Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

Earth Worms---How and What they Eat.

Messrs. Editors:—I see that you have published an article about the habits of earth worms, which useful little creatures seem to be much underrated. They may eat earth, as your author asserts, but I have never seen them do it, although I have seen them eat other things with great voracity, and have also seen them reject particles of earth which adhered to their proper food, such as dead spears of grass, roots and leaves.

I have watched them feeding for hours at a time, and retain a lively recollection of several rheumatic attacks, resulting from the wetting I got while so watching them. They feed at the surface only when the withered vegetation is wet with rain or dew and is in a soft and pliable state. When their food found at the surface is dry, and too harsh for their mouths to manage, they retire to the congenial depths of the ground, delighting in heaps of "long" manure, which they reduce to a homogeneous mass of compost with great rapidity by consuming the vegetable and undigested parts thereof, thus transforming the matter from a vegetable to an animal character, leaving the mass at its lowest chemical status and so fit for the food of plants. Indeed I doubt if any atoms of vegetation can decay and be again fit food for other vegetable organisms without an intervening decomposition in animal digestive apparatus. At all events, it is easy to prove that earth worms are the compost makers, and if we do not give them time to properly manufacture their "product" while the manure is in the compost heap, they will appear in the fields and then complete the job, and further, their work in fields yields another benefit by their boring and opening of the soil.

Their manner of eating is worth noticing. If you seat yourself upon a grass plat or beside the strawberry bed, during a light rain in warm weather, and have the patience to sit perfectly still for ten or fifteen minutes, you will see innumerable worm heads protruding cautiously from the ground, and feeling around until a spear of soft and recently killed grass is found. The worm touches it first with the extreme point of the head, and then the point retracts inward, much like the toe of a stocking when you touch it with your finger to commence turning it: then the worm shortens its length, the other end being fast anchored in the hole: this action makes a bight in the spear of grass, and then the worm crawls along the outside of his supper until the parts diverge too much, when he takes another pull, and so on until the grass is loosened from its own roots and safely swallowed. I have observed that if a particle of earth adhere to the food it is shoved along as the swallowing progresses, and not allowed to enter the mouth. The final act of swallowing the end, and biting off the lump of root which is sometimes attached, I have never seen, as that is performed within the hole: but I have frequently seen the worm re-appear with a pellet of earth balanced upon his head, or it may be only the piece of root if his supper was clean, which he deposits at the surface beside his hole, when he prowls around for more food while it is good.

When two worms seize opposite ends of the same spear, the pulling and hauling is most comical, reminding one strongly of his early days when he strung grains of corn upon opposite ends of a string and fed two rival gobblers. The worm fight generally ends by the breakage of the grass, but if too strong for their strength they both swallow until their heads touch each other, when they both "get," leaving the morsel, which they will not touch again. I have often seen these worms breaking off the dead parts of strawberry leaves, rejecting the living parts, and have also seen them apparently sucking the pollen from strawberry flowers. In the fall large tufts of dead leaves may be seen drawn partially within the worm holes, possibly by way of stoppers to keep out the cold. * * *

Science Familiarly Illustrated.

Why Water Presses Sideways and Upward.

"Truth is stranger than fiction." The young philosopher is surrounded with mysteries and is called upon to accept as fact what seems to him incredible. Many of the fundamental truths of natural science are apparently inconsistent with his everyday experience and observation. It certainly is not all stupidity which makes the boy slow to learn that the earth is round, that the sun is bigger than the earth, and that the air has a weight which squeezes up his body with a force of five or six tuns. It is probably the case that the children who do learn these things, are helped on more by their natural credulity than by conviction of the judgement. And there are many grown up people who remember only the outline of facts taught them in childhood, and have never troubled themselves for reasons about them. How many skillful mechanics can give good orthodox scientific reasons for the fact that water presses sideways and upward as well as downward?

Bodies which make a pressure in consequence of their weight generally press downward only, and this pressure is exactly proportioned to the weight. In fact the pressure and weight in our common experience are the same thing, and upon this conception of the case our balances and other weighing machines are constructed. The weight is due to the force of gravity which pulls in no other direction than downwards, or towards the center of the earth. Then why can there be any movement sideways or upwards?

