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TABLE OF CONTENTS.

The Scientific American Supplement

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Imitation Silver on Stone and Plaster.

Take two sheets of mica, and render them perfectly white by boiling in hydrochloric acid, or by the action of fire. Wash and dry, and then bruise them to fine powder, which sift. Mix the powder with very light collodion; and with a soft camel's hair brush, put two or three layers on the object. This coating, as soon as dry, will assume and preserve the appearance of silver.

SPONTANEOUS COMBUSTION.

We noted, recently, a case of spontaneous combustion due to the saturation of sawdust and shavings by boiled linseed oil. The refuse had accumulated under the floor of a carpenter's shop, through cracks in which the oil had leaked, and the first intimation which the occupant of the premises had of his impending danger was a thin wreath of smoke oozing up between the boards. Instances of this kind are exceedingly common; so common, indeed, that it may be fairly believed that a very large proportion of the fires, the immediate causes of which frequently baffle all attempts at discovery, arise from the flame thus insidiously generated. A case lately happened within our own knowledge, where a gentleman, who had left his house for a brief period unoccupied, returned late at night to find the building filled with smoke and his kitchen woodwork in a light blaze. Prompt measures luckily resulted in extinguishment of the fire; and on investigation it was found that a servant had employed a closet shelf as a receptacle for old greasy dishcloths and oily rags used for cleaning furniture. The ignition of such materials, always favored by a slight warmth, was hastened by the temperature of the kitchen, and the rapid oxidation soon determined active combustion.

It has been determined by experiment that a handful of cotton waste soaked in boiled linseed oil, placed in a chamber at a temperature of 170° Fah., will take fire in less than two hours. If raw linseed oil be used, the time occupied is from four to five hours, and with rape oil about six hours. Gallipoli oil takes about the time last mentioned, under 132° Fah. Castor oil, under like circumstances, is very slow; and at the end of two days, waste saturated with it only became a mass of charred cotton. Lard oil produces rapid combustion in about four hours. Sperm oil, on the other hand, refuses even to cause a charring of the waste. Seal oil, of a strong fish odor not unlike sperm, has produced rapid ignition in one hundred minutes, temperatures being as last stated. The heavy oils from coal and shale, being chiefly the higher olefines, have a remarkable effect in preventing oxidation, through giving a certain protection from the air. Mixtures of these oils with 20 per cent of rape oil gave no indication of heat whatever at 170° Fah.; and even seal oil, with its own bulk of mineral oil added to it, did not at 135° reach a temperature sufficient to char cotton.

As a general rule, it may be laid down that spontaneous combustion of refuse, soaked with vegetable or animal oils, will occur whenever the conditions are such that a temperature of at least 175° continues for several hours. Cotton will burst into flame; wool, on the other hand, becomes a blackened mass. Equal weights of cotton and oil produce the most rapid inflammation. Combustion may be checked or stopped by the addition of mineral oil. Wherever vegetable or animal oil (other than sperm) is largely used, therefore, whether for lubricating machinery or oiling tissues, it would seem to be a safe precaution to add to it as large a proportion of mineral oil as possible, if such addition can be made without interfering with the use of the material.

WHAT IS BAD WATER?

There has recently been some complaint in this city regarding the condition of the Croton water, which has appeared muddy in color, owing to its being slightly charged with organic and other substances. As the Croton is normally of exceptional purity and clearness, the presence of the foreign matter excites attention which would not be accorded it were we accustomed to drinking such water as is consumed from the Thames river in England, or from the Mississippi or Monongahela rivers in this country, where muddiness is rather the rule than the exception. In New York, however, we have the satisfaction of knowing that our water supply is undefiled. No town or factory refuse passes into it; and therefore it is reasonably certain that such impurities as may affect it are those due to natural causes, and not to the addition of extraneous matter which may be deleterious to health. But this is not the case everywhere; and in localities where the supply is taken from adjacent rivers and streams which pass through populous districts, any change in the water may bode its pollution to a degree which renders it unfit for human consumption; and indeed, the same result may happen without the water visibly indicating the fact, save by its effects. This trouble has been found seriously to exist in England; and for several years the subject of the river pollution, which is a necessary consequence of the closely settled country and its immense manufacturing districts, has been under examination by government commissions of scientific men.

