THE GERM THEORY AND ITS RELATIONS TO HYGIENE.

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[PART II.]

THE DOCTRINE OF BIOGENESIS.

This question was, however, not universally admitted to be settled. Dissentients made themselves heard from time to time, among them Gleichen, Othe, Müller, and Previranus, the latter of whom pointed out the significant fact that, while the species of infusorial animals found in infusions of the same kind were constantly the same, those which appeared in different infusions were not so. Early in the present century, the celebrated naturalist Lamarck ranged himself on the side of spontaneous generation. Oken took the same view, and subsequently Bory St. Vincent, J. Müller, Dujardin, Burdach, and Pineau, while on the opposite side appeared, among others, Schwann, Schultze, and Ehrenberg. The experiments of Schultze and Schwann were remarkable. They were undertaken for the purpose of testing the accuracy of those of Spallanzani. Since those experiments had been made, the importance of air, or of oxygen, one of its constituents, to the maintenance of animal life, had been discovered, and doubts had arisen whether, in those experiments, the air had not been rendered unfit for the support of life by the operations to which it had been subjected. In repeating the experiments, Schultze admitted to the flasks, after boiling the infusions, only such air as had been passed through concentrated sulphuric acid, and Schwann only such as had been conducted through red hot tubes. No animalcules made their appearance; and these results, reached as long ago as 1836 and 1837, were regarded by the great body of naturalists as finally settling the question.

CONTROVERSIES OF THE SAVANTS.

The controversy, however, after resting for 20 years, was revived, and prosecuted with even more animation than before, by M. Pouchet, in the first instance, on the side of spontaneous generation, and M. Pasteur, on that of *biogenesis*, but more recently by many naturalists of distinction, among whom may be named Dr. Jeffries Wyman, of our own country, whose experimental researches tend rather to the support of the archegenetic theory, and Professor Huxley, of London, whose opinion, given on a survey of the whole history of the controversy and expressed before the British Association in 1870, is very decidedly the other way. While the controversy was between M. Pasteur and M. Pouchet, there can be no doubt that, in the judgment of the world, the former had by far the best of the argument. His experiments, which were substantially repetitions of those of Needham and Spallanzani, but which were variously modified so as to render his demonstrations, in every possible way, cumulative, seemed to have disposed of the doctrine of spontaneous generation, effectually and forever. In multitudes of instances, infusions hermetically sealed while boiling remained for indefinite periods of time free from all traces of organic life, while portions of the same infusions, exposed side by side with these but open to the air, were speedily swarming with animalcules. He found that even an unsealed flask, of which the neck had been stopped during the boiling only with a plug of cotton, closely pressed together, continued to be equally free from these organisms so long as the stopper remained in its place. This last experiment presented a rather curious resemblance to that of Redi, with his gauze-covered jar; for the cotton forming the plug was found, on a microscopic examination, to contain the germs which its presence had prevented from entering the flask. M. Pasteur finally found—and this result was long supposed to have furnished an unanswerable reply to all the arguments of the advocates of *archegenesis*—that flasks containing infusions treated by boiling as before required neither sealing nor stopping with cotton to prevent invasion of the contained liquids by these low forms of life: provided only that the necks of such flasks had been originally bent over, so as to direct their mouths downward. This result he had predicted as probable, holding, as he did, that the germs by which such infusions are repeopled, when the living embryos they may contain have been destroyed by heat, must necessarily subside into them from the air above.

The experiments of Wyman, Bastian, Cantoni, and others, more recent than those of Pasteur, have led to results singularly, and at present, we must say, unaccountably, at variance with his. Professor Wyman found that *bacteria* will make their appearance in infusions which had not only been boiled before being sealed up, but which, after being sealed, had been kept at a boiling heat for many hours. He found, moreover, that these same organisms perish when exposed to a heat not over 134° Fahrenheit. Bastian, in a very extended series of experiments, has pushed the heat in the tubes containing his infusions as high as 300° Fahrenheit, maintaining this high temperature, in some instances, not less than four hours; and has yet found that living forms do not fail subsequently to make their appearance in them. Such forms appear also, according to him, in solutions containing nothing of organic origin whatever, but which are composed entirely of certain salts of soda and ammonia; and he even affirms that in such solutions he has occasionally seen very remarkable fungi to present themselves with their full fructification, drawings of which he has given in his work, recently published, entitled "The Beginnings of Life."

