Physical Decay.

"If the repair were always identical with the waste, life would then only be terminated by accident, never by old age." This is a fact well known to all who have investigated the subject, though Mr. G. H. Lewes, in his "Physiology of Common Life," makes the statement quoted. In early years this balance of the human system is admirably preserved. As man advances in life, however, and gets up to 50 or 60, he begins to get stiff in the joints, and experiences what he calls "feeling his age." Renovation of various organs of the body depends on the blood, and if this supply is not at all times furnished in sufficient quantity and quality, a gradual deterioration takes place. Heart and arteries become clogged, and the whole delicate machinery suffers from the lack of nourishment. Deposits of phosphate and carbonate of lime accumulate, and the change is really a chemical one, by which the blood is hindered from going to the extremities of the system and fulfilling its work of repair and renovation. Old age, then, is the result of a change in the blood, which becomes overloaded with earthy salts, leaves its refuse matter in the system, and the valves of the heart become cartilaginous. Becoming thus, the heart is not able to propel the blood to its destination. Arteries also having become ossified, a still further obstruction takes place, and the whole body languishes. Blood is life. If it is kept continually in good order, our years are prolonged. New bodies, as in youth and early manhood, do not accumulate these fibrinous and gelatinous deposits, which, as the years go by, help the gradual process of ossification and cause the decrepitude of age. Now if some means were discovered by which the blood could be kept in a condition like that of youth, it would throw off these earthy salts which obstruct the action of the heart and arteries. Our food and drink make our blood. It seems, then, that it is to them we should look primarily for the quality of it.

Without eating and drinking there is no life, but we may select certain kinds of foods containing a minimum amount of the elements which cause the ossific blockages in the system. An English physician, Dr. C. F. De Lacy Evans, who made many researches in regard to our food, comes to the conclusion that more fruit should be eaten, especially apples, grapes, and bananas, they being rich in nutritious elements. Being deficient in nitrogen, they are best for elderly people, as they keep the blood in a better condition than flesh. After the age of 60 people should eat less beef and mutton, and use more apples and nuts of all kinds, the latter being rich in many of the nutritious elements of meat. Fish and poultry have not the objectionable earth salts of beef. In order to retard physical decay and to keep the blood in a wholesome condition distilled water is recommended. It has solvent qualities which act upon the earth salts in the blood and expel them from the body. A goblet of this water taken three times a day, with ten or fifteen drops of diluted phosphoric acid in each glass, has a tendency to assist the blood in eliminating the obstructing salts. A man is as old as his arteries. If they are soft and compressible, the deteriorating effects of old age have not appeared.

Flourens, in his well known work on "Human Longevity," cites the case of the Italian centenarian Cornaro, whose recipe for health and long life was extreme moderation in all things. Flourens himself insists that a century is the normal life, but that 50 years beyond, and even 200 years, are human possibilities under advantageous conditions. Hufeland also believed in 200 years as an extreme limit. Sir James Crichton Browne, M.D., concedes, in a late address, that Flourens was right. Duration of growth gives the length of life. Hufeland held that the human body grows till the age of 25, and that eight times the growth period was the utmost limit of man. But if 20 years be taken as the time of growth, even five times that will give us a century. According to Flourens and Cuvier, man is of the frugivorous or fruit and nut eating class of animals, like the gorillas and other apes and monkeys. Man has not teeth like the lions and carnivorous beasts, neither has he teeth like the cows and herbivorous ones. Intestines in the man are seven or eight times the length of the body; the lion's are but three times the length of his body. Herbivorous animals, like the cow, have intestines forty-eight times the length of the body.

