that special maps have been published with the magazine during that period, what the scale of each is, at what part of the publication it is to be found, and whether the map is topographical, physical, geological, or statistical. These maps, with their variously-coloured lines, show, too, in a moment, what are the regions of the earth which have most engaged attention during the last ten years. In Europe the Balkan peninsula is covered with lines, in Asia the khanates, the Pamir, Tibet, and South-Western China, while the number of lines in Central Africa north and south of the equator form a veritable labyrinth. A rough idea of the work of every traveller in the last ten years could be formed from this outline map alone, as the name and occasionally the date are added in each case. The index and the maps give a bird's-eye view of the work of this famous geographical publication better than anything else can do, and we are glad to know that it begins a new decade full of youthful life and vigour, and with the prospect of a career of as much usefulness in the future as in the past.

HERR NIEDERLEIN, of Buenos Ayres, has been appointed Naturalist and Geographer to the Argentine-Brazilian Boundary Commission, on behalf of the Argentine Government, and he left in October last for the *rendezvous* of the Commission at Misiones. He has been engaged for sixteen months in the Ministry of Foreign Affairs of the Republic, working out the results of a previous journey, especially his surveys on the Uruguay and Parana Rivers and their main tributaries; these, however, did not rest on any astronomical observations, a defect which he hopes to remedy in the present journey. A careful geodetic survey of the frontier districts will be made, and a map of these and of the province of Corrientes will be published next year.

## *TASMANIAN FISHERIES*

THE Report for 1885 of Mr. Saville Kent, Superintendent and Inspector of Fisheries to the Tasmanian Government, contains a good deal that is of scientific as well as economic interest, as will be seen from the following extracts:—

(1) *The Oyster Fisheries.*—It affords me much gratification to inform you that considerable success has attended the experiments made in the direction of breeding oysters on the Government reserves and in private fisheries, upon the system advocated and explained in my last year's Report. This system consisted chiefly of laying "collectors," constructed of thin planks or split palings coated with cement, over the breeding oysters placed upon the beds. At the Government reserve at Little Oyster Cove, on a private bed at Great Oyster Cove, and on one at the Prosser's River on the East Coast, a considerable quantity of brood or spat has adhered to the collectors laid down, giving the greatest encouragement for a yet more substantial and commercially remunerative return resulting from the following out of the system upon a sufficiently extensive scale. The operations so far conducted have been furthermore productive of much valuable information concerning the breeding habits of the oysters of this colony that may be hereafter utilised in their artificial culture. Thus, last summer none of the collectors were placed on the beds until November, which is generally accepted, as is May in England, as representing the earliest month in which the spat or brood is liberated. From the size of the brood deposited on the collectors, as also by an examination from time to time of the parent oysters, it was, however, made evident that the greater portion of the spat had been already emitted before the collectors were placed over them. This circumstance indicates the desirability, in future years, of having at least a considerable portion of the collectors in position by the commencement of September. It is of interest to observe that the larger portion of the spat deposited, at both the Government reserve at Little Oyster Cove and on the private bed in the adjacent bay, was derived from the New Zealand oysters, thus demonstrating that that variety is suitable for acclimatisation in Tasmanian waters. Another important circumstance to be recorded of the Oyster Cove reserve is the fact that the spat thus obtained was attached exclusively to the cemented collectors, and in no case to the shells of the parent oysters or to the rocks, cultch, or other natural objects to which they customarily adhere; this fact of itself affords practical evidence of the efficacy of these collectors for the purpose for which they have been devised.

At the Government reserve at Spring Bay the collectors ordered were not supplied sufficiently early to intercept the fall of spat. At the same time the fall which took place, both in the reserve and also upon the public and private oyster-beds throughout the Spring Bay district, has been a very abundant one, the young brood adhering plentifully to the parent shells, mussels, cultch, stakes, and any other objects that afforded them a suitable fulcrum for attachment. With a continuance of this past season's rate of increase, and provided a sufficient amount of breeding stock is maintained on the reserves and private beds, it should not take many years for this locality to regain its original prominent position with relation to the oyster trade. At the present time the recovery of this district has advanced to such an extent that there has been no difficulty experienced in obtaining from it during the present season a stock of about 50,000 breeding oysters for laying down upon various private beds and the Government reserves. From the third Government reserve, established at the West Arm on the Tamar estuary, no substantial results have as yet been obtained, it having been found impossible to complete it and stock it with oysters in time to obtain last summer's fall of spat. A fourth oyster reserve is in process of formation at Little Swanport; and it is proposed, with the funds available for the purpose during the current year, to establish similar Government reserves in the following neighbourhoods, *i.e.* the Carlton River, Taranna, and Southport in the southern district; and at George's Bay, Port Sorell, and other favourable localities to be yet selected, on the north-eastern and northern coast-lines.