If a lot of bricks be piled on top of each other the pressure will be only downward, and there is no tendency in any other direction. But if we try to pile up sand in the form of a column we know it spreads out at the bottom, and thus in this case there is a tendency or pressure sideways. The reason of this can be made very clear by observing what takes place when a few grains only of sand are experimented with. Sand, however, is composed of little rounded pebbles, and it is better for the experiment to take large pebbles or bullets, as they can be better seen. Place two pebbles side by side, and then a third over and between them. The result is that the two are spread apart and the third falls between them; the third pebble has acted like a wedge to divide and push them laterally. Now what takes place in our experiment may by careful observation be observed in heaping a large body of sand.

Take a tube shaped like the letter L and pour in sand at the top and soon it runs out at the side and with a good deal of force. If the tube be shaped like the letter U, and the sand be poured in at one end it will rise up in the other. In these simple experiments we have plain illustrations of lateral and upward pressure. But it will be observed that the sand loses force in moving and that it will not go very far in the horizontal part of the L tube nor rise very high in the U tube. The reason is simply that the particles of sand are rough and the friction stops the motion; our sand needs to have a lubricator. The particles of water seem to be very smooth and slippery, so that none of the lateral and upward pressure is lost by friction, and the sideways and upward pressure at any given point are equal to the downward.

Machines Mediums and not Reservoirs of Power.

One notable fault with most young mechanics is the belief that machinery is a source of power—that mechanical appliances not merely transmit the force first exerted, but increase its power. In fact, this belief is shared sometimes by those of experience enough to know better, and is the source of the enormous waste of ingenuity and mechanical ability shown in the attempts at mechanical impossibilities and especially in the never-ending experiments for the discovery of a perpetual motion.

Mechanical appliances increase our ability to move objects, but so far as they do this they compel a loss in velocity. For instance: By the use of a lever a man may lift a rock which unaided by this simple means he would be unable to move, but if he could lift it without this aid he could move it much more rapidly. The lever is one of the most powerful of the simple mechanical powers. Archimides was not a senseless boaster when he said: "Give me a fulcrum for my lever and I will move the world." Its value may be seen in the common steelyard where a poise of one pound on the extremity of the bar will counterbalance one of a hundred at the end of the shorter arm. The safety valve lever is an example being what is called a lever of the second class, the weight being between the fulcrum and the power. In this device a weight of a few pounds or a spiral spring counterbalances the pressure or weight of hundreds of tuns.

The pulley and the gear, although not often classed as related to the lever, may be considered as modifications of the same mechanical power. The pulley may be called a double lever, having a common fulcrum in the shaft. So the gear acting by its cogs or teeth on another gear may be considered a lever. None of these are motors or originators of power but only conveniences for its transmission. Indeed they do not transmit all the power which they receive, as friction of the parts absorb or divert a certain percentage of it.

The inclined plane is commonly classed among the rudimentary mechanical powers, but this is hardly correct unless we make a double incline, as the wedge, or a spiral incline, as the screw. In fact the lever is at the root of all mechanical powers, and all others partake, more or less of its nature.

STEEL-HEADED RAILS.

We published in No. 4, present volume, diagrams of a new steel-headed rail for roads and of the pile from which it was forged. Rails with steel faces have been used, the steel being simply a plate welded on the top of the iron. They did not prove very successful from the difficulty of making a perfect union of the two metals, and from the fact that the inside lip of the wheel abraded the iron, contributing to a more rapid deterioration. Since publishing the description of the improved steel-headed rail we have seen cross sections of them which show a perfect weld between the iron and steel, which we are informed by Mr. S. L. Potter, the Superintendent of the Wyandotte Mills, at Wyandotte, Mich., is obtained without the use of a flux and the result is secured by the pecular method of making the pile for heating. These rails are steel, not on the upper face alone, but on the sides sufficiently to take the wear of the wheel lips. They are used on several of the western railroads and give perfect satisfactfon. As they cost at the present price of steel only about forty per cent more than iron rails and much less than rails made wholly of Bessemer steel, they seem well adapted to supersede the ordinary rails whenever they are removed. Railroad men who are interested in the subject of steel rails would do well to correspond with Mr. Potter, at the Wyandotte Mills, as above, where the rails are at present manufactured.