Among other objects of the investigation has been that of determining what bad water is, or rather at what point, whether through mechanical or chemical impurities, pollution of the liquid may be considered as beginning. In a recent report, Professor Frankland answers the question of what a polluted liquid is as follows:

(1) Every liquid which has not been submitted to precipitation produced by a perfect repose in reservoirs of sufficient dimensions during a period of at least six hours; or which, having been submitted to precipitation, contains in suspension more than 1 part by weight of dry organic matter in 100,000 parts of liquid; or which, not having been submitted to precipitation, contains in suspension more than 3 parts by weight of dry mineral matter, or 1 part by weight of dry organic matter, in 100,000 parts of liquid. (2) Every liquid containing in solution more than 2 parts by weight of organic carbon or 3 parts of organic nitrogen in 100,000 parts of liquid. (3) Every liquid which, when placed in a white porcelain vessel to the depth of one inch, exhibits under daylight a distinct color. (4) Every liquid which contains in solution, in every 100,000 parts by weight, more than 2 parts of any metal, except calcium, magnesium, potassium, and sodium. (5) Every liquid which in every 100,000 parts by weight, contains, in solution, suspension, chemical combination, or otherwise, more than 0·5 of metallic arsenic. (6) Every liquid which, after the addition of sulphuric acid, contains in every 100,000 parts by weight more than 1 part of free chlorine. (7) Every liquid which, in every 100,000 parts by weight, contains more than 1 part of sulphur, in the state of sulphuretted hydrogen or of a soluble sulphuret. (8) Every liquid having an acidity superior to that produced by adding 2 parts by weight of hydrochloric acid to 1,000 parts of distilled water. (9) Every liquid having an alkalinity greater than that produced by adding 1 part by weight of caustic soda to 1,000 parts of distilled water. (10) Every liquid exhibiting on its surface a film of petroleum or hydrocarbon, or containing in suspension, in 100,000 parts, more than 0·05 of such oils.

By the aid of the above, it is easy to determine what streams are polluted and what pure; and when the feeders to the source whence the water supply is obtained are found to be thus contaminated, it becomes a question for the authorities to determine as to the necessary restrictive measures to prevent the continuance of the evil. Of course, a stream cannot be regarded as polluting when, although containing deleterious ingredients in a greater degree than is above laid down, it empties into a source of water supply which is even fouler: so that the question of whether a stream is a means of pollution. and hence a public nuisance, is one of a relative nature, depending on individual circumstances.

A SOCIAL PERIL.

The confession of the Boston belfry murderer, Piper, reveals an instance of a mental condition, the evil results of which seemingly defy any preventive measures that society can devise. It shows us that we have to face a new danger, more insidious and more terrible than are magazines of dangerous explosives located in our midst. We can recognize symptoms of lunacy and put the sufferer under restraint: if not before, at least immediately after he has slaughtered one fellow being; but what are we to do with those who exhibit no symptom of mental alienation, but who kill again and again for the love of killing? Unlike the lunatic who makes no effort to hide the crime, or the assassin who in his cooler moments betrays the work done in the heat of passion, these wretches are destitute even of a twinge of remorse, and their covering of the deed is performed with a coolness and thoroughness to which the murderer for greed or revenge is a stranger.

