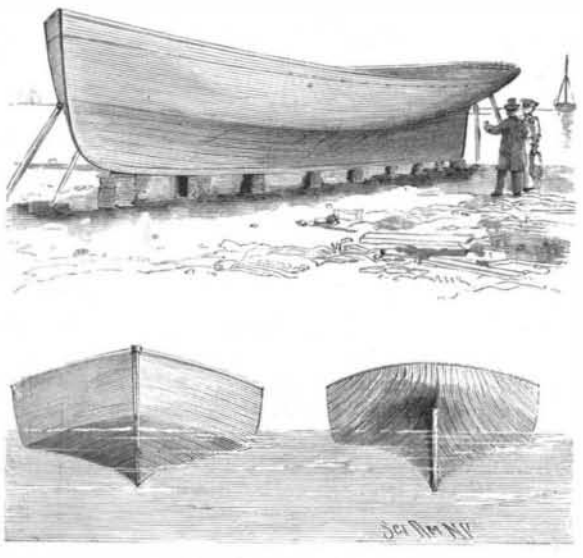
This apparatus may be made in a style which will include an elaborate combination of desk and case, or in a less expensive portable or wall style, in either instance making convenient the compact arrangement and ready display of maps, charts, drawings, fabrics, wall paper, carpets, shades, etc. It is designed for use in schools, railroad and express offices, retail stores, etc., or in a wide variety of ways, including use in the chart rooms of ships. The improvement has been patented by Mr. Daniel W. Tower, of Grand Rapids, Mich. The rolls of maps, fabrics, or other material are supported in holders on an endless carrier made up of links, as shown in the sectional view, each link having at one end a hook and at the opposite end an eye, and the chains thus formed running on sprocket wheels on top and bottom shafts in the case. At each end of the upper shaft is a hoisting pulley, over which passes a hand rope, by means of which the carrier may be moved to bring any desired roll in position for one end to be drawn out for inspection, such drawn out portion then lying on a downwardly swinging lid, with which the front of the case is provided. The case also has side doors and an upwardly swinging wooden curtain, such as is used in the ordinary roll top desk. The roll holders and rollers to receive the maps, fabrics, etc., extend completely around the endless carrier, being arranged between every pair of links. Each link has at one side a plate with a nearly cylindrical socket adapted to receive one end of the roll holder, the socket having at its front edge a slot, in which is inserted a squared stud on the end of the roller. A pivoted keeper on the front of the plate is provided for locking the stud in place, and the roller is actuated in the same manner as the ordinary shade roller, a spring brake, controlled by pressure of the finger, preventing the too easy or accidental rolling up of the map or fabric. The invention also provides for a modified form of carrier, designed to make the apparatus of still greater capacity.



TOWER'S EXHIBITING APPARATUS.

IMPROVEMENT IN VESSELS' HULLS.

The illustration represents an improvement in the hulls of vessels designed to afford the maximum of speed and safety, while the construction is such that drift to leeward will be in a great measure avoided. The invention has been patented in Canada and Great Britain, as well as in this country, by the Rev. Patrick O'Brien, of St. Patrick's Deanery, St. John's, Newfoundland. The bottom of the vessel is curved in convex form from the stem to the stern, and has a concave face from the keel to the sharp-edged bilge, while from the bilge to the top of the hull the sides are curved, presenting an outer convexed surface at the stern. The small figures represent bow and stern views. In every case where a cross section is taken through the bilge the sides and the bottom of the hull meet at an obtuse angle, and the outward inclination of the sides preferably increases from the ends of the hull. The steering qualities of vessels built after this plan are designed to be greatly improved, especially in high winds, which throw the hull over upon its side, as the bilge sections then serve as a side keel to hold the vessel to its course. This improved vessel has received the indorsement of many practical captains and seamen.



O'BRIEN'S VESSEL'S HULL.

Erastria Scitula—an Important Predatory Insect.

An interesting paper upon the habits and metamorphoses of a predaceous lepidopter destructive to bark lice has just been published by Dr. H. Rouzaud, of Montpellier, France.

