being excited concerning it, he learned from Dr. Brewer all facts of interest connected with its production, namely, that it flowed from natural springs on the Watson flats; had been known to the Seneca Indians before the settlement of this region, and had been introduced by them as liniment or medicine to white persons, and sold to the druggists, and latterly had been gathered by Brewer & Watson, and used for lighting the sawmills of the firm and for lubricating purposes.

Drake visited the flats to examine the oil springs, and while there conceived the idea of boring to the sources of the oil. Returning to the East, he presented his view to a number of friends, and the result was that in the following year he came back to the oil region as the agent of an existing oil company at New Haven, who had purchased an oil tract, and Drake had full authority to bore, but very little means for the undertaking.

Drake may have got his idea from having heard that parties, sinking artesian wells for salt down on the Allegheny, were sometimes annoyed by meeting with a flow of oil. At all events, his first step was to visit the salt works near Pittsburgh, and engage experienced hands to go up and sink a well for him. A bargain was made; but it was not kept, the honest drillers for salt concluding, after Drake's departure, that the man must be a fool who thought of drilling for oil. A second trip to Pittsburgh, in a buggy (there was no railroad from Oil Creek then), resulted in another contract, which was broken for similar reasons. Drake then made a third trip; and finding it idle to talk of oil to men who were accustomed to regard it only as a nuisance troubling their salt water veins, he proposed to one of them to go with him and bore for salt. Salt seemed reasonable, and the man accepted his offer; and finally, in June, 1859, ground was broken for the first artesian oil well.

The drillers wished to make a large cribbed opening to the rock, which seems to have been their usual method of starting a well. But Drake said he would drive down an iron tube instead. This plan, which his friends claim was original with him (if so, it is a pity he didn't secure a patent for it, which would have been worth a fortune to him) was adopted, and it has been in use ever since, not only in sinking oil wells but in artesian boring for other purposes. The pipe was driven thirty-two feet, to the first stratum of rock. The workmen then drilled thirty-seven feet and six inches farther, entering what is known as the first sand rock, and making a total depth of sixty-nine and a half feet. They were at this point, when, one day—August 28, 1859—as the tools were lifted out of the bore, a foaming, dingy fluid, resembling somewhat, in appearance, boiling maple sugar, rushed up, and stood within a few inches of the top of the pipe. It was oil. In the meanwhile Drake had great difficulties to overcome, and greater were before him. There was still no railroad in that part of the country, and all his machinery and apparatus had to come in wagons from Erie, a distance of forty miles. He had to send to Erie for everything—once for a pair of common shovels, the store at Titusville being unable to furnish them. He had soon spent the money advanced to him by the company, and it refused to advance him more. He had exhausted his credit, too, and could not get trusted for the value of an oak plank or a center bit. He was thought insane, and people called him "Crazy Drake." His workmen were unpaid and discontented, and his enterprise must have failed when on the very verge of success, had not two gentlemen of Titusville, worthy of mention here—Messrs. R. D. Fletcher and Peter Wilson—having faith in the man and his work, come to his assistance. They indorsed his paper and loaned him money—and with this timely aid he struck oil.

Yet even now, with his well in operation, pumping twenty-five barrels a day, he seemed to be getting deeper and deeper into difficulty. He found, as he afterward said, that he had an elephant on his hands. There had been a demand for oil, at a good price, in small quantities, but there was no demand for it in large quantities. Imitators followed him, other wells were sunk, and the market was flooded. Teamsters charged $10 for hauling a barrel to Erie, where it could not fetch $10. The oil could not be generally used as an illuminating agent without being refined, and the coal oil refiners refused to touch a rival production, whose success in the market would be likely to injure their interests. Drake's health, if not his spirits, gave way under these complications, and he returned to the East about the time when petroleum —first refined by James McKeown and Samuel Kier, of Pittsburgh—was coming into general use. The great oil excitement came too late for poor Drake to profit by it. He died recently in a Connecticut poor house.

MALLEABILITY AND DUCTILITY OF METALS.

LECTURE BY JOHN ANDERSON, C. E., AT THE SOCIETY OF ARTS, LONDON.

In order readily to understand the two remarkable properties of malleability and ductility, which are now turned to such good account in almost every branch of the mechanical arts, it will be convenient to think of the malleable or ductile metals, such as lead, tin, copper, wrought iron, and steel, as substances that can be moved about like dough, that can be spread out as with a roller, that can be elongated by drawing out with the hands, that can be squirted through a hole by presssure like macaroni, or even that the dough can be pushed or gathered back again into its original mass of dough—that is, if proper means are employed to perform the operation gently, and this may be done without breaking the continuity of the particles of which the mass is composed. Such a statement may well seem fabulous, but it will be my province now to enumerate many things in connection with metal much more wonderful than what I have said regarding the dough, and even more strange than the change in dough when overtaken by the biscuit state from the baking process.

It is difficult to understand the possibility of the malleable and ductile properties without fully realizing that their particles are fluid, in a certain sense, and that this is due to the molecular arrangement, not so fluid, as water, tar, or bitumen, but still a fluid which will flow in obedience to sufficient pressure, and just as those fluids require time when acted upon by gravity, so the metals require greater time and more force than gravity, the rate of flow being determined by the nature of the metal, the softer metals requiring less pressure and flowing faster than the harder; and in the case of steel the flow is extremely slow, but with pressure, time, and patience, it also may be overcome and made to flow gently into any shape or form while in the solid condition.

