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PSYCHOLOGY OF INVENTION.

In all that has been written on how to invent, methods of invention, suggestions to inventors, etc., the advice usually given when condensed to the fewest words has been, "Keep on thinking." This is good as far as it goes, but thinking, unless it has a basis of knowledge, is valueless. The inventor must deal with existing materials, whether they be thoughts or matter, in various forms. He is no more able to create thoughts than matter. The mind cannot be coerced, new thoughts will not come at command.

If a conception of any subject be carefully investigated, it will be found to have some relation to a former experience. Possibly such experience may have been of such a nature as to produce a mental impression so slight as to be received unconsciously, and still sufficiently strong to develop into a well-defined thought or idea under proper mental conditions.

Invention being practically synonymous with new thoughts, and thoughts being the outgrowth of knowledge, the value of knowledge to the inventor is apparent, even though it may be in the nature of obscure impressions of the memory, vague suggestions from men and things, or broad yet accurate and practical information on any subject.

It is a fact that the mind, when occupied on a given subject, and forced to consider correlated subjects, acquires the penetrating quality which is vital to the success of the inventor.

It is while knowledge is being acquired in any direction that inventions in that line become possible, and conceived under such conditions they possess greater value, because the work is done intelligently and in the light of fundamental knowledge.

The works of such an inventor are ascribed to genius, while they really represent persistent effort supported by knowledge.

The term invention is here applied with its broader meaning, which includes the idea of calling into existence anything based on or originating in a new thought, whether in the realm of science, abstract or applied, or art or letters.

After all, invention is little more than an excursion beyond the boundaries of present knowledge, rendered possible by the accumulated experience of ages past. Progress is hindered by the fact that men re-enact the same things generation after generation, instead of acquiring a knowledge of what has already been accomplished, and, with such knowledge as a basis, pushing forward to new fields.

Inventors who have followed the plan here outlined have achieved both distinction and pecuniary reward, and if the general standard of invention could be raised to this level, results could be accomplished which would overshadow everything done in the past.

There is certainly no limit to the amount of material available. It is only necessary for the inventor to place himself in the proper relation to existing materials to enable him to reach out and take the reward.

THE EARTH AND THE INNER MOON OF MARS.

The scrutiny of the planet Mars by astronomers during the summer of 1892, with the aid of more powerful telescopes and better equipped observatories than have existed at former favorable periods of observation, and the sensational articles concerning this planet and its two little moons that have appeared in the daily papers, have aroused great popular interest in the affairs of the earth's next door neighbor of the solar system.

The satellites are peculiar as being the smallest heavenly bodies whose orbits and sizes have been even approximately determined.

Phobos, the inner moon, having a diameter of about eight miles, is of a size easily comparable with the earth and objects upon the earth's surface, its diameter and circumference being respectively almost exactly one one-thousandth of the earth's diameter and circumference.

Let us suppose everything on the surface of the earth to be reproduced on the surface of Phobos, as men, trees, ships, mountains, rivers, etc., all reduced in size proportionally. It would be only necessary to divide by one thousand the dimensions of any earthly object to ascertain its dimensions as modeled on a Phobian scale.

A man six feet high would, on this scale, stand 0.072 inch of our measure on Phobos, and looking down with our human eyes to find him, we should have to look for an oval object about 0.022 inch diameter in its longest dimension, as we should see only the head and shoulders. A good magnifying glass would be needed to determine the real character of the mere speck that would be visible to an unaided human eye at a distance of two or three feet from the surface, on which it would be seen to crawl with a painfully slow motion.

A few species of our larger birds could be seen in flight without a magnifying glass; only a few, the ostrich, the condor, the swan, could thus be discerned when their wings were not extended.

The altitude of the highest mountains would not exceed thirty, and the profoundest depths of earthly

seas yet sounded would be represented by twenty-six of our feet.

