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The Air We Breathe

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THE AIR WE BREATHE

General Science

In an examination of recent texts in general science one is impressed by the place given to a discussion and study of air in its various phases and applications. The expression "air minded" does not apply in this connection, but perhaps it holds true that a great amount of interest is always developed in pupils whenever we introduce the subject.

The teacher has many incidental opportunities for teaching simple facts in general science. Often such information as he is able to impart will make a lasting impression. The attention of the writer has been directed to the facts concerning the air which are easily presented with little or no apparatus. "Chats on Science", a title used by the late Dr. E. E. Slosson, may well describe the method used in these occasional demonstrations.

Take an inverted tumbler and a cork floating on water in a jar or basin. Lower the tumbler over the floating cork and notice that the water does not rise in the tumbler. Very naturally the explanation is, that the air in the tumbler occupies space, just as the air in the automobile tire must occupy space. The grocer, wishing to open a folded paper bag, gives it a quick jerk, filling it with air,—and easy way to accomplish his purpose in short order.

Then too, the fact that air has weight may be demonstrated with apparatus easily obtainable or improvised. Secure a chemical flask and rubber stopper. Half fill the flask with water and boil over a flame using a pan of sand or a piece of wire gauze to spread the flame and protect the glass. When it has boiled vigorously, insert the stopper and weigh or balance against an equal load with a crude home-made balanced wooden lever with equal arms. Sand may be substituted for weights in a pan made from the cover of a baking powder can and suspended from one end of the balanced lever. If balanced carefully and allowed to cool, when the stopper is withdrawn, air will rush in to fill the partially vacated space. When the stopper is replaced, it will be seen that the balance has been disturbed quite noticeably and that more sand is required to balance the flask now filled with air. While the density of air compared with that of water seems very slight, it is estimated that the weight of the air in a schoolroom 36 feet by 24 feet by 12 feet is nearly eight hundred pounds. Is it any wonder that a wind storm representing many thousands of pounds of air under great velocity should prove to be so destructive?

Not only does air occupy space and have density but we know also that it is elastic and may be compressed. The football and the bicycle tire are common illustrations of this fact. Also since it is elastic, it will transmit sound waves. When one blows a toy whistle or strikes the bell of an alarm clock, vibrations are produced which disturb the adjacent air and thus set up sound waves. These move about eleven hundred feet per second in all directions, much like ripples produced when a stone strikes the surface of a pond of water. The sound waves in the air reach the ears of distant persons enabling them to hear the sound of the whistle or of the bell.

Perhaps every school pupil knows that air is necessary for sustaining animal life, but he may need to be taught that fish must get air from the water in order to live and that fresh water must be furnished occasionally to supply the necessary air for fish kept in an aquarium. Then too, he knows, that when water is heated it expands and air escapes so that it would be disastrous to supply fish with water that had been boiled. These facts are so simple and elementary to the mature mind that their mere rehearsal seems almost foolish, yet to the inquiring mind of a beginner the helpful teacher may present them as a lesson in science and they will be received with unfailing interest.

To stimulate further interest, take some lime water in a fruit jar and breathe into it repeatedly. The water will turn milky when shaken, which is a sign of the presence of

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the tall corn grows should be especially interested in the products made from corn. Perhaps the majority of people think of corn as a food for hogs, cattle, and horses, and to a small extent corn flakes and hominy for man. The list of samples which the Corn Products Co. will furnish, will give a very widening view of the possibilities of the utilization of corn in starches, oils, rubber substitutes, food materials, and stock food.

The lacquer industry is relatively new but gives promise in many instances of more satisfactory results in preserving surfaces and in decorating purposes than the old paint processes. The E. I. Du Pont De Neumours Co. have prepared a very valuable exhibit to help understand its efficiency. In the preparation of lacquer many other industries are called upon to furnish material, consequently these samples could serve as a nucleus for an extensive study by a class of the industries involved in production and the uses of the finished product.

The rapidity with which our farms are being depleted of nitrogen renders the fertilizer industry one of vital importance. A very valuable study of the maintenance of the nitrogen in the soil can be centered around an exhibit of the Chilean Nitrate Co. Their preparation of fertilizer as well as other sources of nitrogen fertilizer can be compared—thus making an attractive and profitable study.

The teacher can make a list of these exhibits and let each member of the class select one to secure and arrange for study. This will arouse much interest in the work.

Other companies such as the Washburn Crosby Milling Co. have a series of charts costing a few cents each which will help to understand the structure of a wheat grain, and the construction of a flour mill, and the milling process. The Barrett Co. has an instructive chart free of cost showing over one hundred fifty products made from coal. The General Electric Co. has a number of films illustrative of the manufacture of their products which they will loan free of charge. With these they send lectures descriptive of the films.

