Correspondence.

Steam Yacht.

To the Editor of the Scientific American:

Perhaps my experience will be of some assistance to W. N. McA., Notes and Queries (67), of March 13. I had a yacht almost a duplicate of his. My boat was 2 feet longer, 3 inches wider, and the same draught of water. The boiler was 4 inches more in diameter and same height, engine × 57, wheel 2 inches larger. The change from 2 to 3 blades was no improvement, and to 4 a loss. I then lowered the shaft in stern post sufficient to put in a 32 inch 2 blade propeller, and with 100 pounds steam pressure in boiler could make 12 miles per hour, and have exceeded that speed with higher boiler pressure.

While speaking of the speed of steam yachts, I can assure the owners of the Stiletto that they can increase her speed at least two miles per hour by changing her wheel for a two bladed wheel, 60 inches diameter, and lead 1½ to 1. Of course the shaft would require to be lowered enough to put wheel under the water when boat was at rest. A. S. DICKSON.

Meadville, Pa., March 16, 1886.

Cultivating Paste Eels for Microscope Study.

To the Editor of the Scientific American:

Referring to Mr. James' explanation of the paste eel tricks of microscope venders, in the March 13th issue of the SCIENTIFIC AMERICAN, and the difficulties he mentions in the cultivation of the eels, I would say that I have the best success in preserving the eels by keeping the paste in a wide mouth bottle partly full, and loosely stoppered, and set in a cool place. If cool enough to freeze water, all the better for keeping them, but to grow them rapidly and large, warmth is needed. Whenever I discover that they are not doing well, I add a bit of bread to the paste or make a fresh batch. Rye paste seems to answer best, and a few of the eels transplanted into a fresh bowl of paste in warm weather will multiply so rapidly as to cover its surface in a few days with a thick, yellow coat of them. Paste that contains a good supply of them will keep for weeks without moulding, when, without them, it would be covered with mould in a day or two.

W. G. BLISH.

Niles, Mich., March 13, 1886.

The Earth's Past.

BY RICHARD A. PROCTOR.

The earth's surface has long been recognized as presenting a stupendously difficult series of problems—problems indeed which can never be fully solved. So soon as men gave up the old idea that the crust had been fashioned originally much as it is now; so soon as, turning over the leaves of the great earth volume, they began to read what is recorded there, they found, in the first place, that the record runs back over millions of past years, and, in the second place, that it is full of gaps, of blurred pages, of scarce interpretable passages. Yet imperfect though the record is in many places, and hard to read in others, it at least tells us clearly the general history of the earth from the time when first there were lands and seas in her surface as now, and when the rival forces of denudation on the one hand and of land making on the other began the contest which has continued for millions of years in the past, and will last for millions of years yet to come.

We no longer, indeed, look back over such a uniform series of changes as the earlier students of geology contemplated. We no longer regard the layers of the earth as comparable with those of an onion, or formed in uniform succession as to time. We see, for example, that even as, in our own age, the denuding forces are forming new strata out of the materials of Quaternary rocks here, out of Tertiary rocks there, of Cretaceous, Jurassic, and Triassic rocks elsewhere, and in other vast regions, even out of the primary rocks down to the Lower Silurian and Cambrian, nay even to the Archæan rocks themselves, so it has been all the time. The crust of the earth has never presented features purely Pleistocene, or Pliocene, or Miocene, or Eocene—or presented, indeed, any uniform aspect at all; and as the formations have never been uniformly presented, so also the strata have never been uniformly laid down. We can no more say the earth was at one time Carboniferous and at another Cretaceous, than we can say that the soil of England was in such and such an era waste, at another time pasture land, at another crop land.

Yet we can look back over the past history of the earth and recognize her constant, though not uniform, progression from her Archæan condition to her present state.

