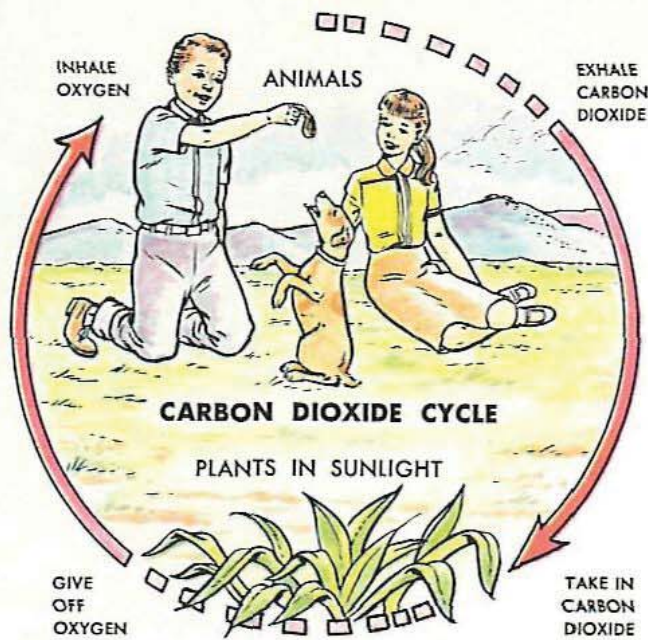


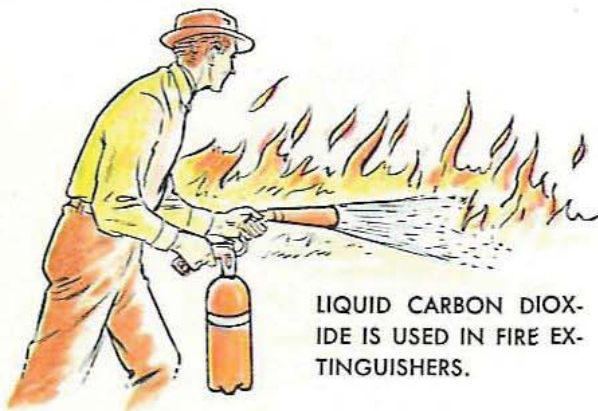
Carbon Dioxide



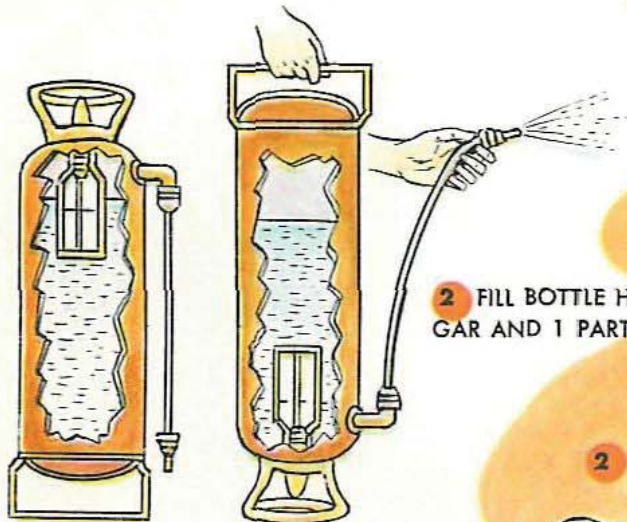
YOU HAVE already learned in experimenting with a burning candle that when something containing carbon burns in the air, a gas, carbon dioxide (CO_2), is formed. This is one of the most important gases for human life. The reason is that green plants, in sunlight, are able to take the carbon out of the carbon dioxide in the air and, by combining it with oxygen and hydrogen from water and with various minerals in the soil, produce all the vegetable matter that humans and animals eat.

You cannot see the CO_2 in the air — but you can see it when it has been cooled and compressed into a solid block of “dry ice.” When dissolved in water (H_2O), carbon dioxide (CO_2) forms a weak acid (H_2CO_3). You know the taste of this acid from soda water — the bubbles are CO_2 being set free.