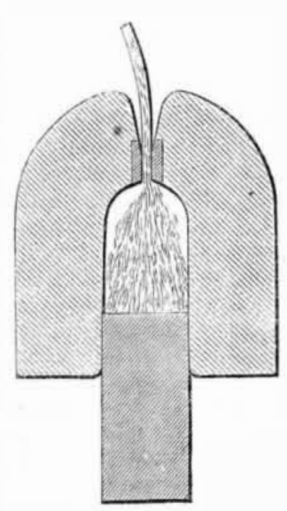
For a number of years the flowing property of the softer solid metals, such as lead and tin, has been taken advantage of very extensively, in the squirting of pipes and otherwise; and for thousands of years the malleable and ductile metals have been under treatment by man, and a vast number of facts have thus been accumulated; but it is due to M. Tresca, of Paris, to say, that he has done more, perhaps, than any other man in regard to the investigation of the natural laws by which the flow of solids is governed under varying circumstances, and the most interesting point of all is the great similarity that exists between the flow of solid metal and that of the flow of water—that in the flow of solids from an orifice there are the same converging currents, eddies, and that the quantity of metal issuing is dependent on the same conditions as water when issuing from orifices of different arrangement, and only differs in degree.

From time immemorial man has been familiar with gold as a flowing metal, both as malleable and ductile. It is in consequence of these properties that gold may be beaten into leaves so thin that it takes two hundred and ninety thousand to make one inch in thickness, or it can be drawn into a wire so fine that an ounce weight would extend a distance of fifty miles. The flowing action which takes place in coining a sovereign or other coin is very apparent. This process is not the mere stamping which it is generally considered to be, but the particles of the gold have really to flow in the same manner as a liquid, from one part of the die to another, in order to fill up the deeper recesses of the die from from the shallow part of the space, and so form the perfect coin from the rush of gold penetrating everywhere. As, however, gold is not one of the most common metals of applied mechanics, its presence in the workshop is less seldom met with than some of the others which have been already enumerated.

The metals lead and tin are both malleable and ductile, but their malleability, or spreading-out property, is much greater than their ductility, or drawing property; and both being soft, and having the flowing property in a pre-eminent degree, they can thus be squirted or rolled to any extent, or into any form of pipe or sheet, so that the want of ductility is scarcely felt.

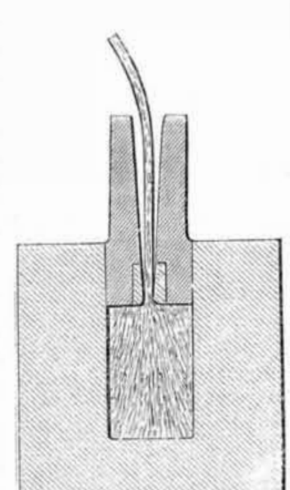
The diagram (Fig. 1) will explain the nature of apparatus which is employed to squirt these metals when in the solid state. It is a powerful syringe filled with solid metal, with pressure on the piston varying according to the dimensions; in some the force required is two thousand tuns. In the earlier machines the arrangement was exactly the same as in an ordinary syringe, as shown in Fig. 1, but it was found that the fluid pressure of the metal within the syringe created such an inordinate amount of friction upon the inner surface as to rapidly wear out the several parts; but by a slight modification, more in accordance with sound principles, the defect has been obviated.

FIG. 1.



In the arrangement shown in Fig. 2, the piston contains the orifice, and in pressing against the upper surface of the metal, causes it to remain in a state of rest within the containing vessel; but as fluid pressure is equal in every direction, the solid finds the orifice as a point of less resistance, hence it flows outward in a continuous stream, thereby avoiding the friction of the solid lead within the cylinder. It will thus be observed that a rod of lead or tin can be squirted of any form or dimensions, depending on the die or orifice. In the Royal Arsenal may be seen lead thus squirted into continuous rod, and then wound upon reels like yarn, to be again unwound and made into bullets by self-acting compressing machinery; but the whole of the several processes are entirely due to the flowing property. Man's mechanism is very subordinate, and may be varied to any extent as circumstances may require.

FIG. 2.



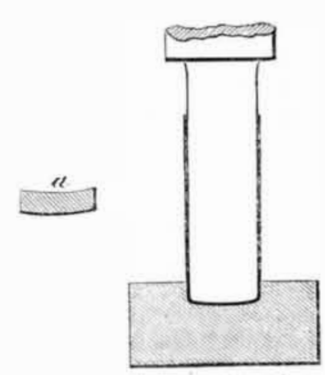
Pipes are made with the same facility as rods, by the mere insertion of a steel pin, the size of the required bore, placed in the bottom of the cylinder, and exactly in the center of the orifice, thus forming an annular space through which the metal flows outward as a continuous pipe; or, by making this pipe of sufficiently large diameter, and then cutting it open by a stationary knife as it leaves the machine the pipe becomes a sheet of lead, which, by means of suitable rollers, may be wound on a reel as a long web of sheet lead, or the sheet lead may be rolled out by rollers. In both ways the same mechanical work has to be done; the respective friction is a disputed point.