The problems thus presented by the earth's history, while stupendously difficult in detail, are yet so far soluble that we can find in the action of air and water on the one hand, and subterranean forces on the other, the explanation of the general progression of the earth to her present condition. It is otherwise with those prior changes by which the earth passed to the stage when she was fit to be the abode of living creatures. We have evidence, indeed, here also, but it is not so close at hand. We have knowledge of the chemical and physical laws involved in the problem, but the conditions under which the processes then taking place proceeded were unlike any under which we can now experiment. So far as I know, the problems suggested by the consideration of the earth's fiery youth have not been as yet very closely dealt with. Let us note some of the evidence, and some of the points which may fairly be regarded as clear.

In the first place, I think we are too apt to regard a planet in its fiery youth as more uniform than the earth is as we recognize it now. We find the idea common that there would be a molten mass, with perhaps a solid nucleus and a solid crust, and outside that a complex atmospheric envelope, high up, in which would be suspended immense layers of cloud, enshrouding the real planet from outside view. These ideas seem as likely to be erroneous as the common idea of the earth as inclosed in a uniform series of strata before wind, rain, and storm cut her surface up into mountains and valleys, hills and dales, ravines and gorges. Probably the structure of the earth, when in its fiery youth, was even very much more complex than the contour of the earth's crust is now. All the conditions favored tremendous disturbances. The upheavals and down, sinkings of the crust, for instance, would be very much more active then than now, though it does not follow that the resulting inequalities of level would be greater. Indeed, they would not be nearly so great, for the simple reason that, whatever the actual materials of the forming crust in those times, the intense heat pervading it would suffice to render it too unstable to be able to stand out to very great heights above the mean level. But consider how rapidly it would be changed by the subaerial forces which in those days must have been at work.

On our present earth we have an atmosphere of oxygen and nitrogen producing a pressure of about 15 pounds to the square inch; water is from time to time added to it in the form of vapor raised by the sun's heat from the sea, and it is this water, forming into clouds, and pouring down on the land, which leads to all the denuding work of river, cataract, rain, snow, ice, and glacier. In addition there is the direct denuding action of the air in wind and storm, the direct denuding action of water as the waves of the sea pulsate on their shore lines.

But such denuding forces can be absolutely as nothing compared with the denuding forces which must have been in operation when the earth was young. It is certain that the oxygen and nitrogen now present in the air are but a residuum of what was once there. But besides these gases, now in due proportion for the support of the earth's life, there were immense quantities of carbonic acid gas, of sulphurous acid, sulphureted hydrogen, chlorine, boracic acid, and other destructive gases, some ready to assume the liquid form, and so to be still more destructive. But there would also be immense quantities—whole oceans one may say—of water in the form of vapor. The pressure of that primeval atmosphere would have been so great that the waters of such oceans as would have existed then would not have turned into steam, save at a temperature so far above the boiling point at the present atmospheric pressure that the surface of the ocean would actually have glowed with inherent luster. The water vapor in the air would have been no such cool and pleasant vapor as now exists in our air, but steam at high pressure and intensely hot. The rains falling then would have been torrents of hot water, impregnated with destructive acids, and falling on intensely heated rocks, ready to respond with intense rapidity to the destructive influences of those falling torrents and of the dense, complicated, and destructive atmosphere through which they fell. We may be well assured that the changes taking place in the aspect of the earth's surface during that remote part of her career were far more rapid than those taking place now.—*Newcastle Weekly Chronicle.*

American Mills and Looms.

The cotton manufacture in 1885 shows the total number of mills in the United States as 826, containing 261,228 looms and 12,280,342 spindles, manufacturing 786,000,000 yards of print cloths per annum. Of these, New England has 481 mills, containing 205,011 looms and 9,481,272 spindles, manufacturing 646,000,000 yards of print cloth.

Fall River has 1,742,884 spindles and 40,908 looms. It has 55 mills, with an incorporated capital of $18,139,000, but a probable investment of $35,000,000.

New England has made a large increase in spindles and looms within the past five years.

