Correspondence.

Size of Chimneys.

To the Editor of the Scientific American:

On page 396 of SCIENTIFIC AMERICAN, vol. xlvii., query 8, H. N. asks for the proper size of a smoke stack. The boiler is 3½ feet in diameter and has forty 2¼ inch tubes nine feet long.

The query and your reply open quite a little field for profitable investigation. Your reply is, "At least 20 inches diameter," and yet your reply is based upon no rule. "There is no rule." Allow me to inquire if experience has fixed the size of the smoke pipe at that particular figure for a boiler of that description? It seems to me there ought to be a rule, and that such rule should be founded in reason. Experience teaches a dear school, and it has been my lot to learn or to invent a rule from this school of experience at a cost of some thousands of dollars. Why should the smoke pipe be twenty inches in diameter? The area of the forty tubes is 159 square inches. Is there any reason why your draught should "be cramped in the tube"? "Cramping" your draught destroys it. The sum of the areas of the tubes is 159 square inches. A smoke pipe 20 inches in diameter contains 314 square inches. Why have more room in the smoke pipe than in the tubes? The gases in passing through the tubes become cooled, and consequently reduced in volume. If you now put them into a pipe of twice the capacity, you largely increase the radiating surface, and hence the heat of the gases in the pipe are more rapidly cooled than they would be in a smaller chimney. The difference between the weight of a column of the gases inside the chimney and of a similar column of air outside is the cause of *any* draught. Hence the theory that the flue may be gradually decreased in size as the temperature of the gases decreases from the fire box to the top of the chimney, thereby giving a uniform motion to these gases through the boiler and smoke stack. Again: The more heat you can get into your chimney, the the stronger will be your draught. The less radiation *in* the chimney, the better the draught. For this reason a good brick chimney is better than any iron chimney.

I have a rule which it was necessary for me to devise, and which is based upon the principles of reason which I have here given. The air space through the grate bars should be only one half the area of the tubes, and I make the chimney the same area as the sum of the areas of all the tubes, and make no wider or larger spaces in the flue after passing the tubes than the sum of the areas of the tubes. Let the fire box be no larger than is necessary to build such a fire as may be supplied with air with strong velocity through the grate bars, and whose gases can pass through the tubes without being "cramped" without too rapid motion.

Tubes may be so long as to destroy any possible draught. My recollection is that nine feet is pretty long for a 2¼ inch tube. They should never be longer than is necessary to take such amount of heat from the gases only that the remaining heat in the chimney will produce the desired amount of draught.

HENRY BAXTER.

[We agree with you in your reasoning about chimneys. There are plenty of rules for smoke chimneys, but no two agree. The size of the chimney was given for supposed consumption of fuel on the grate, and with no reference to the tubes. If the builder chose to put in four tubes instead of forty it would not alter the proper size of chimney for the grate.—ED.]

An Appreciative Reader.

To the Editor of the Scientific American:

I have taken the SCIENTIFIC AMERICAN for ten years and the SUPPLEMENT from No. 1 up to the present. I have all my papers from the time stated, neatly bound and put up in a case, with the number of volume on the back of each. And I would not take one hundred dollars for them, as they are of unlimited value to me, and have proved so hundreds of times. I believe if it were more generally known how much one year's numbers of the SCIENTIFIC AMERICAN contain of real valuable matter to the mechanic few would be without it. I am not a man of wealth, but if your paper cost $10 a year I could not afford to be without it, and would not.

W. S. HARRIS.

Croton Falls, N. Y.

How to Lacquer Brass.

To the Editor of the Scientific American:

I notice in your issue of December 30, 1882, page 424, No. 6, Notes and Queries, that J. A. is in trouble with some lacquering, and being in that line of work myself, think some suggestion by me may help him.

LACQUERING BRASS.

1. Be sure there is no oil or grease on the brass; do *not* touch the work with the fingers, hold it with spring tongs or a taper stick in some of the holes.

2. *Always* handle with a piece of clean cloth.

3. Heat the work so hot that the brush will smoke when applied, but avoid overheating, as it burns the lacquer.

4. It is well to fasten a small wire across the lacquer cup, from side to side, to scrape any superfluous lacquer. The brush should have the ends of the hairs all exactly even. If not so, trim the ends with sharp scissors.