This man, Piper, confessed to have killed two victims, not because he was impelled to do so by any ungovernable impulse, but for a clear motive of self-gratification; he liked "to see them suffer." It appears that the very heinousness of the crimes has caused the idea that the perpetrator was insane, and should not have suffered the death penalty, a notion we think unfounded and fraught with great mischief to society. There is the clearest possible distinction between the case of Piper and of a man who kills through morbid impulse. True morbid impulse, for example, impels a man to lie in wait for and to murder the person who his diseased deliri ous imagination supposes is about to do him some terrible injury. He is perfectly aware of his wrong-doing, but is so impelled to its perpetration that he cannot avoid it. Now, on the other hand, if while in a delirious state he should act according to his reason, no matter how perverted, and then strike down his victim, there is no morbid impulse; nor would there be any, should he commit suicide to avoid some imaginary impending calamity. Note the distinction which is here thus closely drawn: it lies simply in the fact that the murderer is irresistibly impelled to the deed. He does it not merely because he thinks it expedient for his safety, but because he *must* do it.

Now, in this Boston case, morbid impulse is obviously wanting, although it has been predicated on the apparent absence of motive to the crimes. Here is again an error; for there was a motive of the strongest possible description, namely, that of the love of killing; the same motive which induces a brute to slay its natural prey in infinitely greater numbers than are required for its food, and identically the same passion which, in a less dangerous form, finds its gratification in the combats of gladiators or the deadly fights of animals. It is as easy to imagine that such a passion might gain an ascendency as well as the passion for drink, or any other of those which civilization endeavors to curb and repress. There is no insanity in the case, any more than there is in that of the drunkard or the gambler whom the law looks upon as perfectly responsible for his actions.

The vital question, however, is: How is society to protect itself against this evil? Necessity points to the prompt extermination of those affected with the killing lust wherever detected. Reformatory measures seem unavailing; for who can say that, by preventing a person killing his fellows for a certain time, or by submitting him to a certain treatment, a desire which has almost become an instinct will be obliterated? In any event, while society can afford to risk the relapses of a thief, it cannot those of a murderer; nor can it, by immuring him for life, risk the possibility of future mistaken leniency in the shape of a pardon. This, however, only disposes of those persons actually detected, and prevents their subsequent crimes only. How to protect ourselves, against affected persons whose murderous disposition has not actually been manifested, is a problem which must be solved by eradicating such sources of moral contagion as we know to exist.

Despine, the celebrated French psychologist, records that, during the first empire, a soldier hanged himself in his sen-

try box; soon after, other soldiers did the same, and, until the curious expedient of destroying all the sentry boxes was thought of, the contagion remained active. The same observer points out the epidemic character, at one period, of duelling; and it is well known that, so frequent are suicides from particular high monuments, that especial means are there needed to prevent the crime. Despine considers this due to a moral influence. Bouchut, on the other hand, considers the mechanism of disturbance an external "miasmatic influence." Richardson, the most recent observer, thinks that the phenomena are connected with disturbance, that is, modified motion in the ethereal matter which, according to his theory, changes the living person's organism throughout its entire extent, and is the medium of communication between ourselves and the outer universe. "Through it different centers of the nervous organism can be excited by external forces as readily as they can be by direct organic injuries."

It remains, then, to discover accurately the causes of the particular disturbance which spreads the contagion of murder. In the Pomeroy case, the relation of the boy to his father's calling as a butcher and slaughterer gives us a possible clue to his murderous propensities; and at the same time, it may be suggested that the contagion spread by that boy's atrocities could easily have affected Piper, and perhaps others similarly disposed, and thus another argument is added to that in favor of the death penalty. From the Pomeroy case, the moral danger existing in habituating a person, and especially a child, to scenes of violent death is evident; and without further instance, it may be laid down as a duty of society to protect its members from the effect of such scenes. This would involve stringent laws, imposing more severe penalties than now exist for prizefighting, against wanton torture, killing and mutilation of brutes, and for mayhem, or like assaults of a peculiarly brutal character, on the person; also measures would be needed tending to the isolation of slaughterhouses and the prevention of public access thereto. It is, furthermore, obvious that the present publicity of the death penalty must in a measure defeat its object, since it is an open example of killing, fully susceptible of breeding moral contagion. Therefore, executions should be performed secretly, and the accounts now published to cater to a depraved taste rendered impossible. At the same time, such shows of murderers' and burglars' weapons as one which has recently disgraced a prominent thoroughfare in this city, together with that foul blot on modern journalism, the sensational sheet of criminal news, should be rigidly suppressed.