The adult insects of both sexes resemble each other closely, and both afford a striking example of protective resemblance, simulating in repose sparrow droppings. The moths issue at the close of the day, and upon emerging from the cocoon are extremely active. Whatever the position of the cocoon, whether upon the leaves, branches, trunk, or base of the tree, the moths drop immediately to the ground after emergence from the cocoon. They jump, roll over on the back, and vibrate the wing pads actively for forty seconds, and finally become perfectly motionless. Three or four minutes after birth their wings become expanded, and they fly up among the leaves and branches of the tree from which they have previously fallen. During daylight the moths remain motionless, the wings held close to the body, in which attitude, on account of their size, coloration, and general aspect, they bear the close resemblance just mentioned to the excrement of small birds. Copulation, which is of short duration, always takes place at night, the period during which the moths are active. The males live only one or two nights, in all probability, while the females in captivity live ten or twelve days at the least. Egg laying lasts several days, and each female produces about a hundred. These are deposited one at a time, and each is separated from the other by a large interval of space. The female scatters them by preference upon the leaves or the young buds, although they are often laid directly upon the back of the bark louse.

The young larva at once enters its host, devouring all the internal organs, leaving only the dorsal carapace, which is more or less thick and hard. A coccid which has been attacked always shows at some point or other on the dorsal surface an opening by which the predatory larva has entered. The young larvæ are of a red-wine color, except the head, which is brown, and this coloration lasts until just before the transformation to chrysalis. At the time of the transformation, however, a bluish white color is assumed. Although the size of the younger larvæ is not greater than that of the bark lice which they attack, they spin no silk at first and the spinnerets are rudimentary. As soon as the contents of one bark louse have been devoured the caterpillar abandons it and seeks a new prey, and is sometimes found exposed upon the twigs. Apparently realizing the necessity for protection, as well as additional food, it hastens to bury itself in a new victim, which usually is a matter of but some minutes. After having entered a bark louse it seems to be effectually protected from parasites.

M. Rouzaud has kindly offered to transport to this country for experimental purposes living specimens of this extremely valuable insect, and we have arranged to accept his kind offer to attempt the introduction of the species into California upon a somewhat extensive scale.

Although the black scale possesses in California, as well as in Hawaii, an efficacious parasite in *Dilophogaster californica*, the latter does not breed rapidly and seems to have but two annual generations. In Erastria we have a much more rapid breeder, and if it should accommodate itself to the somewhat changed climate, as we anticipate, its introduction will prove a boon to the California fruit grower.

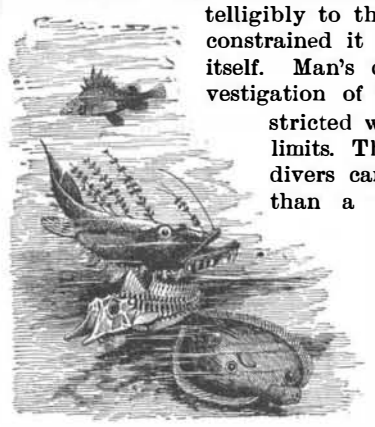
Other things being equal, the Erastria will prove a most profitable insect to introduce into California for work against the black scale. It comes from the native home of the scale insect and is there an effective enemy of the species.—*Abstract from Insect Life.*

Water Proof Masonry.

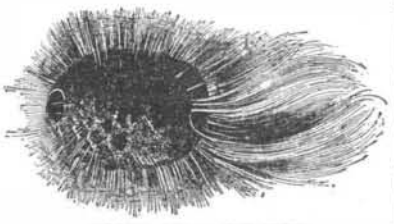
What was at first considered a doubtful experiment, viz., the use of coal tar as a means of rendering masonry impervious to water, especially in positions exposed to direct contact with the latter, has proved a practically valuable resort. Used as a coating for masonry built up of very porous stone, tar renders it quite impervious, even at a depth of some fifty feet of water, and, according to the opinion of those whose experience has been extensive with it, the article should be utilized in all public buildings, particularly those designed for the preservation of works of art, the dissolving action of water, even upon mortar of superior quality, being well known, and also the unfavorable effect of the exudation of water charged with lime salts from the mortar. Two methods of using the tar are named, viz., in a boiling state in one or several layers, this being suitable for surfaces exposed to the air; or it may be made to flame up before using, this being appropriate to surfaces which have to be covered up. It is stated that when boiling coal tar is employed in three coats on masonry the result is a black and very brilliant varnish, which perfectly resists the action of frost, water and sun, being likewise absolutely impervious; and the tendency of the black coating to absorb heat may be overcome by white-dusting the whole before the tar is quite dry.—*National Builder.*

