

but an admission of oxygen from the atmosphere by the leakage through the feed or water pipe, may suffice to make the mixture of gases really dangerous.

A case within the writer's knowledge seems to give color to this hypothesis. On a Saturday afternoon the supply pipe of a boiler refused to deliver water, and the engineer prudently drew his fire and stopped his engine. The pump was overhauled and repaired, but, being late, the boiler was not fired up again. On Sunday, twenty-four hours after, the engineer opened the man-hole at the end of the boiler, to see if any damage had been done by overheating. The interior being dark, he introduced a lighted lamp, when an explosion occurred, sending the engineer through a wooden partition ten feet away, burning his skin and scorching his hair.

What did it? Not steam. Was it gas, and if so, how was it generated, and how did it accumulate in a cool boiler? An answer from thorough-going engineers is solicited. We need facts, not speculations; the results of practice, not the vagaries of theory.

PRACTICAL ENGINEER.

Mechanical Distribution of Electricity.

MESSRS. EDITORS:—Your correspondent, Mr. G. Wright, when asserting, page 21, that the established theory is wrong,—which teaches that only the outside of conducting bodies can be charged with electricity,—overlooks the fact that when he brings into the inside of a charged body one end of a conductor, of which the other end projects outside this body, the electric charge must flow towards the outward projecting end, which is now further from the center than the outside of the body itself. This is exactly conformable to the established theory, which teaches that the electric charge is always distributed in such a way that the greatest amount is further from the center of the body, or from the common center of any number of bodies which are in electric communication. Hence an equal distribution takes place only on a globe; in an elongated body it is accumulated at the ends, and more so in proportion that these ends are further apart. Experiments teach that when a body charged with electricity is touched in its interior by a conductor, so small that no conducting portion extends outside, but is attached to a non-conducting handle, then this conductor will receive no charge whatever, in fact this is one of the common lecture room experiments which I have performed hundreds of times, before my classes in physics. On this experiment, and on many other well established facts, the common theory is founded. But when Mr. W. attaches his test ball (in place of an isolating handle) to a small wire, as he states, he of course can not only draw sparks from the inside of any body charged with electricity, but even discharge it entirely, if he keeps the wire in his hand. These facts are familiar to every person more or less acquainted with electrical experiments.

It has never been claimed by electricians, that a body could not be wholly or partially discharged from its inside by a good conductor, which is in electric communication with other conductors outside; and this is all that Mr. W. has done. When he tries the experiment in the right way, and attaches his ball to a glass rod or silk cord, in place of a wire, and then tries to charge his ball by touching alternately the inside and the outside of a hollow body charged with electricity, and then tests the charge of his ball by means of a gold leaf electrometer, he will see the difference, and it will give him a better understanding of the established theory.

The fault is, that our common text books on natural philosophy are not explicit enough on many points, and this gives rise to misunderstandings of different kinds, the best remedy for which is the study of more extensive works, in which we find the results of experiments and researches which it would take us a life-time to find out ourselves.

P. H. VAN DER WEYDE, M. D.

New York city.

Loss of Gas—Wet Meters.

MESSRS. EDITORS:—A correspondent, whose letter is published on page 10, Vol. XIX., of the SCIENTIFIC AMERICAN, says in regard to errors which may occur in wet gas meters:

"When the consumption is large, and the working of the axle easy, a momentum will be acquired by the drum, so that the buckets will be only partially filled as they pass over to the supply pipe. The register records the same as with full buckets."

I think this could never occur in a well constructed meter, as the "vis inertia" of the fluid in which the drum revolves, would always compensate for the momentum which would be acquired by rapid motion. Besides, meters, if properly constructed, will not permit such a rapid flow of gas as would make any assignable error in the rotation of the drum.

S. L.

Brooklyn, N. Y.

Inventions Needed.

MESSRS. EDITORS:—I read your notices of "Inventions Needed," in a late number of the SCIENTIFIC AMERICAN, and was pleased to see you stimulating the inventiveness of the country. In imitation of your example, I wish, with your permission, to suggest one or two machines and inventions which might be of service to the inventor. I expect, at no remote day, to put up an indefinite number of bushels of desiccated potatoes. To prepare them for the dry house they should be washed carefully, so as not to bruise them, and not a few at a time, but by the wagon load, or by machinery. In the next place, they must be cut up into pieces not over three eighths of an inch thick, and all of a uniform thickness, so that the drying process will be uniform. If a machine automatically fed and worked with great speed, and not too costly, can be produced, it will pay. Among the parties producing vegetable cutters, no one has yet struck at an apparatus

of this sort. If any one is produced we would like to try its working powers. Address

C. KIMBALL.

Baltimore, Md.

