COLORING AND DYEING IVORY.

In reply to the inquiry of E. P. W., in our issue of Dec. 8th, we have received four communications which we condense. Mr. Joseph Hirsch recommends a process similar to that he furnished us, which was published in our number of Dec. 8th, relative to the dyeing of horn; which he informs us was the invention of Gustav Mann, of Stuttgard. If the method employed in dyeing horn is applied to ivory, it is necessary to thrust the ivory directly from the hot bath into cold water, to prevent the production of fissures. He gives the following recipes for dyeing ivory:—

Black.—The ivory is boiled about ten minutes in a solution of logwood and then placed in a solution of green vitriol; to be repeated until the desired depth of shade is secured. Another plan is to immerse the ivory in a solution of nitrate of silver exposed to light. This to be repeated, if the first attempt is not satisfactory.

Blue.—The ivory to be placed in a diluted solution of sulphate of indigo for a few moments, and dried with blotting paper.

Yellow.—Immerse the ivory in a diluted solution of nitromuriate of tin for a few minutes, and then for an hour or less place it in a filtered hot solution of fustic; or immerse the ivory a quarter of an hour in a solution of sugar of lead, then in a solution of chromate of potash for half an hour; or the ivory may be steeped first for twenty-four hours in the chromate of potash and then boiled in a solution of acetate of lead. Another method for yellow is to boil the ivory a short time in diluted nitric acid.

Orange.—As in yellow, first recipe, except to the fustic add Brazil wood to deepen the color.

Red.—Boil the ivory a few minutes in a mixture of cochineal and vinegar; or immerse it in a diluted solution of nitromuriate of tin, then boil it for half an hour in a decoction of Brazil wood or cochineal.

Scarlet.—Same as the last, except the addition of fustic.

Cherry Red.—Same as the last, with the addition of immersing the ivory, after being dyed, in a diluted solution of potash

Violet.—Dye red and afterward blue; or place the ivory in a highly-diluted solution of tin and boil in the logwood bath

Purple.—As in the last, and place it in water containing a little nitric acid.

Green.—Dye yellow and then blue; or immerse for half an hour in a solution of chromate of potash (concentrated), and expose to the sunlight.

Aniline dyes yield a very satisfactory result, being bright and clear.

Another correspondent quotes the following from Dr. Winkler, in Bottger's *Polytechnic Notices*:—

Yellow.—Dissolve one-fourth of an ounce of picric acid in half an ounce of boiling water. Dilute one eighth of an ounce of strong sulphuric acid with one fourth of an ounce of hot water by pouring the acid gradually into the water. Insert the ivory in the acidulated water, turn it around repeatedly in order to admit the acid to all parts, remove the ivory from the fluid and dry it. Then insert the dried ivory in the boiling solution of the picric acid, turn it also around and leave it in the solution until all parts appear of a uniform yellow color. Then remove it from the solution of picric acid, dry and polish the ivory with soap water and finely levigated chalk. After the polishing the ivory possesses a permanent dark-lemon yellow color.

Blue.—Insert the ivory for fifteen to twenty minutes in diluted muriatic acid (half an ounce of acid for one pound of water, having the taste of a good vinegar), and from this acidulated water transfer the ivory into a more or less concentrated solution of indigo-carmine (soluble indigo) and keep it in that solution until the ivory has assumed a uniform blue color; then dry and polish.

Green.—Insert the blue-dyed ivory in a solution of picric acid as prescribed for the yellow color.

Mr. Henry Connett, of Madison, Ind., sends the following, which he has heard pronounced good, although never having personally tried them:—

Ivory may be dyed or stained black by a solution of brass and a decoction of logwood; green, by a solution of verdigris; red, by being boiled with Brazil wood and lime water.

To Soften Ivory.—Soak for three or four days in a mixture of three ounces of spirit of nitre and 15 ounces of spring water, when it will be soft enough to obey the fingers. To color it in this state, dissolve the proper pigment in spirit of wine, then plunge in your ivory and leave until sufficiently tinged, then give it the proper form. To harden it, wrap in a sheet of white paper and cover with dry, decrepitated common salt, and leave for twenty-four hours. To whiten ivory that has turned brown, slack some lime in water, decant, and boil your ivory in this till white.

