they suddenly rose far above the average. This is shown by the following brief statement of the original homestead entries:

Comparison of Original Homestead Entries.

1888.....	6,676,616 acres, a decrease of	917,734
1889.....	6,029,230 " " "	647,386
1890.....	5,531,679 " " "	497,551
1891.....	5,040 394 " " "	491,285
1892.....	7,716,062 " an increase of	2,675,668

Taking the average annual disposal of the public lands at 12,000,000 acres, and assuming all the vacant land susceptible re-entry, it would be entirely taken up in less than 50 years. As a matter of fact, however, only a small portion of this vast area can be acquired under the operations of the present laws or is suitable for homestead purposes. A great part consists of high mountains or deeply-eroded plateaus, of sterile lava-covered plains, or is too rough to be valuable for agricultural purposes. What may be considered as the choicest portions of this vacant public land, where the soil is deep and rich and can be readily tilled, are at present almost valueless on account of the aridity of the climate. While on the one hand mountains, canyons and lava plains cannot be removed, yet on the other the aridity, or at least its effects, can be modified to a certain extent, and lands with fertile soil now useless can be added to the producing farm areas of the country. This aggregate area, however, is relatively small, and at the present rate of disposal of public lands it is a question of only a few years when every available acre will be taken.

Under the operation of existing laws, the rate of disposal of vacant public lands must naturally be constantly diminishing, and it follows, that the probable time of disposal of the lands must be indefinitely prolonged. This decrease in sales or number of homestead entries is, of course, not due to diminution of the demand, for each year this is growing greater and greater, but is the result of scarcity of supply. As previously stated, the more available lands have been taken, and each year the choice is more limited, and men are compelled, by circumstances, to enter upon lands which a few years ago they would not have considered worth taking up. In this state of affairs public interest is being turned to questions bearing upon the reclaiming of portions of the remaining public lands, and greater eagerness is shown in developing all the resources by which these may become valuable.

The results of the eleventh census of the United States, as they have been published, cast light upon some points hitherto obscure, bringing out the condition of development of the western part of the United States, as well as of the whole country. Among other facts, the enumeration has shown that the area irrigated in 1889 was 3,631,381 acres. The scattered patches which go to make up this amount were located from points west of the 100th meridian to the Pacific coast, with the exception of the western part of Oregon and Washington. The total land surface of this area, deducting the 36 counties of western Oregon and Washington, is 1,380,175 square miles, or 883,312,000 acres. The area irrigated thus formed about four-tenths of one per cent of this vast country, which contains nearly all possible combinations of soil and climate, ranging from the smooth, almost arren plains, with scanty vegetation to the high, rough mountains, whose peaks are covered with snow throughout the year, and whose slopes have been clothed with thick forests.

Looking at this vast extent of arid and sub-humid land in a broad way, it is possible to distinguish four great classes, according to the amount of moisture received, or the water supply available, as shown by the character of the vegetation, viz., desert, pasture, fire-wood and timber lands. These may be defined as follows: The desert land is that within which the water supply is so scanty that cattle cannot obtain sufficient for drinking purposes, and the vegetation so ephemeral that it has little value for pasturage. The soil, however, is often rich, and when watered, produces large crops. These desert areas of the United States are, however, rarely without vegetation, and the large amount and variety of plant life are often matters of astonishment to the traveller.

The second class, the pasture land, may be said to embrase all of the Great Plain region which, on account of prevailing aridity, is useful mainly as pasturage. The localities at which agriculture is possible are relatively of insignificant size, although of great importance in a grazing country. It also includes the valley lands within the Rocky Mountain region and the rolling hills on which native grasses grow.

The fire-wood land may be defined as that fringing the timbered areas, and intermediate in character between the pasture land and the high, rough, forested slopes or plateaus. It includes also precipitous hillsides found at an elevation too low to receive a large or constant supply of the moisture which falls upon the more heavily timbered areas.

The fourth class embraces the forested areas upon the high mountains where the conditions are such that trees have been able to attain a size suitable for timber. With this understanding, the following table is given:

	Acres.
Desert land.....	64,000,000
Pasture land.....	620,912,000
Fire-wood land.....	115,200,000
Timber land.....	83,200,000
Total.....	883,312,000

Of this total, as above stated, less than 568,000,000 acres still belong to the general government.

