Correspondence.

Wanted—An Ink That Will Not Fade.

To the Editor of the SCIENTIFIC AMERICAN:

If some one will invent a permanent typewriter ink he will do the business world a great service and probably a good business stroke for himself. Aniline ink is apt to fade if exposed to light. A lot of typewritten matter was stored in a slightly damp vault for six months. On removal the paper and gall-ink signatures were in best of condition, but all trace of typewriting had disappeared. A letter book was wet with water (not chemicals) in extinguishing a fire. The signatures were all that remained of the hundred pages of correspondence. STENOGRAPHER.

Milwaukee, Wis., February 4, 1903.

Dust—Is it Dangerous?

To the Editor of the SCIENTIFIC AMERICAN:

When the maid chases the dust round the room with a feather duster, she might as well be throwing chips to the wind so far as any good can come from it. Our brooms are nearly as bad, for all the fine dust—the kind that does harm—goes up into the air and escapes the dust-pan, to come down again after quiet is restored. Carpet sweepers are a slight improvement, but they do not sweep clean; some carpets require the strength of a good man with a broom to get the dirt out of them. If this is true, there is a great field for the inventor to produce a sweeper that will be sanitary; it must swallow all the dust.

It is quite important to know what dust consists of to be able to judge as to how healthy it is, and for this purpose many analyses have been made, leaving out factory, grain thrashing machine, and country road dust. We will take ten liters of air for a basis; in the Boston City Hospital the number of living bacteria was found to be nearly 450, and of molds 225. In a model New York hospital, where everything is supposed to be clean, and all the attendants are thoroughly drilled to fully understand what the word *clean* means, 12 living germs settled on the disk, and after sweeping 226. In a New York tenement house carpeted living room, 75 living bacteria settled on the disk in an exposure of five minutes; after sweeping, 2,700, and mold settled on a plate or disk three and three-quarters inches in diameter.

Using the same basis for outdoor analyses, in ten liters of air in Central Park, N. Y., 500 were found; in downtown streets, 965, and where the street sweepers were at work 5,810 living germs were found in the small space of three and three-quarters of an inch in a five minutes' exposure. Certainly not very healthy air to breathe.

Just how unhealthy and bad such air is will be left for the reader to guess at. One-half a liter of air (about 30 cubic inches) is what a man takes in every time he breathes, and if of weak lungs, he takes less, but always enough of the dust-laden air that may contain one or more tubercle bacilli, which may pass the many guards nature provides to prevent it, and settle in his lungs. Consumption follows. Nearly one-fourth of all deaths are from consumption, principally distributed by dust. Diphtheria, smallpox, yellow fever, Asiatic cholera, typhoid fever, scarlatina, measles, pneumonia, erysipelas, blood poisoning, etc., are among the diseases often disseminated by invisible dust particles.

The expectoration of a consumptive may contain millions of germs. Falling on the sidewalk of a city, it is soon tracked over a large area and gradually mixed with the dust; the same on the street, especially on asphalt pavements, where each wheel acts as a millstone, grinding everything into the finest powder, to be raised by passing vehicles into the air and sent into thousands of healthy lungs.

These conditions are reversed when it rains; the disease germs are washed into the sewers, and rarely, if ever, get a chance to enter into the air again as dust; then why not imitate rain, and sprinkle the streets? There exists even among well-read people a notion that sprinkling of the streets is unhealthy. A clean street thoroughly sprinkled cannot be unhealthy, and a dirty street is certainly less dangerous to health in a state of mud than if the mud was converted into dust, to be carried into our systems, our houses, and our clothing.