A correspondent from Northboro', Mass.:

Black.—Let the ivory be laid for five or six hours in a diluted solution of neutral nitrate of pure silver, with access of light, and it will assume a black cast. Ivory may be dyed blue by being laid or immersed in a diluted solution of sulphate of indigo, partly saturated with potash. Green is given by dipping blued ivory for a few moments in a solution of nitromuriate of tin, and then in a hot decoction of fustic.

Red Dye may be given by treating the ivory first with the tin mordant and then plunging it in a bath of Brazil wood.

To Make it Flexible.—This may be done by immersing in a pure solution of phosphoric acid of sp. gr. 1·13 and leaving it there till soft. It hardens on exposure to the air, but will resume its pliancy when put in hot water.

We may add that ivory is commonly silvered by immersing it for a few minutes in a solution of nitrate of silver and then placing it in clean water exposed to the sun's rays; or, better, after immersion in the nitrate expose it to the fumes of phosphorated hydrogen.

THE PARIS INTERNATIONAL EXHIBITION.

The extension of space granted to agricultural processes and machinery in the experimental grounds on the Isle de Billancourt, will have the effect of adding considerably to the display of American improvements which had been excluded from the limited space in the Champ de Mars. These must, however, pay their own expenses—the small appropriation by Congress having been already exhausted—and their applications must be made in due form to the Commissioner General at the Palace of Industry, by the 15th of January. Two vessels have been employed by the United States Agent, Mr. J. C. Derby, to convey the goods of American exhibitors already accepted, free of charge, from this port to the Exhibition and back. The second of these, the *Mercury*, is now loading at Pier No. 6, North River.

The whole exhibition is arranged in the ten following classes or groups:—

1. Works of art.
2. Materials and their applications in the liberal arts.
3. Furniture and other objects used in dwellings.
4. Garments, tissues for clothing and other articles of wearing apparel.
5. Products, wrought and unwrought, of extractive industries.
6. Instruments and processes of common arts.
7. Food, fresh or preserved, in various stages of preparation.
8. Animals and specimens of agricultural establishment.
9. Live products and specimens of horticultural establishments.
10. Objects exhibited with a special view to the amelioration of the moral and physical condition of the population.

These are subdivided into ninety-five classes, most of which it would be of no interest here to particularize. Some of the more important or novel features intended, may strike the eye as we glance over the departments in their order, and serve to illustrate whatever is characteristic in the grand design of the French Government. It is gratifying to learn from the assurances of the Agent, that our own country is to be fairly represented in all classes; the space, 42,000 feet within the palace, having been entirely taken up, after rejecting many superfluous or inferior articles.

Group number one will afford such a view of American achievement in the fine arts, as has never before been presented, even in this country. Thanks to the exertions of a self-organized committee of influential connoisseurs, a large collection of the very best works of American art, from private and public galleries as well as studios, will grace this truly great department of the exhibition. The peculiar expenses of shipping and insuring these costly and delicate treasures will be paid by private liberality.

Group number two, nearly allied to the fine arts, includes, under class 10, instruments of music, in which it is needless to say that our country will in certain respects make an imposing demonstration. In photography (class 9) our artists will hardly be behind, and will certainly not be backward. In the medical art (class 11), if humanity in its noblest development is to be the standard, our Sanitary department, organized by Dr. Thomas W. Evans of Paris, with special reference to the operations of the American Sanitary and Christian Commissions during the late war, will exhibit America in the van of real progress. We are glad to learn that a special section of the Exposition has been devoted to this object, outside of the space allotted to the United States. Among the articles shown will be large, elegant and costly models of Dr. Harris's hospital car, and Perot's and Autenreith's medicine wagons, four of the best ambulances from actual service, an ambulance kitchen, a hospital tent completely furnished with Sanitary Commission stores, and the identical Christian Commission coffee wagon which was in use in the field at the time of Lee's surrender. Dr. Evans will have deserved the gratitude of the represented world for this noble movement, on which he is said to have expended $25,000 or $30,000 out of his own pocket.

