

away for future use; with vast deposits of the useful ores, and the precious metals, on the rim of the great basin; and with a climate most favorable to the development of human energy, it is impossible for the mind, even in its most daring speculations, to assign limits to the growth of the North-west. When all of these elements of wealth, now in a crude state, shall have been fully developed, there will be an exhibition of human power and greatness such as no other people ever attained.

Comparing the whole superficial con-

tents of these States with the portions cultivated, it will be seen that only about 16 per cent. of the surface has been subdued; and, if population and cultivation increase in the same ratio in the future as they have in the past, before the lapse of another decade there will be collected annually, on the borders of the Great Lakes, more than 200,000,000 bushels of cereals for exportation, giving employment to a fleet of more than 3,000 vessels, and requiring avenues of more than twice the capacity of existing ones.

## A LUNAR TIDAL WAVE

### In the North American Lakes.

*Excerpt from a Paper read by LT.-COL. GRAHAM, before the American Association for the Advancement of Science, August, 1860.*

"Much has been written, at various periods, on the fluctuations in the elevation of the surface waters of the great freshwater lakes of North America. Valuable and interesting memoirs have appeared from time to time in the American Journal of Science and Arts, published monthly at New Haven, Connecticut, within the last thirty years, on this subject, written by the late Brevet Brigadier-General Henry Whiting, of the U. S. Army, when a captain, by Major Lachlan, Charles Whittlesey, Esq., and others. The observations contained in their memoirs have, however, been directed chiefly to investigations of the extent of the secular and annual variations in elevation of the surfaces of these lakes.

"The learned Jesuit fathers of the time of Marquette, a period near two centuries ago, and at later periods the Baron de la Hontan, Charlevoix, Carver, and others, noticed in their writings the changes of elevation, and some peculiar fluctuations which take place on these inland seas.

In the speculations indulged in by some of these writers a slight lunar tide is sometimes suspected, then again such an influence on the swelling and receding waters is doubted, and their disturbance is attributed to the varying courses and forces of the winds.

"But we have nowhere seen that any systematic course of observation was ever instituted and carried on by these early explorers, or by any of their successors who have mentioned the subject, giving the tidal readings at small enough intervals of time apart, and of long enough duration to develop the problem of a diurnal lunar tidal wave on these lakes. The general idea has undoubtedly been that no such lunar influence was here perceptible.

"In April, 1854, I was stationed at Chicago by the orders of the Government, and charged with the direction of the harbor improvements on Lake Michigan. In the latter part of August of that year, I caused to be erected at the