It seems to me that no one can rise from the perusal of the extraordinary book just mentioned without feeling that, if it does not embrace and contain the conclusion of the whole matter, it is, at least for the present, unanswerable. It leaves us, nevertheless, still perplexed, perhaps more deeply perplexed than before; for it is impossible to understand how the results reached by so many naturalists, all in the first rank of scientific investigators, all conscientiously laboring to elicit the truth of this great question, should be, after all, so singularly discordant. And another weighty consideration adds to this perplexity. It is the existence of a practical refutation of the conclusions of the class of experimenters to which Dr. Bastian belongs, which is presented under our eyes every day on the grandest scale in the operations of one of the most important branches of modern industry. I cannot state this consideration better than in the words of Huxley: "There must," remarks this distinguished physiologist, "be some error about these experiments, because they are performed on an enormous scale every day with quite contrary results. Meats, fruits, vegetables, the very materials of the most fermentable and putrescible infusions, are preserved to the extent, I suppose I may say, of thousands of tuns every year, by a method which is a mere application of Spallanzani's experiment. The matters to be preserved are well boiled in a tin case provided with a small hole, and this hole is soldered up when all the air in the case has been replaced by steam. By this method they may be kept for years without putrefying, fermenting, or getting moldy." He argues—and the argument has a weight that must be felt—that there is no mode of explaining this universal and inevitable result but the exclusion of germs from these cans. And, in view of the marvelous discrepancy between the results on the small and the grand scale, placed side by side, one can hardly repress the suspicion that, if there be any such thing as spontaneous generation, it is a thing which occurs only under rare and extraordinary conditions, which conditions Dr. Bastian has unintentionally succeeded in establishing; while, as a matter of practical importance or daily interest, it is as if it were not.

Zincing Iron.

The following is an excellent and cheap method for protecting iron articles exposed to the atmosphere, such as cramp irons for stone, etc., from rust: They are to be first cleansed by placing them in open wooden vessels, in water, containing three fourths to one per cent of common sulphuric acid, and allowed to remain in it until the surface appears clean or may be rendered so by scouring with a rag or wet sand. According to the amount of acid, this may require from 6 to 24 hours. Fresh acid must be added according to the extent of use and of the liquid; when this is saturated with sulphate of iron, it must be renewed. After removal from this bath, the articles are rinsed in fresh water, and scoured until they acquire a clean metallic surface, and then kept in water in which a little slaked lime has been stirred until the next operation. When thus freed from rust, they are to be coated with a thin film of zinc, while cold, by means of chloride of zinc, which may be made by filling a glazed earthen vessel, of about two thirds gallon capacity, three fourths full of muriatic acid, and adding zinc clippings until effervescence ceases. The liquid is then to be turned off from the undissolved zinc, and preserved in a glass vessel. For use, it is poured into a sheet zinc vessel, of suitable size and shape for the objects, and about 1·30 per cent of its weight of finely powdered sal ammoniac added. The articles are then immersed in it, a scum of fine bubbles forming on the surface in from one to two minutes, indicative of the completion of the operation. The articles are next drained, so that the excess may flow back into the vessel. The iron articles thus coated with a fine film of zinc are placed on clean sheet iron, heated from beneath, and perfectly dried; and then dipped piece by piece, by means of tongs, into very hot, though not glowing, molten zinc, for a short time, until they acquire the temperature of the zinc. They are then removed and beaten, to cause the excess of zinc to fall off.

Water as Fuel.