A very singular result was obtained by an attempt to squirt brass pipes, which are extensively used as steam boiler tubes and for gasfitting purposes. This brass consisted of 60 parts of copper and 40 parts of zinc, and of various other proportions, but, singular to relate, the pipes so squirted were zinc rather than brass; the most of the copper remained in the vessel and refused to flow. We are not to infer from this that the copper would not flow, but rather that the union between the zinc and the copper was less than the pressure necessary to make the copper flow; the mixture may have been more mechanical than chemical, or the temperature may have been such as to have had the zinc too near its melting point. Whatever is the explanation, the subject is well worth further experiment. In any such operation, the nearer the lead or other metal is to the liquid state, the easier it is accomplished; but it must be solid.

Lead or tin may be rolled out to any extent, either singly or both combined, or with a thin coating of tin or other metal upon one or both sides of the lead, so as to have a leaden substance, but yet covered with a tin surface, perhaps not thicker, if so thick, as the leaf called tinfoil, thus combining economy, with scarcely any disadvantage, for many purposes.

A beautiful illustration of the flowing property of tin is shown in the manufacture of the German capsule, in which the paint for artists is made up for sale and use. A button of tin, as in Fig. 3, is laid in the recess of a die in a fly press; a corresponding punch or die, a little smaller, is then brought down upon it with a smart blow, thus leaving, from the difference of dimensions, an annular space between them, when the metal at once squirts upward like water, but at a velocity much faster than the eye can follow, thus converting it into a perfect capsule. The form of the punch and die depends upon the article to be made, but in all provision has to be made for the admission of the atmosphere on the removal from the dies.

FIG. 3.



From these remarks it will be seen that, by understanding a few of the natural properties of these metals, how completely they are under man's control, and, by knowing the simple laws, he can modify the apparatus in thousands of different ways, in order to produce whatever may be required.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Speculative Moonology.

MESSRS. EDITORS:—The idea that the full moon is hot seems to me so unscientific, that, though advanced or advocated by all the Herschels and backed by the Rosse reflector to boot, I take the liberty of offering a reason or two which may go to prove it untenable.

The convexity of the moon's surface is so much greater than that of the earth, that the moon must be effected by the sun's heat less than the earth is by a proportion considerably less than the ratio of size or diameter between the earth and moon would seem to indicate—nearly all the heat being deflected or reflected into space and dissipated. (And this convexity is possibly the cause of so little heat being reflected directly earthward.) The sun's rays can have but a small spot—small, as compared with the earth in this respect—on which they can at any time be said to fall vertically; a much less distance being required there than on the earth to reduce them to rays falling through all degrees of obliquity down to horizontal. So the vertical and nearly vertical rays may move around the moon quite slowly, and yet heat but at most a tropical belt, while there would be temperate and frigid zones as on the earth. But it would be doubtful whether that belt could by any possibility reach a temperature of 492° as claimed by modern astronomers.

All this, supposing the moon has all the conditions and requirements which the earth possesses for rendering sensible the solar heat; but the first and principal one of these is an atmosphere and astronomers tell us the moon has none at all; and without the atmospheric lens to contract the sun's rays together and squeeze out the heat, how, and from whence is free caloric to be obtained? On the earth it is known that at a certain hight, where (and because) the air has but little density, snow never melts, even under the tropics; whence we may infer that at greater elevations and with air still more rarefied, ice and snow would remain unmelted even if exposed to the rays of an equatorial sun for a century,—and with no atmosphere at all it would be still colder than with a little.

It is stated that the addition of a small per centum of a denser gas (carbonic acid) to our atmosphere or increased density due to a few miles more in hight or depth of the air-ocean would—unless corrected by increased evaporation—cause the earth to grow hotter and hotter, so as to finally preclude the possibility of human existence; or it would enable the earth to retain its heat indefinitely long, though the sun should go into the comet business, speed away, and leave us out here in the cold of the planetary spaces.

All depending on atmosphere: now if the moon has no atmosphere, I don't quite see how it can form an exception to what we are bound to consider universal laws, operating always in the same manner—conditions being the same—whether on the earth, moon, sun, or stars. So, unless the moon is formed of materials new to science, or unless it has an equivalent to our atmosphere in some form (a fact which we may not be able either to prove or disprove on account of there not being moisture enough to form clouds, fogs or mists), I must continue to think the moon does not reach a temperature of 492°—or any other number of positive degrees,—"during its long lunar day of 300 hours."

Another thing: give the moon an atmosphere like ours, and as deep, (a larger portion than she is entitled to) yet, attraction is so much weaker there than on the earth that the air would expand into space, and I opine the density of that atmosphere would be less at the moon's surface than ours is at the tops of our highest mountains. Consequently, clouds could not float in it, nor birds fly in it, nor ordinary vegetable or animal life have any existence there. All water, if the moon had any, would be congealed, and there would be but little motion or chemical action. Intense cold would always prevail, and snow or ice would never melt under a perpetually vertical sun—if such a thing could be had for the occasion.

Wilmington, Del. W. L. DAVIS.

To Plow Manufacturers.

MESSRS. EDITORS:—By inserting this article in your valuable paper, it may subserve the interest of the Northern mechanic and Southern farmers.

