generates light, so that the stock piles and the holds of the boats can be illuminated and the work carried on by night as well as by day.

A manufacturer of lead pipes is rejoicing somewhat over a process that has just come into his possession for giving a pipe made of lead a much greater power to resist a bursting pressure than was ever possible heretofore. A coil of steel wire is made use of for this purpose, which is led into the machine that forms the pipe in such a way that it comes out in the body of the pipe all wound in a coil just large enough to be covered up by the lead walls on both sides. This helps to keep the pipe in its circular form, allowing it to be easily bent, and increases its strength twenty-fold. Hose pipes have been treated in this manner for some time, and pipes made of copper, and corrugated in the screw-thread form, can be wound with steel to give the required strength against bursting and still be left free to expand or contract as the case may require. We shall expect to hear of some one before long making use of this very principle in drawing brass tubing that will have a steel wire coiled up within the shell of the pipe to add to the strength of the brass, while the brass can give good protection to the steel.

Boiler Testing.

"How do you know when a plate is crystallized in a boiler?" is a question frequently asked engineers. A plate that is crystallized has a bell-like ring, while a good plate has a deader sound. An old engineer used to say that when the plate sounded as though it was good, he knew it was bad and when it sounded dull, as though something was the matter, he knew it was all right. That is one way of putting it. The inexperienced engineer would say the crystallized plate was the good plate every time, if he judged by the sound alone.

"Every boiler maker isn't an expert at finding cracks in a boiler shell," said an inspector the other day. "I found a crack in a boiler a little while ago directly over the fire about half-way up to the brickwork. We ordered a patch put on, but word came back that there could be no crack in the boiler as the boiler-maker had hunted over every inch and could not find it. I wrote them where the crack was, but still the boiler-maker could not find it, and I had to go out and draw a chalk mark around that crack before the boiler-maker discovered it."

Small cracks in a boiler are not always easy to find; they cannot always be seen and must be detected by the sound or feeling. The latter method is the surer. The inspector taps with his hammer along the boiler shell, with his finger on the plate a few inches in advance of the hammer, and his sensitive finger will feel the vibration of the plate, if it is injured. But if there is a crack in the plate between his finger and the hammer no vibration can be felt, the crack preventing it. In this manner the crack can be readily located.—Boston Journal of Commerce.

Pure Air for Mills.

Operatives in factories or other buildings feel the need of pure air properly heated and in generous amounts in winter, and also require the same amount of air in summer, at a temperature not detrimental to the health. The health of the operatives should be carefully looked after: if they are cheerful and happy, much more work is turned out and in better condition than can be done by people that languish because of impure air. People that have to work in heated, impure air soon have nausea, sick headache and other troubles that they are at a loss to account for. When in such condition they cannot accomplish what is reasonable for them to do, or get from a machine its full complement of work.

Artificial means must be resorted to for proper ventilation and heating in winter, also cooling in summer. The ventilating fan is the medium that meets the requirements at present nearer than any other way, in winter, by using a force-blast fan situated at one end or side of buildings, passing the air forced in around heated pipes, thence to rooms to be heated and ventilated, the air in all cases to be taken from the outside, as far from contamination as possible. At the opposite end or side, a suction fan to eject the air, both running at slow velocities but with great volume. In summer, the heating coil is filled with cold water and cools the air. By so doing, draughts will be avoided and best results reached.

A proper oversight should be kept of the amount of moisture that is in the atmosphere; a hot, dry air is bad, while air surcharged with moisture is worse. A happy medium can be kept with little trouble. By proper attention to the matter of heat, ventilation and moisture, the output can be maintained, steady, with good health for the workers.

Telegraphing Without Wires.

Genuine progress is being made toward the next great electrical triumph telegraphing and telephoning without wires. The latest results of English experiments were described in a lecture before the Society of Arts on Thursday by W. H. Preece. A copper wire a half-mile long was hung on poles on the coast near Cardiff, the earth completing the circuit. Six hundred yards away another wire, 600 yards long, and parallel with the original line, was buried in the sand at the low water mark. More than three miles off, on Flat Holme Island, another wire, also 600 yards and parallel, was laid down. An alternating current, controlled by a Morse key, was sent through the first wire. The signals were reproduced in the wire on the island and read by a pair of telephones. Messages were easily sent. Similar experiments at five and a half miles were similarly successful. The human voice was easily transmitted by the same means one and a quarter miles. Preece's critics contend that the results were due to conduction through the earth. He maintains that the results were due to electro-magnetic induction of the rapidly-alternating current in the primary circuit, throwing the surrounding ether into oscillations, and the energy was radiated in electric waves. These waves, he says, spread out like waves of light, and if they fall on conductors properly placed and sympathetically prepared are converted into an alternate current in the secondary circuit. Enthusiasts on the subject argue that we are fast getting on the track of the secret which, when secured, will enable us to communicate with other planets.

