It is here that the great objection lies to disinfectants which act by oxidation. If we arrange in a series (as set forth in par. 12) the possible substances which may be met with in an infected shed, and gradually mix with them chlorine or ozonized air, we find that those vapors having strong and fetid odors, and which stand at the commencement of the list, are the first to go; while the actual virus of the disease—the organized particles which have no odor whatever—are the last to be attacked. But in using disinfectants of this class, the only test of efficiency which a workman would employ is the sense of smell, and I have on several occasions known it happen that a deodorized shed, to all outward appearances disinfected, was still in reality saturated with infection. It so happens that the stinking gases of decomposition are of little or no danger in the atmosphere, while the deadly virus cells of infectious diseases are inappreciable to the sense of smell. Mere deodorization is therefore no protection whatever.

The following experiment tends to illustrate, if not to prove this:—Cheese mites were put into water mixed with strongly smelling cheese and sulphureted hydrogen. Aqueous solution of chlorine was gradually dropped into the mixture from a burette. The smell of sulphureted hydrogen was the first to go, then some smell of cheese, but it required a considerable quantity of chlorine to kill the mites. Exactly the same experiment was now repeated, only leaving out the sulphureted hydrogen and cheese. The chlorine now had nothing to divert its energy from the cheese mites, which were consequently killed before one-fourth the quantity of chlorine used in the first instance had been added.

Again, oxidizing disinfectants possess little if any continuous action. What they attack is destroyed perfectly, but what they leave has no special resistance to decomposition conferred upon it. They remove the products of decomposition, but they do not take away the power of further putrefaction.

Oxidizing disinfectants produce their effect by actually destroying infecting substances. Antiseptics act simply by destroying their activity. The former act more energetically upon dead than living organic matter. Antiseptics attack first the opposite end of the scale, and destroy vitality; they exert little or no action on the foul smelling and comparatively harmless gases of decomposition, but they act with intense energy on the inodorous germs of infection which these gases may carry into the atmosphere along with them.

If, therefore, the theory which I started be correct; if the matter which conveys infection from one animal to another be of the nature of an organized germ; if it owes its tremendous powers of destruction to the presence in it of vitality, then antiseptics are the only agents fitted to deal with this special case; for they leave almost untouched the crowd of simply odorous gases, and seek out and destroy the one thing to be feared. When I treat of carbolic acid, ample proof of the correctness of this view will be given.

The results of a long series of experiments are given, and the conclusion seems to be that chlorine, chloride of lime, ozone and other substances which have been recommended on very high authority, and almost universally employed, are of little if any value in arresting the spread of the disease, and that the two most efficient substances for this purpose at present known are sulphurous acid and carbolic acid. Among the experiments were the following:—

Other experiments were then instituted in the endeavor to understand more clearly the mode of action of carbolic acid.

IX. Some meat was hung up in the air till the odor of putrefaction was strong. It was then divided into two pieces; one was soaked for half an hour in chloride of lime solution, and was then washed and hung up again; the offensive smell had entirely gone. The other piece of meat was soaked in a solution of carbolic acid containing 1 per cent of the acid; it was then dried and hung up. The surface of the meat was whitened, its offensive odor was not removed, though it was masked by the carbolic acid. In two days' time the bad odor had quite gone, and was replaced by a pure but faint smell of carbolic acid. In a few weeks' time the pieces of meat were examined again. The one which had been deodorized with chloride of lime now smelt as offensively as it did at first, while the piece treated with carbolic acid had simply dried up, and had no offensive odor whatever. It was then hung up for another month and examined; no change had taken place.

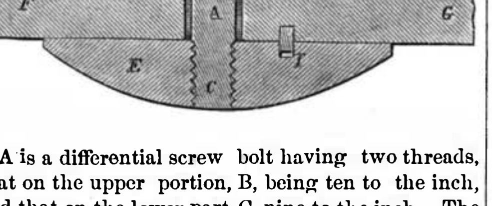
X. A piece of fresh meat was soaked in a 1-per-cent aqueous solution of carbolic acid for one hour; it was then wrapped in paper and hung up in a sitting room in which there was a fire almost daily; at the end of ten weeks it was examined. It had dried up to about one-fourth of its original size, but looked and smelt perfectly good and fresh, a very faint odor of carbolic acid being all that was perceptible. It was soaked for twenty-four hours in water, and then stewed with appropriate condiments and eaten; it was perfectly sweet, and scarcely distinguishable from fresh meat, except by possessing a very faint flavor of carbolic acid, not strong enough to be unpleasant.

These are important experiments. They point out in a striking manner the difference between mere deodorizers and antiseptics. Hitherto attention has been almost entirely confined to the deodorization of gases arising from putrescence. The effect has been combated, while the removal of the cause has received scarcely any attention. Chloride of lime, one of the strongest of the class of deodorizers, acts, as has been shown, only on the gases of existing putrefaction, but it has no influence over the future. Carbolic acid on the other hand, has scarcely any action on fetid gases; but it attacks the cause which produces them, and, at the same time, puts the organic matter in such a state that it never re-acquires its tendency to putrefy.

The same substances that would kill the germs of the rinderpest, would doubtless destroy those of the cholera.

RUGGLES'S SHAFT COUPLING.

There are some mechanical powers which, because of not being of universal or general application, are seldom used and recognized, but which are of a most important and valuable character. Such is the differential screw, which is rarely used, but which, in certain instances, is the strongest grip known in mechanics. This has been applied in the above improvement very effectively. A brief description will easily explain this device.