A correspondent, Dr. A. A. Hayes, writes to say that recently two similar boilers were employed with widely different results as to consumption of fuel. On investigation it was found that, with the deficient boiler, "the workmen had been restricted to about twenty inches in draft of ash pit; the other furnace had a vault, permitting ashes and cinders to be retained for several days, while here the paved, clean floor formed the bottom of the ash pit. The fuel was remarkable for purity, and so compact as to be kindled with difficulty. On opening sight holes, the fire could be seen burning intensely; the radiant heat appeared to be absorbed; very slight flame only could be seen, but the rush of highly heated air was constant. After some time, observation showed that the ash pit was the only point on which suggestion could be excited, the matter of quality of fuel being in favor of the bad furnace. A casual observation had shown that the ashes of the good furnace were damp. The pavement of the room and the ashes were accordingly wetted on the ash pit floor. Immediately flame appeared at the door joints, and from cracks (from unequal expansion); the damper was hurriedly raised to allow the great volume of combustible matter to reach the chimney. The pressure gage partook of the new life, and soon an over abundance of steam was formed. After the adjustments were made for using the steam, and a very little water was constantly admitted to the ashes, more than the necessary quantity of steam was afforded by the boiler, while the consumption of fuel was not increased. It will be inferred that, under conditions not unusual, a great economical gain resulted from the use of a portion of the heat of contact in decomposing vapor, or in heating steam so highly that it transported carbon to form flame; the result was the conversion of an imperfect to an efficient apparatus, without added expense, in opposition to a theoretical law.

In numerous cases, continued through many years of observation, I have seen similar results follow the use of moist air in the combustion of dry anthracite; but this case is considered exceptional from the accuracy of the proofs afforded.

In reviewing these facts, it will be seen that a useless apparatus was rendered thoroughly efficient by forming flame from the otherwise ignited fuel. More importance than here appears belonged to the trials, for on the success thus obtained grew up a most extended application of steam, where every point connected with its use is registered with the precision of philosophical apparatus.

A doubt in regard to the consumption of fuel has probably been present in some minds. How could the fuel be consumed, and vivid combustion maintained, without a corresponding production of steam? The answer is founded, not on observation alone, but on experiments. In a cold, dry atmosphere, the best anthracites produce so intense a radiant heat that near by surfaces of iron become heated above the temperature of economical rapid evaporation. That kind of fuel, too, affording no flame in cold dry air, requires more than double the theoretical amount of oxygen for its combustion; and this volume of heated air and products of combustion is far less hot than flame, and is repelled by the parts of the boiler behind the space over the mass of glowing fuel, as less highly heated gases are always repelled by colder surfaces. In fact the steam-generating surface was so far reduced in area as to render it impossible for steam to be formed in time, and the heat was wasted.

My wish is to see more attention given to flame fuel, as contrasted with radiant heat fuel, not only as a facile and economical application, but as a check to the use of old devices which waste the fuel. A long step in this direction has been taken in heating gas retorts. Apart from great economy, the destruction and wear of apparatus is reduced, as they may be in steam production."

California Wood Choppers.

It is in the logging camps that a stranger will be most interested on this coast; for there he will see and feel the bigness of the redwoods. A man in Humboldt county, says a writer in *Harper's Magazine*, got out of one tree lumber enough to make his house and barn, and to fence in two acres of ground. A schooner was filled with shingles made from a single tree. "One tree in Mendocino, whose remains were shown to me, made a mile of railroad ties. Trees fourteen feet in diameter have been frequently found and cut down; the saw logs are often split apart with wedges, because the entire mass is too large to float in the narrow and shallow streams, and I have even seen them blow a log apart with gunpowder. A tree four feet in diameter is called undersized in these woods; and so skillful are the wood choppers that they can make the largest giant of the forest fall just where they want it, or, as they say, they 'drive a stake with the tree.' The choppers do not stand on the ground, but on stages raised to such a hight as to enable the ax to strike in where the tree attains its fair and regular thickness; for the redwood, like the sequoia, swells at the base, near the ground. These trees prefer steep hillsides, and grow in an extremely rough and broken country; and their great hight makes it necessary to fell them carefully, lest they should, falling with such an enormous weight, break to pieces. This constantly happens in spite of every precaution, and there is little doubt that, in these forests and at the mills two feet of wood are wasted for every foot of lumber sent to market. To mark the direction line on which the tree is to fall, the chopper usually drives a stake into the ground 100 or 150 feet from the base of the tree, and it is actually common to make the tree fall upon this stake, so straight do these redwoods stand, and so accurate is the skill of the cutters. To fell a tree eight feet in diameter is counted a day's work for a man."