City streets should be kept scrupulously clean by hand labor, preferable to machines, and thoroughly sprinkled from four to ten times a day, according to the amount of travel and the condition of the atmosphere. No street used for general traffic can be kept perfectly clean, that is an impossibility; then do the next best thing. A street cleaned once or twice a week cannot be very clean. A man with suitable tools, according to the pavement, should be given as much territory as he can cover from five to ten times a day, removing the droppings at once before they are ground into dust. A sprinkling wagon should keep it damp enough to keep the dust from rising; the wagon should also have a hose attachment, so that a man or boy can wash the dust from the sidewalks at least three times a day. Asphalt pavements require more sprinkling than other pavements, but it is not necessary that they be constantly wet, for the reason that after sprinkling, the dust and dirt form a paste that will not again rise in dust, even if the pavement looks perfectly dry, until the wheels have again pulverized it into powder. Horses do not slip on wet pavements when they are *clean*; the dirt makes them slippery. The first few drops of fine rain or dew sometimes cause trouble, but the heavier the rain or sprinkling (from cart), the better on asphalt. If asphalt pavements contain the proper ingredients to effectually shed water, no injury can come from any amount of rain or sprinkling, in fact the more the better; if, however, any water is absorbed, as is shown by a spot that does not dry at once when the rain stops, such spots soon become holes, especially in fall, when frost gets at them.

Municipal corporations should furnish all the water free, from a sanitary point of view, to anyone who is willing to hold a hose or employ a cart to sprinkle walks or streets. Whenever a village grows out of barbarity into civilization, they close their wells, build waterworks, and employ sprinkling wagons—drink pure water and stop eating dust.

Country air may contain only 200 particles of dust per cubic centimeter, while that of large cities may run up to 150,000, and in tenement houses as high as 1,000,000. These particles consist of sand, soot, cotton fiber, pollen, fine hair, pulverized excreta of animals, parts of seeds, bacteria, molds, etc. Most of these of course are perfectly harmless, except when they are too numerous and irritate the respiratory organs or contain the live germs of contagious diseases.

Our modes of ventilation, so far as dust is concerned, are as crude as our way of chasing the dust from one place to another with dusters, instead of catching it with damp cloths and damp brooms. The only pure air is so far above us as to be practically out of reach, but some day there will be a trust organized to supply dwellings with *pure* air, as we now imagine we enjoy pure water.

C. D. ZIMMERMAN.

Buffalo, N. Y.

Does Water Extinguish or Feed a Fire?

To the Editor of the SCIENTIFIC AMERICAN:

It seems to me about time that the practice of using water in trying to extinguish fire in buildings should cease. Why use an element that assists combustion, in trying to destroy combustion? In theory, water destroys fire very well, in practice it does not, owing of course to the impossibility or reaching the flame, thus feeding the same and adding to the danger. What a magnificent chance for inventors to bring out something practical to destroy fire, and also a way to apply same, so it could be used by anyone, and not require an expert. F. N. DAVIS.

[The proposition of our esteemed correspondent is interesting, and if feasible should lead to valuable results. We are not able, however, to assent to some of the positions of his letter. We are aware that there is a popular impression that water thrown upon a fire assists the conflagration under certain conditions. We, however, are also aware that chemists do not consider this to be a fact. Water cannot feed a flame unless it is separated into its constituent gases, oxygen and hydrogen. Water is the most destructive to fire of any liquid which can be commanded in sufficient quantities for such a use, since it contains all the oxygen it can hold. The question, then, resolves itself into this: Can water discharged upon a fire be separated into gases so as to feed the flame? The probabilities are decidedly against this. Water is every day separated into its constituent gases in all our cities in the making of water gas, as it is called, so that the problem of accomplishing this is well understood. For the beginning of dissociation a temperature of 2,200 deg. F. is required. The dissociation is complete at 4,500 deg. F. It is very safe to say that these temperatures are not possible in the open air. The blast furnace will give a temperature of 3,300 deg. F. In a confined space, as in a water gas plant, anthracite coal under a blast of air will pass the temperature required for dissociation; but with nothing to prevent the escape of the steam there is no reason to suppose that it can be made hot enough to dissociate it, and so there is no reason to believe that any open-air conflagration was ever fed by playing water upon it.

The only substance besides water to be used for putting out a fire is carbon dioxide, a gas most efficient for this purpose. It is the basis of all chemical fire extinguishers. The difficulty in its use is to place it where alone it can be of service, at the very base of the flame. The strong ascending currents of hot air divert the stream of carbonic acid gas, and it does not easily accomplish its object.—ED.]

