ON THE PROBLEM OF COAST EROSION

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Dr. J. S. Owens, writing in the journal of the Royal Geographical Society, has the folowing respecting the Royal Commission on coast erosion:

The third and final report of the Royal Commission on coast erosion was issued under date, May 31, 1911. The commission was appointed under Royal Warrant, dated July, 1906, the terms of reference being to inquire and report:

(a) As to the encroachments of the sea on various parts of the coast of the United Kingdom and the damage which has been or is likely to be caused thereby; and what measures are desirable for the prevention of such

Vhether any further powers should conferred upon local authorities and owners property with a view to the adoption of efecove and systematic schemes for the protecof the coast, and the banks of tidal rivers. (c) Whether any alteration of the law is

desirable as regards the management and control of the foreshore. (d) Whether further facilities should be given for the reclamation of tidal lands.

A further reference was added under a later warrant dated March, 1908:

(e) Whether in connection with reclaimed lands or otherwise it is desirable to make an experiment in afforestation as a means of increasing employment during periods of de-pression in the labor market, and it so, by what authority and under what conditions such experiment should be conducted.

A large number of witnesses were examined, and their evidence analyzed. Committees of the commission made inspections of various parts of the coast of the United Kingdom, and a committee also inspected certain parts of the coast of Holland and Belgium.

The evidence is discussed in the final report under seven separate headings.

Part I. deals with "Physiographical and geological considerations affecting the coastline." The evidence bearing on changes of relative level of land and sea is analyzed; but, it is concluded that the present state of our knowledge does not afford any indication as to whether we are now living in a state of exceptional stability of sea-level or merely in an interlude which may at any time give place to rapid changes. Erosion and accretion as factors in coastal changes are next considered, with the sources, travel, and preservation of beach material; and conclusions are arrived at, especially relative to source and travel, which will be referred to again. A useful section then follows upon the geological features of the coast-line, in which the nature of the materials forming the coasts of England, Wales,

Scotland and Ireland is described, and its influence upon erosion.

"Part II. covers "The Extent of Erosion and Accretion in Recent Years on the Coast and in the Tidal Rivers of the United King-The evidence is considered under two heads: (a) Evidence based upon maps, under which that provided by the Ordnance Survey is dealt with; and (b) Evidence based upon local knowledge and given by witnesses in oral examination, and by local authorities and private owners in their replies to queries circulated among them.

Part III. is on "Engineering (Sea Protection Works)," IV. on "Central and Local Administration," V. deals with "The Reclamation of Tidal Lands," VI. with "The Question of Grants from Public Funds in Aid of Sea Defence," and VII. is a "Summary of Principal Conclusions and Recommendations.

The conclusions and recommendations form the kernel of the whole report; and may be shortly summarized as follows:

The amount and rate of erosion along the coasts of the United Kingdom is governed to a large extent by the geological formations on these coasts. The east and south coasts, where Secondary and Tertiary deposits form a large part of the coast-line, suffer most. The west coast of England and the coasts of Ireland and Scotland suffer less from erosion, as the harder and more ancient rocks appear there to a greater extent. Great losses have occurred in historic times, chiefly on the east coast of England; but great gains in the form of accumulations of shingle, sand and alluvium have also occurred, more particularly in estuaries. These gains have been due partly to material derived from erosion of the cliffs along the coast, but mainly to sediment deposited by rivers. The following very important suggestion is made, which, if adopted, should help to clear up a very difficult question: "It would be of advantage if the Ordnance and Geological Surveys could take steps to ascertain from time to time whether and if so to what extent changes in the relative level of land and sea are taking place."

Relative to the shingle and sand which form a natural protection to the coast, the commissioners concluded that they are derived almost entirely from the erosion of the land, and that a certain amount of erosion must therefore take place to provide a supply to the beach. Shingle and sand are stated to travel as a rule along the shore in definite directions, usually those of the waves as governed by the prevailing winds, and the travel may be arrested by headlands, river mouths, groynes, piers and harbors. These conclusions are of such importance that it may be well to indicate that they are expressions of the commissioners' opinion rather than ascertained facts.