The irrigated and irrigable lands are mainly included within those divisions which in their natural state have been considered as desert or pasture land. In a general way, it may be stated that fully nine-tenths of this area is covered with a fertile, arable soil which only lacks sufficient moisture in order to be of value for agriculture. If this proves to be the fact, then out of this total of, in round numbers, 616,000,000 acres of arable lands less than six-tenths of one per cent was irrigated in the census year. As to the reclaimability of a large portion of this area, the question of water supply obviously must first be discussed.

CONTRIBUTIONS FROM THE LABORATORY OF THE YORK COLLEGIATE INSTITUTE.

BY C. H. EHRENFELD, YORK, PA.

Effect of Burning on the Volume of Limestone,

In the York, Pa., courts recently, a case was tried which involved the question whether limestone shrinks by being burned. The matter was submitted to me to be tested. On consulting authorities I found the statement given that no shrinkage occurs; but no method was given for making the test. Hence I devised methods as follows: Several pieces of limestone of varying firmness of texture were taken, and permanent marks made upon them. The distance between these marks was accurately measured. The pieces were then burned in a gas furnace at a high heat for about seven hours. After cooling, the distances were again measured, and were found to be unaltered. The pieces were then slaked with water, to ascertain if the burning was complete. Another test was made in the following manner: The pieces of stone were dipped into melted paraffin and quickly removed in order to coat them with a very thin layer of paraffin, sufficient to render them impervious to water, but not enough to add materially to their volume. Their volumes were then determined accurately by lowering them into a graduated vessel partly filled with water. After being burned, the pieces of stone were again dipped into melted paraffin and the volume determined as before. It was found that no change whatever had taken place.

Water in the Spheroidal State.

While carrying on a piece of work recently which involved the use of a common Liebig condenser, it was noticed that where the stream of waste water fell into the water-trough, the bottom of which was rough, small globules of water were formed, which darted out on all sides and ran on the surface of the water to the sides of the trough, eight or ten inches distant. Frequently

they would rebound from the side and start back, but would soon disappear. The globules varied in size from an eighth of an inch in diameter to very minute. Sometimes while running along they would gradually decrease in size until they would disappear, while others would disappear in an instant. In a few cases the size suddenly decreased to about one-half the original diameter, the globule then continuing on its course without further change, until it at last suddenly disappeared. Sometimes two globules would run together, combine, and continue on their course as one globule of increased size. In other cases, instead of combining they would rebound from each other like rubber balls. This rebound also took place when they ran against an air bubble. In one case a globule about one-eighth of an inch in diameter reached the side of the trough and rebounded, but it was reduced in size to about one-half of its original diameter. It was noticed, also, that they did not all move with the same velocity: some shot across the water with great rapidity, while others moved very deliberately, both kinds of movement taking place at the same time and in the same direction. In rare instances the globules stopped and lay at rest on the surface of the water until their final sudden disappearance. The rapidity was always greatest at the beginning. In order to ascertain how rapid a current there might be (the water was about a quarter of an inch deep) bits of wood were floated on the surface. The current thus indicated was many times slower than the movement of the globules.

Particular attention was given to ascertain at what place the globules originated. The falling stream made a circular depression in the water about an inch in diameter. The globules seemed to spring up from the outer edge of this depression, fall back on the surface of the water, and then run rapidly away as described above. The thought suggested itself to me that many, if not all, of the observed phenomena could be accounted for by rapid whirling motion of the globule. The gradual slackening of the motion, the fact that some stopped on the surface of the water, the quick rebound from the sides of the trough, are all effects which can easily be produced by a rapidly whirling ball on a plain surface, like the well-known movements of a billiard ball. This would also account for the phenomenon of a ball of water floating on water, without blending with it, somewhat on the same principal that stones can be made to skip over the surface of water without sinking at once; or more remotely, as the pitching of a curve in base-ball. The conditions, too, at the place of origination of the globules, were just such as would produce a sharp twisting motion. The falling stream was first turned to the side by the bottom of the trough and then upward, until at the top of the rebound the little globules sprang out.

I do not recall ever having seen the above explanation given, and so it is offered for what it is worth.

The temperature of the water was never above 30°C., which would preclude the common explanation for high temperatures. Afterwards the same effects were obtained, on a smaller scale, when the prongs of a large vibrating diapason were dipped into water to show the effects of vibration.