5. Scrape the brush as dry as possible on the wire, making a flat smooth point at the same time.

6. Use the very tip of the brush to lacquer with, and carry a steady hand.

7. Put on at least two coats. It is well (to make a very durable coat) to "blaze off" after each coat, with a spirit lamp or Bunsen burner, taking care not to overheat and burn the lacquer.

8. If the lacquer is too thick, it will look gummy on the work. If too thin, it will show prismatic colors. In the first case, add a little alcohol; in the latter, set the cup on the stove and evaporate some.

9. A good deal of cheap work, like lamp burners, is "dipped." Use a bath of nitric and sulphuric acids, equal parts, dip work, hung on wire, into acid for a moment, remove, rinse in cold water thoroughly, dip in hot water, remove, put in alcohol, rinse around, then dip momentarily in lacquer, shaking vigorously on removing to throw off extra lacquer and lay on a warm metal plate till dry, let cool, and it is done.

10. Avoid handling lacquered work until *cold*.

Q. Y. X.

Newton Center, 1883.

Protection of Theaters against Fire.

The following is an abstract of an address by Edward Atkinson before the Boston Police Commissioners:

I am not familiar enough with the condition of theaters, behind the curtain, to be able to say that the use of automatic sprinklers above and around the stage should be made compulsory upon your part. I am informed that theatrical managers think the use of this system impracticable, even if desirable, and it is for that reason only that I qualify the opinion submitted. It is a question of fact very easily determined. This much I do say, if there are no special reasons against the use of automatics as an additional safeguard against danger from fire, although not as a substitute for any other appliances, no well-managed theater can afford to be without them. I would advise every theatrical manager, and every person interested in saving either property or life in theaters, to visit Providence and attempt to burn the combustible building which has been set up by the Providence Steam and Gas Pipe Company for purposes of experiment.

Let me state to you the course which I have taken with many men insured in the factory mutual company of which I have charge, who have been as skeptical in regard to the automatic sprinkler as, I believe, theatrical managers are at this time. When I advise them to protect their premises with these additional appliances, after having required pumps, hydrants, hose, pails, and buckets, and have then advised more buckets and pails, and after a sufficient supply of buckets, more pails, and then more buckets, all to be kept constantly full of water—and when I find them still doubtful as to the expediency of spending more money for self-protection, I give them this advice: "Go to Providence, and burn Mr. Grinnell's building if you can;" and this is what usually happens: The experimenter builds a fire upon the wooden floor of this combustible wooden building, of such a sort that he feels absolutely certain he will burn the building; he then sets it on fire, and steps to the door, remarking, "That building is gone up, dead sure." He waits thirty seconds, and then turns round to Mr. Grinnell with this further remark: "I am ready to sign a contract for the protection of every part of my premises with your sprinkler, whether Atkinson says so or not." The interruption in the course of his thought, by the extinction of the fire in that half minute, has sufficed to convince him that the automatic will put the fire out. If these gentlemen representing Boston theaters will go with you to Providence, and try this experiment, I think you will have no occasion to pass a compulsory ordinance.

Since you asked me to appear before you, I have requested leave to go upon the stage of the Boston Museum, and after examining their appliances for extinguishing fire at the first instant of its appearance, by the use of their system of perforated pipe sprinklers, together with their rules whereby the turn of the valve at the right instant, in case of fire, is as well assured as any act can be by human prevision and action, I concluded that such care and good judgment had already been taken by the managers of that theater for the protection of life, utterly irrespective of any question of property, that I concluded it might be unreasonable to compel the managers of that theater to add the automatic system to what they now have, against their own judgment. They have been moved by influences, deeper than any city ordinance, to do what they believe to be necessary and adequate. It would certainly be unfit to compel them to substitute automatic sprinkling for their present system of perforated pipes worked by means of valves; but I believe Mr. Field will himself decide to add the automatic system as quickly as a proper plan can be adapted to the conditions of a theater, so soon as he has tried the experiment in Providence, which I recommend to him and others.

In view of the fact that there may be some conditions in theaters so different from those of factories as to make it difficult to adjust the automatic system; I am only perpared to advise to this extent, that you should require the use of an adequate system of sprinkling, either the perforated pipe adjusted like those in the Boston Museum, or the automatic system, if it proves to be feasible, in every theater licensed in this city; and I think you will not completely fulfill the duty which you owe to the citizens if you fall short of the enactment of such an ordinance.