A strong case may be made out showing that much of the sand on our foreshores is derived from the sea-bed, and that the movements of sand and shingle are governed by different factors, sand moving with the currents and shingle with the waves.

The commissioners state that the artificial removal of material from the shore and even below low-water mark has resulted in much erosion in neighboring parts of the coast. The preservation of sand-dunes by encouraging the the growth of marrum grass is recommended, as is also the plantation of suitable vegetation such as "rice grass," spartina, on alluvial flats to hasten the process of accretion.

As to total superficial area gained or lost in recent years in the United Kingdom, the evidence shows that far larger areas have been gained by accretion than have been lost by erosion. From the figures supplied by the Ordnance Survey Department, it appears that within a period of about thirty-five years about 6,640 acres have been lost to the United Kingdom, while 48,000 acres have been gained. This gain has been chiefly in tidal estuaries and the loss has been on the open coast. The commissioners believe that the erosion would have been far more serious if extensive works of defence had not been constructed by local authorities, railway companies and others. It is concluded, however, that "while some localities have suffered seriously from the encroachments of the sea, from a national point of view, the extent of erosion need not be considered alarming." This is probably the most important conclusion some to by the commission; but it is one with which some will not agree, since a comparison of the superficial area only of land gained or lost may appear insufficient to base such a profoundly important conclusion upon. It may be mentioned in this connection that the open coast, where the evidence before the commission showed erosion was limited to, is very often high land terminating seaward in a cliff. The average height of eroded land is probably at least 20 feet above H.W.O.S.T., whereas the land gained is in most cases below the level of H.W.O.S.T. If these two types of land are compared from the point of view of permanence when attacked by the sea, the low, reclaimed land might be inundated and lost possibly in a single night if once the protective, banks were breached; whereas the high land can only be eaten away slowly from the edge, and the loss of a large area is a matter of some time. This is a very important difference. Further, it is usual, as the evidence before the commission also showed, to find erosion on promontories or projecting land, accretion in bays and estuaries; in

short, the promontories shield the bays and estuaries, and supply much of the material which accumulates there. When, however, the high, projecting land has been eroded away a time may come when the low land will be again lost, not piecemeal, but by great inundations through breaches in the sea-banks no longer shielded by the promontories. This aspect of the question does not appear to have been considered in the report. In short, a continuous loss of material can hardly be compatible with a continuous gain in area, when a sufficient period of time is taken into account.

Relative to the method of dealing with sea defences the commissioners think that a "sympathetic and tactful supervision" by the central bodies should be exercised over the local authorities and private owners, especially with a view to preventing the erection of unsuitable works, or works which might injure the adjacent coast-line. They recommend that legislative provision should be made for the administration of such foreshore as remains Crown property by one department, viz., the Board of Trade; a transfer being made to that department of that part which is now under the control of the Commissioners of Woods and Forests. It is also recommended that a clear right of passage on foot upon all foreshores in the United Kingdom be conferred on the public in addition to the rights of navigation and fishing which they already possess. This right to be subject to restriction in certain places by the Board of Trade. The commissioners advise that the Board of Trade be constituted the Central Sea Defence Authority for the purpose of administration of the coast-line in the interests of sea defence, and that powers should also be given to that board to control (a) the removal of material and the construction of works on the shores of the Kingdom, and (b) to supervise and assist, where necessary, existing authorities concerned with coast protection, and to create new authorities where necessary. A very valuable recommendation is also made to the effect that the Board of Trade should "have the assistance of scientific experts to collate information and to secure systematic observations with regard to questions such as the changes taking place below the level of low water, the travel of materials in deep water, the movements of outlying sandbanks, etc., which are continually happening on the coasts of the Kingdom, and with regard to which the information at present is scanty and vague."

