In traveling through the South one finds very many signs of coming prosperity, and they are more particularly noticeable in Georgia. I have met with few persons who are not satisfied that emancipation—whatever it may prove for the negro—was the very best thing that could have happened to the white population of the South. In slavery times, in proportion as a man's slaves increased, he had to increase the extent of his plantation; for Sambo was valued only according to his cotton-producing capacity. The natural tendency was an increasing negro population, and a decreasing white population with widening estates, to say nothing of the enervating and demoralizing effects of the institution. To-day the tendency is all the other way. The authorities recognize the value of intelligent white labor, and are making successful efforts to induce immigration. King Cotton has had his day, and while he will ever raise a proud head in this latitude, diversified farming is the motto of the more intelligent and far-seeing. I had the pleasure of riding up from Albany with Senator Gordon, who is deservedly popular. He had just come from his large sheep farm, and interests himself largely in the improvement of stock in the State and in the general advancement of agriculture within her borders; and he is but one of many prominent men equally alive to its advancement.

The great strides made in fruit culture since the war can hardly be appreciated by one who has not been here. The best evidence of its rapid growth, and of the spread of esthetic taste, may perhaps be found in the constantly increasing sales of the nurserymen, and especially of Mr. P. J. Berckman's, of Augusta, who is prominently identified with Georgia's advance in horticulture. The entrance to Mr. Berckman's "Fruitland Nurseries" is by a broad avenue of magnificent magnolias; and after spending a few hours among his greenhouses and his well kept stock of choice fruit and ornamental trees, many of them new to Northern eyes, the secret of his patronage is easy to discern. Exotic conifers are here made a specialty, and I have never witnessed anything more beautiful, outside the grounds of Messrs. Ellwanger & Barry, of Rochester, than his beautiful *Cupressus Knightiana elegans* and the fine *Cunninghamias* that lift their heads forty or fifty feet high.

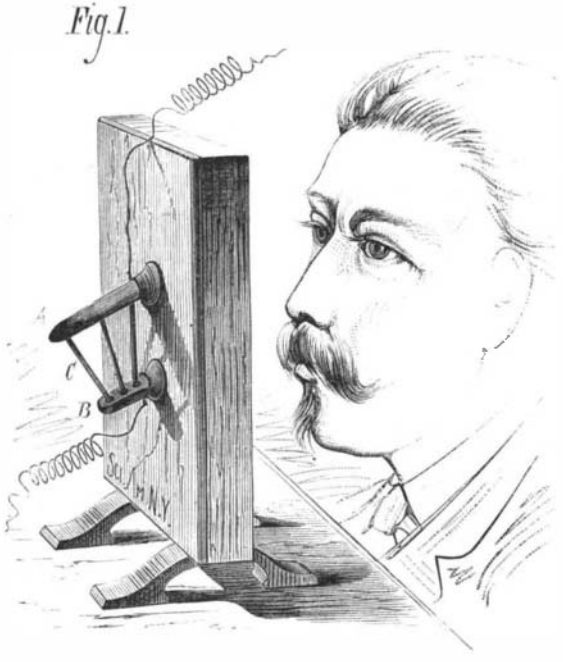
Washington, D. C., October 14, 1878.

SOME MODIFICATIONS OF THE MICROPHONE AND TELEPHONE.

BY GEO. M. HOPKINS.

The microphone now exists in many forms, and is an exceedingly interesting instrument, although it has not, thus far, attained the usefulness of the telephone. The several forms of microphone are easily constructed, but all, so far as I know, are defective in some particular. An instrument of this sort that is sensitive enough to transmit the slightest sounds is too sensitive to transmit the heavier sounds properly. In the instruments shown in Figs. 1, 2, and 3, these defects are in a great measure remedied. These microphones are so simple and so easily made that I give a description of each, so that any one who wishes to experiment in this direction may be able to do so.

Fig. 1.



MICROPHONE WITH GRAPHITE RODS.