What the South mostly needs is manufacturers, and at present the greatest needed, is a plow and agricultural implement factory. The necessity for improved plows, harrows, etc., are being felt, and the use of such would greatly increase were they manufactured among us, but so long as imported from the North, the cost of transportation and commissions put them out of our reach. As one instance, I will mention a case in point. I saw on a gentleman's farm two turning plows (iron beams) made at Hudson, N. Y., which cost at the shop $8 a piece. He told me that the freight on those plows from that shop to Rome, Ga., was $28, making each plow cost $22, and such is a fair representation of the cost of all the plows received, and seven tenths of them are worthless articles imposed upon us. Here is another instance. I showed a farmer from New Jersey a plow manufactured at Louisville, Ky., a one-horse turning plow—cost, delivered at at Rome, $10. He said such a plow would not bring ten cents in their State to use on their farms. The cases recited above show how we are imposed on, and our only remedy is in having factories at the South.

We have iron, coal, wood, and water power in abundance near Rome, Ga., and a more eligible point cannot be found anywhere South to put up such an establishment, the climate, water, society, etc., all that could be desired. If there are any plow manufacturers North desirous of establishing a factory South, they would do well to come and see for themselves, and if they would call on me at my farm, two miles of Cave Spring and fourteen west of Rome, it would afford me great pleasure to give them all the information they may need as to the advantages of setting up such a factory in this part of the country. JNO. H. DENT.

Cottage Home, Ga.

Aero-Steam Generators.

MESSRS. EDITORS:—In No. 13, current volume, of the SCIENTIFIC AMERICAN, you published a description of Mr. Warsop's aero-steam generator, and an account of his experiments. Mr. Warsop is in error in his way of accounting for his gain of power. He attributes it to the expansion of the air which he forces into his boiler. This is not the case, as air becomes heated by compression, to a higher degree than the steam itself, whenever it is forced into a boiler, carrying a pressure of sixty pounds or more to the inch. This heating is done by mechanical force taken directly from the engine. So there will be but little heat taken from the fuel by the air; and, consequently, very little expansion results from this source. The specific heat of steam is greater than that of air, and gases expand equally under the same degree of heat; so in forming an equilibrium of heat between the air and steam, the air being heated to the greatest degree, there will be more contraction of the air than expansion of the steam, volume for volume. That he gains all he claims, I have no doubt at all, but he is not aware of the true source of gain. Were it not for this heating of air by compression, air-engines would be a success; as it is, they can never be of any great value for converting heat into motion; neither can air ever be employed as a medium for transmitting power to long distances, as all this heat resulting from compression will be lost by radiation. The true source of gain in Mr. Warsop's apparatus is this: All water contains a large quantity of air in a state of solution; this air occupies the inter-molecular spaces of the water, and forms an elastic cushion, which forces the molecules of water apart, thus decreasing their cohesion. Air will prevent water from absorbing any other gas, which it will do when it contains no air. Air also has the power to expel other gases in a remarkable degree; consequently, it will prevent water from absorbing its own vapor, and will expel it as fast as formed. Water contained in steam boilers contains scarcely any air; because it is incompressible, while air is very elastic; water always absorbs the same volume of air without regard to pressure, but when it is forced into a steam boiler under a pressure of 100 pounds to the inch, the air contained in the water is compressed into about one fifth its original volume, thus leaving a vacuum of four fifths, besides air is expelled by heat. When water does not contain its complement of air, its cohesion is vastly increased by the absorption of its own vapor, which fills its inter-molecular spaces to such a degree that it restores the attraction of cohesion between the molecules of steam and the molecules of water to a great extent; cohesion not being annihilated by heat but only overcome. When air is absorbed by water there is no attraction of cohesion between the molecules of water and the atoms of air, but a positive repulsion, which widens the distance between the molecules of water, thus decreasing their attraction, thereby facilitating the molecular motion of heat. Also in Mr. Warsop's apparatus we have nearly a perfect circulation of the water; which is attained in no other boiler. After a study of the subject for a number of years, I am satisfied that the above are facts. In 1866, I obtained a patent, through the Scientific American Patent Agency, for a steam generator similar in principle in every respect to Mr. Warsop's apparatus. D. B. TANGER.

Bellefontaine, Ohio.

The Fossil Man of Onondaga.

MESSRS. EDITORS:—As an old subscriber (I have the SCIENTIFIC AMERICAN from its first No. to the last one), and as an admirer of the great truthfulness, candor, and intelligence which have always characterized your opinions and expressions, I beg leave to call your attention to an article on page 310, current volume, upon "The Fossil Man of Onondaga." The writer, "G. B.," who dates his communication "Syracuse, N. Y.," not only makes a general attack upon all connected with the Onondaga Stone Giant, but seeks to palm off both upon you and upon your readers, the infamous and ridiculous Geraud hoax—which was concocted by a physician, in this city, purely "as a hoax and as a test of the credulity of New York editors," and, as the author now says, without the least faith that any one would believe it — as an explanation of this most marvelous wonder of the age. The only theory which gained the least credence in this vicinity, is embodied in what is known as "the Tully story." This story relates, that about one year ago, a "four-horse team" passed through Tully, which is some six or seven miles south of Cardiff, drawing a large box, which was evidently heavy, and that the team was in some way connected with one Geo. Hull, of Binghamton, whose conduct was observed to be mysterious, and who was a cousin of the man Newell, on whose farm the Giant was found. I cannot undertake, in detail, to refute this, at first, apparently *possible* theory to account for the discovery of this Giant Statue, or "Stone Giant." In addition to the affidavits I herewith send you, and which cover this entire ground, I will simply say, that any theory involving the idea that a stone statue, weighing 2990 pounds, was brought in an ordinary wagon, from nobody knows where, and deposited some three or four feet below the surface, and partially under a large limb of a tree, by two men, is so entirely ridiculous, that no sensible man, who is in the least acquainted with the surroundings, can possibly give it a second thought, and any belief, either in this, or the crazy Canadian or Geraud story, requires a stretch of credulity far greater than that necessary to regard it a very ancient statue, or even a petrified Giant. Its removal required about fifteen selected men, with the most nicely adjusted machinery and appliances, and the whole, wagon, box, and sand into which it was embedded for safety of transportation, weighed 7965 pounds, or almost four tuns.

