tude in that region. The tides of the Pacific are not likely to make themselves felt in that vast expanse through a strait only some forty miles in width and less than thirty fathoms in depth, with far-stretching shoal approaches on either side. On the other hand, the relation of the Polar to the Atlantic Ocean is so intimate as to amount to identity. The continuity of the Atlantic basin has been demonstrated by soundings up to and beyond the 80th parallel. The channel between Spitzbergen and the European coast is about a hundred fathoms deep and four hundred miles in width; that between Spitzbergen and Greenland has about the same width, but is one, two, and three miles deep. The tides of the circumpolar seas cannot avoid forming a part of the Atlantic system. As to the tide in Lady Franklin Bay, it seems almost a certainty that it is chiefly an Atlantic tide that has flowed up through the Spitzbergen Sea, rounded Greenland, and entered Robeson Channel from the north, where it probably meets another and fainter Atlantic tide from the south, which, delayed and spent in the shallow West Greenland seas, comes into Lady Franklin Bay two or three hours later.

But the laws of the tides in the circumpolar seas, a *cul de sac* into which run the tides of an ocean stretching from pole to pole, and where the absence of controlling astronomical forces is favorable to tidal anarchy, can only be determined with certainty from long series of observations at stations generously distributed about the polar basin. The establishment and maintenance by Lieutenant Greely of one such station, and his preservation of the records of observation, will be regarded as substantial services to science by all interested in this branch of physical inquiry. A. S. C.

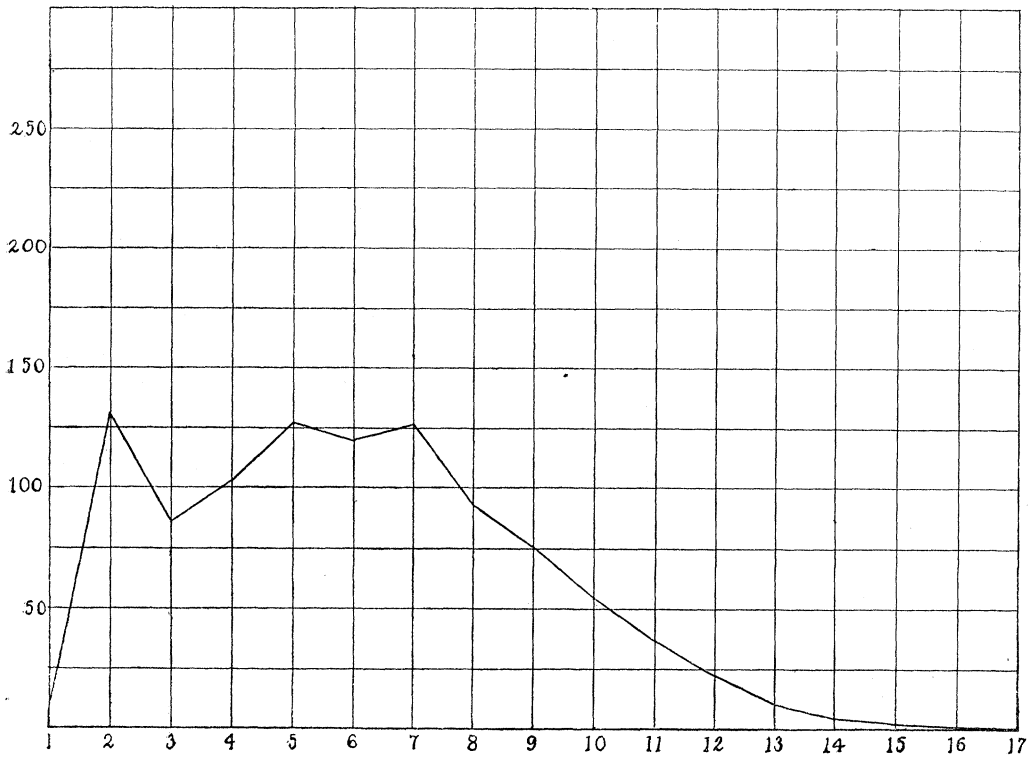

FIG. 13. — GROUP OF FIVE THOUSAND FIVE HUNDRED WORDS FROM CAESAR'S 'COMMENTARIES.'

AGRICULTURE IN ENGLAND IN 1886.

IN outlining, in a recent number of *Science* (ix. No. 212), the reports presented by the British commission on the existing trade depression, special attention was called to the fact that it was admitted on all hands that the agricultural classes were the worst sufferers. The lower prices of agricultural produce were very far-reaching in their consequences. For this reason the latest returns as to that produce are of timely interest; and we con-

dense them from a recent parliamentary paper which shows the extent of acreage, and the estimated average produce per acre, of the principal crops of the United Kingdom for 1886. The estimate is based on returns received from about 14,000 parishes.

