

ent sized cylinders are employed, all jacketed with spiral tubes cast in the metal, which are supplied with steam direct from the boilers, and keep up the temperature of the cylinders. The first and second cylinders are arranged one above the other, and their pistons are connected to a common piston rod. The operation is thus described by Mr. Loftus Perkins, the inventor, in a paper read before the Institution of Mechanical Engineers, London:

"The high pressure steam is introduced into the upper end of the first cylinder, where there is no gland, and where the piston is formed so as to require no lubricating material. The steam is cut off at about half stroke in this cylinder, and when it is admitted for the return stroke into the bottom of the second cylinder, of four times the area, the temperature is so much reduced as to cause no difficulty when brought into contact with the piston rod gland. From the bottom of the second cylinder the steam expands into the top of the same cylinder, which is of larger capacity than the bottom, and serves as a chamber, and is in direct communication with the valve box of the third cylinder; this last is double-acting, and is arranged to cut off at about a quarter stroke, and at the termination of the stroke exhausts into the condenser, with a total expansion of about thirty-two times."

Although it has been some years since Mr. Perkins began to advocate the merits of this system, and he has taken out many patents covering his inventions connected therewith, the difficulties attending its practical working, and the disposition to oppose it of those who had enormous sums invested in old style machinery, have thus far prevented its general adoption, although in several cases in England it has been successfully introduced. The boilers and engines of the Anthracite contain all the latest improvements of the inventor, and it is believed they afford a practical demonstration of the entire success of the Perkins system, and show how all stationary and marine engines can be run at an expense of less than one-half the present cost for fuel. Two and a half pounds of coal per horse power per hour is now considered very economical running, and some of our best managed ocean steamers use one hundred tons of coal a day in their voyages. To demonstrate the practicability of reducing this more than one-half, thereby not only saving the cost of fuel, but giving so much more space for freight, is the purpose of the visit of the Anthracite to our waters.

STATEN ISLAND AND OYSTERS.

[Continued from page 65.]

As soon as attention was turned to the necessity of cultivation, the Legislature was applied to. Laws have been enacted that allow each individual to take up three acres in his own name. The occupant must stake out and clearly mark the ground, and plant the same with not less than fifty bushels of seed oysters within six months, or he forfeits his right to hold it. Those owning land along the shore have the first right to the ground in front of them. No oysterman is allowed to take fish in any county but his own, nor anywhere on public beds, between the 15th of June and the 15th of September. No dredging is allowed on natural beds. The cultivators have found so much of their labor experimental that they have earnestly resisted all efforts to tax them for their grounds. They look upon a tax as a burden that would outweigh and seriously check their industry. The owners of grounds buy their seed from men who obtain it from natural beds. These men, by the hundreds, are engaged in procuring such seed. It is their business only, as they hire out to help in other things during the season that the law forbids their working upon natural beds.

Most of the cultivated ground lies in Prince's Bay, New York Bay, and Raritan Bay. The natural beds are found in Staten Island Sound, the Kills, and in parts of the bays previously named. Much seed is also brought from out of the State. Many of the cultivators live at Mariner's Harbor, though their oyster farms are in Prince's Bay. Near New Dorp, on this bay, Mr. Petter has built a fine summer hotel. He has endeavored to surround it with special attractions. He has fitted up one room as the "Pompeian room." He has made it to resemble a room in an old Pompeian palace, having obtained many things to do it with direct from the remains of ancient Pompeii. In this vicinity was the Vanderbilt home. It was a "pirogua" that Cornelius Vanderbilt first aspired to own when he began his career as a boat man. To this island of his birth he always remained loyal.

Most of the oysters grow for three or four years on ground that is a little muddy. They are moved the spring before using to a hard and sandy bottom. They are taken up by tongues or dredges, culled and put into floats, and taken where they may have an infusion of fresher water, and then to the markets. Most of the Staten Island oysters have to be taken up near Rahway for the freshening. They are usually left in the floats there over one tide.

Sail boats or yachts are almost universally used. One cultivator has lately procured a small steamer. The harbor of New York abounds in tugboats. Their captains have an understanding with the oystermen; so, if the wind is unfavorable or the tide, they hitch on and pull the oyster boats up to the city. For pay the oystermen keep the tugmen supplied with oysters. These boats carry all the way from one to four hundred bushels at each trip. The Staten Island men are considerably annoyed by persons from New Jersey oystering in their waters. So far they have failed to secure a very effectual check to this.