An Inexhaustible Inkstand.

We have received from Messrs. Root, Anthony, & Co., of 62 Liberty street in this city, an inkstand, for the use of which the directions are: Put in a little cold water, let it stand, for 3 or 4 hours, and the ink will be ready for use. We suspect that the coloring matter is supplied by some means analogous to Professor Bottger's invention for portable ink, already described in our columns. Our readers' grandchildren will be better able to speak to the permanency of the supply of ink; in the meantime, we can say that, after a trial, we find the inkstand to be filled with black ink of an excellent quality.

Sexadigitism.

A valued correspondent, W. T. R., writes as follows: "Recently, I fell in company with a gentleman with a peculiarity in one of his hands. I requested permission to make an examination, when, to my surprise, I found that he had an extra finger hinged on to the metacarpal bone, just back of the little finger and extending sideways from the palm of the hand; it shut up in the fist, but at right angles to the other fingers. Four of his children have similar developments on each hand, while a fifth child has six fingers on but one hand. The father and the children have each six toes on each foot, and a nephew who accompanied them was similarly endowed. Many of their ancestors and some of their relatives had or have sexadigital limbs. It appears, from evidence adduced, that these peculiarities were derived from a family in which they have existed from time immemorial.

If by any means a family inheriting such peculiarities should become isolated, the consequence would probably be a sexadigital race, which, according to the common rules of classification, would constitute a new species."

How Tin Plate is Made.

A paper recently read before the Franklin Institute of Philadelphia, by Mr. T. S. Speakman, representative of the Institute at the Vienna Exposition, gives the following interesting details of the manufacture of tin plate as carried on in Wales:

In the opinion of Mr. Henry I. Madge, tin plate manufacturer, of Swansea, in Wales, from whom I received the following information, the manufacturer prefers making his own iron to purchasing it, because he can thereby insure a more equable quality; he therefore buys suitable pig iron.

For common coke tin plates, the "iron bars" are made from puddled iron. The puddled ball is sometimes squeezed and sometimes hammered; much depends on the care of the puddler to so bring forward his ball that all its parts shall be equally decarbonized, when the fracture will be of a uniform, dull gray color, without crude admixtures of bright crystals. The unreduced crystals produce "wasters" of the iron plates; and if any such escape the notice of the mill manager, the wasters are thrown aside again after being covered with tin. If they escape the eye of the "assorter," the tin plate worker will find them fracture across the angles or bends of the sheets in working them up. The puddled ball, produced under the best conditions, is then taken to the "shingler," who submits it to the squeezer or hammer, sometimes both. This operation should be carefully executed. As the puddled ball is rugged and full of cinder, the cinder has to be squeezed out by this operation, and at the same time the roughness must be so managed as to be welded into a solid compact mass, which cannot be so well done in after operations. Some say it cannot be done afterwards, as the whole mass can never again be brought up to a thorough welding heat throughout, unless at the expense of much waste and loss. The bloom from the "shingler" is at once passed through the rolls, or roughed down to No. 1 bar. Some prefer letting the blooms lie exposed to the action of the elements for a time, and others think it of no importance. The bar, while hot, is cut into lengths and piled, five pieces being put and heated together in the "balling" or reheating furnace. When the faces are brought up to a welding heat, and the whole mass softened, it is again taken to the hammer, some rolling at once, others returning the bloom into the furnace to again bring up the heat. It is then rolled out into the finished bar, of suitable size and thickness for the kind of plates required.