IN OCEAN DEPTHS.

The greater part of the surface of the earth is hidden deep under the waves of the ocean. The area of the dry land is 136,000,000 square kilometers, while the water surface is approximately 374,000,000. This vast submarine area remained for long an unknown world. It is only in recent years that science has called intelligibly to the vasty deep, and constrained it to give account of itself. Man's direct personal investigation of the sea floor is restricted within very narrow limits. The most experienced divers cannot remain more than a few minutes at a depth of sixty fathoms. Investigation of the depths is now carried on by apparatus on shipboard. The ordinary deep sea lead is dispensed with, and a metal tube substituted. The tube is heavy and is further hung with weights which are increased with the depth of the floor. For great depths the weight is five or six hundred weights. The line, strengthened with steel wire, is several miles long, and is kept rolled on cylinders which are operated by steam power. The work is heavy, and to test the bottom at a depth of three or four miles occupies hours or even a whole day. Attached to the deep sea tube are other instruments for determining the temperature of the several strata of water passed through, and also for bringing to the surface samples of the water from various depths. But it is also desired to know whether the various depths of ocean are inhabited, and by what creatures. To this end specially designed nets are employed. A great deal of ingenuity has been spent on these nets, some of which open and shut automatically at prescribed depths. These arrangements admit, not only of exploring the sea floor and of bringing up samples of the ooze for investigation, but also of securing specimens of the types of life proper to various ocean depths



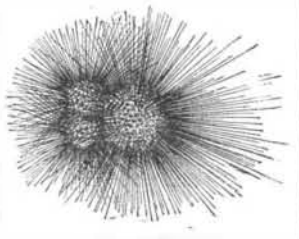
TYPES FROM INTERMEDIATE DEPTHS.



DEEP SEA SPONGE.

During the last thirty years, several countries have fitted out deep sea expeditions, and thousands of deep sea soundings have been made, but our knowledge is still very fragmentary. We have learned that the ocean floor is not a level surface, but furrowed like the surface of the dry land, and similarly diversified with hill and dale; but the mountains of the sea, instead of being subject to erosion like those on the dry land, are covered with a continuous soft shower of mineral and organic matter, interspersed with occasional bones and teeth. The ocean bed is almost invariably a loose material. In the neighborhood of the shore, the rock is covered with debris wrested from the land, or with sediment brought down by the rivers; but this extends only to a short distance from the land. The ocean depths are covered with a soft ooze. Everything that falls into the sea, and that has a greater specific gravity than its waters, sinks sooner or later to the bottom. Its floor is the sepulcher of all that lives and dies above—the treasure house of all that is committed to it. Meteoric stones innumerable have been quenched in it, and the floor is composed, in great part, of minute particles of iron—the so-called cosmic dust—and volcanic fragments and dust are widely distributed. Icebergs from the polar regions, freighted with rocks and other land debris, are often wafted into tropic waters before they melt and release their burdens. The sea receives everything, but, for the most part, the character of its floor is determined by its minutest denizens, the *diatomaceæ*, the *foraminiferæ*, and the *radiolarœ*. These short-lived creatures multiply and die, and their shells sink slowly, but surely, to the bottom, their innumerable multitudes falling in a perpetual soft shower. The floor of the Atlantic, from 1,000 meters to 4,000 meters deep, is, over large areas, covered with a characteristic material known as deep sea slime. Microscopic investigation shows that it is, for the most part, composed of microscopic shells of the *globigerina*, of which we present a magnified illustration. These are subjected to enormous pressure at great depth, and form chalk and limestone strata. Thousands of years may be required to form an inch of this deposit.