The instrument shown in Fig. 1 has a wooden diaphragm one eighth inch thick and four inches square, which is glued to a narrow frame supported by suitable legs. Two pieces of battery carbon, A B, are secured by means of sealing wax to the diaphragm about an inch apart and at equal distances from the center. They are both inclined downward at about the angle indicated in the engraving, say 30°. The carbon, A, is longer than the carbon, B, and has in its under surface three conical holes—made with a penknife point—which are large enough to receive the upper ends of the graphite pencils, C. The lower ends of the pencils rest in slight cavities in the lower carbon. The pencils, C, are simply pencil leads sharpened at each end and placed loosely between the carbons; they are inclined at different angles, so that the motion of the diaphragm which would jar one of them would simply move the others so as to transmit the sound properly. Battery wires, which are connected with a telephone*, are attached, one to the carbon, A, the other to the carbon, B.

The diaphragm and its support in Figs. 2 and 3 is the same as that already described. The microphone shown in Fig. 2 has a piece of battery carbon, D, secured in an inclined position to the diaphragm near the middle, by means of

Fig. 2.

MICROPHONE WITH PENDANTS.

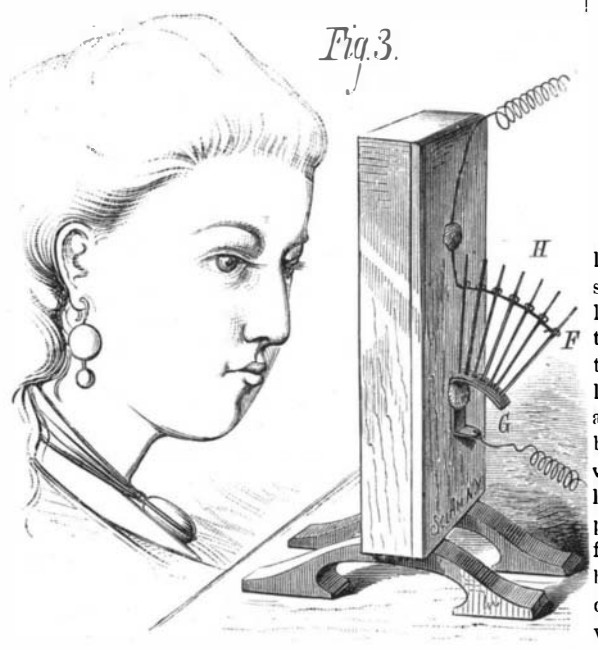
sealing wax. Three carbon pendants, E, of different sizes, are suspended by very fine wires, so that they rest upon the upper surface of the carbon, D. The three fine wires are all connected with one of the battery wires, and are fastened at suitable distances apart to the face of the diaphragm by a drop of sealing wax. A fine copper wire is wound around the carbon, D, and connected with the battery.

The construction of the microphone shown in Fig. 3 is so obvious as to require little description. One of the battery wires terminates in a series of coils, F, and is attached to the diaphragm above the middle. The other wire is connected with a strip of metal, G, which is secured to the diaphragm below the middle, and is curved and indented to receive the wires, H, which, by the way, must be quite fine, say No. 30.

These instruments are used as transmitters; a Bell telephone is used as a receiver. By using a number of rods, pencils, or pendants instead of a single pencil, as in the Hughes microphone, much if not all of the jarring is avoided, while it is capable of performing the feats usually expected from instruments of the name, such as the transmission of the sound of the ticking of a watch, the tramp of a fly or an ant, the crumpling of paper, whistling, instrumental and vocal music, and, under the proper conditions, articulate speech, whispering, etc.

The instrument shown in perspective in Fig. 4 and in section in Fig. 5 fulfills the requirements of both microphone and transmitting telephone, being capable of transmitting articulate speech as loudly and clearly as any of the well known forms of telephone. It is not necessary that one

Fig. 3.

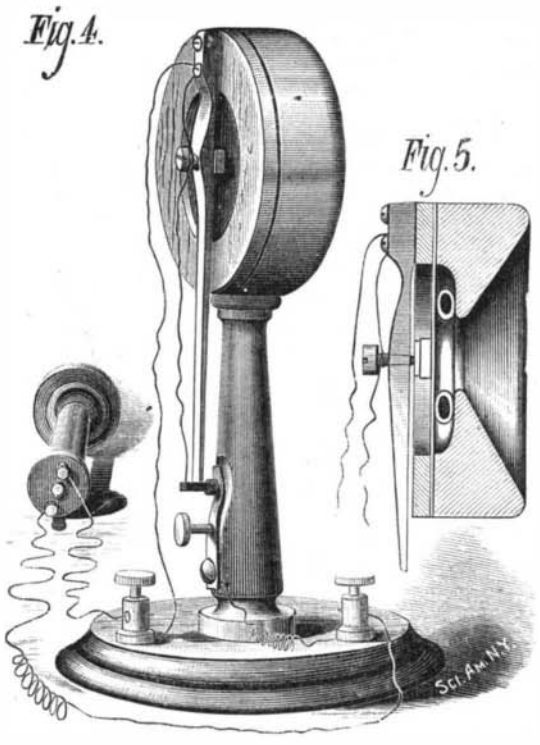


MICROPHONE WITHOUT CARBON.