A ship of the size of the Great Eastern sailing on a Phobian ocean would be less than 7 1/2 inches long. A right whale of average size reduced to our Phobian scale would be less than five-eighths of an inch long.

A railway train of ten vestibule cars with locomotive and tender would have a length of less than six of our inches and its breadth would be represented by a line less than 0.02 of an inch in thickness.

An earthly river, two miles in breadth and one hundred feet deep, would be represented on Phobos by a stream a little more than ten and one-half of our feet in breadth, and one and one-fifth inches in depth. Let this river be frozen over with a sheet of ice four Phobian feet thick, and the ice would be only as thick as a sheet of drawing paper.

A square two and one-half of our inches on each side would represent a Phobian acre of land. A United States postage stamp would cover a space of nearly three Phobian city lots. A city like New York built to the Phobian scale would have streets ranging from four-tenths to one and two-tenths inches wide, and these would pass between buildings ranging from six-tenths of an inch to two and four-tenths inches in height.

Having thus constructed an earth to the scale of Phobos, in which, to unaided human eyes, only the largest quadrupeds and fishes would be visible, wherein we should have to look for all but the largest birds with microscopes, and in which all insect life would be undiscernible by any means at present known to us, let us suppose an ordinary sized man transferred to its surface.

If a good pedestrian, he could walk over the Phobian equator, circumnavigating the globe, in six of our hours, making strides of three thousand Phobian feet. The soles of his walking boots would be thirty Phobian feet thick. Each hair of his head would be ten Phobian inches in diameter. His feet would be over nine hundred Phobian feet long and about three hundred Phobian feet in breadth. In walking he would raise the toes of his feet above the heads of the Phobians to a height of five hundred feet. If his stature in earthly measurement be taken as five feet ten inches, he would tower into the Phobian sky to a height over one and one-tenth miles.

Enormous giant as such a man would be to our imaginary Phobian, he is, as compared with our globe, no larger than such an inhabitant of that satellite would be as compared with his little world. The truth is, there is no absolute standard of large or small. Size is strictly relative, and the physical man, considered in relation to the universe, is nothing but a material point—a center of vital mental and moral forces, whose effects reach as far beyond the limit of his ken as the universe extends beyond the power of his vision. The life of man is a brief and narrow strip of imperfect light, bordered on either side by impenetrable mystery.

Memorial Fair Coins.

Congress has appropriated two and a half millions of dollars to help the World's Fair, to consist of memorial half dollars, or "Columbian half dollars." The designs of the coin have been selected. The reverse will show the main building of the exposition, and the obverse the head of Columbus. The plaster cast of Columbus was made by A. S. J. Dunbar, sculptor, of Washington, from a portrait which is recognized by experts as being as nearly authentic as any that exists, and is believed to have been painted for Domenico Malipiero, a Venetian senator and historian, in 1501. This portrait, with a well-traced history approving its antiquity, was recently purchased by the United States Consul-General at Frankfurt, Germany, for Mr. James V. Ellsworth, of Chicago. The work of coining the souvenir "Columbian half dollars" will occupy a month or six weeks.

The bill also provides for the striking of 50,000 bronze medals, with appropriate devices and emblems, at a cost of \$60,000, and 50,000 vellum impressions for diplomas at a cost of \$43,000.

A Water Weight Railroad.

A novel form of inclined railway has been built at Bridgenorth, England. It connects the upper and lower parts of the town, communication between which was formerly provided by means of steps cut in the solid rock. The length of the track is rock 201 feet, but its vertical rise is 111 feet. There are two cars, on separate lines of rail, and they are connected by a steel cable passing round a wheel at the top. They are thus balanced, and a preponderating weight is given, whichever one is at the top, by pumping a supply of water into a tank placed in the frame of the car. The steel rails are secured to ties which are bolted to the solid rock and also embedded in concrete. The brakes are normally on the wheels, and motion is only possible while the brakeman turns his handle. The track is cut out of the solid rock, so that it shall not spoil the beauties of the landscape.