For the Scientific American.

USE OF RAW AND COOKED FOOD.

The design in cooking food is not only to make it more digestible (many varieties being as easily digestible raw as when cooked), but the principal use of cooking is the destruction of microscopic seeds and eggs, often existing in raw food, which would produce vegetable and animal parasites in the system. The last are called entozoa, and the study of them, with the injury they produce in man, now constitutes a peculiar branch of medicine.

The most interesting of these are two species of the tapeworm, one of them originating from raw pork. Swine are subject to a disease called measles, and such diseased pork is full of the germs of future tapeworms in men. When human beings are thus affected they discharge daily thousands of microscopic eggs. When one of these—which may become dry as dust without losing its vitality—enters the stomach of a pig with its food, it produces again the measles in this animal. This explains why Jews are rarely affected with tapeworms—cooks and butchers often. Even raw beef has produced tapeworms by being cut with a knife also used for pork. Cooking, thorough salting, and smoking destroys the germs, but cleanliness, of course, is essential. It is only at present that the sanitary measures prescribed by Moses for the Israelites have been fully appreciated.

Dr. Fleming, last year, read a paper before the British Association on the prevalence of tapeworm in Birmingham, Eng. He supposed it was caused by the water containing sewage contamination. If this is so, it would appear that tapeworms may be propagated by impure water as well as by unclean pork. It is a hint to us to take precautionary measures to have our drinking water as clean as possible. Without containing germs of tapeworms, it may contain many other impurities and parasitical eggs. Cooking, of course, destroys all these, and this is one of the reasons why the general moderate use of coffee and tea has been universally productive of increased health. Simple water becomes flat and unpalatable by cooking, as the heat drives out all the air which it contains in solution; therefore a perfect filter, or melted clear ice, is the best thing for obtaining good drinking water when it cannot be obtained from a deep pure well or spring, purified by natural filtration.

The trichinæ are another class of parasites, affecting the human system even more frightfully than the tapeworm. They are also produced by the use of raw meat, but there has lately been published so much on this subject that the mere mentioning of it will be sufficient.

The distoma, or fluke, called by the French douve, is a large class of parasitical worms, of which more than two hundred species have been studied. One of them is very common in the liver of the sheep and horse, and infests also the human liver. The polystoma, an allied genus, has also several species, two of which are sometimes found in the human body, one inhabiting the veins.

We will only mention the ligula, which infests the abdominal cavities of birds and fishes, and proves fatal to them; the hydatids, which are often found in enormous abundance in the abdomen of quadrupeds, especially of the ruminant order; the cænuræ, common in the brain of sheep, destroying the animal by pressure on that organ; the different entozoa, by which cats and dogs suffer in different parts of their bodies; and, finally, the snake-like worm occasionally developed in the interior of the eyeball of the horse.

Now, as regards the origin of these animals, spontaneous production is out of the question. Every living being is produced from an egg; therefore, the only possible explanation is, that the microscopic small eggs are taken into the system with the food. When their vitality resists the digestive power, these eggs are absorbed, enter in the circulation with the blood, and are developed at that part of the body where the conditions are favorable for their growth. This idea is verified by the latest microscopic examinations about the origin of the infusoria, by which it is proved that the very dust of the air is full of myriads of eggs of all kinds, only waiting a favorable opportunity to be developed into the corresponding animal.

The most common of all human internal parasites are the ascariæ, of which the largest species have nearly the shape of a common earth worm, attaining sometimes the length of two feet, and cause alarming symptoms. The small variety is very common in children, and is supposed by some to originate from the eggs of flies deposited on or in the food. Most animals of this class are at first worms, the eggs being laid in some dead animal, meat, cheese, or other article, which gives nourishment to the growing worm, which afterward passes through the regular transformation into a fly. When these eggs are hatched in the intestines, under very different circumstances, they are developed into an animal which differs greatly from that developed in the air.

In healthy, vigorous children the digestive powers will resist the hatching of these eggs, and even the worms themselves will be digested, when accidentally hatched or otherwise introduced in the system. Only those of weak digestive powers are subject to worms, and this observation has lately given rise to a different medical treatment successful in many cases of these infantile troubles, namely, in place of administering to the little sufferers vermifuge and purges (which only give temporary relief and do not remove the cause, when this cause is weakness, but even weaken the system still more), tonics and a strengthening diet are prescribed. In this way the primary cause (the weak digestion)

is removed, as in healthy, strong intestines worms cannot exist, but are at once digested.