Fall River has thus nearly one-seventh of the spindles in the country, and about one-fifth of those in New England.

Bacillus of Consumption.

Dr. Cantani, of Naples, having in mind the fact that the bacillus of consumption is destroyed when other bacteria are grown in the same soil, has proposed to eradicate consumption by introducing into the system other bacilli which are injurious only to the germs of the disease. If an organ of the body be attacked by a bacillus dangerous to human life, he would introduce another, harmless to man but fatal to the destructive bacillus. In the case of a consumptive patient, Dr. Cantani introduced a harmless organism, known as the *Bacterium termo*, and found that the *Bacillus tuberculosis* gradually disappeared from the patient's expectorations. The widespread desolation wrought by consumption is more than sufficient to urge the strongest effort on the part of the medical fraternity to discover a successful treatment. It may be possible that this suggestion will bear fruits of the greatest importance. We hope, at least, that it will receive careful investigation.

The Colliery Manager.

Mr. Laurence Hill, a well known Glasgow engineer, is one of the professional examiners of candidates for colliery managers' certificates in the eastern district of Scotland, over which Mr. Ralph Moore is Her Majesty's chief inspector of mines. A few weeks since Mr. Hill was applied to by a young man, with the request that he would assist him in his studies for the examination for one of these certificates; and as every year many men present themselves at the examinations without being qualified, Mr. Hill and his friend, Mr. Moore, thought that it would do a service to intending candidates if they were provided with some outline of the course of study necessary to enable them to secure certificates. Accordingly, the first named gentleman put in writing a reply to the young man who desired to become a candidate; and as it may be equally useful to intending candidates in all the colliery districts of the kingdom, we give it the benefit, says the *Colliery Guardian*, of publicity.

Addressing his correspondent, Mr. Hill trusts that he will understand that it is not for want of wish to assist him in a praiseworthy object, but because it would be wrong for any examiner to give special instruction. This would, he says, be very unfair to other candidates. He makes his correspondent welcome, however, to the following information, and he remarks that he will be recompensed for his trouble if the recipient of the information will circulate it among his friends.

In the first place, he would remark, he says, that if his correspondent is only now (February) beginning to prepare himself for the approaching examination, he would not advise him to come up this year, but to use all his spare time from now till next year to prepare himself, as he cannot cram himself in a few weeks or months. Much patient study is required for the examination.

1. The candidate must be able to write a good, clear, and legible hand.
2. He must be able to express his ideas in a clear manner.
3. He must be well up in ordinary arithmetic, and if he understands decimals, so much the better.
4. He ought to be able to draw tolerably well.
5. He must understand mechanics, including a knowledge of the steam engine and mining machinery.

The foregoing will be of much use to the intending candidate, whether he continues his mining studies or not.

In addition to these, a mining manager must—

1. Be thoroughly conversant with the Mining Act, that he may know what the government requires for the safety of miners.
2. Know all the different modes of working coal.
3. Be able to survey and make neat plans of coal workings, and of roads above and below ground, and make neat sketches of machinery.
4. Know the best and safest modes of hauling and winding, and the costs of the different systems.
5. Know the best, safest, and most economical modes of sinking.
6. Be well acquainted with pumping machinery and other appliances for draining workings.
7. Have a knowledge of natural philosophy, to enable him to understand the effects of alterations in atmospheric pressure, the ventilation of mines, the strength of materials, the nature of explosives, and the cause and effects of explosions.
8. Have a knowledge of geology, and the nature of upheavals, distortions, and disruptions in strata, dikes, etc.
9. Be well up to the various and requisite precautions for the safety of miners and sinkers; and though not expressly called for by the examination, yet Mr. Hill recommends intending candidates to acquire a habit of taking copious notes, and sketches of any useful thing which may come under their notice, either from books or from personal observation. This and a knowledge of book-keeping will be of great service to them in any capacity.