I am gratified to be able to report to you that there are already substantial prospects of accomplishing one of the most important objects of the establishment of the Government oyster reserves. At the time of their inauguration it was anticipated and intended that these reserves, in addition to fulfilling the part of nurseries for the propagation of oysters and the replenishment of the surrounding waters, should likewise constitute central stations for the assistance and encouragement of private enterprise in a similar direction, and by whose aid, if developed upon an extensive scale, the restoration of the oyster fisheries of this colony on a thoroughly substantial commercial basis would be greatly accelerated. One private bed with breeding oysters is already established in the vicinity of the Government reserve at Little Oyster Cove, one at Spring Bay, and another at the Prosser's River. Encouraged by the success of these undertakings, applications have been or are about to be made for the leasing of three more suitable areas for the same purpose at Spring Bay, for the same number at Great and Little Oyster Cove, and for others in the neighbourhood of Little Swanport, and at Port Sorell on the north coast.

The important operations connected with oyster-culture in course of progress at the newly inaugurated Fisheries Establishment at Battery Point are recorded under the following heading.

(2) *Fisheries Establishment, Battery Point.*—Since the date of my last Report, and in accordance with the recommendations therein made, suitable premises, including a residence, have been selected and are now rented by the Government at Battery Point for the development and maintenance of a Fishery Establishment. To this site the marine hatchery originally erected at Gore Street has been transported, and re-erected with various additions. The premises occupied include a sea frontage of about three hundred feet, allowing the location of the hatchery so close to the water's edge that the salt water necessary for the maintenance of a constant circulation through the tanks is pumped direct from the sea. The mechanical arrangements are at the same time so disposed that in the event of a storm or flood rendering the outside water temporarily unfit for circulation, the intake pipe can be disconnected, and the water circulated independently from a small reservoir beneath the building. The great advantages derived from the transport of the marine hatchery to its present site, next to the means now afforded for obtaining an unlimited supply of pure sea-water, are the facilities it has provided for constructing in connection therewith tidal ponds for the culture of oysters and marine fish generally upon the adjacent shore. For this purpose an area of about one acre has been inclosed with stakes wired together after the manner adopted for the fencing off of the Government oyster reserves, and within this inclosure two such ponds have been already constructed. In consequence of the circumstance that at ordinary ebb tide the water recedes from a large portion, and at spring tides from almost the entire extent of this inclosed area, the plan has been adopted of excavating these ponds for a foot or two below lowest tide-level, so that under any circumstances they contain an abundant supply of water. The nature of the ground upon the

foreshore inclosed has proved to be well adapted for the construction of these ponds, as immediately beneath a thin superficial covering of sand it is composed of pebbles and tenacious clay so firmly amalgamated as to almost resemble concrete; any excavations made in this bed are consequently thoroughly water-tight. In the preparation of this site for the required purpose, it was found desirable to divert the course of that portion of the Sandy Bay Rivulet which formerly at low tide flowed over the area now occupied by the ponds. This has been accomplished by further excavating the main channel of the stream straight out to sea, and away from the area inclosed, and by interposing between the two a barrier or groin of rocks and tree-trunks, which has had the desired effect of accumulating along its course a natural sand-bank which effectually shuts off the water of the creek. One of the ponds constructed in the inclosure, measuring sixty feet long by thirty wide, is situated immediately beneath the hatchery, and serves as a reservoir for the constant supply of the tanks. This pond, being fenced round with wire netting, is further utilised for the storage and culture of a variety of edible fish in addition to oysters. With each ebb and flow of the tide the water in this pond is more or less completely renewed, and the fish under these conditions are found to thrive remarkably. A list of the edible species of fish that have been cultivated in the pond and tanks since the establishment of the fishery at Battery Point—that is, between the months of February and July 1886—is herewith annexed.

1. Native Salmon (*Arripis salar*).
2. Sea Carp (*Chilodactylus allporti*).
3. Black and Silver Perch (*Chilodactylus macropterus*).
4. Magpie Perch (*Chilodactylus gibbosus*).
5. Real Trumpeter (*Latris hecateia*).
6. Silver Bastard Trumpeter (*Latris forsteri*).
7. Rock Gurnet (*Sebastes percoides*).
8. Flathead (*Platycephalus bassensis*).
9. Tasmanian Whiting (*Sillago ciliata*).
10. Snotgall Trevally (*Neptonemus brama*).
11. Sea Mullet (*Agonostoma forsteri*).
12. Rock Cod (*Pseudophycis barbatus*).
13. Tasmanian Ling (*Genypterus blacodes*).
14. Flounder (*Rhombsolea monopus*).