Referring to reclamation, the commissioners find that there are areas of tidal lands, especially in Ireland, which could be reclaimed with profit to the community. And they suggest that the Board of Trade should be charged with the duty of scheduling and obtaining detailed and scientific reports upon such lands in the United Kingdom as come to their knowledge as being prima facie capable of profitable reclamation, and that in this the board should obtain the co-operation of the Development

In the concluding paragraph of the report it is stated "we cannot see that there is any grounds for the contention that sea-defence is a natural service; it is true that there is serious erosion in places, but this erosion does not affect the nation at large. We therefore recommend—that the making of grants from public funds in aid of sea-defence should not be en-

Certain members of the commission have signed the report subject to reservations, which are set forth separately at the end.

Drawings are given illustrating a few of the types of sea defences used on the south and east coasts of England and on the coasts of Belgium and Holland.

A careful study of the evidence given before the commissioners shows that there were great differences of opinion with regard to important questions; and some of the conclusions arrived at have been based on witnesses' opinion in the absence of direct experimental evidence or ascertained facts. Now there are few subjects on which opinion differs so widely as upon some of the questions relating to the movements, and agencies governing the movements, of shore material. It is to be hoped, therefore, now that the commission has laid bare the paucity of knowledge, and the consequent differences of opinion, in relation to some of the most vital problems bearing on coast erosion and protection, the recommendation as to securing systematic observation and collating information will not be allowed to become a dead letter. It may be useful to summarize here a few of the problems which still require definite opinions-but by skilled experiment and observation. A simple enumeration of some of these problems must suffice: (1) The question of alteration in relative level of land and sea. (2) The relative amounts of shore material derived from land erosion and the sea bed. (3) The relation between erosion of the coast and erosion below L.W.M., and between foreshore drift and drift below L.W.M. (4) Depth to which wave action extends. (5) Rate of wear of shingle, especially flint pebbles. (6) Ultimate destination of material derived from coast

The Ministes of Evidence contain a most valuable collection of information relating to coast erosion, and should be perused carefully by all who are interested in the subject. The evidence is analyzed in a masterly manner in the final report, and the three volumes published by the commission should pove of very great value as works of reference.

Explorer Cook's Story

Fierce as has been the controversy waged over the discovery of the North Pole, the publication of Dr. Cook's book in England is certain to arouse interest, and that feeling can only be deepened by the mystery which discovery, says the London Standard. On the material contained in this volume the author asks the world to judge him, and whatever the verdict may be, few will deny his skill as a narrator. The story of his journey is a tale of breathless excitement, but at the end the average reader can only say that he is in no position to pronounce an opinion. Expert opinion can alone decide the merits of the claims of Cook and Peary, and this being so it seems nothing short of deplorable that the concluding chapters of this work should be couched in violent language which tends to reduce the whole matter to an undignified squabble. Much is to be forgiven a man who imagines himself robbed of the crowning glory of a life's work, but those who have trodden in the footsteps of so many martyrs of the north should not resort to insinuations against the fair fame of another. Doubtless Dr. Cook would excuse himself on the ground that he, too, has been attacked in the same manner.

The part of the book to which one naturally turns with the greatest interest is that in which Dr. Cook records that he and his boys arrived at the "Great Nail," and how "the American Eagle spread its wings of glory over the world's top." Powers of vivid description mark all these pages, strangely contrasting with the simple and somewhat bald statements with which so many heroes have dismissed their epoch-making exploits.

The Goal of Heroic Men. "We all were lifted to the Paradise of inners as we stepped over the snows of a destiny for which we had risked life and willingly suffered the tortures of an icy hell. The ice under us, the goal for centuries of brave heroic men, to reach which many had suffered terribly and terribly died, seemed almost sacred. Constantly and carefully I watched my instruments in recording this final reach. earer and nearer they recorded our approach. Step by step, my heart filled with a strange rapture of conquest. At last we step ver colored fields of sparkle, climbing walls purple and gold-finally, under skies of crystal blue, with flaming clouds of glory, we touch the mark! The soul awakens to a. definite triumph; there is sunrise within us, and all the world of night darkened trouble fades. We are at the top of the world! The flag is flung to the frigid breezes of the North

Probably it will be thought that this is a little too vivid. It is not quite in the style general announcing a victorious battle to his country. But presently comes the more sober description of the Pole itself.

