structs the steamer by constantly fouling the paddle-wheel. There is another very light kind of duckweed which covers some of the small open pools, and in the absence of a current, is a great nuisance for the same reason.

Strange as it may seem, the sudd interferes but little with the flow of the river, and the Nile passes under it with little resistance. This is because the growth is principally near or on the surface. As the river is over a mile wide in some places, and the deep channel may be only a hundred feet, it is often hard to tell where to find the channel to clear it, as all of the water may be hidden. Men with long poles push them through the sudd to the water, and by this method of sounding locate the channel, when the sudd clearers get into operation.

The water papyrus plant so often seen in the sudd has given rise to the theory that the growth is composed of papyrus, but an analysis by naturalists shows that there are four vegetable elements that are the principal creations of this strange natural bridge. They are known scientifically as the *Papyrus cyperus*, the *Panicum pyramidale*, the *Phragmites communis*, and the *Typha australis*. They form the framework of the mass, but interlaced with them, as stated, are several species of twining and climbing plants that greatly strengthen this strange fabric. It may, as already stated, support even the weight of an elephant where it is thick enough. The papyrus with its wide top covers the sudd, and thus gives the idea that it is the only obstacle, when as a matter of fact this is a great water carpet, woven as deftly and strongly as if by the loom.

The Highest Flight of a Balloon.

The unprecedented elevation of 95,250 feet, or 18 miles, was attained by an unmanned registering balloon which was recently released at the Belgian meteorological institute at Uccle. At this elevation the barometric pressure is only 2/5 inch. The greatest height ever attained by a manned balloon is about 6.7 miles, or 35,400 feet. The Berlin aeronauts Berson and Suering, who established this record, were unconscious when they reached the highest point of their flight.

The Belgians adopted Hergesell's plan of attaching the instruments to a small and partially inflated balloon, suspended from a larger and fully inflated one. The large balloon rises until it bursts, and the small balloon falls slowly, so that it can be easily observed and brings the instruments safely to earth. At the maximum elevation, 18 miles, the thermometer recorded a temperature of —82 deg. F., but a lower temperature, —88½ deg. F., was registered at the comparatively small elevation of 8 miles. These observations appear to support the hypothesis that some of the ultra-red solar radiation is absorbed by the higher strata of the atmosphere, but additional observations will be required to solve the question.

The Current Supplement.

What is probably the very highest branch of the molder's art is the casting of bronze figures and statues. The opening article of the current SUPPLEMENT, No. 1758, discusses this art most thoroughly. The ultramicroscope and ultramicroscopic objects are discussed in simple language. Charles Engel tells something of the economy of cold in modern life. Of the many problems that confront the American housewife, the subject of vegetables for her table during the winter months is not the least important. How that problem can be solved is told by J. F. Breazeale in an article entitled "Canning Vegetables in the Home." Prof. E. H. Starling points out the lesson of evolution. The importance of ferments in organic life is dwelt upon by Dr. A. Zart. Sir Andrew Noble recently read a paper before the Institution of Engineers and Shipbuilders on the history of propellants. That paper is reprinted in the current SUPPLEMENT. "The Aerial Propeller, Its Form and Construction," is the title of an article by Lucien Fournier. Sir J. J. Thomson's brilliant paper on recent studies of electricity and matter is concluded.

An epidemic disease known as the "white" of oak has been studied recently by Griffon and Maublanc. It prevailed in France especially during 1908. The disease is properly called oïdium, and it is not confined to the oak, but also attacks the ash, elm, and chestnut. It is also found in Algeria. The disease is supposed to be due to a micro-organism known as *Microsphera alni*. The question as to whether it is indigenous or not has not been determined. It increased in France during 1907 and 1908 in an unusual way. Should we suppose it to be imported like blackrot or mildew, this would appear bad for the future, while if it is indigenous it is likely to disappear again. Some persons advocate a treatment with sulphur, but others claim that this has no effect. One important point in any case is the time of the year when the treatment is made.

Correspondence.

THE NUMBER OF OUR ANCESTORS.

