

COAL-DUST EXPLOSIONS

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(Continued from last issue.)

Moistening the Air Current.

The simplest method of keeping a mine damp is to put moisture into the ventilating current; then the air going through the mine does not dry the dust but carries moisture to it. There are two ways of putting moisture into mine air. One is by using fixed sprays of water placed at intervals through the mine; the other is by moistening the intake air at the mouth of the mine.

Water Sprays.

Water sprinklers should give a fine spray, as much like fog as possible, so that the water will be carried along by the air until it is absorbed as invisible vapor. The chief care needed in using sprays is to keep the nozzles from clogging and to prevent men and boys who do not understand the necessity for spraying, from damaging the sprays or turning them off to avoid getting wet in passing by.

Clean water should be used for spraying. The nozzles should be of the form least liable to clog and most easily and quickly cleaned after clogging. All nozzles should be inspected at frequent intervals.

There can be no question of the value of water sprays for laying dust. However, to get the best results from their use some mine official must be made responsible for the condition of the sprays at all times. He must also be required to see that there are sprays enough running to keep the relative humidity of the air currents at, or above, 90 per cent. In zero weather the incoming air may traverse 2,000 to 3,000 feet of entry before its temperature rises above the freezing point. Therefore at mines in districts where the winters are cold, provision must be made for draining pipes and nozzles throughout the intake part liable to freeze; and in cold weather the area must be wet down by hose or by water cars, so that it does not become dry. A recent dust explosion started in the haulage road, which was also the intake, at a point only 600 feet from the mouth of the mine.

Heating the Air and Using Water Sprays.

At certain mines the experiment is being made of heating the ventilating current at the intake to mine temperature and then moistening it by water sprays. This requires a somewhat costly heating plant, for in zero weather the warming of 100,000 cubic feet, more or less, of air per minute takes much heat. This method will moisten the mine air, but it is more expensive and complicated than the following method.

Steam Jets.

Under some conditions the easiest way of moistening the air current entering the mine is to use exhaust steam. The heat of the steam warms the intake air a little, and the moisture is supplied as vapor and in finely divided form, like fog. Generally the exhaust steam from the fan engine will suffice to dampen the air except in the coldest weather. After a mine has been thoroughly moistened, a slight shortage of water in the intake air for a week will not prove serious, and in most of the coal fields of this country cold waves do not last long. However, if a mine shows a tendency to get dry, some live steam will be needed to supplement the exhaust steam.

Many mining men have thought that the use of exhaust steam would mean the presence in the intake air course of a vapor so hot that the roof would slack and fall, as it does in some entries where a steam main is laid. Such is not found to be the case in practice. The steam expands as it leaves the nozzles, and rapidly cools, so that 15 or 20 feet away the air current feels merely warm even in medium weather, and 50 feet away there is no perceptible warmth from the presence of the vapor.

If the part of the entry close to the jets is protected by lining or lagging, the roof will not be perceptibly affected by the heat. Although moisture may have a bad effect on some roofs, generally it has been alternate wetting and drying that has caused roofs to weaken.

The steam-jet method, if systematically used, will make the ventilating current evenly humid. Many mines that have introduced the method have experienced no bad results. The cost of maintenance is virtually nothing if steam is employed around the mine and the exhaust steam is not otherwise used.

If the ventilating fan is driven by a slide-valve engine, as is usually the case, the exhaust steam therefrom is sufficient for moistening the air in all but the coldest periods; then some steam from other sources may be needed. The efficiency of the method, when systematically followed up, has been shown beyond question by its trial and adoption in a considerable number of important mines.

Steam jets can not be used on a haulage road where locomotive tenders, mule drivers, or trip riders are employed, since the jets fog the air for a long distance and make the haulage difficult or dangerous. Therefore, their application is generally limited to mines that have pressure or blowing fans and do not use the intake airways for haulage.

Steam Jets and Water Sprays Combined.

With the generally approved system of ventilation employed in mines that make an appreciable quantity of methane, haulage and travel are not allowed in entries carrying the return currents, but only in the intake entries. Where this system is used and no haulage is done except on the day shift, a combination of water sprays and steam jets has given good results. When trips are being hauled over the road the water sprays are used. In cold weather these sprays must be situated so far inside the mine that the incoming air will not freeze them. During the night, or when there is no haulage to the outside, the exhaust steam sprays are turned on at the mouth of the intake and the main entries thoroughly dampened. In this way a small number of water sprays help to keep the mines moist during the day shift.

Use of Calcium Chloride.

Another method of keeping down coal dust is by using a deliquescent salt, one which slowly dissolves by absorbing moisture from the air. Calcium chloride is such a salt. It has been used for a couple of years at coal mines near Welch, West Virginia; also at several mines in different parts of this country.