In both the ponds and tanks of the Fisheries Establishment the chief attention is at present being given to the culture of oysters. There is already upon the premises a stock of some eight or ten thousand oysters of different varieties, and in all stages of growth, which stock it is proposed to yet further increase in anticipation of the approaching spatting-season. The varieties include the irregular-shaped Rock Oyster (*Ostrea angulata*) from New South Wales; the smooth variety of *O. edulis* from New Zealand, and many modifications of the indigenous type of the same species. The majority of these oysters have now been acclimatised in the tanks and ponds for the last three or four months, in which space of time it is gratifying to have to record that all of them have thriven and considerably increased the size of their shells. This is particularly noticeable of the New South Wales species, which it is anticipated from this experience it will be found possible to establish and propagate in these waters. The experiment now in course of trial, as to whether they will be able to withstand the severity of the Tasmanian winter months, will be an important factor in this question. The series under cultivation includes, in addition to the stock of adult oysters for breeding purposes, samples of brood raised last summer at Little Oyster Cove and other Government reserves. Among the useful functions accomplished by the Oyster-Culture Department of the Fisheries Establishment at Battery Point may be mentioned the *rôle* it fulfils of an accessible model for the advantage of those who, in increasing numbers, are taking up oyster-culture as a private enterprise, and who can there obtain information and instructions as to the best methods upon which to conduct their operations. It is also of much value as a central station, at which practical experiments can be made with the view of solving the many vexed problems that present themselves to the pioneers of this industry, and of discovering newer and more profitable methods of cultivating and breeding this mollusk. Already among eminent American and European oyster-culturists it is maintained that the secret of obtaining a far larger percentage of the brood produced by the parent oyster than has hitherto been accomplished is to be solved through the medium of tidal ponds and tanks, wherein the oysters will be supplied with all the equirements necessary for their healthy growth and development, and wherein at the same time suitable provision is made for the retention of the produced spat. Tentative experiments having this object in view are now in course of progress under scientific direction in all of the more important oyster-growing communities, and it is hopefully anticipated that some material assistance towards the solution of this important question may be forthcoming from this newly-established practical branch of the Fisheries Department of this colony.

Among the more important points to which my attention has been recently directed and advice solicited is the widely recognised desirability of discovering some method for cultivating oysters in localities in all respects suitable for their growth, with the exception that the labour involved in keeping them constantly clear from sedimentary deposits, or from sinking beneath a too yielding bottom, is too costly for their profitable culture. Experiments made with the view of surmounting this difficulty have resulted in the invention of a species of frame or cradle composed of wood and strong galvanised wire netting, measuring 6 feet long and 3 feet wide, upon which the oysters are placed, and raised to a height of from 9 to 10 inches off the ground. This description of frame so completely answers the purpose for which it was devised that they are being supplied to all of the Government reserves, and are recommended for the use of private growers. Each frame of the dimensions above quoted, which are found to be most portable, conveniently carries as many as 500 adult oysters, so that for a well-stocked bed of, say, 10,000 oysters, a score of them will be sufficient. Having the stock placed on frames of this description, a vast amount of labour usually bestowed in keeping the beds clean and the oysters free from sediment can be dispensed with. In place of the tedious process of dredging the bed through and raising the oysters a few at a time, to be cleaned and re-deposited on the cleared ground, each frame, with its contents, can be raised to the surface, a few shakes suffice to get rid of the sediment that may have accumulated upon them, and they may again be lowered to their place. This object may indeed be accomplished in many instances without raising the frames to the surface, it being sufficient merely to tilt the frame to and fro a few times, as it lies on the bottom, with the aid of a boat-hook, such agitations effectually getting rid of all the sedimentary matter. Wire handles for raising the frames to the surface of the water, with the aid of a boat-hook, should be attached.[1] Further advantages are attached to this frame-system of oyster-culture, since not only can the frames and their contents be raised to the surface at all times to be cleaned and manipulated, but it affords facilities, hitherto unprovided, of keeping an accurate estimate of the amount of stock placed upon the beds, and of watching, from time to time, the progress it is making in development. The form of spat collector that can be most advantageously utilised in conjunction with these oyster-frames is the one figured and described in my last Report under the title of the "single pale" collector, consisting, as its name implies, of a single split paling 4 feet long by 8 or 9 inches wide, having its under surface coated with cement and a brick attached at either end to retain it in the desired position. The experience gained by the past season has demonstrated this to be the most economic and productive form of collector, no alteration in its construction being suggested, with the exception that, by placing a single wire loop or handle in the centre instead of one at each end, as hitherto, their portability, both in and out of the water, is greatly increased. The adaptability of these paling collectors for use in conjunction with the newly-invented frames is very obvious, and their size is such as to allow of their being placed over the oysters in either a single or in two or more transverse rows. It is anticipated that the oysters placed upon the frames will of themselves constitute very efficient spat-collectors, their under surfaces, exposed through the meshes of the wire netting, being kept free from slime and sediment, and raised to a height above the ground favourable for the adherence of the spat. Empty shells or cultch similarly placed on frames in the vicinity of the breeding stock are also likely to prove favourable fulcra for the brood to adhere to. A remaining direction in which the oyster culture department of the Fisheries Establishment at Battery Point is found to be of great assistance in the operations now in course of progress relates to its value as a central depot for the reception and temporary storing of the stock brought from a distance for distribution among other reserves.

[1] The frames are raised to the surface of the water by blocks and cord attached to a tripod; where the boat is sufficiently large to carry a mast, the same apparatus may be more conveniently worked from a small derrick affixed to the mast.