Correspondence.

Remarkable Mental Energy and Memory.

To the Editor of the SCIENTIFIC AMERICAN:

In a recent issue of your valuable paper reference was made to a remarkable case of the development of the memory in a blind person. Such instances analytically considered sometimes become not only interesting and instructive, but very suggestive.

The power of the human mind in blind persons to produce and retain before itself, as if on a mental blackboard, so to speak, vast arrays of things, positions, and figures, almost as tangible and fixed, so far as being there to refer to for the time is concerned as the real blackboard before the eye of the sighted, is astonishing.

Permit me to give a case which is regarded as very remarkable. Professor John A. Simpson, of Raleigh, director of music in the North Carolina institution for the education of the blind, though blind from childhood, is one of the best educated men in the State. He is a graduate of the institution he now serves, as also of Trinity College, North Carolina, from which he received regularly the degrees of A.B. and A.M., notwithstanding there were at that time, some twenty-five or more years ago, no embossed text books of any value; and hence he was compelled either to have the prescribed course of studies read to him, or to copy the books laboriously by the use of an embossed alphabet. His studies there and since were of necessity carried on largely without the help of teachers, and he was thus forced to compare one authority with another and otherwise test his own work at every step.

In this thorough manner he has gone over the whole field of pure mathematics, from algebra to quaternions, omitting nothing and working out every problem mentally. In the same way he has mastered several ancient and modern languages, and has by his own work accumulated a very valuable manuscript library in Latin, Greek, French, German, Italian, and Spanish. His life has been devoted mainly, however, to music; his task being to train his blind pupils to become teachers of the sighted, and in this he has been eminently successful.

As pianist of a local philharmonic society, he has accompanied entire cantatas, masses, and oratorios without error and with finished precision. Once, when a schoolboy, he multiplied mentally, without the aid of any apparatus whatever, a number consisting of twenty figures by another number equally large. At another time he committed to memory the whole of Milton's "Paradise Lost." He has frequently read very difficult pieces of music white sitting at the fireside and then gone to the piano and performed them without leaving out a note. He can readily detect, locate, and rectify any ordinary defect in a pipe organ; take the largest and most complicated of them to pieces, repair their most delicate parts, and tune them to exactness; and he is frequently called upon to do such work in the city. T. C. W.

Star Trails.

The extreme sensitiveness of the modern photographic dry plate and its ready adaptability to the purposes of celestial photography has opened to the student of astronomy an exceedingly interesting line of research.

Perhaps the simplest and most easily accomplished work of this character is the photographing of star trails. All that is required is to point the telescope with its attached camera, or simply a camera, with a sensitive dry plate in the focus of its objective, toward the region of the sky to be photographed, and the motion of the earth will do the rest.

The stars, so far as concerns this work, are fixed and at rest. The earth, with the telescope or camera, is revolving. As a consequence the position of the sensitive plate with respect to the image of the star is constantly changing, the plate sliding, as it were, beneath it.

And with what a beautifully smooth, equable motion is the plate drawn along—no jar, no tremor, no irregularities. The lines made by the stars are as sharp, clear, and uniform as those of the finest steel engraving.

If the camera be directed toward the celestial pole, the trails will be arcs of circles, longer or shorter, according to the time of the exposure of the plate and their angular distance from the pole.

The farther away we go from the pole, the arcs traced by the stars form portions of greater and greater circles, until we finally come to the great circle, the equator, whose stars trace perfectly straight lines—striking examples of the "Copernican system."

In December, 1893, the writer made a series of negatives, beginning at the pole and extending to the equator. The lens used for this purpose was one having an aperture of 3½ inches, with a focal length of only 11 inches, giving a field of great brilliancy.

Upon the circumpolar negatives the trails of some fifty stars nearer the true pole than Polaris are found to have impressed their images. Yet the pole is unmarked by even the faintest star.

Directing the camera toward the celestial equator, and giving an exposure of one hour, a very different set of trails present themselves. During this hour the constellation of Orion, with adjacent stars, have trailed their images across the plate.