The Pole Described

"The field upon which we camped was about three miles long and two miles wide. Measured at a new crevasse, the ice was sixteen feet thick. The tallest hummock measured twenty-eight feet above water. The snow lay in fine feathery crystals, with no surface crust. About three inches below the soft snow was a sub-surface crust, strong enough to carry the bodily weight

Our ingloo was built near one edge in the lee of an old hummock about fifteen feet high. Here a recent bank of drift snow offered just the right kind of material from which to cut building blocks."

Naturally enough the Eskimos were bitterly disappointed when they were told that this was the place of the "Big Nail," and they peopled the desolate waste with all the creatures of their superstition. The breath of their great submarine god was in the rising vapor, and the dwelling of the land god was a motionless little cloud. These aborigines, we read were sharp enough to note that the high air currents did not correspond to surface currents, and this represented to them a rival among the powers of the air. Dr. Cook claims that they followed him with the blind devotion of friendship, but that they were never allowed to know that they were more than two days out of sight of land. This latter statement is of course a reply to the evi-

The story of privations undergone and difficulties overcome is to be found everywhere; and about one-half of them would show Dr. Cook to be a man of indomitable courage and resolution. The first marvels recorded are of that part of the journey when land had been left for good. "Until now," he writes, "this strange white world had been one of grim reality. As though some unseen magician had waved its wand, it was suddenly transformed into a land of magic. Leaping into existence, as though from realms beyond the horizon, huge mirages wove a web of marvellous delusional pictures . . . peaks of snow were transformed into volcanoes belching smoke;

dence which Mr. Peary subsequently obtain-

ed from Ah-we-lah and E-tuk-i-shook.

out of the pearly mists rose marvellous cities with fairy like castles . . . huge creatures misshapen and grotesque writhed along the horizon and performed amusing antics."

A Plausible Appeal

Verily this was a region of romance, and it is not hard to imagine that one returning from such a world would come back with a mirage still before his eyes. Without taking sides in the dispute between the explorers it may be mentioned that it was in this very "land of magic," a little to the north of Axel Heiberg Land, that Dr. Cook is said by his opponents to have remained for three months. His reply to the accusation is certainly plausible, for he says, "Would any man sit down there and shiver in idleness when the reachable glory of Polar victory was on one side and the get-at-able gastronomic joy of game land on the other?"

If all this were purely imaginative writing it would excite some admiration; but the author of course presents it as part of his nar-rative of facts. He asks his readers to take his book and compare it with Mr. Peary's, and he contends that their similarity in matters of detail will convince all unbiassed critics that his rival's work is mere plagiarism or proves up to the hilt that Peary, if he reached the Pole, followed in his tracks. The story of the return journey is as exciting as that of the race northward, and was rendered more terrible by the lack of food. It is a splendid tale of adventure, and one scarcely stops to consider its probability until one is roughly pulled up by Dr. Cook's arrival at Annoatok. Thenceforward the book is too full of controversial matter to make pleasant reading. First comes the statement that Peary deliberately seized his house and supplies at Etah, and after this initial accusation there is no end to the wrangle save the conclusion of the volume.