THE HIEROGLYPHICS AND SYMBOLS OF ANCIENT MEXICO.

BY FRANCIS PARRY, F.R.G.S., LONDON, ENGLAND.

The inquiry into the construction of the hieratic writing of the Maya people, drags its extended length over many a passing decade, and does not go forward by leaps and bounds. So it has been with the investigation of the groundwork of the symbolism of the temples, the carved slabs of Palemké, the monoliths of Copan, the profusely ornate external walls of the numerous temples of the Yucatan peninsula. This symbolism is the very foundation of the whole matter, the essence of the spirit pervading the sacerdotal mysteries of Central America.

Mainly graven on stone, its variations are noticeable at a date far from and greatly preceding the manuscripts, consisting of the limited number of four, that have been transmitted to us. These written records, probably because of their being in a form affording an easier study than the numerous drawings representing the many sculptured remains of ancient Mexico, have had the attention of the book student fixed upon them in no ordinary degree. This concentration of thought has been a hindrance to progress, inasmuch as it surveyed a comparatively narrow field, and, observation not reaching far enough, the rise of the hieroglyphic forms, the initial composition of the hieratic writings, and the evolution of religious thought, giving life and spirit to the whole, has been but partially traced.

In order to obtain a firm grasp of the situation, the view should be extended, and broadened to the utmost bounds of our knowledge. Primitive rock scratchings, the roughest sculptured stones, the cup and ring incised carvings of prehistoric times, — each and every source of information should be called upon to contribute material.

In all study connected with hieroglyphics, in fact in all scientific research, an endeavor to find radicals, to establish simply foundation truths, and follow the processes of Nature or the compositions — the artistic productions — of the fertile brain of man from the lowest source, is the surest way of following the ramifications of evolution.

Persistent efforts to break up the mass of concrete Maya symbols have, during a century, given results that have been disappointing. Had the clue been discovered the entire outline of the sacerdotal system must have been traced. The United States Government has, however, largely contributed towards the attainment of a perfect knowledge of these ancient mysteries, by lavishly aiding inquiry and publishing from time to time records, the work of professors, accompanied by engravings which, as ideographic forms are a main feature of the system, are invaluable when the consummation of the inquiry is about to be reached.

To state that the end has been reached would be to assume the subject of Maya symbolism is exhausted. I may, however, confidently predict we are on the high road to the desired goal and announce the striking of a vein, the discovery of the lode, and invite scientists to scrutinize my observations upon that Maya relic, "The Sacred Stone." The whole question of its identity, is treated in a popular manner in a monograph entitled, "The Sacred Maya Stone of Mexico and its symbolism." The stone had been misnamed, and its use conjectured. Supposed to be connected with the ancient Aztec ritual or sacrifices, it was given an incorrect place chronologically, historically.

In the museums of the United States and throughout the archæological collections of Europe, it has been classed as sacrificial. That excellent serial, "Archives International d'Ethnographie," published in Leiden, has in Volume III. an exhaustive disquisition on the many varieties of the stone by Herr Strebel of Hamburg. The conclusion he arrived at is the rejection of the nomenclature of the museums. In this result I heartily concur, but taking an independent view and a new departure, I venture to assert and am prepared to prove it to be a relic of paramount interest. Its earliest archaic type is the key to opening out a vista of a nature worship of wide extent, and the ornate, highly finished examples demonstrate evolution, in religious thought, a recognition of combined natural forces, and *solve the mysteries.*

CURRENT NOTES ON ANTHROPOLOGY.—XXVI.

[*Edited by D. G. Brinton, M.D., LL.D.*]

The Ethnic Study of Religions.

A SUGGESTIVE sketch on "Recent movements in the historical study of religions in America" appears in a late number of *The Biblical World* from the pen of Professor Morris Jastrow, Jr. He details the progress of the historical and comparative study of religions, both in this country and in Europe, and very properly urges its importance as a branch of instruction in universities and similar institutions.

It appears, however, that it is now generally taught as a branch of psychology, ethics, speculative philosophy or doctrinal instruction. This is unfortunate, as these are not the real and nearest relations to religions. Their closest ties are to ethnic characteristics, and only by the light of these can they be clearly