Some Aspects of Underground Environmental Control

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The literature abounds with information pertaining to the many phases of man's atmospheric environment. The information available lacks in specific procedures for the prevention and alleviation of concentrations of undesirable atmospheric contaminants.

Control procedures for underground operations become complex and installations difficult due to the physical nature of the surroundings.

It may be of interest to those concerned to present some of the results of experience and experimentation. Much of the material will be a review.

The management of the Anaconda Copper Mining Company has for many years directed the efforts which have achieved control of the underground environment.

The policy of the Aanaconda Company in its control of an environmental hazard has always been to improve conditions by proper ventilation, wet methods and any other methods that have been tried and found practical, thus eliminating the use of encumbering gadgets such as masks, helmets and the like. Respirators are used only occasionally and in very few places.

The campaign on dust control began with the adoption of wet drillings in 1918. Conversion of percussion drills then in use was complete by 1926. During a full normal operation in the Butte district an excess of 1,400 drills have been in service at one time.

One of the major undertakings to improve the underground environment was the program to increase the airflow through the mines. The program was formulated by Mr. A. S. Richardson, who has given much toward making mine ventilation the science it is today. His coefficients of frictional resistance to airflow and technical papers have been of great assistance to the progress of mine ventilation. Mr. Richardson conceived and developed the most ingenious scheme for air conditioning in use today.

Knowing that power requirements vary as the cube of the air volume passing through the system and that resistance pressure losses vary as the square of the volume it can be readily realized what an accomplishment was prosecuted and the economic outlay involved. Actually the air flow was doubled for a power increase of approximately 70 per cent. Normally the power increase would have been 800 per cent. Smooth surfacing was installed in 20 air shafts to reduce the resistance pressure losses. Airways of high resistance were enlarged or paralleled and 23 new, reversible and more efficient main surface fans were installed.

With a skin to skin octagonal air raise of a diameter of inscribed circle 9'. Area = 67 sq. ft. the friction factor = A 0.0000000018.

In a vertical rectangular shaft smooth surfacing is treated and pegged with hardwood dowel pins.

In a horizontal airway long treated smooth surfacing is also pegged.

The Anaconda Copper Mining Company has always cooperated to the fullest extent with the United States bureau of mines, and the assistance from the bureau has been very helpful and constructive. Accordingly, in 1935 the bureau was extended an invitation ot make a survey of the existing conditions in the Butte mines.

In 1936 a survey was made under the supervision and direction of Dr. Carlton E. Brown, chemist, United States bureau of mines. The average dust concentration for the Butte mines was found to be approximately 2.05 millions of particles per cubic foot. The survey results supported the findings of surveys made by our own engineers in their investigations both before and since the bureau survey. The free silica content will average about 16 per cent.

A very fruitful research program was prosecuted with the cooperation of the U. S. bureau of mines. One of the major accomplishments benefiting the industry as a whole was the investigation of the relation of dust dissemination to water flow through rock drills. Findings have been published as Re-