This much, and perhaps more which further consideration may suggest, society may do. But after all, the principal measures lie in the hands of parents and instructors. It is for them to repress the first manifestations of an abnormally destructive nature, for during early youth that nature is most clearly exhibited; and it is for them likewise to see to it that such sources of moral contagion as society tolerates shall not influence the plastic and receptive minds of those entrusted to their care.

SUGGESTIONS FOR YOUNG MASTER MECHANICS.

It is a great error for a young workman to suppose, because he has mastered enough of his trade to be considered a good hand, and now contemplates starting for himself, that all he has to do is to hang out a sign and people will thereupon rush to employ him. Every man has got to build up two things, first, his education, second, his business. There is no royal road to either. Because a workman has his trade education, it does not at all follow that he can command trade. True, he may have his reputation, and through it may obtain employment under others with ease; but in starting for himself, he should remember this distinction: that he becomes the servant not of one or of a dozen persons, but of the whole public; and for him to prove to the public, who knows nothing about him at first, that he is worthy of employment, takes time and patience. Now, it is usually the case that the young workman has no large amount of funds wherewith to maintain himself during that period of enforced idleness which must follow before sufficient business for his support is secured by him. To expend that amount in high rent, or in tools other than those absolutely necessary, or for costly fittings to the shop, is excessively fool-hardy and rash. He does not know how long he must wait before his period of independence will arrive, and it is therefore the commonest prudence to husband every resource, under the assumption that that period is a very long time in the future. The best policy, then, is to take a small room, just large enough for the purpose of the work to be done, and for the workman not to attempt anything "in all its branches." We never fancied that addition to a sign on a small shop; in ninety-nine cases out of a hundred, it is a misstatement of the capabilities of its owner. Better begin with the specialty that can be done best, and then, as business increases, add on the branches. Get a reputation established for doing one thing extraordinarily well, and it will go a long way toward extending a business to other affairs when the proper time arrives.

Never slight a job, no matter how small and trivial it may appear. People form estimates of ability from small things very frequently, arguing that a workman who attends to *minutiæ* carefully will be likely to produce more important work complete in all its parts. Besides, the favorable impression conveyed by some little action has laid the foundation of many a man's subsequent future.

Be satisfied with small though just profits. Because you perhaps can do a job a shade better than any one in the vicinity, do not be exorbitant. We heard an unpublished story of the great drygoods merchant, Stewart, recently, which is just to the point here. He said he never took advantage of the market but once, and then he had a large stock of a very superior fabric, not elsewhere found. The temptation was strong to run up the price, and he yielded. Despite the high figures, every yard was sold, and he realized two or three hundred thousand dollars. "I thought this a good bargain at the time," he said, "but I afterwards discovered that it cost me two or three millions. I found that people said: 'Stewart has first class goods, but you've got to pay good prices for them.' It took all my efforts to dispel that impression, and I believe it affected all my future business operations."

We would counsel young workmen to be saving, not only of money but of brains. It is a great deal easier to spend money than to get it, and it is easier to forget than to learn. We have great faith in savings' banks, when they can show a good surplus; and in this respect we would advise working men to avoid those institutions that offer remarkable inducements in the way of interest, and to deposit their funds in banks which pay less but which are firmly established. Thousands of New York workmen had their savings swept away recently by neglecting this precaution. Money at reasonable interest increases wonderfully fast, and nothing can make a man feel more independent of fortune than a neat sum, safely stored away, which can be drawn upon in times of emergency.