It would, after stating the above facts, be not only a waste of words, but an insult to your good sense, to spend more time in this communication, to disprove either of the silly theories above alluded to, to account for this strange image. I hardly need state, as it is already a matter of such public notoriety, that the State authorities have undertaken the investigation, sending here the Regents of the University, together with the State Geologist, Prof. James Hall. While these gentlemen have not (so far as we know) been enabled to come to any definite conclusion as to its origin or exact antiquity, they have settled several questions which are of great importance, as connected with this subject. The composition of the Giant is declared to be sulphate of lime or gypsum. On the supposition that it is hewn from a rock, where did it come from? Could it have been made here, or hereabouts? Prof. Hall, after a most careful examination of all of the gypsum quarries or beds in this county (and there are none near elsewhere), has decided that no gypsum, either in kind or quality, exists in this region, from which this stone Giant could, by any possibility have been taken. If, then, his Giantship be a carving, or the production of the artist's chisel, he is a foreigner. This is further shown by the fact, that from first to last, there is not the least shadow of evidence tending to show that the work was done anywhere near where he was found. The figure is wholly unique in design, and in the surface left in every part of the body and limbs where they are not corroded by water. The figure is that of a male, entirely nude, with every part fully shown, but without any attempt at representing hair or whiskers. It is made, neither to stand up or lie down, having neither pedestal or tablet accompanying it. It is carved(?) as perfectly upon the back as upon the front side, and was found lying upon a clay bed, which underlies the surface of the whole valley, which is alluvial and vegetable mold, to a depth varying from one to five feet throughout the valley. It was found lying upon its back, almost exactly horizontal, and in the direction corresponding to that of the stream, as it is supposed to have run at some former period. On its removal there was no trace of anything whatever to indicate its origin.

The statue(?) is most imposing and impressive. It has now been seen by not less than twelve thousand persons, including many of the most scientific men of the nation, and, so far as I am informed, or have had the means of knowing, not a single individual has ever examined it who was not impressed with the feeling and belief that it is the most extraordinary and gigantic wonder ever presented to the eye of man. Be it what it may, it presents a most perfect human form, of colossal size, defying the present state of science, whether geology or archæology. Its origin, we have to confess, is as deep a mystery as when first brought to light. Any theory, traced but a few steps, involves a belief in hitherto unproven facts or assumptions having, mainly imaginary foundations. Had it ever been well established that the human body was capable of becoming petrified so as to preserve the entirety of every part, it would be far easier to suppose this a veritable petrifaction of one of the Giants that lived "in those days," than to suppose it a statue. But the negative of this having been assumed, and all subsequent reasoning and facts, made to square to the assumption, that the petrification of the human body was impossible, the statue theory is, of course, the only thing left, and the conclusion is, that it is a statue, because it cannot be a petrifaction.

Whether this is, or is not, good logic, in the present state of knowledge upon this subject, I am not now disposed to offer an opinion, but will merely add, in this connection, that we have, really, no fewer obstacles to overcome, in concluding it a statue. There is not a chisel mark upon the entire image, nor of any other implement employed by human hand. The style of model, its perfection, its peculiarly smooth surface, all defy the artist. Be it statue or petrifaction, it has every indication of having occupied its late bed for a great number of ages, and was not, as your correspondent asserts, gotten up to impose upon "a gullible public." It is now "lying in state" in this city, where, for some time, all who are disposed to examine its form will have ample opportunity to do so; and I would add, in all due deference to your all-wise correspondent, that men of sense and wealth have thought it a reality of sufficient magnitude to make it an object to pay a large sum of money to possess it.

A. WESTCOTT, A.M., M.D.

Syracuse, N. Y.

The Stone Giant.

MESSRS. EDITORS:—Upon reading the several communications in your paper, I judge there are two disputed questions in relation to the stone giant, recently exhumed at Cardiff.

1st. As to its being a fossil.

2d. As to its antiquity.

On page 43, vol. I., of Clark's "History of Onondaga," published 1849, is recorded the fact that there existed among the Onondaga Indians a tradition that among the things that heretofore had been troublesome to their nation were the "Quis Quis, or big hog, the big bear, the horned water serpent, and the *stone giant*." The author seems to have thought the tradition not well founded, as can be seen by reading the work (which I have not at hand or I would quote further). They have found the stone giant, and no doubt the hog, bear, and serpent are there.