So judging man by his teeth, his stomach, and his intestines, he is naturally and primitively frugivorous, and was not intended to eat flesh. Fruit is aperient, and apples act on the liver, and are good brain food also, as they contain much phosphoric acid. As to the effect of certain climates, perhaps too much stress has been laid upon that. We find that Thomas Parr, who lived in England, died in his 153d year, and was dissected by the celebrated discoverer of the circulation of the blood, Dr. William Harvey (who expressed no doubt of his age), was never out of his native country. Accounts of men who have lived to extreme age in Ecuador and Mexico indicate possibilities. A climate that allows much outdoor living is the best for health. More depends on food than on any climate. Exercise, fresh air to live in and to sleep in, daily bathing, and freedom from medicine are the important things. In July, 1893, the Courier Journal, of Louisville, published a long account of James McMullin, who died in Carlisle County, Ky., at 117 years of age. When Buffon, Hufeland, Flourens, and men of that class, who had studied the subject, believed in the possibility of 150 or 200 years of life, the subject is not to be laughed at.—William Kinnear, in Harper's Weekly.

FOSSIL FROST CRACKS.

BY J. A. UDDEN, ROCK ISLAND, ILL.

Sun cracks have long been known to geologists as characteristic of littoral deposits. During the summer season they are quite often to be seen on the muddy shores of larger waters and still oftener, perhaps, on the bottom of desiccated inland ponds. Their recognition in the fossil state was easy. But there is another kind of mud cracks which are produced under quite different conditions of less common occurrence, and these have, perhaps, but seldom been preserved during past ages.

Their making may be described as follows: When mud freezes, the water which it contains has a tendency to crystallize. The crystals begin to grow on the surface, and a continuous coating of ice is apt to form, if water is present in sufficient quantity. Such a coating will be much thicker along certain lines where the freezing commenced, and the ice will often extend as a thin plate some distance down in the mass, which is thus fissured by clefts filled with ice crystals. These clefts are mostly straight, and they branch and cluster after the crystalline properties of water, uniting preferably at angles of 60 and 120 degrees. When dry winds cause the crystals to disappear, as sometimes will happen, the empty cracks remain open and exhibit perfectly the forms of the branching plates which made them.

As a result of the special conditions attending their

FROST CRACKS ON A BLOCK OF SANDSTONE IN THE BLACK HILLS, S. D.

formation, frost cracks are quite unlike sun cracks in their appearance. The most important points of difference may be tabulated thus:

SUN CRACKS	FROST CRACKS
are jagged and curved irregularly,	are straight,
are of somewhat uniform and rather large width,	are apt to taper to a point at one end and are narrow, and
tend to form a network with six-sided meshes and, as a consequence, often meet in tri-radiate clusters	form branching tree-like patterns, in which shorter members run out from one side of a longer main stem
at various angles approximating 120 degrees.	usually at angles of 60 and exceptionally at 120 degrees.

While out on a tramp in the Black Hills last summer, the writer found some fossil marks that appeared to be frost cracks produced in this way. They were seen on some blocks of sandstone resting on a talus about three miles south-southwest of Minnekahta station in the southern foothills. The blocks were evidently detached from a ledge which comes in a little below some strata that have lately yielded a number of petrified stems of cycad trees. On one side these blocks presented an unusually smooth and plane surface, which was almost glossy and covered with a coating of fine red material about $\frac{1}{16}$ of an inch in thickness. There was something of a resemblance to an ice surface. It bore impressions which corresponded to the description of frost cracks as given above. The lines were but slightly sunk below the plane of the surface and measured from one-half to four inches in length and from one-sixteenth to one-eighth of an inch in width. Some of the branched patterns they formed were over eight inches in length, and most of the angles observed measured just sixty degrees, while a few of them exceeded seventy and even eighty degrees. Quite a few lines also met at angles of one hundred and twenty degrees.

The series of sandstones and shales to which the rocks of this locality belong furnishes sufficient evidence of shallow water conditions attending its making. This consists in ripple marks, cross bedding and the remains of ancient land plants. Sun cracks are also known to occur. The rocks were made during a period of transition between the Jurassic and the Cretaceous ages. This is known to have been a time of increasing cold, when the tropical plants of the earlier age were giving place to the temperate vegetation of the later. During an age of such changes it would, indeed, be quite probable that a frozen mud flat should occasionally become buried under the sediments of an advancing tide, and to such a contingency the singular markings on these sandstone blocks are probably to be ascribed.

Muzzle Velocity of Shot.