Thirty years ago the oysters were prepared for market by men and boys handling them all over to sort them. Work-

men stood in the water even in the coldest weather beside a pile of oysters and sorted them into a boat. Then it took fifteen persons all day to get a boat ready. It involved great exposure and hardship. Some years ago an old man straightened himself up after such a job, saying he could stand it no longer. He contrived a fork, at first a little straight-tined affair, with a guard at the top to prevent the oysters falling off. It at once took with the men. All quickly provided themselves. The day of hand culling was over. The fork was gradually improved in size and shape, until it has reached a very perfect and complete form. Now with this aid two men can accomplish more in two hours than fifteen men formerly did in a whole day.

The beds here are in shoaler water than on the Connecticut shore. But the full and swift tides render them a protection from ice in winter, and some other troubles of shoal water in more quiet seas.

Stars and drills have at times been a trouble, but their greatest enemy has been the "drum fish." When the oysterman hears him "booming" over his grounds he trembles for his property; for this fish will crunch up oysters as cattle will apples or clover. The "moss-bunker" fishermen are now catching many of them, and thus rendering good service to the oyster cultivators.

Every planter has from five to ten men in his constant employ. He also hires others for short periods from time to time. It will be seen that considerable numbers of the people living around the shores of Staten Island are working at some part of the oyster business. Quite a good many colored families live at New Dorp and Prince's Bay. Most of these find steady work in this line. Seed oysters are found in considerable quantities from Rossville, on the northwest shore, up to Elizabethport, New Jersey. The same is true around Schuten's Island, and from Kill von Kull down to Port Richmond.

Important facts are to be noted in the conclusions to which their long experience has led the Staten Island oyster cultivators.

1. They think their planting grounds need rest every few years. An element in the mud or sand, needful for producing good oysters, becomes exhausted by successive crops. To then leave the ground bare for a year or two enables it to regain that element anew.

2. The continual working of the ground produces many "poppy" mud holes. These are holes where the mud has become so soft and slimy it kills all that is put upon it. A year or two of rest allows the action of the water to fill up and "heal" over such holes.

Some say the "poppy" mud holes render the ground poisonous to the oyster. They note this condition by finding an increasing number of black-meated oysters, and soon after many dead ones. Ceasing all work there for one or two years they can then plant anew with an assurance of success.

3. The ground is affected by the change from winter to summer. Though no frost is in the bottom of the sea, yet there seems to be a certain hardness of the mud or sand which holds the oysters and renders them more difficult to secure. As the spring opens the men see a marked difference. There is an evident loosening of the bottom much as takes place in the upland as the frost comes out of it.

4. A wet summer is much more favorable to the growth and quality of oysters than a dry season. This partly accounts for the varying quality of oysters produced in the same waters. Thus, a year ago, New York Bay oysters were much better than usual.

5. One peculiarity is found in Staten Island oysters, making them superior to most others for several purposes. Their shells are unusually hard and firm, and preserve their meats better than other kinds. Therefore they can be shipped farther in good condition than almost any other. They are in considerable demand for the foreign and other distant markets. They are sent in large quantities north, south, and west. One firm sent three thousand barrels to California a year ago. They have been sent as far east as to Constantinople.

Some patrons are so attached to these oysters they continue to send for single gallons of them even when they go to reside in distant country places.

The demand for them increases in every direction from year to year. They are sold in three grades. The "box" is the finest grade, commanding the highest price. They must be good size, good color, good shape, hard shells, and even size. The next are "barrel" oysters, running a little smaller and a little less even. The third are "culls." The second grade are also called "counts." The "culls" sell from thirty to forty-five cents a hundred, when the "box" grade cost from sixty to ninety cents per hundred.

Those that are sold out of the shell are opened on the boats at New York. A single firm on the North River sometimes opens one hundred and fifty thousand counts in a single day. Men who open oysters there are able to earn about three dollars a day.

With a fair season and no special adverse circumstances, the business is lucrative. But in the present stage of practical knowledge the risks are so many and so great that no man is able to estimate with much certainty at the beginning of a season what its results may be. Every year shows improvement, however, both in the quality of the oysters and the modes and security of cultivating and handling them.

Hundreds of vessels, thousands of people, and millions of money are already employed in the business. Its growing

value only begins to be realized. It most certainly has a grand future. Staten Island has been noted for several important things, but this developing industry promises more for it than all its other interests, ancient or modern.

