

to flow along the pipe from the heading, and it is surprising how great is the efficiency of this cheap and simple exhaust ventilator. I have often seen in this big tunnel, with the air-hose for two drills open to supply more fresh air, an 8 inch pipe thus have the air fresh and good in twenty minutes after the firing of 25 holes loaded heavily with dynamite. Of course, as the tunnel gets long, the air along it may get sluggish and poor except near the heading, and as soon as possible natural ventilation should be secured through another connection with the surface, or the decay of the timbering will be very much more rapid. In using the drills the exhaust air from them is aiding very materially, but this is not enough in itself after the work is 800 or 900 feet long.

Drainage.—In cheap work, even in very good work, if a large flow of water has not been anticipated, water when struck is allowed to flow out over the floor, planks being laid between the rails to keep the men's feet dry; but this is a wet, dirty way, especially near the entry in winter time. Much better is it, remembering that water is almost a certainty, to prepare to confine it in a trench or small box along the side, or if a large flow may be expected, to put in water boxes from the first under the centre of the mud-sill (Figs. 4-7), at very little extra cost, such a box 12 x 16 inches, with $\frac{1}{2}\%$ fall, safely carrying 2,000 gallons per minute. I have seen a torrent pouring from a tunnel when it was then necessary to make the timber sett higher to permit the putting in for the tracking of a second sill 12 x 14 inches, above the mud-sill, just such as is seen in the Sutro tunnel of the Comstock.

Illumination.—Around where the miners are at work, as at the face, the paraffine candle is by far the best illuminant, as it can be put anywhere and does not vitiate much air as do the foul-smelling, dirty coal oil lamps or torches that must be used in very wet places. The electric light is of course most efficient for permanent lighting, all wires being well insulated and the lamps usually with a wire mask, but no key for turning on and off the current. These protected incandescents can be used at the face, but are not as convenient as the candle in a miner's stick.

Explosives.—In tunnelling only some form of dynamite or giant is the explosive used, giant No. 1 or 75% nitro-glycerine being used in the centre cutting holes, where a concentrated effort is required in blowing out this central wedge of rock, while in the following or side holes when greatest effect is gained by spreading the energy of the blast over more