should speak directly into the instrument; it may be in one part of the room and the speaker in another. It will transmit a whisper, or the conversation of two or three persons, and it is partial to violin and flute music or whistling. It seems almost incredible that an instrument of this construction should do these things, as everything is accomplished through the medium of a long lever actuated by the diaphragm; but this construction amplifies the vibrations of the diaphragm, and renders the instrument effective. The mouthpiece, which contains a ferrotype diaphragm, is mounted on a standard, and the diaphragm is damped as in the phonograph by means of short pieces of rubber tubing placed between it and the mouthpiece. A wooden spring is attached to the diaphragm support, and extends across the diaphragm downward toward the base of the standard. A small set screw passes through the spring and bears upon a thin metal plate that rests upon a soft rubber block, placed against the center of the diaphragm. The spring between the set screw and the fixed portion is reduced somewhat in thickness, and from the set screw to the lower end it is tapered to make it as light as possible. A small pencil of battery carbon is cemented to the extreme lower end of the spring, and a very fine copper wire is wound around it and carried upward to the fixed portion of the spring, thence downward to the binding post at the left. A small metallic spring is secured to the standard near the base, and carries at its free end a block of battery carbon, which is brought into light contact with the carbon on the end of the wooden spring by turning the adjusting screw that passes through the metal spring and bears against the standard. The metal spring is connected with the binding post at the right. This instrument, placed in an electrical circuit in which there is a Bell telephone, will transmit speech with considerable loudness. It requires no call or alarm, as a loud sound made directly into the mouthpiece will produce a noise in the receiving instrument which may be heard in any part of a room of ordinary size.

* Full directions for making telephones in SCIENTIFIC AMERICAN SUPPLEMENT, No. 142.

Fig. 4.



NEW FORM OF TELEPHONE.

The French Dam below Pittsburg, Ohio.

Three years ago Congress appropriated $100,000 for the construction of a Chamoin dam at Pittsburg, under the direction of the War Department. The construction was begun during the past summer. It is intended to form slack water to the two rivers which unite at Pittsburg and form the Ohio River, to create a harbor six miles long for the commerce of the city.

The peculiarity of the French dam is that it is the dam of low tides. That is, it is a dam which is set up against the stream when the stream is low, diverting the water into a lock, after the manner of a canal, and falling in ordinary times prone on the bottom of the river, allowing navigation to pass over it in its usual course. The dam is raised or lowered by means of a series of props which are handled by a simple process. The gate of the canal is opened and closed by hydraulic power operated from a gigantic tank at an elevation on the river bank. In detail, the French dam, which has received the name of Chamoin, after its inventor, is simply an extended series of wooden wickets from four to six feet in width, and from ten to fifteen in length, placed side by side on end on a stone platform, at an angle of eighty degrees (from the horizontal) across a river bed. Each wicket as it faces the stream has behind it a cast iron prop, whose lower end is adjusted when the dam is up in a hurter or catch, at the head of a slide on the platform of the structure, along which it can be lowered at pleasure, the wicket falling with its prop; the whole dam being let down by degrees according to the necessity made by the rising water. Such is the character of the dam which is everywhere employed for the improvement of the low tide rivers of France; which converts the Saone, the Meuse, the Marne, the Yonne, and the Oise into navigable slack water, and the Seine from its head waters to Rouen into a canal.

The dam to be constructed on this principle in the Ohio River at Pittsburg is one of the largest of its kind, the main dam being 1,200 feet in length and composed of 200 wickets. The lock will be the largest in the world. It will have a width of 110 feet, and will admit the passage in bulk of an entire coal fleet. The engineers who have the work in charge announce their intention to prosecute it with such energy as to complete it within a year.