To the Editor of the SCIENTIFIC AMERICAN:

If it is not too late, I would like to add a few words to the correspondence which appeared recently in the SCIENTIFIC AMERICAN concerning the number of our ancestors.

Your first correspondent, Mr. A. K. Venning, comes to the conclusion that long before the 5,000 or 6,000 years of authentic history is reached, the number of our ancestors would be so large that there would not be standing room for them on the face of the earth; while your second correspondent, Mr. Ernest McCullough, is inclined to ridicule this, and thinks that the figuring is more apt to work the other way. Permit me to offer the following explanation: The explanation lies in the difference in the ages of our ancestors. There is usually a considerable divergence in the ages of our grandparents; and going back farther, the difference in age increases with each generation, so that by the time the fifth or sixth generation back is reached, some of our ancestors would be new-born babes, while others would be in their graves. It is readily understood from this that the number of our ancestors is just as liable to decrease with each generation, owing to the ravages of the grim reaper Death, as to increase. If our grandparents were all born the same year, all married the same year, and both couples had children the same year, Mr. Venning's conclusions would be correct, provided no one ever died. When I say grandparents in this case, I mean all our ancestors indiscriminately.

East Canaan, Conn.   DEWEY C. CANFIELD.

To the Editor of the SCIENTIFIC AMERICAN:

I notice in one of your recent issues a communication from Mr. Venning of Los Angeles, Cal., in which he seeks a solution of the puzzling question of accounting for the discrepancy between the apparent
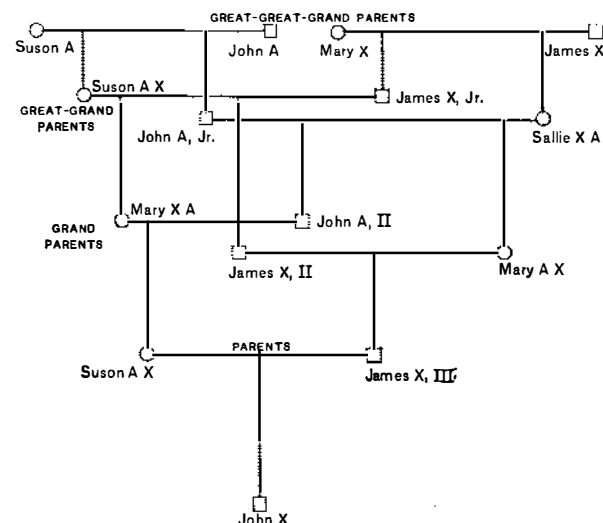
number of a man's ancestors as given by the rules of geometrical progression and the lesser number which experience shows to be the case. I think the solution is to be found in the simple fact that our ancestors have been in the habit of intermarrying with their cousins, sometimes this relationship being near and sometimes more distant. Otherwise we would inevitably enjoy our allotted number of 2^x ancestors for any given generation. Thus one set of one's great-grandparents on the maternal side are often one's great-parents on the paternal side also. For instance, a man whose ancestors for two generations had intermarried with their first cousins would have the lamentable misfortune of possessing but four great-grandparents, as shown by the inclosed diagram, when by all the rights of arithmetic he should have sixteen to be proud of. Of course this relationship is often so far removed that it is impossible to trace it, but each time one's parents have a common set of ancestors, no matter how far removed, it is evident he is being deprived of his allotted share of ancestors to that extent at least, and it might be mentioned it would be next to impossible to find any two Englishmen to-day who had not in common an innumerable number of ancestors.   F. W. A.

Knoxville, Tenn.

To the Editor of the SCIENTIFIC AMERICAN:

Publication of this problem has not as yet brought any solution, but it has cleared the air to some extent, I am glad to see. May I point out to Mr. King that the question of relationship of descendants has not really anything whatever to do with the answer? He is leading the hunt off on a false scent. If we leave out of consideration altogether the present inhabitants of the earth, and start from the premise that there is only one person alive to-day—say Mr. Constable's John Brown—the problem remains unaltered, only being thrown back a few centuries.