Some manufacturers have made very good iron from the puddled ball direct, saving in wasters and improving the quality; but as the labor and number of hands were reduced by this mode, the men struck against it, and spoiled their work if not well looked after. This kind of iron was homogeneous and not fiberous, as the iron "piled" and brought through the reheating furnace is. The "shingler" must be very careful to form a second bloom under the hammer, and the bloom should be upset once or twice, so as to secure a welding of all the rough edges. If, after the shingling, the bloom has lost too much heat, it should be reheated. Care and expedition will remedy that necessity, and the reheating furnace dispensed with altogether. The saving is much in cost and waste; but the trouble with the workmen was great. Some also produced very excellent iron from the puddling furnace by adding to the charge about 60 lbs. of scrap or shearings, the trimmings of the plates when cut to size. The 60 lbs. of shearings were thrown into a bath of saturated solution of nitrate of soda, but added to the charge during the "boiling." The advantages gained were: the scrap iron improved the charge in proportion it bore to the whole mass; it was melted down quickly without waste, as the smelting took place under the surface. The weight of solid cold iron would take it to the bottom of the charge, carbon would be eliminated by fusion with the nitrate, and thereby improve the quality of the charge again. The ball was treated in the same way as ordinary puddled balls afterwards. The iron was tough as charcoal iron, with the characteristics of puddled iron, arising from crudities; for crystals unreduced were not exterminated, but greatly lessened. A careful puddler can at all times prevent these crude lumps to a very great extent. Another saving arising out of the process was that the scrap "shearing," formerly put into a furnace and reduced to a welding state, hammered out and rolled, gave only a return of 13 per cent to the tun, whereas the other returned the full weight of the shearings. However, difficulties with the union men prevented them from pursuing this mode of manufacture.

The bars are cut up into the required sizes, brought to a cherry red heat in a reverberatory furnace, rolled out to a certain length by gage, "doubled," and returned to the furnace, rerolled, again doubled, heated and reheated. The several foldings of the sheets adhere slightly.

After the sheets are cut down to size for tinning, they are separated from each other by what is called opening; during the process of opening, "stickers" and imperfect plates are thrown out, and the passed sheets then go into the "pickling room." There they are put into a hot pickle of dilute sulphuric acid, to be cleansed from oxydized and silicious matters, and undergo another rough examination in the "scouring process;" that is, any plate not cleansed is rubbed with sand in water. Defective sheets are again thrown out, and the sheets or plates are now passed into the annealing room.

The annealing furnace is a large reverberatory furnace, capable of holding several annealing pots. The pot is composed of a stand, of sufficient size to take the sheets, with a raised rim. Several hundred sheets are piled on the stand, and a square, box-shaped cast pot completes the pot. This is inverted over the sheets, and the space between the rim of the stand and the rim of the inverted pot is filled with oxide of iron, to lute it down and exclude the air. The pots are then put into the furnace until it is full, and the whole brought up to a cherry red heat, or a little beyond. About eight hours are necessary for its perfect saturation by the heat. When removed from the furnace, they are slowly cooled in a place free from draft, and then the pots are opened. The plates never lie perfectly flat, and should be of a dark straw color at the edges. If the air should get in in small quantities, a deep blue color will cover the sheets more or less. The plates adhere slightly, are again separated, and ready for the second pickling room. The plates are then submitted to a hot but more dilute pickle of sulphuric acid, and again chemically cleansed; taken from the acid bath, they are well washed in running water, and kept in clean water until the tinman is ready for them.

The tinman takes the plates from the water bath (where they lie some hours) and plunges them wet into a bath of hot palm oil, called the "grease pot." When they have acquired the temperature of the grease pot, they are removed with tongs and quickly submerged in a bath of tin. The oil mixed with the water from the plates floats at the top, forming a flux which covers the melted tin and prevents oxidation. With the tongs, the sheets or plates are continually kept moving and separated, to insure the tin getting between all of the sheets. When the bath has recovered its heat, which it generally does in about half an hour, the tinman examines the charge, and if he finds that perfect amalgamation has taken place between the two metals, he removes them with a tongs to the next bath, which is kept at a low temperature.

