tains over any other in this country, yet in this article he has tried to put aside any personal bias, and he desires to carry conviction only in so far as he has been able to adduce facts, and to interpret them rationally and logically. He would state, further, that, if the reader should take exception to any interpretation given to the facts, the tables still stand as the best and most reliable data of these facts attainable, and they are not to be controverted.

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Denver, Col.

REARING OYSTERS FROM ARTIFICIALLY FERTILIZED EGGS AT STOCKTON, MD.

IN order to test the feasibility of such an undertaking on a considerable scale, a pond three and a half feet deep was excavated on the premises of Messrs. George V. Shepard and H. H. Pierce, not far from Stockton, near the shore of Chincoteague Bay, and connected with the latter by a trench ten feet long, two feet wide, and three and a half feet deep. Before the water was let into the trench connecting the pond with the bay, a wooden diaphragm — made in the form of a box three feet deep, and two and a half feet wide, and two inches thick, and lined on the inside with gunny-cloth; the sides of the box being perforated with numerous auger-holes, and filled with clean sharp sand, so as to form a filter — was placed in the trench vertically and transversely, and so secured that no water, except such as had first filtered through the diaphragm, could gain access to the pond. In this way the natural fry from the bay was effectually excluded from our artificial enclosure from the very start, so that the results of our experiment might not be vitiated. In the construction of this simple apparatus we depended entirely upon the rise and fall of the tide to partially renew the water in the pond in the intervals between the tides. The tidal rise and fall of the water in the enclosure was from four to six inches, or from six to eight inches less than the rise and fall of the tide in the open bay. Into the enclosure, covering about fifty square yards, artificially fertilized spawn was poured at odd dates, from July 7 to the first week of August.

The spawn was taken from the adults much in the same way as from fishes; the right valve of the adult animals being removed, and the ducts of the reproductive organs stroked with a pipette to force out the eggs and milt from the females and males. The products mixed together in water were then allowed to stand in pails for a few hours, until the eggs had developed as far as the swimming stage. The spawn so prepared was then distributed over different parts of the pond, and left to take care of itself.

The collectors used were simply oyster-shells strung upon galvanized wire; strings of shells being suspended to stakes driven into the bottom of the pond at intervals corresponding to the dates when fresh lots of spawn were introduced, each stake being marked with the date when it was put in place. The suspended oyster-shells were introduced so as to afford the young fry clean surfaces to which it could attach itself. On the 22d of August Mr. Pierce found that some of the shells hanging to the stakes had spat attached, ranging from one-fourth to three-fourths of an inch in diameter, and which had undoubtedly been derived from some of the brood placed in the pond by us. Some specimens of these young oysters are now in my possession, attached to the perforated oyster-shells used as collectors.

To our great surprise, we found that the water in the pond maintained about the same specific gravity as that in the bay, or 1.0175 to 1.018, and that the temperature of the water was also the same as in the open bay. The microscopic vegetable food upon which the oyster feeds was found to multiply rapidly in the enclosure, inasmuch as it was confined by the gate or diaphragm, so that it could not escape. The water in the pond was also found to remain sweet, and free from putrefactive odors. It will accordingly be seen, that all the conditions of success had been established, as was fully proved by the result.

While it is too soon to affirm that artificial breeding may be profitably available on an extensive scale in practical oyster-culture, our experiment has demonstrated a number of very important facts. These are: 1. Oyster-spat may be reared from artificially fertilized eggs; 2. The spat will grow just as fast in such enclosures as in the open water; 3. Food is rapidly generated in such enclosures; 4. The density of the water in the ponds is not materially affected by rains, or leaching from the banks; 5. Ponds are readily excavated in salt-marsh lands, and can in all probability be used for fattening and growing Ostrea virginica for market just as successfully as Ostrea edulis and angulata are grown by a similar method on the coasts of France. Pond-culture, where there are salt-marshes adjoining arms of the sea the waters of which have a density below 1.020, can doubtless be carried on profitably in connection with the intelligent use of simple,