Perhaps if the Onondagians could read their own history there would be less of a pow wow over their recent discovery. C. ALVORD.

Washington, D. C.

Cultivation of the Poppy in Texas.

MESSRS. EDITORS:—In a former number of your paper, I noticed an article on the culture of the poppy, written by my brother, James Byars.

He mentions seeing the white poppy growing wild and in great abundance about West Liberty. This is the Argemone Mexicana, or prickly poppy. The whole plant abounds in a milky, viscid juice, which becomes yellow on exposure to the air. This juice, which is acrid, has been used internally in obstinate cutaneous eruptions, and as a local application to warts, etc. The flowers are said by De Candolle to have been employed as a soporific. The seeds, which are small, round, black, and rough, in doses of two drachms to a pint of watery infusion, act as an emetic. In smaller doses they are purgative. An oil may be obtained from them by expression, which is equal, if not superior to castor oil in mildness and certainty of action.

The oil might be made here in any quantity from the abundant wild growth of the plant. There is no doubt, I think, of the adaptability of the soil and climate here for the culture of the white poppy (Papaver somniferum), and if you can send the seed or inform me where to procure it, I will give it a trial. WM. M. BYARS, M. D.

Columbus, Texas.

Supply of Water in Large Cities.

MESSRS. EDITORS:—I would like, through the medium of your very able and valuable journal, to make some suggestions relative to the supply of water in large cities in cases of fire, and others of importance to those using steam boilers, etc. It is well known that immense amounts of money are lost annually by fire which might be saved provided there was some means by which water could be obtained at a few minutes' notice instead of being compelled (as is the case in many instances) to await the arrival of fire apparatus. The latter alternative has to my certain knowledge resulted several times in severe losses, which, had the case been otherwise, would have only been a trifling loss.

I would suggest placing at the supplying reservoir large pumping engines, supplied with safety-pressure valves, and instead of allowing the water to flow by its own gravitation, to force it through the pipes under pressure, of sufficient strength to throw water at any desired hight or distance, and by placing hydrants at various points throughout the city (the more the better), with 4, 6, or 8 discharge openings, and establishing hose houses near by, an immediate and abundant supply of water could be obtained at any time, thus making a saving of millions of dollars worth of property annually. It would furthermore be a means of feeding steam boilers without the necessity of using steam pumps.

I should think that a large portion of the water now wasted might be saved, as the above arrangement would necessarily involve the passage of laws, levying a heavy fine upon anyone allowing the water to run when not in actual use, and would also compel the abandonment of lead pipes, which could not stand the pressure, and which are the sole cause of much sickness in large cities on account of their poisonous action on water. It would compel the use of pipes of different metal, and thus be the means of saving many valuable lives.

I should think that this arrangement could be carried out without much expense, compared with the expense of the present fire department, and in the end allay all fears of a scarcity of water, which is now caused by the immense waste through carelessness and otherwise.

Mobile, Ala. CHARLES S. BAILEY.

[Some of our practical correspondents will be able to point out grave impracticabilities in this scheme.—EDS.

For the Scientific American.

THE CANAL OF SUEZ AND THE FUTURE OF EGYPT.

As we approach the 17th of November, the day appointed for the final opening of the Canal of Suez, the interest felt in Europe and America in this vast enterprise, increases with every new report of its advance towards completion. A few days more, and the two seas—the Sea of Corals, or Mediterranean, and the Sea of Pearls, or Red Sea—will be joined by a water route of 26 feet in depth and 328 feet in width, except at El Guisr, Serapeum, and Chalouf, where the canal only measures 196 feet.

The greater part of the expense of the works, conducted with as much patience as courage, has been borne by Egypt, while France will carry off the triumph, and England may in time derive the greatest profit.

The influence which this enterprise will have upon Egypt itself, is at the present moment a great and general question among Egyptian agriculturists as well as European traders. It is certain that the commercial aspect of Egypt will undergo a change within a short time, and the culture of the soil will be carried on in a different way from what it has been for centuries.

The large and powerful machines constructed, and many even invented for the works of the canal, will, after its completion, never return to Europe but remain in Egypt, to be used for the drainage of the Nile and the canals employed in irrigation. The "chadouf," the "sakie" or noria, and other irrigating machines often portrayed in engravings representing Egyptian scenes, will soon give way to steam engines, the price of coal having already fallen from $14 to $10 and even less according to the distance of transportation.

The great civil war of America when cotton rose to such a high price, and the speculators were so blinded by their success that they hoped it would rise still higher, caused many failures in Egypt. Even the late Pacha, Mohammed Ali, himself was carried away by the excitement. He believed that the low rate of wages for manual labor and other natural advantages, destined his empire to the cotton and other industries; he did not calculate, however, at that period upon the great worker of modern times—coal. No manual labor, even at the lowest rate, can compete with coal at a low price, such as it bears in England. Many grain mills and factories were built during the year 1864, principally in the Delta of the Nile, which were however abandoned as soon as they were constructed, and are to-day in a state of ruin.