The proportion of ammonia contained in rain water is liable to considerable variation. In one million parts of rain water collected in Paris during the last five months of 1851, Barral found 3·49 parts; Boussingault, at Liebfraunberg, in 1852, found only 0·744 parts; Lawes and Gilbert, at Rothamstead, in 1853 and 1854, found the average amount from March to August to be 1·42; from September to February 0·927 parts, or about one grain of ammonia in fourteen gallons of water.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

Explosive Compound.—H. A. Bleckmann, London.—Dated May 10, 1866.—This improved composition is composed of the following ingredients: Sawdust or other particles of wood, or other cellulose substance in a finely reduced or comminuted condition; saltpeter, or nitrate of potassa, and charcoal or carbon, and sometimes ferro-cyanate of potassium. These materials, that is to say, the sawdust or other cellulose substance, the saltpeter or nitrate of potassa and charcoal, with or without the ferro-cyanate of potassium, form or constitute, when mixed together, a compound or agent which will not explode by impact, ramming, or friction, but only by ignition or the application of fire, or very strong heat.

Treating and Applying a Certain Vegetable Plant for the Purposes of the Tobacco Plant.—F. C. Buisson, Natiat, France.—Dated April 21, 1866.—This invention consists in treating the leaves of the tuberous sunflower or Jerusalem artichoke (*helianthus tuberosus*), and applying them to the purposes for which the leaves of the tobacco plant have been employed. The patentee collects the leaves of the tuberous sunflower, dries them, and submits them to the operations to which the leaves of the tobacco plant are ordinarily submitted in order to manafacture therefrom a tobacco for smoking—cigars, rolls, cakes, snuff, or other usual forms. The smoke arising from the tuberous sunflower leaves, when thus heated, is odorous, sweet, and slightly acidulous; it is not acrid, and has no poisonous effect.

Director.—W. G. Grant, Wakeman, Ohio.—This invention relates to a director for inserting a sponge or other similar or suitable pessary into the vagina, to act as a support to the mouth and neck of the uterus, in cases of female weakness.

Chemical Process.—René Cupper, New York City.—This invention relates to a process for the extraction of iodine from sea water, which is accomplished by precipitation.

Chimney Top or Cap.—W. F. G. Beeuwkes, Holland, Mich.—This invention relates to a top or cap for chimneys. The principal object of this invention is to prevent the roof of the building through which the chimney extends, from becoming heated by the action of the heated currents of air and products of combustion passing through the chimney.

Copy Holder.—Charles B. Moseley, and Lucius L. Woolley, Medford, Mass.—This copy-holder is specially intended for the use of compositors, although it can be readily and easily adapted for use by various persons such as copyists of legal and other papers, proof-readers, etc.

Saw Set.—W. A. Alexander, Mobile, Ala.—This invention relates to an improved device for setting saw teeth, and consists of a clamp formed in two parts, one of which parts contains a recess for receiving the saw tooth when it is bent as desired, by means of a lever in the other part, the extent of the deflection of the tooth being regulated by a set screw in the recess, which limits it as desired.

Vise.—James S. Ralston, Indiana, Pa.—This invention relates to an improved plan of construction of a vise for blacksmiths, carpenters, or other mechanics, and consists in an arrangement for opening and closing the jaws of the vise by means of two eccentrics or cam disks placed outside of the jaws on a connecting and operating rod.