The figures show that during the year, England produced a wheat-crop of 58,071,171 bushels, which shows the large falling-off of 15,950,077 bushels, or more than 21 per cent on the year 1885, at an estimated average in 1886 of 26.87 bushels an acre, against 31.51 bushels in the year before. The falling-off from the average yield of an acre appears in all the counties of England except four. For Wales the estimated total produce of wheat amounted to 1,501,075 bushels, at an average rate of 21.86 bushels an acre, being .33 of a bushel above the estimated normal average. For Scotland the total produce of wheat is shown to be 1,895,652 bushels, at an average rate of 33.77 an acre, which may be compared with an average of 34.33 in 1885. The year's average, though smaller than the previous year's, is larger by nearly a bushel than the ordinary average. The aggregate results for wheat in Great Britain thus amount to 61,467,898 bushels, as compared with 77,587,666 in the preceding year, while the acreage under wheat was 7.8 per cent below that of 1885. Ireland also shows a diminution in the production of wheat, the numbers of bushels being 1,879,987 as against 2,048,103, a decrease of 8.21 per cent.

Of barley, the United Kingdom produced 78,309,607 bushels, as against 85,721,632 in 1885, and this decrease of 8.65 per cent is shared by all parts of the kingdom. The return for oats is more favorable, as the production of the whole kingdom was 169,376,088 bushels, an increase of 5.57 per cent over 160,440,907 bushels, the yield of the preceding year. In this crop Wales is the only portion of the kingdom where there is a decrease, and that is very small.

The pulse-crops are again a partial failure in many counties, and the production of beans and peas shows unsatisfactory results when compared with the normal rate of yield. The numbers for the whole kingdom, however, show an advance on those of 1885, being, for beans, 10,307,187 bushels, an increase of 15 per cent; for peas, 5,855,382, an increase of 35 per cent.

Of the root-crops, potatoes show a decrease from 6,374,242 tons to 5,835,487, a falling-off of 8.45 per cent; and of this, Ireland bears more than her share, as the returns from that country fell off 16 per cent. Wales and Scotland, on the other hand, are a little above the average. Turnips show an improvement in all the four divisions of the kingdom, having risen from 24,062,608 tons to 33,957,415, which means an increase of over 41 per cent. Mangold, again, shows nearly as large an increase, from 5,969,523 tons to 7,788,811 tons, which is over 30 per cent.

The hay-crop from grass grown on permanent pasture-land is shown to exceed slightly the average yield an acre in Great Britain, the total produce amounting to 5,763,235 tons, while that from clover is at the normal average of 3,311,449 tons. the total produce of both descriptions thus showing an aggregate of 9,074,684 tons. Hops show a decided gain in the year, as the yield in 1886 was 776,144 hundredweight as against 509,170 hundredweight in 1885, or an increase of over 52 per cent.

The tables show, that, on comparing the figures for 1886 in Great Britain relating to the produce of the crops dealt with, mangold, hops, and hay are the only ones showing an increase on the estimated ordinary average yield. Corn and pulse crops, potatoes, and turnips all show a decrease on the average, though in some cases they are in advance of the previous year. The returns for Ireland show a decrease, on the average, of wheat, barley, beans, and potatoes, and an increase of oats, peas, turnips, mangold, and hay.

NATURAL GAS.

In a paper on the pressure and composition of natural gas, read before the Engineers' club of Philadelphia, Dr. H. M. Chance stated that there are no records of the gas-pressure first shown by the larger wells The recorded pressures were nearly all observed after the gas had been blowing off for some weeks, months, or even years; and the pressure then shown by a gauge is evidently no measure of the pressure under which the gas exists in the rock, for the gas soon becomes exhausted from the immediate vicinity of the well, which then draws its supply from a considerable distance, and perhaps through bands of rock of such texture — and perhaps even through the clay filling of crevices — that the pressure shown at the well may be only a fraction of the actual pressure.

Hence, while recorded pressures range from about 600 down to 200 pounds per square inch, there is every reason to believe that the actual pressures are perhaps from 500 to 1,000 pounds per square inch, or even in some cases much greater, but still being less than the maximum as limited by depth. This maximum is very much less than the pressure necessary to effect liquefaction, and the supposition that the gas exists as a liquid must therefore be abandoned.

One of the most interesting phenomena recently observed in natural gas is its variability. The analyses of Professor Sadtler, made some nine years