Occasionally persons are found who have the peculiar notion of frequently eating raw meat and who give it to their children, with the idea that it possesses more nourishing qualities. But, even if this idea be correct, it is more than fully counterbalanced by the perils we have indicated, and experience teaches us that those persons who have apparent good health are subjected to more diseases than others. Freshly cooked food, therefore, is preferable for the reasons above given.

M. D.

Glyphography.

Having recently made trial of the process of glyphography in connection with the reproduction of engraved plates from photographs, and having obtained a considerable measure of success, we shall describe the process, if not in complete detail, at least so minutely as to enable any of our readers to practice engraving by the process in question with a fair degree of success.

A polished plate of copper, such as is usually employed by engravers, is blackened by being washed over with sulphide of potassium, sulphide of ammonium, chloride of platinum, or other means. The plate is then washed and dried, and is evenly coated with a mixture of wax, resin, and sulphate of lead, the thickness of the coating not exceeding a thirtieth of an inch. This coating is white and smooth, and the plate when thus prepared is ready for being sketched upon, or, as was the case in our trials, for being photographed upon. The details of our method of effecting the photographic part of the operation shall form the subject of another communication.

On the figure thus photographed, or traced by pencil, the artist proceeds to make his drawing with little tools like needle points, fixed in wooden handles. These tools should vary in size, or rather in the thickness of point, according to the nature of the work intended to be accomplished. It will be found most advantageous to use tools one side of which has been filed flat, and a curve given to them near the point by bending them while heated in the flame of the gas. Every touch or stroke of the artist should penetrate through the waxy varnish to the surface of the plate, which, being black, reveals every touch—the work thus appearing black on a white ground, in the same manner as if it were effected by pen and ink on white paper.

The coarseness or heaviness of the lines depends upon the tool by which they are cut; hence broad lines require a tool flattened at the point like a chisel. The drawing must be made as in nature, or non-reversed.

When the picture is examined and found to be right, it is dusted over with plumbago, which, by means of a bushy camel's-hair pencil, is distributed through every line and over every part of the surface. Although we find that other conducting substances, such as bronze powders, act better than plumbago, we have very beautiful pictures produced by Mr. Palmer, in which the coating is the same as that here described.

The plate thus prepared is immersed in an electrotype cell, and a thin tissue of copper is deposited on it by the battery. When the plate has been immersed at night, we find in the morning that the deposit of copper is sufficiently thick to allow of its being removed. The battery we use is Smee's, and the depositing solution is the sulphate of copper, rendered decidedly acid with sulphuric acid.

The cast thus obtained must be backed up with soft metal, *sec. art.*, and in this state it will, if printed from as a wood engraving, yield an exact fac-simile of the original drawing.

If it be required to lower broad masses of white, this can be effected in one or other of the following ways:

After the drawing has been finished, and before it is brushed with black lead, paint over the broad masses of white with melted wax, and let the thickness of the mass thus painted on the surface be determined by the area of the white portion, care being taken not to approach too closely to the lines of the drawing. This having been done, proceed with the plumbago as already directed.

Another way by which to lower the broad whites is to take a cast in plaster of Paris from the original plate, and in this cast to lower any part required by means of a suitable gouge-shaped tool. From the plaster block thus trimmed may be obtained, by means of recasting in plaster and stereotyping, any number of metal blocks in a condition ready for printing.

We have in our possession some pictures which have been obtained from surface blocks prepared nearly as described, and which are so fine and delicate as to warrant any person unacquainted with the method of their production in believing that they were printed from engraved copper or steel plates.—*British Journal of Photography.*

Another Invention Wanted.

Some small, neat thing, to be worn with watch seals, or as a ring, or anywise one pleases, with which to cut open envelopes when one receives letters from the post office, is greatly required. What pulling, tearing, looking for knives, scissors, paper folders, or thrusting in of finger nails, or ripping open and rending by main strength, is daily practiced. Some neat, simple, convenient instrument can be supplied and presented that will sell to nearly every body, and I know the SCIENTIFIC AMERICAN will do the business well, if employed.

K.

ELECTRO-MAGNETIC machines are perhaps the least likely of all inventions to supersede the steam engine. The consumption of a grain of zinc, as Mr. Joule has shown, though much more costly than a grain of coal, does not produce more than one-eighth of the same mechanical effect