In the third and fourth groups, we hear of nothing remarkable from America, except the suggestion that our grand deputation of fifty red aborigines, with their native attire, weapons, paint, wigwams, domestic arts and utensils, and mode of life, will be a unique though primitive illustration of the subjects of "furniture" and "garments." This remarkable feature of the Exposition has been provided by the agency of the Commissioner for Minnesota, Dakota and Idaho, at the suggestion of the Imperial Commissioners themselves. The fifty Indians will embark with their "traps" about the 10th of March. They will probably fall under class 92, group 10, "Specimens of costume."

In the fifth group, class 40, products of mines; class 41, products of the forest; class 42, products of hunting and fishing and collections of natural growth; and class 43, agricultural products not food—no country can on the whole present so varied and important an exhibition as our own. The mammoth trees as well as the mines of the Pacific coast will be represented.

The sixth group has been overwhelmed with American contributions, with which, as a whole, no other country can vie. The whole infinite variety of our useful inventions it was impossible, of course, to accommodate. A selection of the better class had to be made, and we must hope it was judiciously and yet liberally done. A very large amount, unavoidably left out of the palace, will find accommodation as above stated on the island.

The seventh group will include some of the most original, interesting and "refreshing" items of the exhibition. Every country and grade of civilization will be represented, as far as possible, in its materials and styles of preparing and taking food. A genuine Japanese coffee house, with Japanese girls as attendants, is on its way; and specimens of the eating and drinking of New England, New York, and the West, with every other race and nation—not merely to be looked at—will invite the hungry and thirsty and curious millions (for so they are reckoned) of strangers from all lands.

We pass to the tenth, and to our mind the grandest, group of the exhibition. In this department the world will not deny that we have much to show for the benefit and instruction of mankind. In devices and arrangements for the improvement of the condition of the laboring classes, and for the better organization of labor, it must be confessed that England and France are ahead of us. The obvious reason of this is, that our operatives are so well off in their independence, that it is difficult to induce them to combine, except for higher wages. For the same reason there is comparatively little pressure upon the other classes to organize beneficent movements for them, or to offer them an interest in the produce of their labor, as has been done so nobly and successfully by a few English and French employers. Hosea Biglow's

> ——true American idee,
> To make a man a man, and let him be,

is the principle upon which our social economy has proceeded so far. The first part of it—to make a man a man—which is certainly better than everything else that can be done for a man, we have carried further than any other people in history, and the exhibition will give our fellow-nations some hints, at least, of our process. Our public schools are to be represented (chiefly through Massachusetts liberality), in models of our best school houses, and representations of our most approved apparatus and modes of instruction, school books, results of education, and educational laws. Incidentally, not as a matter of display, the free, simple, Bible religion, which nourishes the root of all our national happiness and grandeur, will be illustrated by an evangelical chapel, in which the great Parisian gala day, which we revere as the Christian Sabbath, will be sacredly observed, in strange contrast, to Frenchmen, with the restless gayety which seems happiness to them. The daily union prayer meeting is also to be maintained there, for the devout of all races and sects who hold one common spiritual Head.

Every sort of religion and manners have free and equal welcome, and as an offset to the above, Spain will exhibit a national characteristic—six bull fights—for which a Spanish company are making preparations on a gorgeous scale. Comment is unnecessary; yet the condition of Spain will afford it, in the almost entire absence of contributions to the welfare and honor of humanity from a nation once the foremost in civilization and grandeur.