In the course of his first Cantor lecture, delivered before the Society of Arts on "Explosives and their Modern Development," Prof. Vivian B. Lewes referred to the method of determining the muzzle velocity of shot which is effected by means of the chronograph. He said:

"Two screens are arranged, one about 120 feet from the muzzle of the gun, and the second 120 feet beyond the first. These screens consist of wooden frames strung with fine copper wire, the disruption of a single strand of which is sufficient to break the flow of the galvanic current. In the Boulenge chronograph, a current from a battery of eight Bunsen cells flows through these wires and back to the instrument house, where the wire from each frame is coiled round a separate soft iron core and converts it into an electro-magnet, each of which attracts and holds a rod of steel. The electro-magnet in connection with the second frame is fixed at a lower level than the electro-magnet connected with the first, and carries a short rod with a weight at the bottom, while the first magnet is at a much higher level, and carries a longer rod. The current being allowed to pass through both electro-magnets, the rods are suspended in position. By pressing a key both circuits can be simultaneously broken, with the result that both the rods are liberated and drop down guide tubes; the short rod strikes a catch and causes a knife edge to be brought against the longer falling iron, and to make a nick in it. When both rods are liberated simultaneously, this nick occurs at a definite place. The current is then allowed to pass, the rods hung on the electro-magnets, and the gun containing the charge, the power of which is to be tested, is fired, the projectile passing through the screens and breaking the current by cutting the wires. Under these conditions the long rod is liberated a fraction of a second sooner than the shorter rod, the result being that the nick of the knife blade is no longer in the original place. By measuring the distance between the two nicks, and knowing the length of time to which this is equivalent, allowance being made for the time taken in liberating the knife blade, etc., the interval of time which elapses while the projectile is passing between the screens can be calculated, and, being corrected for the distance of the first screen from the muzzle, gives the muzzle velocity of the projectile."

Cooling Devices for Dwellings.

It must be something like fifteen years since the air of the Madison Square Theater was artificially cooled in summer by passing it over ice; and refrigerating apparatus is in use in every large city in the civilized world, for cooling rooms for the storage of provisions. Many attempts have been made to introduce refrigerating apparatus of the same sort as that used in the cold storage buildings into dwelling houses, but they have failed, and with reason, to please the public. The apparatus now attracting the attention of the newspaper reporters is simply an ammonia machine, depending for it frigorific properties on the alternate condensation and expansion of ammonia gas. To judge from the accounts, the apparatus is, as a piece of machinery, well designed, but the descriptions of the methods by which it is intended to convey the chilling influence to the rooms of a dwelling are rather amusing. We are told, by way of introduction, that the use of ice for cooling rooms causes "dampness," while the ammonia apparatus produces "a pure, dry cold." It is hardly necessary to say that the facts are just the other way. When warm air, which, in inhabited buildings, is always moist air, is passed over ice, after the Madison Square plan, the moisture of the air is condensed by the reduction of temperature, and deposited on the ice, to be carried away with the drainage water from the ice; and the air which passes beyond the ice is not only cool, but comparatively dry, as its moisture has been, so to speak, wrung out of it by the ice.

With pipes filled with ammonia-chilled liquid running through the room to be cooled, the case is reversed. All the moisture originally contained in the air remains in the room. Such air as comes in contact with the cold pipes will deposit its moisture in the form of drops of water, which will either fall on the floor or must be collected in some way and drained off; while the remaining air will be held at the point of saturation. A more unwholesome atmospheric condition it would be difficult to conceive than the reeking, dripping, chilly dampness of a room to which such a cooling system had been applied.—American Architect.

The Effects of Intense Cold upon the Mind.