This constellation is well situated to exhibit the departure from a straight line, as traced by a great circle, and the gradually contracting circles as the poles are approached.

Delta, the northernmost star in the belt, being only twenty-three minutes of arc south of the equator, may be taken as fairly typical of an equatorial star, and one whose trail will be almost exactly a straight line—at least so far as an unassisted eye observation is concerned. Upon looking at these trails in the direction of their length, it will be observed that the deflection from a straight line, although very slight near the equator, is yet pronounced enough at the distance of six or eight degrees to at once attract the attention. The brilliant first magnitude star Rigel, in Orion's knee, traces a portion of a circle with the south pole as a center.

The equally brilliant Betelguese, in the shoulder, traces a curve in the opposite direction.

The difference in photographic action due to color between Rigel and Betelguese is very noticeable. To the unaided eye both stars are of apparently the same magnitude, yet the intensity of chemical effect of the light from these two sources is quite marked, as evidenced by their trails; the latter star, visually the equal of the former, sinks several magnitudes photographically. W. C. GURLEY.

Marietta, Ohio, June, 1895.

A Review of Railroad Invention.*

Few instances of great industrial development present a more orderly sequence of progress from small things to great than does the mechanical history of our railways. There have been but very few sudden and general "revolutions." It is rather a story of intelligent and, in the sum, successful working out of competent means to meet evident needs.

Neither speed, safety, nor comfort is possible in railroad work without a thoroughly good track, and it is only within the last twenty-five years that any general effort has been made to secure excellence in this respect. The strap rail soon proved its inadequacy, but the invention of the fish plate, in 1844, by Robert Barr, was the first step in the direction of a substantial track. The "T" rail was brought out by its inventor, R. L. Stevens, in 1830. Blake, with his rock crusher, provided the means of securing cheap and abundant stone ballast, and Howe and Fink, with their bridge trusses, had already paved the way for the huge iron and steel viaducts of later days.

Leaving out of the question, as apart from our immediate subject, the immense advantages secured to railroads by the introduction of steel rails and the greatly increased sections, which were so largely due to the labors of Ashbel Welsh and O. Chanute, the factor in the rapid movement of railroad service which has marked the last quarter century was, necessarily, the locomotive. Probably the two contrivances which contributed most immediately to the rapid and enormous development of the American engine were the pivoted truck, first introduced by J. B. Jervis, on the Delaware & Hudson Railroad in 1831, and the equalizing lever, invented by Joseph Harrison, of Philadelphia, in 1838; for these two improvements gave to our locomotives their most notable characteristics—flexibility and adjustment to the peculiar conditions of their operation. As far back as 1836 Campbell, of Philadelphia, built the first eight-wheeler; in 1847 the Norrises, of the same city, made a ten-wheeler for the Reading Railroad; in 1863 Rogers, of Paterson, turned out the first "mogul;" in 1866 Mitchell built the first consolidation; the following year Norris, of Lancaster, completed the first decapod.

In 1836 the Cumberland Valley Railroad introduced the use of rude sleeping cars on its night trains. In 1859 Mr. Pullman brought out the first cars furnished with berths and lavatories, wherein could be more or less dimly discerned the progenitor of future Pullmans and Wagners, and in 1864 they were followed by the first true sleeping cars. The "parlor car," with its greater independence and increased comfort, upon its appearance quickly became popular, and was followed, in 1869, on the Chicago & Alton Railroad, by its natural development—the dining car. Once a railroad had sleeping, dining, and parlor cars running on its trains, with their exclusiveness and higher rates of fare, it was an easy step to hitch a number of them together, without any ordinary coaches at all, and so construct a strictly "limited" train. This was first done in 1872 on the Pennsylvania Railroad. Of the several inventions entering particularly into the building of sleeping cars, perhaps the two most important are the method of lowering and raising the upper berths and the vestibule connections. The priority of invention in both these appliances has been disputed, but it is only recording facts, and not expressing an opinion, to note that the suspended upper berth was first used in 1864 by Pullman and the vestibule in 1886 by the same inventor, although as far back as 1857 a covered way between cars was in use on the Naugatuck Railroad in Connecticut.