Tool for Cutting Boiler Tubes.—Richard H. Burke, New York City.—This invention relates to a tool which is intended to cut off boiler tubes inside the tube sheet, but which may also be used for cutting off the ends of such tubes. It consists of a pipe which contains a conical head provided with slots to retain the cutters, and with a feed screw in such a manner that by the action of the feed screw and conical head the cutter can be gradually fed out as the operation of cutting progresses, and boiler tubes of any desired thickness can be cut with the greatest ease and facility. The pipe, which contains the conical head and the cutters, is provided with a series of sleeves in such a manner that said pipe can be adapted to boiler tubes of different diameters.

Cooler for Coffee and Other Articles.—Jabez Burns, New York City.—This invention consists in an apparatus for cooling coffee as the same is discharged from the roaster, or other articles of a similar nature, by a downward draft produced by a suction blower or other suitable apparatus in such a manner that the smoke and dust which generally rise from the coffee or other article to be cooled, are prevented from filling the room, and all inconvenience and danger of fire arising from that source are avoided.

Roof for Railroad Cars.—John Stephenson, New York City.—This invention relates to the construction of the roofs of horse or street cars, and has for its object durability, a greater convenience than hitherto in shipping cars of this class, and a greater facility and economy in repairing the roof.

Peat Car.—Thomas J. Wells, St. Anthony, Minn.—This invention relates to a new car for transporting peat blocks or bricks from the machine or place where they are prepared to the drying house, where they remain until they become sufficiently dry for fuel. Also, in a novel construction of the car, whereby one person is enabled to load and unload the car, with the greatest facility.

Composition for Coating or Covering Ships' Bottoms.—R. Hamilton St. Helen's Place, London.—Dated April 19, 1866.—This composition is composed of fifty pounds of tallow, thirty pounds of white arsenic, and ten pounds of mercurial ointment.

Treating India Rubber—S. Bourne, Harrow, Eng.—Dated May 3, 1866.—This invention consists in heating india-rubber and india-rubber compounds in the presence of charcoal, by preference animal charcoal, whereby all unpleasant odor is removed from the india-rubber.

Compcsition for Removing and Preventing Incrustation In Steam Boilers.—G. Feasey, Camberwell, Eng.—Dated May 2, 1866.—This improved preparation or composition for removing and preventing incrustation steam boilers is composed, mainly, of carbonate of soda and co on salt, with a small quantity of borax, and sometimes sal ammoniac or hydrochlorite of ammonia mixed with soap, a small quantity being added from time time, to the water in the boiler.

Combined Corset and Skirt Supporter.—Wm. Bacheller, Boston, Mass.—This invention relates to a skirt supporter and corset combined, the said supporter being made of sheet metal or other suitable material molded to fit the form of the person wearing it, and so secured to the corset as to form a part of the same and to be susceptible of being attached and detached at pleasure when the corset is to be washed or cleansed.

Globe Valve.—C. L. Frink, Rockville, Conn.—This invention consists in forming a peculiar-shaped disk by which a person is enabled to hold the elastic packing in globe or other valves in place.

Cultivator.—C. P. Norton, Roseville, Ill.—This invention relates to the construction and arrangement of the several parts of a corn cultivator whereby an efficient and very simple machine is produced.

Life-boat.—William Henry Wylly, Savannah, Ga.—The object of this invention is to provide a life-boat which shall not only combine lightness, strength and durability with safety, but be so constructed that it can be easily transported from place to place overland or on shipboard.

Pump.—J. G. Weisinger, Danville, Ky.—This invention consists in so constructing and arranging the various parts composing the pump as to secure contiuuous suction and thus discharge therefrom in a continuous stream.

Fan Blower.—George W. Bright, Philadelphia, Pa.—The object of this invention is to obtain a blast by the reaction of steam or other elastic substance discharged from the wings of the blower thereby causing them to revolve with great rapidity.

Plant Tray.—Dr. William W. Smith, Montrose, Pa.—This invention consists in forming a box or tray for the propagation or growth and cultivation of plants and flowers either for outdoor or indoor use.

Gold Condenser.—William G. Redman, Louisville, Ky.—This invention consists in constructing an instrument for condensing gold in the process of filling teeth, and for preparing the cavity for filling, whereby the operation is much more perfectly performed than by the old method.