end of the pipe being fitted with a blind flange. This being the main suction pipe, branches are cast on at certain intervals and pipes fitted thereto in connection with the main sewer, or still smaller pipes in connection with each drain from the houses. These should be smallest nearest the fan, and varying in diameter to the extreme end of the main suction pipe. We consider that, by this arrangement of graduated main and feeders, the draft would be equalized throughout the entire length of pipe.

When it is desirable to lead a pipe from the main into each house drain, it must be placed between the sewer and the trap, fitted to the drain pipe. These feeders must be small in diameter, so that their combined area does not exceed the area of the suction pipe, as likewise to embrace as many house drains as practicable. For the sake of illustration, we will take all the feeders of a uniform diameter of ½-inch. The area of the 30 inches suction pipe is 706 square inches, and as the area of one-half an inch is .196, it will require 3,600 feeders to make up the area of the 30-inch suction pipe, or, in other words, 3,600 house drains will be in communication with the suction fan. As the fan discharges 25,000 cubic feet per minute, each feeder would be drawing from the sewers, say, 6,94 cubic feet per minute, or 416 cubic feet per hour. Thus it will be seen that the sewer air would be gently drawn out over the entire area to be ventilated.

We will now assume that a street contains 320 houses to the mile, the houses, of course, being on each side of the street. As there are 3,600 house drains to be ventilated, the total length of the street would be 11¼ miles. This shows the capability of a suction fan discharging 25,000 cubic feet of air per minute. We consider this arrangement of small feeders extends the area to be ventilated. Were the feeders 1 inch in diameter, more air would be drawn through each, but there would be only 900 house drains ventilated, and the mileage would be reduced in proportion. In another arrangement, larger feeders are fitted to the main suction pipe and placed in communication with the main sewers. These pipes would be placed further apart than the former arrangement, and graduated from a small diameter at the end nearest the fan, and increasing in diameter toward the extreme end, thereby tending to equalize the draft throughout the entire range of piping.

In some situations the main sewers may be of sufficient capacity so that the suction pipe could be hung from the roof. It should be pierced with holes at certain intervals, which would act as feeders, drawing off the gases immediately over the parts when generated, and we consider all new works should be so arranged when practicable.

In the meantime, we have to deal with existing arrangements. In some towns steam-power would be preferable for driving the fan, and in other towns water pressure may be adopted. In laying down this proposed pneumatic mode of ventilation, a central situation must be chosen. The area to be ventilated we will assume to be four square miles. A powerful suction fan must be erected centrally in that area and placed in connection with a circular suction box, from which the various suction pipes would diverge. These pipes would be arranged through the main streets and cross streets, in a similar arrangement as for the distribution of gas for lighting purposes and the feeders carried into the house drains, or in direct communication with the sewers in the same way as the small gas pipes are taken into our houses. The one system of piping is identical with that of the other; the gas from the gas works is delivered under pressure; the pneumatic method of ventilation supplies air to our sewerage systems by the exhaustion of a large volume of air drawn out of a system of piping, which, if properly arranged, cannot create negative pressure in the sewers, and which we consider would prove a great blessing to the community at large, by the thorough ventilation and purified dispersion of sewer gas carried up high chimneys, far overhead.

THE USE OF COPPER BY THE ANCIENTS.—Copper is widely spread over the face of the earth, and man, in all ages, has adapted it to his wants. It was one of the greatest articles of commerce with the Phœnicians, who derived a large supply from the mines of Nubia, that at one time supplied the whole of the known world, and combined with it the tin obtained from the islands of Great Britain. It was used by some of the northern nations of Europe in the fabrication of weapons, at a period and under circumstances when steel appears to have been more precious than gold. This has been illustrated in Denmark, by the opening of many Scandinavian tumuli of very remote ages, and from which have been collected specimens of knives, daggers, swords, and implements of industry which are preserved in the museum at Copenhagen. There are tools of various kinds, formed of flint, or other hard substance, in shape resembling our wedges, axes, chisels, hammers, and knives, the blades of which are of gold, while an edge of iron is attached for the purpose of cutting. Some of these tools are formed principally of copper, with edges of iron, and in many of these implements the profuse application of copper and gold, when contrasted with the parsimony evident in the expenditure of iron, seems to prove that at that unknown period, and among the unknown people who raised these tumuli, gold as well as copper were much more common products than iron