The prizes amount to 800,000 francs, in sums of money or medals of gold and silver. Each nation is represented on the grand international jury of six hundred, according to the space allotted to it in the exhibition. This jury is divided into sixty-eight sub-juries on classes, which are to work simultaneously, from the opening of the exhibition on April 1, and finish their awards before the 14th of May, except with regard to certain specified classes. The largest prizes are ten of 100,000 francs each, and one grand prize of the same amount, to persons, establishments or localities where by special institutions harmony and well-being, material, moral and intellectual, have been promoted among those who carry on the same labors. A special jury will determine these awards. In art, there are 139 prizes, from 400 to 2,000 francs each. In agricultural and industrial products, 250,000 francs will be distributed in gold, silver and bronze medals; the gold worth 1,000 francs each, and the others of the same character except the material only. Many other topics of interest present themselves; but we reserve them for maturer attention as they shall come up in the actual progress of the exhibition.

THE OCEAN YACHT RACE.

On the 11th of December, at 1 P. M., three pleasure yachts started from Sandy Hook for the Isle of Wight, in a friendly trial of speed and good seamanship. The *Henrietta* arrived at Cowes, Isle of Wight, at 5 minutes to 6 on the evening of the 25th; the *Fleetwing*, 8 hours and 15 minutes, and the *Vesta*, 9 hours and forty-five minutes, after. Considering the tonnage of the vessels, the season of the year selected, and the prevalence of gales during the passage, the time made was remarkable. The owner of each vessel staked $30,000 on the result.

The *Henrietta* is a fore-and-aft schooner of 205 tuns, 108 feet long, 23 feet beam, and 10 feet depth of hold. She is a keel boat, and was built in 1862, by Henry Steers, of Greenpoint, L. I., from a model by Wm. Tooker, of New York. She carried a crew of 27 men. Her owner, Mr. J. G. Bennett, Jr., son of the editor of the New York *Herald*, sailed in her.

The *Fleetwing* has a capacity of 212 tons, is 106 feet long, 24 feet beam, and has 10 feet depth of hold. She is also a keel boat. Her builder is Joseph Van Deusen, and she is not quite one year old. Her owner is Mr. George A. Osgood. Her crew consisted of 21 men.

The *Vesta* is a center-board boat, built last spring, by Mr. Carll. She is 108 feet long on deck, and carried a crew of 24 men. She is owned by P. Lorillard, of this city.

The interest of this race does not end with its termination and the transfer of the money staked on the result. There is something behind all this to make it noteworthy. The daring and skill displayed in crossing the stormiest ocean on the globe, at the most inclement season; the confidence in the skill of man to thwart the fury of the elements; and, above all, the triumph of mechanical genius and good workmanship, guided by scientific knowledge, evidenced in the build of these tiny craft, are facts in which every man and mechanic must feel a pride. Again, as one of the results, the cordial and generous manner in which these facts were recognized and the crews welcomed, by our brethren of the "sea-girt isle," are additional elements in our satisfaction. Only

one occurrence casts a shadow on our gratification—the sad accident of the loss of four men from the *Fleetwing*.

PRACTICAL EDUCATION FOR MECHANICS.

Some months ago we advocated briefly the advantages of theoretical knowledge for mechanics, quoting one notable instance in support of our position. We wish now to allude as briefly to another department of the mechanic's education—the practical. This, it may be said, is obtained during the apprenticeship and in the practice of his business. True; but some of it might be obtained before he enters upon his apprenticeship, and more during the period of his noviciate than s commonly the case. There are few schoolboys who do not evince the bent of their tastes before reaching the first stages of manhood, and it is saddening to notice sometimes how the years of schooling have been little better than wasted by attention to branches of study which were not only distasteful to the pupil, but could be of little or no value to him in his after progress. To be sure, there are elementary studies which are necessary for all. Whatever may be the youth's after station, he should be drilled in the rudiments of general knowledge. But it is possible to partially prepare the future mechanic for his business by instruction more or less practical, and to familiarize him with the results as well as the principles of mechanical art. The structure, strength, useful properties and management of materials; the differences between the metals; the varying qualities of wood; the uses of the simpler tools and machines; the principles of mechanical movements and natural forces; the application of the rules of arithmetic to measurements and mechanical calculations, and illustrations of all these by reference to familiar objects, can be taught the boy with but little effort.

Thus practically informed, he will enter the workshop prepared to appreciate its object and fitted to unravel its mysteries. We shall have fewer of human machines and more of intelligent mechanics, who can do a good job and also understand the philosophy of the means and materials employed and used.