Extreme cold, as is well known, exerts a benumbing influence upon the mental faculties. Almost every one who has been exposed, for a longer or shorter period, to a very low temperature has noted a diminution in will power, and often a temporary weakening of the memory. Perhaps the largest scale upon which this action has ever been studied was during the retreat of the French from Moscow. The troops suffered extremely from hunger, fatigue, and cold—from the latter perhaps most of all. A German physician who accompanied a detachment of his countrymen has left an interesting account of their trials during this retreat. From an abstract of this paper by Dr. Rose, in the New Yorker Medicinische Monatschrift, we find that of the earliest symptoms referable to the cold was a loss of memory. This was noted in the strong as well as those who were already suffering from the effects of the hardships to which they had been exposed. With the first appearance of a moderately low temperature (about five degrees above zero Fahrenheit), many of the soldiers were found to have forgotten the names of the most ordinary things about them, as well as those of the articles of food, for the want of which they were perishing. Many forgot their own names and those of their comrades. Others showed more pronounced symptoms of mental disturbance, and not a few became incurably insane, the type of their insanity resembling very closely senile dementia. The cold was probably not alone responsible for these effects, for a zero temperature is rather stimulating than paralyzing in its action upon the well-fed and the healthy. These men were half starved, poorly clad, worn out with long marching, many already weakened by dysentery and other diseases, and all mentally depressed, as an army in defeat always is. It needed, therefore, no very unusual degree of cold to produce the psychic effects observed under other circumstances only as a consequence of exposure to an extreme low temperature.—Medical Record.

Will Coal Dust Explode?

That the dust of certain coals is explosive has been asserted time and time again in these columns, and evidence in support of the assertion has been abundant. We now have fresh evidence in a series of experiments conducted by Mr. W. Galloway, formerly one of the British mine inspectors, at Merthyr, on December 1. Mr. Galloway fitted up special apparatus with internal fans for the purpose of mixing the dust with the air. No gas was used, as the object of the experiments was to determine whether coal dust alone was explosive.

Before commencing his experiments, Mr. Galloway delivered an address to a number of gentlemen interested in the matter. In the course of his address he said that the reason the coal dust theory had not been more generally accepted as the cause of great explosions in deep, dry mines was because the public had not had opportunities of seeing dust in actual explosion. He had therefore determined to make these public experiments so as to convince skeptics that the theory was correct. He explained that when explosions occurred in dry mines the flame traveled through the intake airways and not through the returns or the faces, the reason being that the intakes, being the main haulage roads, were naturally very dusty, and this dust was deposited on the ledges and timbers, ready, when a disturbance occurred, to be mixed with air and become explosive. He further stated that whenever, after an explosion, smoke or dust issued from a mine, and wherever charred coke was visible on the timbers, it was safe to say that a coal dust explosion had occurred, or that coal dust had been the principal cause of the explosion, for a fire damp explosion produced no smoke and left no charred coke on the timbers.

The reason why, after some explosions, charred coke was found in some parts of the mine and not in others was explained by the fact that in these parts where coke was discernible the dust had been pure coal dust, whereas in other parts of the mine the coal dust on the roadways was largely mixed with stone dust, and although there was sufficient coal dust to be inflammable and to carry on the explosion, the admixture of stone dust prevented the formation of coke. In order that coal dust might combine rapidly with air and form an explosive mixture it had necessarily to be very fine. It would not ignite immediately if taken from the roads, there were too many coarse particles in it, but the coarse particles would rapidly fall to the ground and the mixture in the air become explosive.

The following is a list of Mr. Galloway's experiments, with the reported results:

1. A cannon shot, with 1 oz. of gunpowder, stemmed with great care, but not too tightly, placed on a ledge 9 in. from the ground, fired into vacancy, produced a flame 3 ft. long.

2. A cannon shot, with 1 oz. of gunpowder, stemmed as before with 1 oz. of coarse coal dust, made a flame 7 ft. long, fired from the same place and position.

3. A cannon shot, 1 oz. of gunpowder, stemmed with 1 oz. of coal dust, mixed with 1/8 oz. of heather dust, made a flame 8 ft. long, but of greater volume.

4. A cannon shot fired into the tube, where 1 lb. of coal dust had been placed and stirred, caused a flame 12 ft. long.

5. A shot with 1 oz. of gunpowder, stemmed with 1 oz. of coal dust, fired into the tube, which contained 1 lb. of coarse coal dust, produced a flame 15 ft. long with a greater volume.

