planned but too ambitious programme of work, involving a concert of action between two such observers, had to be abandoned; and that the work of forming a star-catalogue had to be postponed until it could be done with a single instrument.

We have no grounds for challenging the accuracy of this statement. Two opposite conclusions are, however, drawn from it. The view taken by the naval superintendents is, in brief, this: if line-officers of the navy, trained from youth in the art of managing men and making them work together, cannot get two men to work in the same room, observe the same stars, and look at the same clock, what would be the result of intrusting such a task to a civilian astronomer untrained in naval discipline? No organization would last a week under such a *régime*. The view of the civilian astronomer is, that all the trouble is a necessary consequence of placing the work in charge of a man who knows nothing about its execution. Between these views we leave our readers to decide for themselves.

The commodore alludes to the 'so-called scientific men of the country' who want a national observatory, in terms which do not strike us as happily chosen. He tells these misguided men that 'the navy will take no responsibility' for their observatory, in a tone which evidently implies that the threatened absence of this responsibility would impress them with a deep sense of their rashness. Whether the commodore's threat will have this effect is a question for future consideration, and we shall dismiss the subject with a single remark. It has often been said that there is hardly a graduate of the naval academy who is not ready, with great alacrity and at a moment's notice, to take charge of the coast survey, the fish commission, or any other scientific work, without any consciousness that he is undertaking a more formidable task than standing watch on the deck of a ship. We have always looked upon this statement as a humorous exaggeration; but it is hardly possible to read Commodore Belknap's utterances without a feeling that the remark may have more truth in it than we had supposed.

THE SWAMPS OF THE UNITED STATES.

THE conditions which have determined the occupation of land in the United States differ widely from those which have controlled the settlement of most other countries. In other states there have been political or geographical limits which have greatly restrained the movements of population. In this country there has been, from the beginning to the present day, an abundance of good, readily subjugable land awaiting the settler. It is evident, however, that within this decade we pass from this old condition where excellent land was to be had for the asking. Before 1890 all such fields will have been occupied. There will be no more rich frontier lands ready to welcome the immigrant: therefore the tide of immigration will be turned upon the areas which have been passed in the swift westward movement of our population. These neglected districts are of great extent and very varied nature. They consist, in part, of land which is somewhat less fertile than the best soils, but which in every other respect is fit for tillage. In larger part, however, these unoccupied districts, which constitute the land-reserves of the United States, afford soils which contain the elements required for the most profitable crops; but they are rendered infertile by an excess or a deficiency of water. In the arid but irrigable regions, and in the inundated or swamp lands, we have a very large tillable area which may be won to agriculture; and, when so won, these lands will afford resources of the utmost importance to the people.

In his report on the lands of the arid region of the United States, published in 1879, Major J. W. Powell has given an admirable account of those districts where the soils suffer from a deficiency of water, and in the preface to that report he notes the importance of the class of inundated lands; but so far, no detailed studies of the latter class of lands have been prepared. Recently, however, Major Powell has organized a division of the U. S. geological survey, which is charged with a careful inquiry into the geological history and physical conditions of the swamps and other inundated lands of the country.

A preliminary study of the field has shown the remarkable fact, that, owing to the abundance of cheap land which could be easily won to tillage, we have left untouched, in the region east of the Mississippi, districts of easily drained swamp-lands amounting to more than fifty thousand square miles of area. These lands have the same nature as those which, in England and the states of northern Europe, were drained centuries ago, and now afford the most fertile fields of those countries. The inundated lands of the seaboard region of the United States, as well as the lands of the lower Mississippi, remain in the state in which they were when first seen by men, while the similar areas in England were long ago won

to the state of the most fertile fields of that country.

Our American inundated lands are divisible into several classes, determined by the condition of their origin. Of these, the most important are the tide-water marshes, the lacustrine swamps of the glaciated district, the delta swamps of the Mississippi, and the class of wet lands or upland swamps where the marshy condition is due to the action of plants in retaining water under the surfaces of considerable districts. The formation of the sponge-like sphagnum-peat has been well described; but it is evident that a very large part of the southern swamps of the United States are essentially climbing bogs, though the retention of the moisture is due, not, as in the north, to the mosses, but to the close-growing, flowering plants, principally to the common cane.

Preliminary studies of the great area of fresh-water marshes, extending from the mouth of the James River to the south of Albemarle Sound, show, that, in that district, this class of marshes covers an area of about four thousand square miles. Throughout this district the peaty deposit is generally thin, not usually exceeding four feet in thickness, thus permitting the roots of the trees to force their way to the subsoil below the decaying vegetable matter.

The surface of the swamp, as well as the substratum on which it rests, is generally inclined towards the natural drainage of the country to the amount of two feet to the mile. The water is retained by the dense mat of stems, roots, and decaying fragments of plants, which are so closely interlaced that the friction in the interstices prevents the speedy outflow of the rainfall.

This class of marshes can be easily and cheaply drained, and, when so improved, they afford exceedingly rich soils. Along the outer margins of these vast morasses, some hundred thousand acres have been won to culture. These lands are remarkably fertile; and I am told that they often yield fifty bushels of shelled maize to the acre, and that they endure tillage for a period of many years without fertilizing.

It seems likely that of these easily reclaimed upland morasses, resembling the Dismal Swamp, there is a total area, in the southern states, of not less than twenty-five thousand square miles. To these might be added the lands which are subject to serious inundations from rivers, which probably amount to something like eight thousand square miles.

In the northern states the area of improvable swamp-land is less extensive, but there is not a state in which they do not constitute an important part of the land-reserve which the coming generation will be glad to use. It is easy to see, that, in these inundated lands of the United States, we may find fields which will give a larger return to the husbandman than those now tilled in any state of the union; and, furthermore, that, with the rapid increase in our population, it is none too soon for us to be considering the aspects of this portion of our domain. It is clear that the national survey can, by a proper study of these swamp-districts of the country, so determine their condition as to prepare the way for the engineer. The aim will be to ascertain their extent, the conditions determining their value for tillage, and the best method of approaching the economic questions which they present. Even where these swamps may be unprofitable for agricultural use, it may often be found that they are admirably adapted for timber-culture. The juniper (Cupressus thyoides) and the bald cypress (Taxodium disticum) are particularly suited to this form of forest-culture.

The scientific aspects of the American swamps, their relation to the changes of level of the continent, the ways in which their deposits were accumulated, cannot be considered in this place. My aim at present is to call attention to the great economic importance of this field of inquiry.

N. S. SHALER.

GEOGRAPHICAL NOTES.

Russian Lapland. — Charles Rabot, during the past summer, obtained interesting details on the Kola peninsula, which lies westward from the White Sea and between it and the Arctic Ocean, in Russian Lapland. This region is very little known, and large blanks occur in the best charts. The country is rather monotonous, covered with forests, and dotted with lakes, some of which attain a large size. Imandra is a hundred and forty kilometres broad, surrounded by grand scenery, and hemmed in by two mountain-chains, which reach about three thousand feet in height, Umbdek, on the east, being a little the higher. There are no glaciers, but permanent snow exists on the peaks. After the Caucasus, this region contains the highest elevations of European Russia, and presents a desolate, barren, and impressive aspect. The lakes are very shallow: the greatest depth of Imandra does not exceed fifteen or eighteen feet, from which it shoals to a few inches. It contains many wooded islets. From this lake the explorer went to the Arctic shores, and crossed the unexplored region which extends westward from the lake. Here, where the maps indicate a flat country, he found a rugged region, bristling with mountains exceeding three thousand feet in height.