Charges Against Peary

It is impossible to give even in brief the countless charges which Dr. Cook brings against the other explorer. The most important point is that Peary got the full report of his attainment of the Pole whilst at the wireless station at Labrador, and then withdrew behind the rocks to a place where no one was looking and digested the message. Witnesses to the contrary have, of course, been fairly plentiful, but Dr. Cook does not hesitate to call his opponents liars, and, indeed, produces certain much graver charges. One of them is an insinuation of wilful murder; but no good can be done by repeating this tale. As Dr. Cook himself says, his case rests "not

Church Bell Legends

Many quaint legends attach to church bells in England. Within the last century a spot at Branckburne, in Northumberland, used to be pointed out by old people, who said they had been told when they were young that a great treasure had been buried there. When at last this "treasure" was exhumed it proved to be the fragments of the bell of the priory church which stood in ruins near by. According to the legend—and it is one which well be true—the bell's last resting place can be thus accounted for. A party of moss-trooping Scots. bent on plunder, were seeking far and wide to discover the priory. But it lay in a cleft be-tween the wooded banks of the Coquet concealed from view from the higher lands about it. The moss-troopers, exceedingly wroth at last gave up the search in despair, and the monks, deeming themselves safe at last, by way of thanksgiving for their deliverance, rang a peal upon the bell. Unluckily the sound of the bell reached the Scots in the forests above and with this as guide they found the priory, which they sacked and burned. The priory bell presumably fell to the ground during the conflagration and was eventually buried.

To this day the choristers of Durham Cathedral ascend the tower, on the eve of the feast of Corpus Christi and sing the Te Deum. This ceremony is in commemoration of the marvelous extinguishing of a fire on that night in the year 1429, four hundred and eightythree years ago. At midnight the monks were at prayer when the belfry was struck by lightning and set on fire. All night the flames raged and until the middle of the following day. But for all that the tower escaped serious injury, and the bells were not damaged at

Buried somewhere beneath the soil of the graveyard of Etchingham Church, in Sussex, lies, according to the legend, a peal of bells intended once upon a time for the tower, which still has only a single bell to call the faithful to prayer. As far as can be ascertained the story is as follows: In the early middle ages, when the church could be approached by water as well as by land, a certain valiant knight

wished to present to it a peal of bells. These with any body of armchair explorers or kitchen geographers, but with Arctic travellers

who can see beyond the mist or selfish inter-

est," and he may rest assured that his out-

breaks of violent temper will have no weight

with those whom he summons to his aid. Ad-

bells were cast at a foundry many miles away, and brought to the church by water. They arrived in safety, but through carelessness, or inadvertence, they were allowed to slide to one side of the boat during unloading. and in a few moments the vessel listed over and sank, depositing the belts in the mud at the bottom of the canal, where they are to this day. When he heard of this, the donor made a "vow, enchantment or spell," saying that Etchingham Church should never have more than one bell until the peal he had given was dragged from the bottom by a team of four milk-white oxen. The white oxen do not appear to have been forthcoming, and in later times the canal was filled in. The church is still possessed of only one bell.

Old bells bore many quaint legends graven upon them, such as ejaculations and prayers, and sometimes quite a little history, as in the case of the great bell in Glasgow Cathedral, which bears the following inscription: "In the year of grace 1583, Marcus Knoz, a merchant in Glasgow, zealous for the interest of the Reformed Religion caused me to be fabricated in Holland, for the use of his fellowcitizens of Glasgow and placed me with solemnity in the tower of their cathedral. My function was announced by the impress on my bosom: Me audito, venias doctrinan sanctam ut discas; and I was taught to proclaim the hours of unheeded time. One hundred and ninety-five years had I sounded these awful warnings when I was broken by the hands of inconsiderate and careless men. In the year 1790 I was cast into the furnace, refounded at London ,and returned to my sacred vocation. Reader! thou also shalt know a resurrection; may it be to eternal life!"

The London office of an American typewriter company, says Office Appliances, has as a window display a large, slowly revolving terrestrial globe, no less than 525 flags indi cate places at which the typewriter may be bought at salesrooms of the company. Thus it appears that the martial airs of England, which are supposed to circle the earth, now have a strong competitor in the click of the American typewriter key.

miral Schley's words: "I believe that both are entitled to the honor of the achievement." would be a pleasant way out of the difficulty, and, one would imagine, would be welcomed by Dr. Cook, but clearly he is no mood for compromise.