In the shop the apprentice should be shown the object of a manipulation, as well as taught how to perform it. He should be directed to see and understand the connection of a drawing with the pattern, and of that with the parts and whole of the completed structure. If a good job is given him to perform, a little explanation as to its object and uses would often assist him in its completion, and give him an interest in his work impossible otherwise to be awakened. His judgment and discretion would thus be developed and he be improved, to his employer's benefit and his own advancement.

We cannot subscribe to the opinion of the engine driver in Dickens's "Mugby Junction" that fitters make the worst drivers because they understand too much of the internal structure and workings of the locomotive. In mechanics, ignorance is neither bliss nor benefit. Knowledge here is power. An educated judgment is better than the skillful hands of the mere human machine. The operator of any machine should have a thorough knowledge of all its parts, even though he may not be able to repair or replace them when injured or lost; and this statement applies to the driver of a locomotive as well as to the manager of any other machine, the "Mugby Junction" engineer to the contrary notwithstanding. Even where operatives are employed to attend to machines almost self-acting and requiring only to be fed with material, as in manufactories, a general knowledge of their structure as well as operation is desirable; for it would sometimes prevent accident to the machine or imperfection in its results. Such knowledge is not all that is required to make a good practical mechanic, but is not to be despised because it is somewhat superficial.

The willing learner, working in any business, or following any vocation, can always find subjects enough to employ all his capabilities. If, after a process which was expected to yield a certain result, he finds his expectations unrealized, as not unfrequently occurs, instead of leaving the matter uninvestigated and unsettled, there should be considered an opportunity presented for gaining additions to his stock of useful, practical knowledge. Many valuable discoveries have been made when the manipulator of experiments was in search of something entirely different; and he must be a dullard, in deed, who could honestly proceed with an investigation into the secrets of nature without deriving benefit from the work.

RAILROAD ITEMS.

A road locomotive is now in constant use in the neighborhood of Zurich, and is remarkable for the ease with which it ascends considerable inclines, drawing after it carriages containing as many as forty passengers. It is said to be easily guided, its speed regulated with great facility, and may be quickly stopped.

The introduction of horse railroads into London, has met with but little success. In Hamburg they are considered a great public benefit, and a line four miles long between that city and Wandsbeck, a market town in Holland, has carried during the three months since it was opened to the public, no less than 330,000 passengers, giving an average of 3,700 francs per day.

A project is now in contemplation for laying city railroad tracks through the principal streets of Dublin. The scheme has received official sanction and approval.

The railway bridge across the Mississippi River at Quincy, Ill., will be a first class iron structure about 4,000 feet in length, on stone piers and on foundations of the most substantial character. It is to be built by a union of the interests of the Toledo, Wabash and Western, the Hannibal and St. Joseph, the Chicago, Burlington and Quincy, and the Michigan Central, Railway Companies.

The rights of the traveling public, according to judicial decisions, are governed by the following rules, which have been adopted by the courts. All railroad tickets are good until used: the condition "good for this day only" being of no value. No person has a right to monopolize more seats than he has paid for, and any article left in the seat while the owner is temporarily absent, entitles him to his seat on his return. Passengers are bound to observe decorum in the cars, and are obliged to comply with all reasonable demands to show their tickets. Conductors are not obliged to make change, if applicants for tickets do not offer the exact amount of their fare. A loss of a ticket necessitates the purchase of another, or ejection from the car, and the latter penalty is lawful for standing on the platform, or otherwise violating the rules of the company.

The Directors of the Company organized about a year ago for the construction of a railroad from Oswego, N. Y., to Jersey City, have been actively engaged in pushing forward the project, and claim that the prospect for the ultimate construction of the road is now flattering. The main reliance of the friends of the new line, is in securing town subscriptions or the pledge of town bonds.

The Southern Railroad of Chili, is now completed as far as Curico, connecting the latter place with the capital, a distance of 120 miles.