Ismail Pacha—the "Prince of the Fellahs," as he pleases to call himself— sees clearly the many deficiencies of Egypt. He is aware that in the present state it cannot rival other commercial nations. He knows that its agriculture must undergo a change. He is not ignorant of the fact that the Egyptian wheat is much inferior to that of other countries, on account of a certain acrimony and musky flavor, and that it contains less azotic substance than other cereals. With these defects it brings only two thirds of the usual market price, and even then it is not greatly in demand. The cause for this degeneration in the quality of the Egyptian cereals is but too plain: the fellahs force the same land to produce the identical crop a hundred times successively. They do not yet understand that it refreshes the soil to change its culture, and as they have always been pressed for money, they have sold the best of their harvest, and sowed the worst.

Most of the Egyptians believe that their soil in its fertility is exempt from the law of restitution; they forget that the nurse must be nourished, else she will become weak. Those who are aware of the fact that their soil requires manuring, have taken recourse to the columbine or pigeon dung. But the culture of pigeons has proved to be a greater loss to the country than actual profit. It is estimated that the food of each of these birds amounts to about a quarter of a cent per day, which multiplied by the estimated number of pigeons in Egypt, makes up a sum of $60,000 value of wheat which they annually devour. The meat of these birds is of but little value, and the revenue of columbine produced by 20,000 pigeons is insignificant. The attempt to restore the land by the use of columbine is consequently a failure.

The Koran forbids the believers to spread the dejectures of men and beasts upon their fields, the former as being impure, the latter as being necessary for kitchen-fuel, for which purpose they have been used since time immemorial, on account of the scarcity of wood in Egypt. For this purpose they are formed into a sort of thin cakes and dried in the sun, which renders them hard and fit for burning.

A few cultivators who have studied deeper into the science of agriculture, have discovered that the phosphate of lime is wanting in the soil of Egypt. They need, however, not go far to find the remedy for this defect. The deserts are strewn with the bones of animals. This is an open mine. The bones may be gathered and ground with little trouble, and the dust gained therefrom will restore the wanted phosphate of lime. Experiments with these bones have already been tried with decided success.

Sugar-cane is extensively cultivated throughout Egypt. All the fellah's are allowed to raise, express, boil, and even refine their sugar if they choose; but the high price of machinery and implements has prevented the petty cultivators from producing sugar for the market. Only the viceroy himself is rich enough to set up sugar-works, and this sugar manufacturing has almost become a monopoly of the sovereign. The largest of his works is at Ermentin Upper Egypt; but as the price of the tun of coal rises to $20 before it reaches that place, the home-made sugar cannot compete with foreign productions.

Out of ten sugar-canes the Egyptians carry nine to the mill and keep the tenth for planting, which they lay into the ground in its full length and every joint produces a bunch of young sprouts. This method is faulty in a double way; it is absurd to bury every year one tenth of the harvest, when it might be used to so much better advantage; and it is useless to press the upper or white end of the cane, which yields an insipid juice, containing but little sugar. Another great mistake in their planting is that they do not leave a space large enough between each separate plant, the air cannot circulate, the under leaves dry up, while the cane grows high but has no body. Irrigation is often practiced at an improper time, a month before the crop is gathered in. This is done especially by those who sell their harvest for the works of the viceroy. They bring in their cane gorged with water; this excess of moisture, which has to be removed requires a greater quantity of heat, which causes increased consumption of fuel. Yet it seems that it is difficult to hinder the fellahs from exaggerating the weight of their crop to the detriment of its quality. They are like the farmers of Flanders, who sell their beets by the pound, and therefore prefer to have them heavy, rather than rich and good.

The rate of wages paid to the fellahs for their labor is on an average about eight cents per day, and it is often paid to them in food, yet they appear satisfied with it. And yet, working hands are wanting in Egypt. For centuries, masters of the country have squandered human life. Those works of art which to-day are the admiration of travelers, the pyramids, the hypogeums, the temples, and the monuments, have cost the lives of thousands. The insecurity of property, and more than that, the severe laws of bondage have been the cause of many formidable emigrations. When the neighboring tribes will have the assurance of their liberty and that they will not be overtasked, immigration will not be slow and the working population will soon increase.

Ismail Pacha has tried to remedy all these defects ever since his accession to the throne; but what are six years of an improved government in counteracting the evils of centuries of despotism.

Until of late, the Egyptian fellah has been tortured by an insecurity of person and property. The farmer never felt secure against an arbitrary order from Government, which would send him perhaps some hundred miles away from his home to do public work, just at the time when his own fields needed attention; and no one could be sure that the tax levied upon him to-morrow would not take everything he possessed. As of old, the Egyptian of the present day, when he receives a piece of gold, makes it his first care to dig a hole in the ground and bury it as if it was an ill-gotten gain. Egypt may be paved with gold, for this custom dates back to time immemorial. The cotton crisis during the civil war of America had enriched Egypt, yet where are these riches? The apparent prosperity of the fellah has not increased, and hardly any public buildings have been constructed. It is but too probable that all the riches are holden in the ground and will be so, until Ismail Pacha has given full assurance to his subjects, that a new era has begun for Egypt, and that personal liberty will henceforth protect every commercial enterprise.

The Isthmus of Suez, once the curse of the fellahs, may ere long become a blessing to them; for assuredly there is a rich mercantile harvest in store for Egypt since the Eastern portal has been unlocked, and the traffic which, until now, was divided, will concentrate on this hitherto barren neck of land, which in time will become cultivated. Lake Timsâh, which was formerly filled with fresh water and in which crocodiles flourished, has been filled with salt water, and sea-fish and oysters can in future be raised in its deep waters, as also in the Bitter Lakes. As to the extensive Lake Menzaleh, another great project has been laid before the members of the Company by a Mr. Ritt, a young Frenchmen, who proposed to drain off this vast lagoon and prepare it for the rice culture. The idea is grand, though it can only be accomplished at great expense.