Suggestions Regarding the Metric System.

To the Editor of the SCIENTIFIC AMERICAN:

The objection to the metric system of measurement for common use, is that its subdivisions are odd and do not give the even or binary divisions of quarters, eighths, sixteenths, etc. The division of the centimeter into ten equal millimeters is for many purposes entirely unsuitable.

It is precisely similar to our subsidiary coins. In strict adherence to the decimal system, the next denomination below the dollar is the dime; but if we had no intermediate coins, we should find the decimal system of currency very inconvenient for practical purposes. The half and quarter dollar coins are very necessary; and although they are entirely foreign to the decimal system, their use detracts nothing whatever from it.

The metric system possesses all the advantages of our decimal system of currency; but in order to make it available for general use, it should be modified in the same way; that is, to divide the centimeter into halves, quarters, eighths, etc., same as we now divide the inch. The 1-32 centimeter is a little smaller than our 1-64 inch. This subdivision of the centimeter will correspond with the halves, quarters, etc., of the decimeter, and also of the meter.

For some uses, the millimeter divisions are necessary, and rules should be made with the binary divisions of the centimeter on one side or edge, and the millimeter on the other. Rules three and six decimeters long would be nearly the same length as our one and two foot rules respectively.

This slight modification would make the metric scale as convenient and acceptable as our foot rule, while retaining all the advantages of the metric system. LEVI ORSER.

Galveston, Tex., March 19, 1903.

The Duodecimal System.

To the Editor of the SCIENTIFIC AMERICAN:

Regarding the suggested "duodecimalization" of our arithmetic and weights and measures proposed by Mr. Reeves, I wish to state that few practical men have ever been guilty of proposing to substitute a duodecimal system of weights and measures without a similar change in our arithmetic. The inconvenience in calculation would be very great, and no compensating advantages would be felt unless our arithmetic were changed. To abandon our decimal system of arithmetic would be as impracticable as to adopt Volapuk. Our decimal arithmetic is like our language, a universal inheritance of the race; and the metric system is the further extension of the decimal plan already applied to our arithmetic and our coinage. The metric system is evolutionary; a duodecimal system would be revolutionary.

James Watt, the inventor of the steam engine, proposed the *decimal* division of the pound; Thomas Jefferson suggested a *decimal* system of weights and measures; John Quincy Adams favored the *decimal* base. Abbe Gabriel Mouton (in 1670) first proposed a universal *decimal* system. Note that all the proposals of the great practical metrologists have been for the *decimal* system. The unanimity of this point resulted in the establishment of the metric system, conforming to our arithmetic and our coinage. This system involves neither the introduction of strange numerical symbols nor the readjustment of our arithmetic as would a duodecimal system. The adoption of a duodecimal system would multiply the inconvenience of learning weights and measures, whereas the metric system would simplify it, because no special arithmetic is required, and our computations are cut short about fifty per cent, and our arithmetics could be reduced to two-thirds their present size by omitting the present sets of tables.

When we have a duodecimal arithmetic, it will be time to talk of changing our coinage, and our arithmetic, and our weights and measures to that system. The present movement for the adoption of a metric system would result in a maximum gain with a minimum of inconvenience. The simplicity of a single ratio in all commercial calculations, accounts, measures, and numbers is so obvious as to appeal to every one who thinks. Lord Kelvin states that instead of involving confusion during the transition, the reverse happened in his own establishment; that the adoption of the decimal system was a convenience from the very first.

Our country has been very slow in accepting the metric system, largely through ignorance of the metric system, but partly because of the inconvenience of making the change. Surely it would be folly to expect that we would accept a reform which is a hundredfold more sweeping, and the results of which are doubtful. Why not accept first a reform the practical value of which has been tested in all civilized countries, and proven beyond doubt by the forty nations who have already adopted the metric system?

January 21, 1903. N. Y. HUBBARD.