If, when the work is completed and tried, Congress decides to adopt the system for the permanent improvement of the Ohio River, probably not less than $20,000,000 will be required to convert through this means its whole length, at low tide, into navigable slack water. The enterprise receives its large present interest from the fact that it is a national one, and, at the same time, the introduction of a foreign engineering device for the improvement of one of the most important of American rivers.

The Mediterranean Trade.

The import trade of the cities on the shores of the Mediterranean Sea is estimated at $500,000,000 a year. Of this not more than one fifth falls to the share of the United States, the greater part being monopolized by England. For a year or more efforts have been making in Philadelphia to win a larger share of this profitable trade, and already the *Record* reports that nearly thirty-five agencies for the sale of American goods have already been established along the Mediterranean. Many of these agencies are in the hands of influential mercantile houses who have hitherto acted in the interests of the English. The wisdom of this method of bringing American goods directly in contact with those produced by our English competitors is demonstrated on the arrival of every foreign mail. Orders and inquiries are pouring in for various kinds of American products never before sent to Southern European ports. A few weeks since came a communication asking for estimates of the cost for equipping a hundred miles of railway with Bessemer steel rails. At the present moment negotiations are in progress for the shipment of over 70,000 feet of iron piping for a Mediterranean entrepot which has hitherto been supplied exclusively from Glasgow. A large order from Egypt has been received for canned goods. Inquiries have been made for samples and prices of our paper manufactures for purposes of comparison with those of English and German makes. All kinds of agricultural implements and machinery are in demand. Leathers also are being called for, the foreign consumers finding that American fine calfskins and carriage leathers will hold their own in competition with the French product. Our oilcloths have been pronounced as being cheaper, more durable, and less heavy than those of English manufacture, which are gradually being superseded. Boiler rivets, an entirely new article of export, have also grown into favor, and a preliminary order for five tons was recently shipped to Italy. American biscuits, also, are making headway against the British article in France and Cuba, while as an outgrowth of the same movement the importations of English biscuits into the United States have been almost entirely stopped through the demand for the article of home manufacture.

Mr. George N. Torrence, the senior member of Torrence & Co., the pioneers of the Mediterranean trade, says that all that is now wanted to obtain complete control of this trade is a line of Mediterranean steamships. That want will soon be supplied. Half of the required capital, about $2,000,000, has already been subscribed, and the vessels will probably be in course of construction before the close of the year. No subsidy will be asked for or expected. Meanwhile the establishment of agencies will continue until the whole European Continent is honeycombed with sample depots of American productions.

American Competition in Great Britain.

The *Ironmonger* (London) in its last issue mentions a number of articles in which the United States is entering into alarming competition with the English. It says: Curriers complain of American competition. In Australia more particularly the American skins and general prepared leather have got a strong footing, against which curriers in Walsall find it difficult to contend. The demand from home centers is also adversely affected by reason of the United States importations. It is, however, satisfactory that curriers here believe that the consumption of the foreign product in this country is declining consequent upon the quality being inferior to the English make. There is a certain rottenness about it which results from hasty curing. The prices of our transatlantic friends are such as to keep down those of English makers, and it is peculiar in this connection that the more finished the American leather is the more severe is the competition with us. The American leather really becomes cheaper in proportion to the labor that is expended upon it.

Plating by nickel, another American introduction, seems now to be taking root here, though in the opinion of many it is still in its infancy. It appears to flourish mostly in bar and restaurant fittings.