To paraphrase a well known axiom, "the price of knowledge is eternal study." The world moves. Because you mastered a subject ten years ago, it does not follow that you know all about it now. A person that expects to keep abreast with the times, and especially one engaged in a mechanical pursuit, in which improvements are constantly made, must read, or fall in the rear. Brains can be saved by reading, just as money can be by putting it in the bank. Study scientific and practical books and papers an hour a day; and the accumulation of money at interest will not be nearly so rapid as the growth of your knowledge. We believe more can be learned in half an hour's intelligent study, followed by a thorough thinking over of the subject, than in six hours' steady application. The study can be done out of working hours; the thinking you can do at the lathe or while performing any job which requires no special skill.

Honor your calling, and it will honor you. It is a thousand times better to be a successful mender of pots and pans than an unsuccessful mender of peoples' bodies; better to be able to draw a straight forging than a bad brief; better be able to compose good mortar than a poor sermon. There are plenty of examples of good workmen becoming great lawyers, and inventors, and senators, and presidents; but very few of poor doctors, or attorneys, or clergymen transforming themselves into anything useful at all. It is a pretty safe rule to believe that, in this world, sooner or later, every man finds his proper level; it is only a question of starting low and working slowly upwards, or starting too high and coming quickly down. The one is usually graceful, the other disgraceful; and there is no human task half so hard as regaining a lost position, nor one in which honest work more often fails to commend success.

DRUGGING HORSES.

We have in a previous article called attention to the barbarous practice of drugging horses in order to put them into apparently good condition. The present is the time of year when this most commonly done, both by those having the animals under their care, or by dealers who find that the effects of spring weather have rendered their horses less sleek and plump, and consequently less salable. It therefore is advisable for those who own horses to see that their stable men do not administer condition powders of their own concoction, however desirable it may be that a tonic of some kind in the spring time be administered; and in buying new stock, it would be as well to let bargains pend for a fortnight or so, in order to afford time for observation whenever the animals show suspicious signs.

There are very excellent veterinary surgeons in this and other cities; but the profession is ridiculously small in numerical strength, as compared to the live stock in the country. The last census states that the total number of surgeons is about 1,100, and there are over 8,000,000 horses and mules. There is 1 skilled cattle doctor to every 7,500 horses; or if we take into consideration other live stock, excluding sheep and swine, the average is as 1 to every 21,655 animals. We adduce these figures simply to show the lack of educated veterinarians, which exists throughout the country, a lack which, as every one knows, is made up by amateur doctoring *ad libitum*. There is nothing so utterly pernicious and unreliable as the work of amateur dabblers at professions; and in this very fact exists the short-sightedness of those who entrust the doctoring of valuable animals to men who are absolutely ignorant of the nature and cause of disease and of the proper scientific treatment to be adopted, and even of the anatomy of the animal. If the carriage breaks down, it is sent to a skilled workman for repairs. No one would listen to the idea of a groom attempting to replace the neat forgings. But when the horses break down, then, in nine cases out of ten, the groom's suppositious knowledge is deemed ample security against his working harm by administering drenches and boluses of fearful and wonderful ingredients. An English agricultural contemporary publishes a letter from a country druggist, which sheds some light on this ignorant system of dosing. One man demanded "condition powders" containing 4 ozs. of tartar emetic. Cream of tartar was meant, and the dispenser gave that harmless substance, otherwise the condition powders would have infallibly killed the patient. Another prescription called for 1 oz. of Spanish flies, a frightfully irritating poison. "Again," adds the writer, "the men somehow obtain enormous quantities of sulphate of zinc (white copperas) and sugar of lead, which they afterwards dissolve in water to use as lotions. The substances lie scattered about the stable shelves, and are carelessly mixed with chopped food or mashes, in mistake for condition powders. When we hear complaints of actual horse poisoning, we wonder how it has been done. There need be no wonder. The local druggist could in most instances throw light upon the case."