6. Shot, stemmed as before with powder and coal dust mixed with 1/8 oz. of heather dust, produced a flame 14 ft. long.

7. Similar shot fired into tube containing 1/2 lb. of finest coal dust produced a flame 14 ft. long.

8. Similar shot, 12 oz. finest coal dust, flame 14 ft., greater volume.

9. In this case no additional dust was placed in the apparatus, but some remained since last shot; 1 1/2 oz. gunpowder used, flame 9 ft. long.

10. No additional dust, similar shot, 10 ft. flame.

11. Similar shot, tube entirely free of dust, 1 oz. of gunpowder, flame 5 ft. long.

12. Similar shot, no dust, tighter stemming, flame 5 ft., report considerably louder.

13. Shot with 1 oz. gunpowder, fired into a mixture of stirred-up coal dust, produced flame 14 ft. in length.

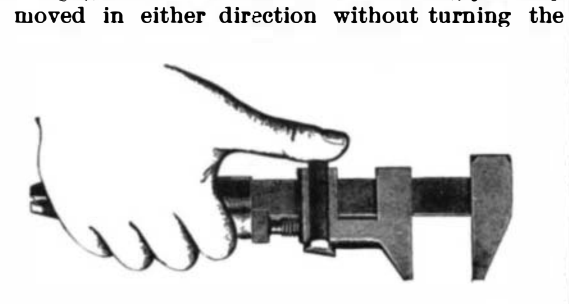
14. Similar shot, 12 oz. coal dust, flame 12 1/2 ft. long.

15. Similar shot, 1 1/2 lb. of coal dust, flame 16 ft. long.

16. Similar shot fired into tube extended to 18 ft. long, containing 2 lb. of coarse stirred-up coal dust, made a flame 23 1/2 ft. in length.—Colliery Engineer.

A CONVENIENT WRENCH.

The bar of this wrench is of open hearth steel, drop forged and case hardened, and it is designed to be an especially well made and durable tool. It is manufactured by the Standard Tool Company, Athol, Mass. The sliding jaw and the working parts are of hardened steel, and it is styled the "rapid transit wrench" from the fact that, by a slight thumb pressure at the point indicated in the illustration, the screw is released from engagement with a nut, and the sliding jaw may be moved in either direction without turning the



screw. The screw lies flat on the bar, preventing its being accidentally bent or sprung, and a spring under the point on which the thumb is represented normally draws the nut to a true bearing on the screw and takes up all wear.

The Electro Nickeling of Metallic Surfaces.

The following baths (most of them well known) have all given good results, but require careful handling:

1. 8 kilos. nickel ammonium sulphate in 100 liters of water, made slightly alkaline with ammonia, and then weakly acidified with citric acid.

2. 5 parts nickel sulphate neutralized with ammonia, 3·75 ammonium tartrate, and 0·025 gallotannic acid per 100 of water. This gives a homogeneous white and smooth reguline deposit, even when of great thickness.

3. 2·75 nickel acetate, 2·5 calcium acetate, and 100 of water, afterward mixed with 0·7 part of acetic acid (sp. gr. = 1·047) and filtered. (Potts' formula.)

4. 5 nickel ammonium sulphate, 2 ammonium sulphate, 0·5 citric acid, and 100 of water. Boil and filter.

5. 8 nickel ammonium sulphate, 1 ammonium chloride in 100 of water, with or without the addition of 0·5 part barium oxalate.

6. 6 nickel ammonium sulphate, 3·5 ammonium chloride, and 2·5 ammonium sulphate per 100 of water.

7. 5 nickel ammonium sulphate, 1 ammonium sulphate, and 100 of water. Specially suitable for cast iron.

8. 5 nickel ammonium sulphate, 2·5 boric acid, 100 water.

Powell has found that the addition of not more than 1 to 8 grms. per liter of benzoic acid or of a benzoate to a suitable nickel bath produces a good and pure deposit. Baths containing boric acid, such as are commonly employed, give a good deposit upon smooth surfaces, but refuse to cover cavities or hollows; this difficulty may be removed by the addition of sodium chloride to the bath. Such a bath may be made by dissolving 5 kilos. nickel ammonium sulphate in 100 liters of water, adding 2·5 (or 1·25) kilos. of boric acid and 1·25 kilos. of sodium chloride, boiling, acidifying with citric acid, neutralizing with ammonia, and filtering.