A correspondent in the same paper states: I have just had my attention called by Messrs. Selig, Sonnethal & Co. to some new American articles in labor-saving machinery, a tool called a "lightning" tire shrinker being a noticeable one. This tool saves all cutting and welding of iron, is managed by one man with perfect ease, and is said to work as well on the lightest steel tire as on a wagon tire 3 inches wide; it only occupies about 2 feet of space on the floor. The "lightning" horseshoeing machine, probably the production of the same brain, is a vise, with an arrangement for fixing steel dies and saws. It has a small anvil attached to it and is worked by a treadle. The shoes are griped when the foot is placed upon the vise, and the latter falls open when the foot is removed. The work of shoeing with this machine is done rapidly and in good finished style. The wear of the hammer and anvil is saved, and no help is needed. If our moulders imagine that the fine iron castings from the States, that have been so much commented upon, are due to superior material, they are very much mistaken, as it is through moulding machines that the superiority is attained. For a new one, called the "Pioneer," also shown to me by Messrs. Selig & Co., it is claimed that a workman of ordinary ability can perform one third more work in a day with much less fatigue, and produce better castings than by hand ramming. The patent quick speed drill, making 1,500 to 2,000 revolutions per minute, and worked by the hand, is also a most meritorious production. I was further shown a "Universal Lathe Dog," which stands square with the work, and will hold any shaped pieces without "skewing;" and a "Black Diamond Mill Pick," on a new principle, the "blades" being hardened by a patent process, in which quicksilver is a prominent operator, the steel becoming wonderfully hard. I asked for the "Lester" saw, and was shown a machine worked by a treadle, having a scroll saw with tilting table, capable of various operations, and doing 1,000 strokes per minute; also a circular saw, 2½ in. diameter, with a drilling attachment, an emery wheel, and a turning lathe, capable of making 7,000 revolutions per minute. Some time since, in your "Notes on Novelties," you illustrated a new frame pulley by Messrs. Harper, of Willenhall, which, it was intimated, would compete with the lowest-priced American ones in the market. But I find that the American firms have not found it necessary to reduce their prices to meet this competition.

Rapid Increase in French Woolen Industries.

The total wool industry of France has doubled since 1867, and trebled since 1860. According to the report of the Vice President of the Jurors appointed to decide upon worsted yarns and fabrics exhibited at Paris, Mr. Henry Mitchell (President of the Bradford, Eng., Chamber of Commerce), it appears that the worsted manufacture of France employs 2,648,000 spindles, 27,557 power looms, and an enormous number of hand looms. Not many years ago the value of the silk manufacture of France was far in excess of that of worsted, but the latter is now of more value than the former. The total value of the worsted industry in France is 700,000 000 francs, or about $140,000,000, nearly half of which is for export. The wool industry of France is rapidly attaining great proportions. M Legrand, one of the largest French manufacturers, informed Mr. Mitchell that in the district with which he is connected the number of spindles in 1860 was 140,000, while at the present time there are 670,000 spindles. The value of the products is 150,000,000 francs, or about $30,000,000.

The Adelphi Explosion.

The common verdict of juries called to investigate the causes of "accidents" resulting in loss of life through boiler explosions was strikingly varied in the case of the Adelphi disaster. Our readers may remember that the boiler of the steamer Adelphi exploded in Norwalk Harbor (Conn.), on the morning of September 28, 1878, killing several persons and wounding a large number.

The coroner's jury, instead of finding nobody to blame, as usual, distributed the blame impartially among the steamboat owners, the officers of the boat, the Government Inspector, and the laws which govern their action. The verdict rendered contains the following strong language:

"We find that the said steam boiler exploded because of overwork and overpressure, legalized by a United States statute, increased after shiftless inspection, and persistently used by the attendants in charge after sufficient evidence of dangerous defects."

The rules of Supervising Inspectors of Steamboats require: "To ascertain the tensile strain of the plates (used in manufacturing marine boilers) the inspector shall cause two pieces to be taken from each sheet to be tested; . . . that piece showing the greater tensile strain shall be held to be the tensile strength of the plate from which the test pieces were taken." This rule the jury deemed injudicious, as the whole plate is strong only as its weakest part is strong.

Furthermore, section 4,433, title li.i, United States Revised Statutes, provides: "The working steam pressure allowable on boilers constructed of plates inspected as required by this title, when single riveted, shall not produce a strain to exceed one sixth of the tensile strength of the iron or steel plates of which such boilers are constructed."

The jury pronounced this law unsafe in the extreme, and contrary to the best mechanical authorities both in this country and Great Britain.

"Cognizance should be taken of the fact that the riveted joint is the weakest point of the whole structure, being only about 56-100 the strength of the solid plate, and we find that the best practice allows the strain not to exceed one sixth the strength of the riveted joint, instead of one sixth the strength of the solid plate. Under this section, 4,433, we find the United States Inspectors allow about 75 per cent more pressure than is the practice of other reputable mechanical authorities."