The temperature, raised by the change from the "tin pot," is again allowed to cool down to a few degrees over the melting point of the tin, when the plates are taken in lots of a dozen or two at a time, and laid on an iron slab, which is at the side or head of the pot. The waste metal and grease run back into the pot, the slab being inclined. The workman then takes up sheet by sheet with the tongs, and dips each into another bath of fine metal, kept at a heat little over melting point, immediately withdraws it, and places it in a rack immersed in a large pot of melted palm oil kept at the proper temperature, where they are allowed to remain a certain time. The sheets are then slowly lifted out of the grease by a boy, who separates them into proper lots by counting carefully, regulating the intervals of time between them. The grease recoils from the top plate; and as little is left on the sheets, they are again placed in a rack in the open air to cool; when cool, a lad takes each sheet in a tongs, and dips the lower edge into a small bath of melted tin so regulated that the sheet can only enter to about the eighth of an inch. It is kept long enough to melt off the drops of metal which adhere to the lower edge; and when lifted, the sheet is struck to throw off the superfluous metal from the edge. The plates are again put into a rack, and taken while warm to a bin of bran, where each sheet is thrust into and under the bran, to get rid of the grease which adheres. It is then passed on to a second and third hand, when the grease is pretty well behind in the last bin, which is kept filled with new bran. The sheets are turned out covered with flour dust and bran, and dusted off with cotton shaggy cloth.

The next process is in the sorting room. Here the finished sheets are laid on tables, and each sheet undergoes an examination by the sorter, who throws out those shearings which are defective in the iron or trimmings. The latter are reheated to regain the tin; the imperfect sheets are sold as "wasters" at a less price; the sheets are counted, and the box of 100 lbs. weight is composed of 225 sheets of 14 inches by 10 inches, for home use or for exportation.

What an Englishman Thinks of American Railway Traveling.

Mr. Robert W. Edis, an intelligent English architect, is now communicating to the *Building News*, London, a series of interesting letters from this country, giving an account of his experience in traveling from New York to the West. In one of these recent letters he draws the following comparisons between the railway facilities of the old and new worlds:

"No one who has not been in America can thoroughly understand or appreciate the comfort and luxury of these palace cars, in which, whether by night or day, the traveler may journey for days together without the misery and cramped-up feeling in our own railway cars; a comfortable seat by day, with plenty of room for legs and knees, and a luxurious bed by night, entirely shut off from your neighbor, with good attendance, lavatories, and other conveniences, all tend to make traveling in the States, where great distances have to be got over frequently and rapidly, comfortable, not to say as luxurious and safe as human ingenuity can make it. It may not be out of place to mention that no expense is spared in the construction or fitting up of these cars, the cost of which often varies from $15,000 to $25,000, and that, built as they are in the most strong and substantial manner, and attached invariably to the end of the train, the minimum amount of risk is thereby incurred in case of "telescoping" or "colliding" in the course of a long journey. Not only in this comfort of traveling, but in the universally adopted system of baggage checking, by which endless trouble and annoyance is saved to travelers, may we in England learn a useful lesson; but while railway directors here are content to allow their servants to labor ten or twelve hours at a stretch *per diem*, on work requiring not only constant hard bodily labor, but continual mental anxiety in "blocking," "signaling," and "switching," etc., we can hardly expect to be free from those pleasant but exciting incidents in railway traveling which too often terminate fatally, or, as frequently is the case, maim and wound, either bodily or mentally, for life; for which some poor, wretched, overworked signalman or under servant is sought to be made responsible, while the real workers of the evil, the directors and heads of departments, seem to value the safety and comfort of the public as little as they recognize the mental and bodily labor of their servants, and for which they pay the minimum amount of wages. I can imagine the horror and dismay with which an English railway director would look upon the comfortable seats, the luxurious fitting up, the pleasant heating apparatus, the general good system of lighting, the lavatories, etc., and the iced water tanks attached to the palace cars of America and Canada, not to mention the comfortable beds and night accommodation which make traveling in the States almost a pleasure, instead of a nuisance and a trouble, as it invariably is in this country; or the dismay with which they would accept or adopt the aids to safety in case of accident, in the shape of Miller's platforms, Westinghouse brakes, and get-at-able cord communications. This is a digression, brought about by a comparison of recent traveling in the old and new countries, for which I pray the pardon of my readers."