So also nickel chloride with boric acid in the proportion of 5:2 or 2:1 gives a good bath, but it is not suitable for depositing upon iron or steel, as all baths containing chlorine are apt to cause rusting of these metals. The use of citric, benzoic, tartaric, or other weak acids is to be recommended for them, except upon the score of expense.—Ding. Poly. J.

The Oil Fields in Ohio.

A number of very valuable oil fields have been discovered in Ohio the past year. The income from these wells, based upon their present output, promises to make an appreciable addition to the oil interest of the country. One of the new wells, known as the Kirkbridge, produces 310 barrels of crude oil per hour, or 7,440 barrels per day of 24 hours. Another single well averages over 1 200 barrels per day. To do the work of collecting, refining and shipping this immense product, an elaborate system of pumping stations, tanks, piping and other forms of machinery have been provided.

It is not generally known that the oil interests of Ohio have developed very rapidly of late, and that Ohio, as an oil producing State, promises to rival Pennsylvania. In a single county, Wood, the pipes for carrying the oil consist of 340 miles of 2 inch pipes, 70 miles of 3 inch pipes, 125 miles of 4 inch pipes, together with other sizes, making a total of some 800 miles of pipe, and representing an outlay of $15,773,000. In addition to this the oil territory contains 260 storage tanks, which have cost $6,000 each, and there are besides immense outlays necessary for bonuses, rentals, labor and building. At present the storage tanks of Wood County contain about 8,000,000 barrels of crude oil, valued at $4,400,000. During the past year the output of oil from Wood County alone has been 20,000,000 barrels of oil. In other counties of Ohio the interests are also very large. There are at present some 17,500 oil wells in Ohio. Of this number over 3,000 have been drilled during the past year.

The Registration of Trade Marks in Germany.

Under the act which came into force in Germany on October 1 of 1894, the local registrations of trade marks are completely abolished, and they must, in future, be registered at the Patent Office in Berlin. There the authorities take every precaution against innocent or other duplications of trade marks, or infringements of the rights of those who already own such things. When an application is made, the officials search the register, and if a trade mark in any way approaches that which is proposed to be registered, the owner of the old trade mark is communicated with. He can then take steps to prevent the new trade mark being registered, or, if it be a flagrant infringement, the government may perform this office on their own account. Also, the old plea of "ignorance of registration" is now abolished, and, by the new act, the infringer of a trade mark is liable to penalties and damages for "carelessness." The carelessness in question may simply consist in the fact that he did not properly search the register and find that he was doing wrong in using a trade mark which either did not belong to him or was a colorable imitation of an older mark. Under the old law, an English or foreign owner of a trade mark had to warn a German pirate before he could take action, but now this is abolished, and, if only the original trade mark be registered in Berlin, the owner can claim damages for infringement without giving warning to anybody. At present, the marks in the register under the old act can be registered under the new, and old foreign trade marks can likewise be protected.

Powder Engines.

In the course of an interesting lecture on "Modern Explosives," recently delivered by Colonel Barker, Superintendent of the Royal Small Arms Factory, Sparkbrook, reference was made to the possibilities of the industrial use of high explosives for generating motive power. The construction of a gunpowder engine has often been attempted. But this explosive is ill adapted for such a purpose—in the first place, because it only develops in combustion about 280 volumes of permanent gases, while the solid residues are very considerable, and would soon clog any machine. At the same time, it should be remembered that one pound of gunpowder is capable of developing 170,280 foot pounds of energy. The new smokeless powders are capable of developing still higher energy, and are also more under control, while giving off nearly 1,000 volumes of permanent gases, and leaving no solid residue. The temperatures developed by all these propellants are high; but it is very possible to overcome this difficulty, in the same way as it is done in the case of gas engines, or even by making use of the energy of the water so employed when converted into steam. As English cordite develops 1,250 calories per gramme, the possibility of its employment in some form of "powder gas" engine is not without attractiveness to engineers of a speculative turn. The temperature of gunpowder on explosion is about 4,000° Fah., and that of the smokeless powders is believed to be considerably higher, though this has not yet been fully determined.