The island was General Horn's headquarters, and he had thirty thousand troops there during a most important crisis of the Revolutionary war. To the great disgust of its inhabitants a quarantine station was maintained on its north shore for many years. Some of its names recall noted places and persons of the Old World. Its climate is of great salubrity. Many seek its shores and elevations for quiet and healthy homes. Several humane retreats, like "The Sailors' Snug Harbor," "Retreat for Sick Seamen," "Home for Destitute Children of Seamen," "The S. R. Smith Infirmary for the Sick," are located upon it. Some of its old taverns bore the significant names of "The Black Horse," "The Bull's Head," "The Morning Star," "The Blazing Stars." But all these names and interests, though interesting and important, are eclipsed by the healthful and useful oyster cultivation.

ENGINEERING INVENTIONS.

The nuts of bolts for securing fish plates to railroad rails have been locked by means of bars or slotted plates, which were so constructed and applied as to abut against one or more sides of the nuts, and were held fixed in position by the nuts themselves, or by attachment to the bolts, or by wedging between the head or base of the rail and the nuts. Mr. James W. Payne, of Tipton, Mo., has patented a simple means for securing a nut locking plate, whereby it may be easily and quickly applied and removed.

Mr. Jacob Rhule, Jr., of Pittsburg, Pa., has patented a feed water heater for the inside of a boiler, which serves at the same time as a depository of mud and sediment from the water, and thereby prevents scale in the boiler.

Mr. John J. Reed, of Lyons, Ia., has patented an improvement in windmills. The invention consists in a wheel hung to swing in a horizontal plane, and having a vane hung on the wheel to swing in the same plane, the normal position of the vane being slightly inclined to the axis of the wheel, so that the wheel is held by the vane with its edge more or less presented to the wind, according to the pressure. This movement is regulated by an adjustable weight connected with the wheel. Brake mechanism of novel construction is applied to this mill.

Mr. William Tucker, of East Toledo, Ohio, has patented an improvement in the class of automatic couplings for railroad cars in which a spring jaw upon the draw head of one car engages with a jaw secured to the draw head of the next adjoining car when the cars are to be coupled, and in which chains secured to the spring jaw are employed to draw and hold the spring jaw in such position that it will not engage with the jaw of the next adjoining car, so that the coupling may be rendered inoperative when desired, or may be readily uncoupled without going between the cars.

An improved lubricator has been patented by Messrs. Isham T. Hardy and Noah H. Dibble, of St. Louis, Mo. The invention consists of a combined steam condenser, oil receptacle or tank, and gauge or indicator, so arranged that the steam from the boiler entering the condenser and condensing therein will flow into the oil receptacle or tank and force the oil thence through the gauge or indicator into the steam cylinder, to which the device may be attached.

The Tay Bridge Disaster.

The London Times makes the following editorial comments on the report of the Tay Bridge Investigating Committee: "The Tay Bridge, it appears, was simply blown down by a violent gale of wind while a train was passing over it. This is the net result of the inquiry when disengaged from its technical details. The bridge was not strong enough to bear the strain imposed upon it, and it gave way in consequence of the inherent weakness and defects of its structure. The remoter causes which brought about this result were numerous and far-reaching. First, the spans of the bridge were enlarged beyond the original design in consequence of difficulties encountered in connection with the foundations. Then, for the same reason, piers consisting of cast-iron columns were substituted for the piers of brickwork originally proposed. Moreover, the casting of these columns was very slovenly and imperfect; they were found in many instances to be of unequal thickness, and the bolt-holes connecting the various sections together, as well as those in the 'lugs' to which the cross-braces were attached, were all merely cast and left conical instead of being properly drilled and reduced to a cylindrical form. Thus, the cross-braces, on which the whole strength of the structure depended as regards resistance to lateral pressure, were very imperfectly fastened, and, by consequence, ill calculated to bear the strain imposed upon them. Such being the initial defects of the bridge, its practical supervision was intrusted to a person very imperfectly qualified, in the judgment of the court, to undertake such a responsibility. What defects he observed he did his best to remedy promptly; but he does not seem to have been sufficiently alive to the serious indications of weakness and danger shown in the loosening of the ties of the cross-braces, to the effect of which, as seems most probable, the disaster must be immediately attributed. In fact, it is impossible to resist the conclusion that the bridge was an unsafe structure from the very beginning. A weak and slender bridge is built in a peculiarly exposed situation; no attempt is made to calculate the possible effects of wind-