PUTTING UP AND RUNNING STEAM PUMPS.—The Dean Pump Works, of Indianapolis, gives the following valuable hints on the management of steam pumps: Never use a smaller pipe on the suction than the list indicates. Avoid right angles in the pipe where it is possible. Where it is practicable, make bends with a large radius. Put a foot valve and strainer on the end of the suction pipe, Do not place the pump more than 29 feet from the water. Where hot water is pumped, the supply must be above the pump. Make all joints in the suction pipe tight. A small leak in the suction is very detrimental. Keep the stuffing boxes nicely packed. Oil the pump before starting it, and keep the oil wiped off where it is not needed. Some engineers seem to think that if their boilers are supplied with water, there is no need of looking after the pump or taking any care of it. A good pump is as worthy of being taken care of as a good engine, and we would suggest to all engineers and persons using or having charge of pumps, that they spend a few minutes every day in cleaning them up, removing all extra oil on them, wiping off the dust and dirt and seeing that they are in good condition and working well.

CEMENTS FOR IRON WORKS.—It is sometimes advisable to fix two pieces of iron, as pipes for water or steam, firmly together, as a permanency. A rust cement is frequently used, and the materials are sal ammoniac, sulphur and iron borings. If the cement is desired to act quickly, the proportions should be: Sal ammoniac, 1 part by weight; sulphur, 2 parts; iron borings, 80 parts. If plenty of time can be allowed for setting, make the proportions: Sal ammoniac, 2 parts; sulphur, 1 part; iron borings, 200 parts. The sal ammoniac and sulphur should be pulverized, and the borings of iron tolerably fine and free from oil. The mixture should be made with water to a conveniently handled paste. The theory of its action is simply union by oxidation.

BLACK ENAMEL.—If wood is immersed in sulphuric acid it is dyed a jet black, and when dry can be polished by rubbing with a bone spatula; but what would best suit, I think, is the following: Grind up very finely some drop black in water, put the paste in a cup and mix it with a little size or very thin glue, brush the wood over with this, let it dry, sandpaper it and give it another coat, allowing it to dry well, and again apply some worn emery or sandpaper. If well covered you may now use French polish when you will have a brilliant black surface. If it is not a flat surface, brush over with a coat or two of polish varnish, made the same as French polish, only a little thicker.

TEMPERING THE POINTS OF TOOLS.—After being tempered the volume of the tool is slightly increased, and consequently its specific gravity is decreased. As the expansion or increase of volume is so very slight, it is quite immaterial which is plunged into the liquid first; however, every moment the edge is kept out it is cooling, and the tempering may be rendered defective thereby. Mercury tempers the hardest, then water, then salt and water, then oil of various kinds—as whale oil. As oil cools the metal more slowly, it is not tempered so hard, but the tenacity is increased.

WARTS.—If they give you no special inconvenience, let them alone. But if it is of essential importance to get rid of them, purchase half an ounce of muriatic acid, put it in a broad-bottomed vial, so that it will not easily turn over; take a stick as large as a knitting-needle, dip it into the acid, and touch the top of the wart with whatever of the acid adheres to the stick, rub the acid into the top of the wart, without allowing the acid to touch the well skin. Do this night and morning, and a safe, painless and effectual cure is the result.

PRETTY EXPERIMENT.—If seeds (barley, corn, etc.,) be placed between moist pieces of litmus paper, the roots stick to the paper, and color it so intensely red that even on the back of the paper their course can be traced in red lines on a blue ground. It tincture of litmus be repeatedly added the intensity of the red color is increased.