A Cheap Condenser for Exhaust Steam.

Mr. F.H. Wenham, of London, describes a method of condensing the exhaust steam from a high pressure engine, which is new to us, and probably will be to most of our readers. It is capable of a very extended application, and in many cases would be very useful. Mr. Wenham says:

"I had to burn anthracite or smokeless coal, yet the exhaust steam up the chimney caused particles of iron to descend on to linen hung out to dry in a laundry next door. For this I was threatened with an injunction and damages. I therefore had to take immediate steps to get rid of the exhaust steam. Water was scarce and expensive, so I turned the steam into a disused rainwater well as a temporary expedient; this got rid of it for several days, till the ground got dry and hot; then the steam finally escaped up through five holes in a stone sink in the corner of the building. Above this was a 5 inch wooden spout reaching to the roof; up this the steam was drawn by a strong draft, but I noticed that none came out at the top. It was all condensed, and fell in a shower out of the open bottom of the spout, and drained back into the sink. As the wood was scarcely warm, I saw that external or surface condensation had nothing to do with the result; it was simply the rush of cold air mixing with the steam that condensed it. I then carried the suction of my feed-pump to the bottom of the tank, and for years fed my boiler with hot distilled water, very little extra being required to make up waste. The consequence was that my boiler was kept free from incrustation. Several engines that I afterward erected were provided with this inexpensive arrangement, using ordinary stone-ware pipes to the top of the building, of course leaving the bottom open for the free ingress of air. The arrangement cost but little, and never caused any trouble. About 16 cub. ft. of air will be required to condense 1 cub. ft. of steam."—American Engineer.

The New Diazotizing Process.

The importance which the producing of colors by diazotizing and developing on vegetable fibres has lately attained, has induced Wm. J. Matheson & Co. to issue a special sample card with a series of dyeings produced by this method, which they will be glad to send to those interested.

In some branches of the dyeing industry the want has been felt to produce in this way not only staple shades, as blues, browns, and blacks, but also fancy shades, as well as all other colors obtainable by developing on the fibre. Up to three years ago primuline was the only dyestuff suitable for developing on the fibre, and only by the introduction of black, blue and brown diazotizable Diamine Colors has a more general application of this process become possible.

Among the advantages which this process offers may be mentioned the following.

First.—Quick and cheap working, as no mordanting is required.

Second.—Superior fastness to washing of the dyeings produced, a large number of which are even fast to milling.

Third.—Perfect preservation of the cotton fibre, which in some cases even gains in strength.

This last claim has lately been confirmed by repeated tests made with cotton thread dyed in the cop with Diamine Black and developed, the strength of which was found to be by 30 per cent. better than that of the same undyed fibre.

The following is the method for dyeing and developing Diamine colors and Primuline:—

(1) Boil for one hour, using for each 100 lbs. cotton yarn Diamine colors required for the shade desired, and 30 lbs. common salt; or

(2) Diamine colors required for the shade desired, and 5 lbs. sal soda; 15 lbs. glauber salts.

(For water free from lime we recommend recipe numbered 1; for water containing lime, we recommend recipe numbered 2.)

For standing kettles about one-half the dyestuff used in the first kettle is required, and about one-quarter to one-third the quantity of mordant.

After dyeing wash in cold water, giving the yarn three or four turns, and pass into the diazotizing bath.

Prepare this bath by dissolving 3 lbs. nitric soda in one pail of hot water. Add this to the kettle filled with cold water; then add to the kettle 5 lbs. oil vitriol or 10 lbs muriatic acid, diluted in one pail of cold water. Work the yarn 15 minutes; lift, rinse in cold water, giving three or four turns, and pass at once into the developing bath.

Prepare this bath by adding to the kettle filled with cold water the quantity of developer dissolved as per instructions for each. Work