May I now be permitted to suggest an additional ordinance for the adoption of automatic sprinklers in some other premises. Referring to the late fire in Lovell's gun shop upon Washington Street, where the fireman were perhaps exposed to greater danger from the explosion of the cartridges than they were from the danger of the gunpowder kept in stock, I beg to suggest that gunpowder and cartridges might well be kept in stock in a chest, built of light pine wood incased in tin, and placed where it could be readily removed in case of need. A small chest would suffice for the gunpowder alone. Connected with this chest there should be a city water pipe, fitted with an automatic valve on the outside, which would be released by the heat of a fire in any part of the shop, whereby the chest would be filled with water, and after being thus filled, the continued flow of water would be over the outside. The place for such a magazine should be close to a door or window and under a brick arch, sufficiently strong to resist the falling of timbers or walls upon it, so that the chest might not be broken if circumstances prevented its removal before the complete destruction of the building. Such a chest, made of pine wood protected with tin, would be light and strong, and very much safer than iron. Iron is one of the most treacherous of all substances under fire, and the building act ought to prohibit such use of cast iron girders as is now not uncommon. I should also think it would be expedient to require automatic sprinklers in all shops or premises in which fireworks are made or kept in stock for sale.

The work which has been done by automatic sprinklers in saving mill property from loss, where fires have actually occurred under the most dangerous conditions, has caused the mutual underwriters to press for their adoption throughout the premises insured by them, which had not been previously protected in full by the old fashioned perforated pipe sprinklers. We do not think it reasonable to compel our members to change or substitute the automatics for perforated pipe, but some of them, perhaps the most judicious of the number, are doing this without being asked by us in the more hazardous part of their works. Had the mill lately destroyed by fire in Fall River, been protected by self-operating automatic sprinklers, it probably would have been saved; it was not saved by the perforated pipe sprinklers, because the valves were not judiciously worked at the right time.

Carbamide as a Substitute for Quinine.

The *Journal d'Hygiene* learns from Gen. Kokhowski that Dr. Belvousoff has discovered an efficient successor for quinine. Belvousoff, Prosector at the University of Kharkoff, presented his memoir before the Russian Commission of hygiene on the 5th of October last, recommending carbamide, the rational formula of which is

$$\left.\begin{matrix} CO \\ H_2 \\ H_2 \end{matrix}\right\} N_2,$$

as the substitute for quinine.

From experiments made in the hospitals, the following results were obtained: 1. That in cases of intermittent fever carbamide acts as a specific. 2. That this remedy can be employed in many other complaints to reduce the temperature of the patient; it is, moreover, without taste, and does not depress the nervous system.

This action of carbamide is easily understood in the light of the latest researches on uremia. It is also well known that in southern Russia and Montenegro the peasantry are accustomed to cure themselves of intermittent fevers by the use of urine as a medicine.

Belvousoff has also shown that carbamide instantly kills the lower organisms, such as bacteria and vibriones, just as quinine does.

From an economical point of view, says the writer, the discovery is very important, as carbamide is much cheaper than quinine.

[Carbamide, or *urea*, can be obtained from urine, but is usually made by the action of cyanate of potash on sulphate of ammonia.]

Railroad Law.—Railroad Track in a Street.

The owner of lots on a street in Denver, upon which he had erected a hotel and dwelling house, sued the Union Pacific Railroad Company to recover damages for the injury to his property by the laying of its track in the street. This track was put down 18½ feet from the pavement and above the level of the street, so that wagons could not freely pass to and from the houses. The company set up as its defence that the track had been laid by virtue of an ordinance which granted it the right of way through the street. The plaintiff recovered a judgment for $1,850 in this case—Malandin *vs.* Union Pacific Railroad Company—in the United States Circuit Court for Colorado. Judge Hallett, in the opinion, said: "The right and interest of the plaintiff in the street in front of his property is secured to him by section 75 of the Bill of Rights of the State constitution, which declares 'that private property shall not be taken or damaged for public or private use without just compensation.' It has been said that property cannot be 'taken' within the meaning of that provision except by an appropriation of the land itself, but no such limitation is applicable to the clause relating to damages. The beneficial use of plaintiff's estate embraces the right of ingress and egress, which cannot be withdrawn or obstructed without substantial damage to it. The use of the street is therefore a right of property in plaintiff, which, if not 'taken,' is certainly 'damaged,' within the meaning of the constitution, by the act of defendant in building its road through the street."—*Baltimore Day.*