The revised problem is: If, x generations back, John Brown had 2^x ancestors, then it is only a question of time—of a few thousand years—for the number then alive to be so great that there would not be standing room for them upon the globe. The existence of 1,500 million or so of other persons, and those, moreover, composed of different races, to say nothing of the vast animal life, only adds to the mystery. If we limit the inquiry so as to bring it more clearly within the focus of human understanding, say to 1,000 years, we find that one single Englishman alive to-day had, at the time of Alfred the Great, 1,094 millions of progenitors living at that time, as mentioned in my original letter.

Five hundred years gives a proportionally similar result, as incomprehensible and puzzling.

Los Angeles, Cal.   A. K. VENNING.

THE RECENT CURIOUS ECLIPSE OF THE SUN.

To the Editor of the SCIENTIFIC AMERICAN.

The recent eclipse of the sun was both annular and total, an anomaly which becomes intelligible if we consider the data given in the American Ephemeris and Nautical Almanac for 1909, under the head of "Eclipses and Phenomena Accompanying the Same." The interesting phenomenon was not caused *per se* by the varying distance of the moon, which could not be possible, but by the varying distances on the earth where the moon's shadow or better where the shadow caused by the moon reached the earth's surface. Let me say that the phenomenon is a rare one and can occur only when the sun, moon, and earth are so situated that the moon's position with relation to the other two bodies gives it such an angular diameter that the nearest point of contact of its shadow on the earth will just cover the sun's disk, thus giving us a total eclipse. This condition we might call a critical one; for should that distance be increased by a few hundred miles between the moon and the point of contact of its shadow on the earth, there would be an apparent decrease in the angular diameter of the moon's disk, thus allowing an annulus of light from the sun to pass over its edge, and thus producing an annular eclipse.

Now this is just what happened in the last eclipse. The first annular phase was about the latitude of Tomsk in Siberian Russia in the early morning; and as the solar rays had a large angle of inclination, they had to travel much farther before they reached the earth than when the sun was in the meridian at midday.

The same conditions were present when the sun was low in the western horizon, i. e., the solar rays reached the earth's surface at a low inclination, thus repeating the annular phase on the west coast of Greenland in the evening.

Just at what points on the earth's surface the total phase commenced and ended, I am uncertain. I do not believe that the points have been worked out, owing to the fact that the duration of the eclipse at any one place would be so short that astronomers did not deem it worth while to consider it as of enough value to send an expedition, even should it have been in an accessible part of the world. As the total phase was likely all within the Arctic Circle, it goes without saying it wasn't worth while. Data are given in the American Ephemeris by which the problem can be solved for any part of the path of the eclipse.

I made a search through Grant's "History of Astronomy," and found no similar eclipse noted; but Dr. Schlesinger, director of our observatory at Allegheny, tells me that it may occur once in about a hundred years. Yet when we think of the many anomalous motions of the moon, we cannot but have the most profound respect for the mathematical astronomer who can sift out from the intricacies of these anomalies such a marvelous solution of the problem of eclipses as noted above.

I trust this note will be of some use to my old-time friends of the SCIENTIFIC AMERICAN. Too often my humble contributions on astronomical subjects are sadly distorted, and before they have traveled the rounds of newspaperdom have been made sensational, to my regret, but I am always content if I have added only a little to the sum of human knowledge and human happiness.   JOHN A. BRASHEAR.

Beaumaris, Ont., Canada.

The stirring of chemicals in the solution tanks of the Oberlin, Ohio, water softening plant, states the Engineering Record, is accomplished by the use of power furnished by a Pelton water wheel. The wheel is 12 inches in diameter, operates under a pressure of from 9 pounds to 22 pounds per square inch, and consumes about 50 gallons of water per minute. The wheel drives a main shaft, which drives the stirrers, or revolving arms, through the medium of a belt. The waste water from the water wheel is used for preparing the lime solution. The speed of the wheel is 180 revolutions per minute; of the lime agitator, 38 revolutions per minute; and of the soda agitator, 13 revolutions per minute.