The Iowa extension of the Chicago and Northwest Road, is now completed to Woodbine, on the western boundary of the State, 450 miles from Chicago, and thirty-nine miles from Omaha, on the Missouri River, the initial point of the Union Pacific Railway. It is confidently expected that the track will be laid into Council Bluffs, Mo., before another month. From the terminus at the North Platte station, 290 miles west from Omaha, a day and night mule team freight line, connects with Denver, Colorado territory.

The proposed railroad from Millerton, N. Y to Sheffield, Mass., will when completed open a new through route from New York via Pittsfield to Montreal

The average cost of constructing a railroad in England, is three times as much as in this country.

There are thirteen railways in Canada, with 2,148 miles of road open for traffic. The total value with equipments is $1,300,000.

The traffic across Egypt is enormous. Immense quantities of manufactured goods for India are continually passing over the Suez line, and the return of cotton from Bombay by this route, is in like proportion. There has been a late reduction of twenty-five per cent, on the rate of carriage of goods sent by slow trains.

The city of New York supports eleven horse railroads, having a total length equivalent in single track to 170 miles.

The roads and equipments are valued at $16,000,000. The gross earnings of ten companies for the year ending in September last, were over $4,000,000: the net profits for the same time amounted to $800,000.

Seventeen international railway lines branch off from Paris, of which nine go to Belgium, one to Luxemburg, one to Rhenish Prussia, one to Rhenish Bavaria, one to Baden, three to Switzerland, and one to Italy.

On the London, Chatham and Dover Railroad, England, three trains are run into London between the hours of four and six, every morning, for the convenience of those at work in the city, but who reside out of town. Commutation tickets on the road, for stations not more than five or six miles out, entitling the holder to two passages each day, cost but one shilling or twenty-four cents per week. On the Metropolitan Road, on which early trains are also run, no weekly tickets are issued, but the fare is the same by the single trip, two cents.

The indebtedness of Southern railroads for rolling stock and locomotives bought since the war, is estimated at $7,000,000, of which the Nashville and Chattanooga road owes $1,300,000.

GLEANINGS FROM THE POLYTECHNIC ASSOCIATION.

Reported for the Scientific American.

The regular meeting of this branch of the American Institute, was held on Thursday evening, December 20th. Prof. Tillman presented the following items of scientific interest:

PERSISTENCE OF RAYS.

An experiment by Abbe Laborde, seems to show that waves in the sunbeam of higher velocity, producing the perception of blue, make a stronger impression than waves of lower velocity. When a disk of metal, having slits in its circumference, so as to admit and intercept the solar beam, is caused to rotate with a high velocity, the ray of light, when received on a plate of ground glass, is tinged with blue, green, rose, white, green, blue, in this order. After the second blue, the image is white at all higher velocities of rotation.

REMAINS OF A GIGANTIC DINOSAUR.

At the Academy of Natural Sciences, Philadelphia, Prof. E. D. Cope exhibited some fossil remains found about two miles south of Barnesboro' N. J., just under the stratum of green sand, and about twenty feet from the surfa e. The bones were those of a gigantic Dinosaur, an extinct tribe of reptiles of great size, and approaching in many characteristics the mammals. In length, this creature equalled the Megalosaurus (measuring seventy feet), and must have been one of the most formidable of the rapacious terrestrial vertebrates.

NITROGFN FROM MANURES.

J. B. Lawes, F. R. S., and Dr. J. H. Gilbert, F. R. S., experimenting with wheat grown for twenty years on the same land, both with and without manure, found that much of the nitrogen supplied by the manure was not recovered in the increase of crop. A considerable part of this loss is retained in the soil, yet a larger amount is as yet unaccounted for. Field results show that there was an increase of but one or two bushels in the crops, due to the accumulated residue of nitrogen in the soil, notwithstanding its amount was much greater than if freshly applied every year, to the soil otherwise in the same condition.

TREATMENT OF SEA-WEED.