The first radical improvement in coupling coaches so as to hold a train solidly together was, in general application, the Miller platform and coupler, which came into somewhat general use in the later sixties, and at once robbed passenger trains of their last remaining resemblance to a string of coal hoppers. Wm. Martin, of Dunkirk, is believed to have originated the method, now so general, of heating the train with steam drawn directly from the engine, although there has been the usual patent wrangle over this idea. W. C. Baker, in 1867, brought out his excellent plan of hot water circulation in connection with his safety heater, and did as much as any one else to establish an equable and wholesome temperature in passenger coaches. To a German inventor, Mr. Pintsch, we are indebted for the first practical application of illuminating gas to car lighting, although other good systems have been produced since the introduction of the Pintsch light in 1877. Finally, the gradual improvement in trucks, the invention of the paper wheel by Allen, and the borrowing of the large spoked wheels of our English friends, the nice determination of spring resistances, the production of car seats fitted to the lines of the human body rather than to those of a wooden manikin, and other similar minor improvements, all contributed sensibly to the attainment of that degree of comfort which has become so habitual to us that we rarely give a thought to the manifold steps by which it was secured.

The first really practical and efficient method of signaling was secured when the "block system" of protection was imported from England. This, with the mechanical improvements made by Saxby & Farmer, and the electrical ones added by Sykes, was the origin of most of the really successful signal work done on our railroads. The exceptions are the ingenious and elaborately perfected system of electro-pneumatic signal control invented by George Westinghouse and associates, and the well planned "disk" or "banjo" signal system invented by the elder Hall. Both systems are automatic. We have purposely left to the last what, in the opinion of every unbiased railroad man in our own and foreign countries, is the crowning individual triumph of American railroad invention, and its most distinctively native production—the Westinghouse air brake. Dating in its first form from 1868, this apparatus fairly leaped into prominence in the next few years, and, spreading from the locomotive back to the entire passenger train, soon invaded the freight service, and is now as common on freight cars as it was on passenger coaches not many years ago. In the production of this appliance both inventive and technical skill of the highest order was required, and the result was incomparably the greatest contribution to railroad management that has been offered since the first locomotive wheel was turned by steam.

The lines on which our inventors have to do their future work would seem to be far more clearly defined than ever before. There is no engineering reason why speed of 100 miles an hour should not be maintained on fast trains; the objections are commercial rather than technical. The chief obstacle lies in the ponderous and wasteful mechanisms needed to generate the requisite amount of steam under even the best present methods. The remedy will be found when electrical energy can be generated in a simpler and less expensive manner than hitherto, and signs are not wanting that the inventor is at hand.

*C. P. Mackie, in the Engineering Magazine, New York, July. Condensed for Public Opinion, from which we copy.—ED.

How to Build a Road.

Seeing the necessity for a good road between Florence and their beautiful little city of Fiesole, the authorities of the latter place issued titles of nobility which were inscribed in a "book of gold," and for which titles good round sums were asked—from three hundred dollars up, according to the dignity of the title.

Counts, barons, and marquises were created by scores; a man who taught dancing in England became a baron and a young clerk in a banking house bought the right to be called duke.

The road is a fine one, and as the carriage rolls along it, the visitor tries to fancy what it must have been like to go bumping along in the great sort of wicker basket, without wheels, that used to be drawn by two oxen.—Boston Commonwealth.

THE American Journal of Photography truthfully says the importance of steady and useful employment, especially by the young, can hardly be overestimated. The unemployed are generally the most unhappy and the most liable to wrong doing. The person that is busy will have less time or inclination to find fault with others or to engage in disreputable affairs. Keep employed. Do something useful. Work for small wages if you cannot get more. Or work without pay rather than be idle. Such a person will not long lack employment, neither will he work long without fair compensation.