SEA LILY.
(*Metacrinus.*)



GLOBIGERINA.

On the surface of the deep sea, and again on its floor, life is abundant; but, at intermediate depths, the types are few and poorly represented. Fish which make their home in this desert of the sea are often exposed to hunger. Many of them are provided with a peculiar sac under the jaws—a bread bag—in which the fish stores the surplus when he has made a good catch.

It is remarkable that many deep sea fishes have very large eyes. It is, hence, evident that the depths are in some sort illuminated, even although the rays of the sun do not reach them. But many of the fish are themselves highly luminous—they carry their own lanterns about with them, in fact; and some, at least, of them can flash and extinguish their light at will.

The thousands of mariners who have gone down at sea will leave no durable remains, the minute dwellers of the deep leave nothing unconsumed, even the bones of whales dredged up are found bored through and through; but the depths of the Pacific have yielded countless thousands of sharks' teeth—thousands even at a haul—but the greater portion of them belong to extinct species.—*C. Falkenhorst, in the Literary Digest.*

Southern Inventors.

The *Boston Journal of Commerce*, alluding to important inventions made by Southern men, names a number who have contributed many notable inventions to science.

Despite the fact that the people of the South were but little engaged in scientific or mechanical pursuits, and that their intellectual energies have for the most part been absorbed with other thoughts, yet many notable inventions and contributions to science have been made by Southern men, writes Barton H. Wise, in the *Popular Science Monthly*. Cyrus H. McCormick, a native of Rockbridge County, Va., and the inventor of various agricultural implements, among them his famous reaper, received the thanks of the French Academy of Sciences for having done more for the cause of agriculture than any other man living. "Owing to McCormick's invention," said William H. Seward, in 1860, "the line of civilization moves westward thirty miles each year." Richard J. Gatling, of Hertford County, N. C., devised various machines and the Gatling gun, now an arm of the United States service and adopted by foreign governments as well. Both McCormick and Gatling moved west, the former to Chicago and the latter to St. Louis—the country districts of Virginia and North Carolina affording them poor fields for their endeavors. Henry J. Rogers, a Baltimorean, was the practical adviser and assistant of Morse in the construction of the first telegraph line in the United States, which was built in 1844, between Washington and Baltimore. He was the superintendent of it, and made many improvements in it, and was the inventor of several telegraphic instruments. Rogers also devised the first system of pyrotechnic signals in the United States and the one by means of flags that was adopted by the navy in 1846. The author of international fog signals was Samuel P. Griffin, of Georgia; and the inventor of the first complete system of ciphers used by the Associated Press was Dr. Alexander Jones, of North Carolina. The name of Maury stands above that of every other Southerner, if not of every American, in his contributions to science. Maury's writings demonstrated that meteorology could be raised to the certainty of a science, and Humboldt credited him with being its founder.

Sir Samuel Baker.

The distinguished African explorer Sir Samuel Baker died at his residence at Newton-Abbot, Devonshire, England, on December 30. He was born in London, June 8, 1821. In 1861 he formed a small party to proceed to the source of the Nile. Without guide or interpreter, he discovered, on March 23, 1865, the great fresh water lake which he christened Albert Nyanza. He proved that the Nile was navigable for large vessels as far as Gondokoro, 1,450 miles south of Khartoum. The slave trade of the interior, with Khartoum as its base, had grown to enormous proportions. In 1869 Sir Samuel Baker was appointed bey by the Viceroy of Egypt. In the face of great difficulties he worked his way through the hostile tribes, subduing them and abolishing the trade in slaves, until the name of the "White Pacha" was known and feared all through Central Africa. When his commission expired the slave trade was resumed with all its horrors.

As a writer, Sir Samuel was very entertaining, and his books had an enormous sale. Sir Samuel Baker takes a high place among the explorers of the dark continent, and his name will be ever remembered along with those of Livingstone, Grant, Speke, Sweinfurth, Stanley, and others.