cheap collecting-apparatus placed in both open and confined waters to catch a 'set' of spat, which can then be transferred to ponds or open beds. The methods of spawn-taking and pond-culture introduced by the writer are inexpensive and very simple, and can be understood and conducted by any person of ordinary intelligence, and are fully described in papers already published, or in course of publication, by the U. S. fish-commission, under the auspices of which he has been enabled to carry out his investigations. The experimental difficulties have been overcome. It remains for practical men to avail themselves of whatever of value has been determined by these experiments. There are thousands of acres of salt-marsh land along the eastern coast of the United States, which, with proper preparation, might be made to yield a living to a large number of persons, and which is now not productive of any thing except mosquitoes and malaria.

Pond-culture has one other decided advantage over culture in the open water; namely, that it is possible to effectually exclude from the artificial enclosures certain enemies of the oyster, such as whelks and star-fishes.

J. A. Ryder.

THE EXPLOSION OF THE RIVERDALE.

The boiler of the steamer Riverdale exploded on the 28th of August, a few minutes after the boat had left her wharf at New York, and started for her destination on the Hudson River above the city. Several lives were lost, and the boat itself was sunk in sixty feet of water. The boiler was raised, and placed upon the wharf near the Delamater iron-works; and the boat, a worthless wreck, was towed to the New-Jersey side of the river.

The steamer had two 'flue-boilers' 25 feet (7.6 m.) long, 6 feet 4 inches (1.93 m.) in diameter, containing four 'direct' flues 14 inches (0.36 m.) in diameter, two of 9 inches (0.23 m.) diameter, and five 'return' flues of 11½ inches (0.28 m.) diameter. The shell was of no. 3 iron, and the area of heating-surface was 676 square feet (63 sq. m.). The iron was of good quality, and was in good condition throughout, except along the bottom, where it gave way. The form, proportions, and workmanship of the boiler were good. The builders, Messrs. Fletcher & Harrison of New York, were among the most reputable constructors of engines and boilers in that city, and were noted for doing good work.

On examination, it was found that the bottom was corroded along its whole length, and had been patched in a number of places where the iron had become dangerously thin, and that in some places the sheets were reduced to one-fourth their original thickness. The shell had been repeatedly patched, and five 'soft patches' were found on the girth-seams. The rupture seems to have started in the thin parts of the bottom, and to have followed the weakened girth-seams quite around, and divided the mass into two parts of nearly equal size, tearing the middle sheet out of the shell entirely.

A coroner's jury made an inspection, examined such witnesses as could be found and such experts as could be induced to testify, and rendered a verdict to the effect that the boiler ruptured in consequence of the weakness of the sheets on the bottom of the shell, which were unable to sustain the working pressure allowed by the U. S. inspector; which weakness had been produced by corrosion on the interior, due to the action of the feed-water. It was further asserted, that the boiler was tested in June up to a pressure of 62 pounds (5 atmos. abs.), and burst ten weeks later under a pressure of but 32 pounds (3 atmos.), in consequence of the neglect of the inspector to observe its condition at the time of testing it. The engine-driver and the inspector were censured by a vote which was not unanimous. The jury expressed the opinion that the present law is not sufficiently explicit and mandatory, and that the use of the test by hydrostatic pressure is insufficient to detect and reveal such defects as here existed.

The inspector acknowledged that he did not try the strength of the boiler with the hammer, as is now usual in all thorough examinations by competent engineers, but merely looked it over; and that at previous inspections he had not entered the boiler, but had only looked in at the manhole. The evidence of the most superficial and inefficient 'inspection' was conclusive; and the fact that proper inspection would have revealed the dangerous condition of the boiler was equally well proven. The so-called 'inspection' was a farce; and the inspector, in a spirit of indifference or indolence, took the chances of an explosion.

The exploded boiler weighed 27,000 pounds (12,247 kilos), and contained 25,000 pounds (11,340 kilos) of water. The explosion was not remarkably violent, but was what old engineers are accustomed to call a 'burst' rather than an explosion. The consequences were, however, sufficiently serious. The energy producing the effects seen in the case of a