By Stamford's process of destructive distillation, the sea-tangle is collected, dried, placed in a closed iron retort, and subjected to a low red heat. After carbonization, the stems contain about forty per cent of salts, consisting of chloride of potassium, sulphate of potash, iodine, bromine, and iodide and bromide of potassium. The products of distillation saved are chloride of ammonium, tar and pitch; from the tar, oils acetone, naphtha, and illuminating gas.

THE SOURCES OF ANIMAL FAT.

A large proportion of the fat of the herbivora, fattened for human food, must be derived from other substances than fat in the food. When such animals are fed on the most appropriate fattening food, much of the stored-up fat must be produced from carbo-hydrates. The nitrogenous constituents of food may also serve as a source of fat, in defect of a liberal supply of the non-nitrogenous ones.

GRAVITATION.

By invitation, Dr. Van der Weyde again appeared before the Society, making some interesting remarks on the origin and creation of the world, pointing out the action of gravitation in forming regular bodies from matter previously existing in a highly rarified condition, and dispersed through space unequally, both as regards quantity and quality. This force of gravity alone sufficiently explains the creation of the whole planetary system; the cause of the light and heat undoubtedly once given out by every planet; the revolution of the planets on their axes, and around the sun; the higher velocities of the inner planets; in short, all the results observed in the admirable system of worlds. As heat is the result of this same force, then all life and motion is merely gravitation in disguise.

TEMPERATURE AND VITALITY.

The cooling down of these masses has been gradual, and modified by their distance from larger bodies communicating heat by radiation. The smaller interior planets, Venus and Mercury, still have a temperature much above that of the earth. As vitality can only exist at a temperature ranging from 100° to 40° Fahrenheit, Prof. Loomis has suggested the hypothesis, that organic life on the planets Uranus, Saturn, and the asteroids, has long since passed away; that on Jupiter, its existence is doubtful; that Mars and the earth are now populated; and Venus and Mercury have yet to cool for some millions of years before being adapted for organic life.

THE CRUST OF THE EARTH.

For every thirty or forty feet of descent toward the center of the earth, it has been observed that the temperature is raised one degree. It has thus been accepted as a foregone conclusion that this increase goes on in the same ratio for all depths, till, after a few miles, every thing is in a melted condition. A comparison with the diameter of the earth, 8,000 miles, seems to show a very thin crust. But no guaranty exists that this increase in temperature goes on according to this law. Hopkins, in England, has calculated, from the precession of the equinoxes, that the earth's crust can not be less than 300 to 1,000 miles in thickness. But we may suppose that masses of melted matter may be distributed through this crust, and give still cause for volcanic eruptions when reached by water penetrating through the surface of the ground.

The great extent of country over which an earthquake is felt, is an argument in favor of a thick crust; and, again, it has been calculated that a crust of at least 400 miles thickness, is required to support the computed weight of the vast Hi malaya system of mountains; for if the slight thickness commonly supposed were indeed the case, a depression of the surface would follow, and this would show itself by elevating the bed of the Indian ocean.

The Zoetrope.

This is the name of a mechanical toy, constructed on philosophical principles, and capable of affording amusement to the old as well as the young. It is an exemplification of the science of optics, and is a valuable aid in illustrating this department of natural philosophy. It consists simply of a rotating drum open at the top, in which, around its inner periphery, are placed strips of paper having figures of men, animals, etc., in varying positions. By turning the cylinder, the images are seen through slots in its upper side, giving the effect of action to the figures. For instance, a porpoise is represented in perhaps a dozen different positions. The turning of the drum brings into view, in rapid succession, the varying positions of the fish until they blend into a perfect image full of motion and operating to produce the natural action of the animal. It is manufactured by Milton Bradley & Co., Springfield, Mass.

Scrap Iron for Heavy Forgings.

On page 357 of our last volume we published some important information in regard to the quality of iron used in heavy forging, indicating its unfitness for such purposes. A correspondent, writing from Detroit, says: "I find your article on 'Scrap Iron for Heavy Forgings' is causing steamboat and steamship owners to look into the material shafts etc, are made of, pretty carefully." Undoubtedly; and if manufacturers would generally heed the instruction imparted through the SCIENTIFIC AMERICAN, it would be vastly to their benefit.