The jury found also that while a pressure of 36⅛ lbs. was all the law allows to a boiler of the size and construction of the one exploded, the inspector had allowed 37 lbs. in 1876, and subsequently increased the allowance to 40 lbs. per square inch, contrary to law and reason; that the certificates of inspection falsely described the structure of the boiler; that the inspector's work had been very superficial and negligent in character; that the engineer had withheld from the inspector's knowledge certain known defects in the boiler, and had not regarded the requirements of the law in respect to making repairs; that in requiring the chief engineer of the steamboat company to perform the duties of captain, the owners had prevented him from maintaining a proper oversight of the machinery of their boat; that the company's agent had made to the Government Inspector false statements regarding repairs ordered by him; and that the rules and practices of the Steamboat Inspection Service were incorrect, loose, uncritical, and unworthy of respect.

We have not heard that any of the parties responsible for the disaster—it cannot be called an accident—have been, or are likely to be, held to account therefor, further than is shown in the dismissal of the assistant inspector, who failed to discover the boiler's fatal weakness.

THE ROCKPORT GRANITE QUARRIES.

At the extreme point of Cape Ann, on the Massachusetts coast, is the small town of Rockport, where are situated the extensive granite quarries for which the region is noted.

Forty years ago quarrying for granite was begun here in a small way by Mr. John Stimson, whose success led to the development of one of the most important granite quarries in the country. The quarries are now owned by the Rockport Granite Company, who have shown great enterprise and engineering skill in the prosecution of the work. Roads have been made, bridges built, breakwaters and wharves constructed, houses and stores erected, and employment furnished for from one hundred to over three hundred men, for whose convenience and accommodation neat cottages and well stocked stores have been provided by the company.

The Rockport granite is noted for its superior quality, being very hard, durable, and free from iron or other substances which injure and discolor granite. It is found in huge masses of great solidity, and of a remarkably uniform structure. The finer varieties are susceptible of a good polish, and when carved they retain their color and sharp edges admirably. The pressure required to crush this granite varies from 300 to 1,200 tons per square foot.

The first granite paving stones used in the United States were furnished by these quarries, for Lafayette, near New Orleans. The first blocks were 7 inches deep, and nearly 12 inches square. Their length was afterwards doubled and their depth increased to 10 inches. Thousands of tons of these paving blocks have been sent to Cuba.

The Rockport quarries have furnished great quantities of granite for the dock improvements of New York; for the reservoir on Beacon Hill, Boston; for Forts Warren, Winthrop, and Independence, Boston Harbor; the sea wall at Lovell's Island, and the sea wall at Brewster, Mass. The Henry Clay monument, New Orleans, the Lincoln monument at Cincinnati, and many imposing monuments at Mt. Auburn, Forest Hills, and other cemeteries are of this granite.

For engineering purposes, mechanical and civil, Rockport granite is in great demand. In this connection reference may be made to the foundation of the large engine at Glenham Mills, Dutchess county, N. Y. In the stones used for this purpose 115 feet of 3½ inch holes, made perfectly round, were cut in eighteen days—sufficient evidence that the company possess facilities for furnishing blocks of the largest size at short notice.

At the quarries may be seen blocks 25 feet in length, and upward; piles of paving stones, 100,000 and upward in number, ready for shipment; and blocks of all sizes and forms for special purposes. The quarries are well supplied with steam engines, pumps, derricks, and other appliances for keeping the works clear of water, and for lifting the blocks for transportation. The splitting of the granite is easily accomplished. With hand drills and hammers the workmen cut lines of holes an inch in diameter, from three to six inches deep, and from two to six inches apart, according to the size of the block. Into these holes are inserted half round slips of iron, a pair to each hole. Then steel wedges are driven between the irons so as to exert a uniform and steady pressure, which gradually increases until the great mass yields and splits apart. The blocks are shipped either in the rough or are first taken to dressing sheds, where they are cut to ordered sizes, hammered, and faced.

A notable enterprise in connection with the quarries is the construction of a breakwater, which enables shipping to approach the quarries at all stages of the tide and in all sorts of weather. Before it was built it was only in fair weather, when the sea was smooth, that vessels could come near. At present the breakwater rises 25 feet above low water, is 500 feet in width on the bottom, 75 feet deep, and 2,000 feet in length; yet this huge work is constantly being extended by the addition of tons upon tons of granite blocks.

THE Key West (Fla.) *Key* says: "Our fishing smacks report a stream of fresh or poisonous water along our bay coast from two to ten fathoms out, that kills all the fish in its range. They report sailing for two hundred miles through dead fish, covering the sea as far as the eye could reach with all the varieties. Immediately on the shore the water is salt and natural, while less than a mile off it appears of a red brick color."