With these large sheets of inland water, rain will be a more frequent occurrence in the neighboring deserts, the lack of which has hitherto been the main obstacle to the culture of the surrounding country.

The route which the pilgrims and caravans from and to Arabia pursued was to cross the Red Sea at Kosseir, whence they traversed the desert to Keneh to gain the Nile, and thus followed the water route to Cairo and Alexandria. The tedious journey will doubtless be abandoned after the opening of the canal; already thousands of pilgrims going and coming from Mecca have chosen this new road. Keneh and its environs may, nevertheless, become a place of importance through its rich sulphur mines and granite quarries. The borders of the Red Sea abound with inestimable treasures; but they are guarded against the desires of men by an evil genius—thirst! How can a mine be explored, even if it contains gold and emeralds, in a country where it never rains, and where in consequence, not a drop of fresh water is to be found?

Should this Canal of Suez prove a decided success, then navigation will spread upon waters that have heretofore been undisturbed, and we fully agree with Edmund About, when he says that "though M. de Lesseps cannot claim the original idea of this work, which is almost as old as the world itself, yet he has invented its success." The glory of the execution will be so much greater as the obstacles appeared at first insuperable. To conquer the indifference, skepticism, avarice, and ill-will which this work has met in its progress, is a greater triumph than was ever won on a field of battle.

Facts about Varnishes.

From the Hub.

"Crawling" is caused by the gloss of the coat beneath it, which does not form proper footing, as is shown by the fact, that just so soon as this gloss is removed, there is no further trouble found. "Crawling" is therefore not a serious trouble, for it may be easily prevented by washing the under coat with water and wiping with wash-leather, as this will destroy the brilliancy of the gloss, and, in many cases, the mere dusting with a stiff duster will be found sufficient. When a previous coat "crawls," I have found that the following coat is generally more apt to do so, and in cold weather there is more liability of this trouble than in summer, for then the gloss of the under coat seems to come up to a "harder sharp." But kill the gloss of the under coat, and you kill "crawling."

Most liquids give more or less of a varnish effect—that is, they give a shining appearance to the surface upon which they are placed. Thus, when water is poured upon a deal table, it brings out the grain of the wood, and brightens the place it occupies; but water dries, and the brilliancy is only momentary, consequently water is not a varnish, so-called. A solution of strong glue gives all the desired solidity, but having no brilliancy, it cannot be called a varnish.

There are many points to which the varnish manufacturers must direct careful attention, and which the customer must understand in order to judge of the merits of an article. Varnish should be a clear limpid fluid before application, and after being applied should become solid and have a brilliancy which reflects and refracts the rays of light like the fragment of a crystal. It is as a fluid what glass is as a solid. It hightens the tone of colors and preserves them; it brings out the delicacy of outlines and of shading, and time should neither color nor dim it. It is necessary that it should adhere to glass, wood, or stone, that it may not be removed by anything short of an iron instrument or by the action of fire. It must also be strong drying, and when dry and hard should become firm and unalterable in character so that it shall neither crack nor turn white, nor be affected by light or ordinary heat, nor removed by any ordinary solvent. In other words, the qualities to be considered, in testing a varnish, are as follows:

1st. *Its Paleness*—an important feature for some classes of work, and the one which is generally first looked to.

2d. *Its Fluency.*—Upon this depends the working quality. It also has much to do with determining the real value of the article, as it governs the amount of surface which a gallon will cover.

3d. *Time of Drying.*—This is essential, because it affords a speedy protection from atmospheric changes, insects, etc., and dispenses with the inconveniences of housing newly-varnished work for a long time.

4th. *Time of Hardening.*—This feature is entirely independent of the foregoing. A varnish is *dry* when its surface is sufficiently tough to resist dust, insects, and currents of air, and after *hardening* it is solid.

5th. *Fullness.*—This is often expressed by painters as "stay ing where put." If a varnish continues to look bright and to stand out prominently after drying and hardening, we say it has *fullness.* Otherwise it will look thin and "saddened."

6th. *Brilliancy.*—Next to durability, this is the most important qualification of a varnish.

7th. *Durability.*—This is the principal consideration, and in examining the merits of a varnish, the consumer should direct careful attention to this point. It includes the quality of elasticity, which will prevent cracking and scaling, and the quality of resisting the corrosive action of the atmosphere and of moisture. It is the most difficult feature to decide upon, for it is simply a question of time, whereas the six conditions which precede may be fully tested by a few trials.

Having defined the seven qualifications which are requisite to the perfect coach varnish, we will add in the way of caution, that while testing a varnish, the purpose for which it is required must be held constantly in mind, and especial heed should be given to those features which will best qualify it for the class of work in question.

M. REGNAULT thinks it is impossible to lay down rules for the registration of mercurial thermometers; the only exact instrument suited for experiments requiring precision is the air thermometer. This is, however, an inconvenient instrument, and therefore M. Regnault recommends that it be used only as a standard with which to compare the mercurial instruments.