The Horse Bit.

The question of the bit, and of the hand that rules the bit, underlies the consideration of the whole subject of man's dominion over the horse. The intelligence of mankind has hitherto invented but two principal forms of bit; the snaffle, the simple piece of iron which lies across the mouth, subject to endless modifications, such as being twisted, jointed, and so forth; and the curb bit, a more powerful implement, which has likewise undergone innumerable variations. The curb bit is an adaptation of the principle of the lever, and the lengthening of the check piece allows a very powerful pressure to be exercised upon the jaw of the horse. The snaffle is, so to say, a natural bit, and the curb an artificial one. The snaffle was used by our ancestors and by the ancient Greeks; the curb is an Asiatic invention, and was probably brought into Europe with the Moors. In the famous mosaic found at Pompeii, representing, as is supposed, a battle between the Greeks and Persians, and which, at any rate, is the picture of a battle between Europeans and Asiatics, the Eastern horsemen ride with curbs, and the Europeans with snaffles. The difference in the bit modifies the whole style of riding; and as there are two sorts of bits, so are there two quite different styles or schools of horsemanship, which may be called the Eastern and Western styles. The type of the Eastern is best seen in the modern Bedouin Arab, with his short stirrups, peaked saddle, and severe bit; and the Western type in its simplest form is beautifully exemplified in the Elgin marbles, where naked men bestride barebacked horses. To ride after this fashion is an athletic exercise; the strength of the man is set against the strength of the horse, with little adventitious aid. The rider restrains the horse's impetuosity by the sheer force of his arm, and he maintains a seat on his back by exercising the muscles of his legs. It is the equitation of athletes and of heroes; but it is clear that the balanced seat of the Arab, and the more complete command over his horse which follows from the greater security of his seat, would make him infinitely more formidable in war than the European, in spite of the superior size and strength of the latter. History teaches us how the cavalry of the Saracens—small men on small horses—rode down the Christian horsemen till they learned to ride with the bits, and saddles, and lances of the Moslem cavalry. The invention of the curb bit necessitated the stirrup, for a man sitting upon a barebacked horse is forced to bear, at times, more or less heavily upon the bridle; and if, so riding, he were using a curb bit, and he were to lean any part of his body upon it, his horse would stop, or would rear, or would flinch. The ancient Greeks and Romans are believed not to have known the use of stirrups. They are, indeed, said not to have been discovered till the fifth century of our era. This, if it is true, would only apply to Europe. In the East they were used many centuries before. The earliest representation of one I know is in the above mentioned mosaic, where the horse of a dismounted trooper in Oriental costume is drawn with clearly indicated stirrups; the Greek horsemen in the mosaic are without them.—*New Quarterly Magazine.*

A PRACTICAL SYSTEM FOR THE SALE OF PATENTS.

We have recently received from Messrs. S. S. Mann & Co., corner of Linden avenue and Hoffman street, Baltimore, Md., a neatly printed manual and a number of sample blanks, the collection being explanatory of a system which the above firm have devised for the use of inventors desirous of disposing of their patents or rights under the same. The book of instructions comprises practical and excellent advice relating to the proceedings incident to selling patents or of making arrangements for the manufacture of articles on royalty. With this work are supplied full sized blanks, handsomely printed, consisting of forms for grants of rights, powers of attorney, etc, with which are furnished detailed printed explainations.

From examination of the method we believe it will be an acquisition of much value to inventors. We are informed that the system has been adopted by many patentees, all of whom have expressed complete satisfaction.

CEMENT FOR WOOD VESSELS.—A mixture of lime clay and oxide of iron, separately calcined and reduced to fine powder, then intimately mixed, kept in a close vessel, and mixed with the requisite quantity of water when used. This will render a vessel watertight if the ingredients are good.