A is a differential screw bolt having two threads, that on the upper portion, B, being ten to the inch, and that on the lower part, C, nine to the inch. The head, J, of the bolt is six-sided and is flush with the surface of the box. It is seated in the circular recess, K, which is large enough to receive on the end a cylindrical or socket wrench. D is the upper half, and E the lower half of a box made to fit the shafts, F and G. Threads corresponding with those on the two portions of the bolt are tapped in the boxes.

The above is sufficient to explain to any practical man the operation of this device. It will readily be seen that a few turns of the screw will be sufficient to clamp the shaft ends in a grip the power of which is limited only by the strength of the material. Two steady pins, H and I, are inserted in the shaft and project into holes drilled into the coupling boxes to provide against negligence in setting up the screw, thereby allowing the shaft to turn. The annexed engraving is a vertical section.

This is evidently a valuable and efficient coupling. It presents no nuts or bolt heads to catch belts or clothing, obviates the necessity of keys and splining, cannot get out of order, and presents a neat appearance, when turned and polished, looking nearly like the enlargement of the shaft.

This invention was patented April 24, 1866. For further information address S. P. Ruggles, No. 152 Washington street, Boston, Mass.

Useful Plants.

A German author states that the number of useful plants has risen to about 12,000, but that others will no doubt be discovered, as the researches yet made have been completed in only portions of the earth. Of these plants there are 1,350 varieties of edible fruits, berries, and seeds; 103 cereals; 37 onions; 460 vegetables and salads; 40 species of palms; 32 varieties of arrowroot, and 31 different kinds of sugars. Vinous drinks are obtained from 200 plants, and aromatics from 266. There are 50 substitutes for coffee, and 129 for tea. Tannin is present in 140 plants, caoutchouc in 96, gutta-percha in 7, rosin and balsamic gums in 389, wax in 10, and grease and essential oils in 330; 88 plants contain potash, soda, and iodine; 650 contain dyes, 47 soap, 250 weaving fibers; 44 fibers used in paper making; 48 give roofing materials, and 100 are employed for hurdles and copses. In building, 740 plants are used, and there are 615 known poisonous plants. One of the most gratifying developments, is that out of 278 known natural families of plants, there are but 18 species for which no use has yet been discovered

Gun-Paper.

Mr. G. S. Melland, of Lime street, London, who has distinguished himself among British makers of fire-arms, has recently invented a "gun-paper" to supersede the old gunpowder. The invention consists in impregnating paper with a composition formed of chlorate of potash, nine parts; nitrate of potash, $4\frac{1}{2}$; prussiate of potash, $3\frac{1}{4}$; powdered charcoal, $3\frac{1}{4}$; starch $\frac{1}{12}$th part; chromate of potash, $\frac{1}{16}$th part; and water 79 parts. These are mixed and boiled during one hour. The solution is then ready for use, and the paper passed in sheets through the solution. The saturated paper is now ready for manufacturing into the form of a cartridge, and is rolled into compact lengths of any required diameter. These rolls may also be made of required lengths, and cut up afterward to suit the charge. After rolling, the gun-paper is dried at 212 deg. Fah., and has the appearance of a compact grayish mass. Experiments have been made with it, and it has been reported favorably of, as a perfect substitute for gunpowder, superseding gun-cotton and all other explosives. It is said to be safe alike in manufacture and in use. The paper is dried at a very low temperature. It may be freely handled without fear of explosion, which is not produced even by percussion. It is, in fact, only exploded by contact with fire, or at equivalent temperatures. In its action it is quick and powerful, having, in this respect, a decided advantage over gunpowder. Its use is unaccompanied by the greasy residuum always observable in gun barrels that have been fired with gunpowder. Its explosion produces less smoke than from gunpowder; it is said to give less recoil, and it is less liable to deterioration from dampness. It is readily protected from all chance of damp by a solution of xyloidin in acetic acid. The xyloidin is prepared by acting on paper with nitric acid, one part thereof being dissolved in three parts of acetic acid of specific gravity of 1,040.

In experimenting with this new explosive substance, six rounds were first fired with cartridges containing 15 grains of gunpowder, and a conical bullet, at 15 yards range, which gave an average penetration of $1\frac{1}{16}$ into deal. Six rounds were then fired with 10 grains of gun-paper and a conical bullet at same range, and gave an average penetration of $1\frac{3}{8}$ into deal. Here was 33 per cent less of paper than powder, and greater penetration with paper. Six rounds followed with an increase charge of 15 grains of gun-paper and a conical bullet, at the same range, and at each shot the bullet passed through a 3-inch deal. At 19 yards range, 12 grains of the paper, fired from a pistol of 54 gage (44-inch), sent a heavier bullet through a 3-inch deal. A fouled revolver was preserved four days, but betrayed no symptoms of corrosion after using gun-paper. It is expected that gun-paper will be manufactured cheaper than gunpowder.—*London Artizan.*

Growth of Our Navy.

In 1783 our navy consisted of four vessels; in 1815 of 276, carrying 1,636 guns; in March, 1865, we had 684 vessels with 4,477 guns. These comparisons of numbers of ships and guns, however, do not fairly represent our progress in naval power. What comparison can be made between a frigate or line-of-battle ship of fifty years ago, with its wooden sides, heavy spars, dependence upon wind for maneuvering, and battery of eighteen, thirty-two, and forty-two pounders, and a monitor of impenetrable iron, moved independent of wind or tide, and armed with a battery of four fifteen-inch guns!

DEPTH OF MILK FOR CREAM.—A correspondent of the Boston *Cultivator* says that the form of the vessel containing milk, from which it is intended to collect the cream, does not affect the quantity of cream raised. He says: "desiring to test this matter, I took glass cream jars, in which were graduated scales, and set milk at different depths, from 2 to 18 inches. The depth of cream was always in proportion to the quantity of milk."