It is bad enough to dose sick horses by the rule of thumb; but for the drugging of well animals, there is positively no excuse; and if our societies for the prevention of cruelty to animals would open a vigorous crusade against the system, we probably should hear less of it than we now do. It certainly is just as cruel to cause the animal suffering by doses of cantharides or arsenic as it is to drive it when its neck is galled; and as the officers of societies are empowered by law to prohibit the one, they doubtless are equally empowered to check the other. Meanwhile we suggest to those who possess horses that the present is an excellent time to inspect stables, and to destroy all the bottles of stuff and papers of powder sure to be found on out-of-the-way shelves, and of the uses and nature of which a satisfactory explanation cannot be given.

THE KEELY MOTOR DECEPTION AGAIN.

"When it is considered that machines driven by steam rarely or never create a pressure of over 200 pounds to the square inch, the enormous force of the Keely motor, and its immense capacity for propulsion, can be realized. The power will be generated by a vaporizing of water mechanically, and without the agency of heat. The expense of fuel will thus be saved. Those interested claim to have been misunderstood in saying that a pint of water only would be needed for the propulsion of a train of cars between this city and Philadelphia and back. They meant that if five gallons were used for an engine of 100 horse, a pint only might be lost by vaporization through the pores of the metal. None at all might be lost. *The water, after being vaporized, and passing through the various tubes and chambers, does its allotted work upon the engine, is recondensed into its former state, and, again becoming vaporized, starts again upon its mission of mighty pressure.*"

The foregoing we clip from a recent account of the Keely motor obtained by a *Sun* reporter, at the factory of Messrs. Sergeant and Cullenworth in this city, where a 100 horse power apparatus is alleged to be in process of construction. The italics are ours; and in the sentence thus emphasized, the claims of the deluded believers in the trick are reduced to a point to which, sooner or later, we always considered they must come. It scarcely needs any explanation to prove that the above is simply an assertion of the possibility of the perpetual motion; and that after all, those engineers who have committed themselves to Keelyism stand before the world in the professionally unenviable position of upholding the actuality of that mechanical *ignis fatuus*.

There is no simpler principle in Science than that whatever work is spent in moving a body, through a certain course in one direction, is exactly regained by letting the body return along the same track, friction being avoided. And this is true for every case of natural law. The Keely motor, according to the above, performs two operations, one by which the water is vaporized, the vapor acting on a piston, and the other involving the work which recondenses the vapor. Obviously the work (no matter what its nature may be) required to vaporize the water, acting in one direction, is precisely equal to the work required to condense it, acting in the other direction, other circumstances being equal. Therefore work, drained off to impel other machines, comes from nothing, and the apparatus reduces itself to a self-sustained continuous mechanical motive power. In simpler terms, it is the long-sought problem, exemplified in its simplest form in attempts to lift one's self over a fence by one's boot straps.

Both criticism and speculation regarding the Keely motor must here terminate; for in this enlightened age, no thoughtful person can waste time on that which is so obviously a chimera, unless to contemplate the curious phase in the human mind which sets at naught the dicta of mechanics and mathematics and the admitted laws of Nature. As regards those who have been deceived by the juggle, with its attending fog of unknown forces etc., we can best quote from the preface of Dirck's work on the *Perpetuum Mobile* "The theoretical and practical engineer, unhappily led away by this substitution of prolific fancies in place of sound judgment, is the last person to be convinced by the most obvious obstacles to success in the fulfilment of his views and statements. To himself, all his opinions stand for realizable objects. We cannot avoid having some, though a very chastened, sympathy with such enthusiastic projectors, who would seem to pride themselves on the strongly expressed notion that 'genius to madness is near allied.' It is unquestionably in such cases a constitutional weakness, ill fitting its possessor for that calm, cool, reflective character which alone commands confidence and secures respect."

How to Make Small Racks for Gears.

To cut small racks, to fit pinions made from pinion wire Secure the blanks, on which the teeth are to be cut, in slots cut in a mandrel of large diameter. Put the mandrel in a lathe, and arrange the screw gears to cut a thread of the same pitch as the teeth in the pinion; and with a tool of the proper form, cut the teeth in the blanks. The pitch of the thread will not be appreciable if the racks have a narrow face.