The following companies have signified their willingness to send their exhibits to schools when requested by the proper authority. A letter having the endorsement of the president of the school board would be sufficient.

Corn Products Refining Co., Whitehall Bldg., 17 Battery Place, New York City.

The Electric Storage Battery Co. (Exide Battery), Marquette Bldg., Chicago, Ill.

Aluminum Company of America, Pittsburgh, Pa.

J. T. Baker Chemical Co., Phillipsburg, New Jersey.

E. I. Dupont De Neumours & Co., Parlin, New Jersey.

Chilean Nitrate of Soda, Educational Bureau, 57 William St., New York City.

Gold Medal Flour, Minneapolis, Minnesota.

General Electric Co., Schenectady, New York.

The Barrett Company, (Coal Products), 178 W. Adams St., Chicago, Illinois.

Willard Storage Battery Co., Cleveland, Ohio.

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carbon dioxide and carbon dioxide is always present in expired air. The chemist tells us that oxygen in the air is required by animals to produce oxidation in the body, and that carbon dioxide is waste material which is exchanged for oxygen every time we breathe.

(Lime water may easily be made by taking a small chunk of lime obtained from your dealer in building materials. Pour water on the lime and let it stand until it slakes and becomes "white wash". Later pour off the clear water for your experiment.)

To test the condition of the air in a school room in which there is much carbon dioxide, place a small quantity of lime water in a basin. After a time, examine it and see if it has become cloudy. If it has, then the need of ventilation is demonstrated.

Take a short lighted candle and

place it upon a smooth surface and hold a lamp chimney tightly down around it. It will be extinguished because the burning candle requires oxygen from the air and gives back carbon dioxide as the oxygen is used up. If the chimney is lifted slightly, fresh air is admitted and the heated gases arise so that burning is continued. This explains why the burner of a kerosene lamp has openings underneath to admit plenty of air.

These experiments will introduce the subject of ventilation and suggest how windows in a room opened at the top and bottom supply a circulation of proper air for breathing. It should be pointed out that impure air is largely due to stagnant expired air which does not have the proper amount of moisture. The prime essentials for perfect ventilation are, air movements, proper temperature, and humidity. If any one of these three is lacking, perfect results are lacking. In modern homes today we find attempts are made to provide proper temperature with a furnace, proper air movements with a fan system, and proper moisture by means of humidifiers of some sort.

The teacher will be interested to secure a little instrument, now on the market , called an air tester. It is sometimes used as a desk ornament and attracts attention by its grotesque appearance and uncanny behavior. It consists of a metal water container in which stands a glass tube having a bulb covered with cloth kept wet by capillary action from the water in the container. The red liquid in the tube pulsates and flows back and forth repeatedly. It is probably exhausted of air in part so that the liquid and its vapor are extremely sensitive to temperature changes on the bulb. The evaporation of moisture from the bulb changes the temperature slightly causing the pulsation by disturbing the equilibrium of the vapor within the tube. It is said that the condition of the air in the room with reference to humidity may be judged by counting the number of pulsations per minute. At any rate the device is interesting and instructive, and directs attention to air conditions in the room and the possible need of ventilation and additional moisture to relieve the dryness so common in heated rooms. An open dish of water in a room is an easy method of supplying moisture by evaporation. If the dish is placed on the heating stove or radiator, the evaporation will be greater of course. Humidifiers are often advertised as necessary to give the required amount of moisture in our living rooms. They are often installed in the furnaces where houses are heated by the circulation of warm air.

S. F. Hersey.

A CLASSIFIED BIBLIOGRAPHY OF REFERENCES FOR GENERAL AGRICULTURE

Agriculture

Most teachers are exceedingly busy with their regular duties in the school. This leaves but little time to look up references or for that matter to plan the work once the school year has begun. Their success is largely determined by the preparation which has been made before the school year opens. The following references have been prepared for these busy teachers who would like to enrich their courses in agriculture, but who do not have time to study or select references.

Textbooks in such subjects as agriculture are soon out of date. This is no fault of the author, but is due to the constant addition of new information by the research departments of the agricultural colleges. Bulletins enable the wide-awake teacher to keep his course up to date. This makes the work far more valuable and much more interesting.

Textbooks cannot treat subjects fully. References will make it possible for progressive teachers to enrich their course by presenting more data and new points of view.

The references cited below have had extensive use in classes in general agriculture and have been found of much value. It seems, therefore, that the busy teacher would be safe in ordering them with some degree of assurance that they will fit in the plan of his par-