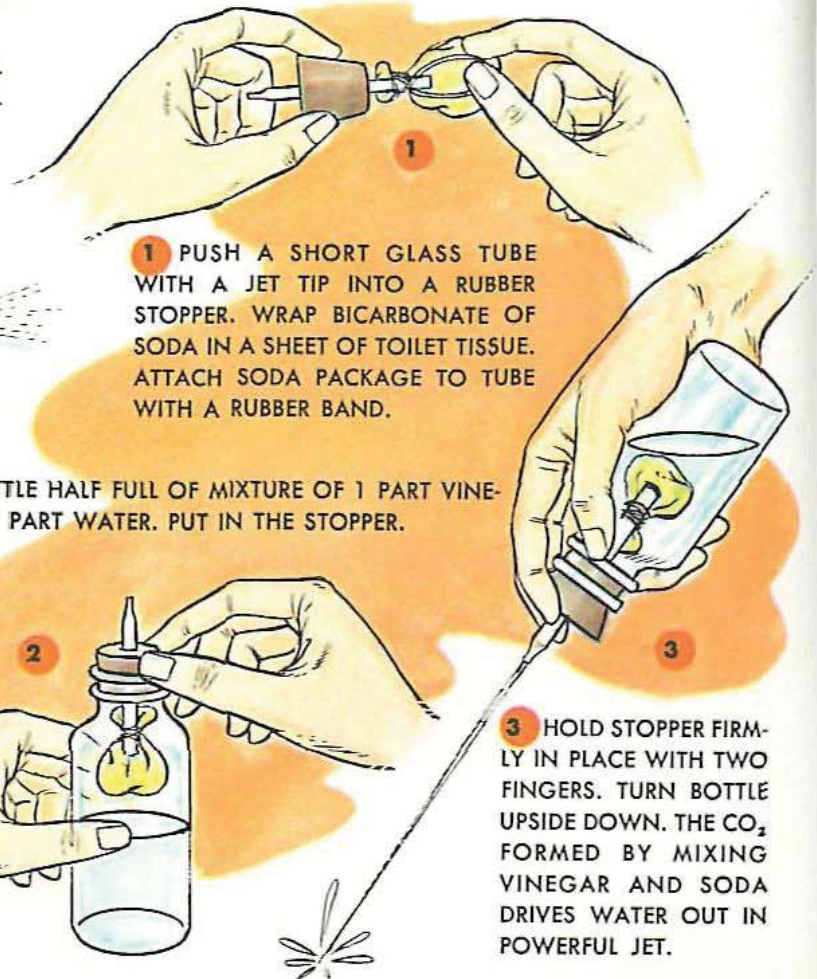
Carbonic acid combines with many metals to make “carbonates.” You can drive the CO_2 out of most carbonates with the help of a weak acid — even with vinegar, which is diluted acetic acid.



MAKING A FIRE EXTINGUISHER MODEL



CHEMICAL FIRE EXTINGUISHERS CONTAIN SOLUTION OF BAKING SODA AND A BOTTLE OF SULFURIC ACID. WHEN TURNED UPSIDE DOWN, THE CHEMICALS MIX AND FORM CARBON DIOXIDE WHICH FORCES OUT THE WATER.



1 PUSH A SHORT GLASS TUBE WITH A JET TIP INTO A RUBBER STOPPER. WRAP BICARBONATE OF SODA IN A SHEET OF TOILET TISSUE. ATTACH SODA PACKAGE TO TUBE WITH A RUBBER BAND.

2 FILL BOTTLE HALF FULL OF MIXTURE OF 1 PART VINEGAR AND 1 PART WATER. PUT IN THE STOPPER.

3 HOLD STOPPER FIRMLY IN PLACE WITH TWO FINGERS. TURN BOTTLE UPSIDE DOWN. THE CO_2 FORMED BY MIXING VINEGAR AND SODA DRIVES WATER OUT IN POWERFUL JET.

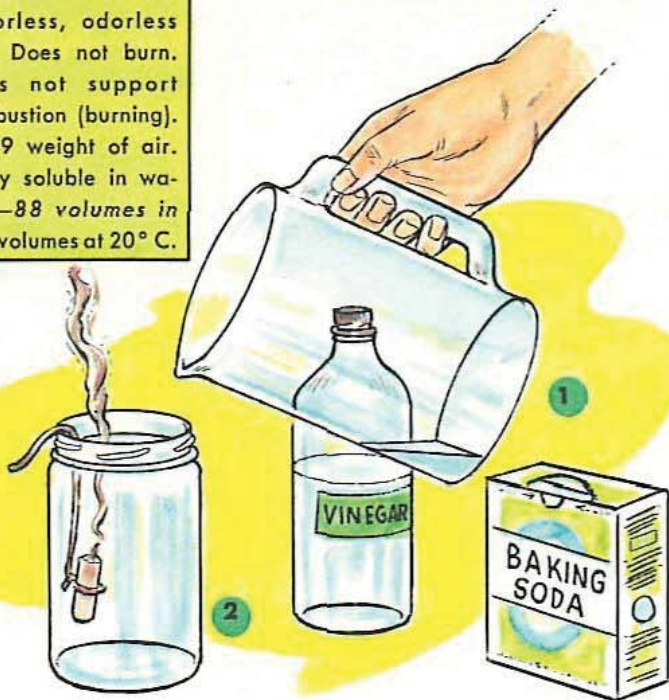
CO₂ CARBON DIOXIDE

Compound.

Molecular wt. 44.
Colorless, odorless gas. Does not burn. Does not support combustion (burning). 1.529 weight of air. Fairly soluble in water—88 volumes in 100 volumes at 20° C.

FEATURES OF CARBON DIOXIDE

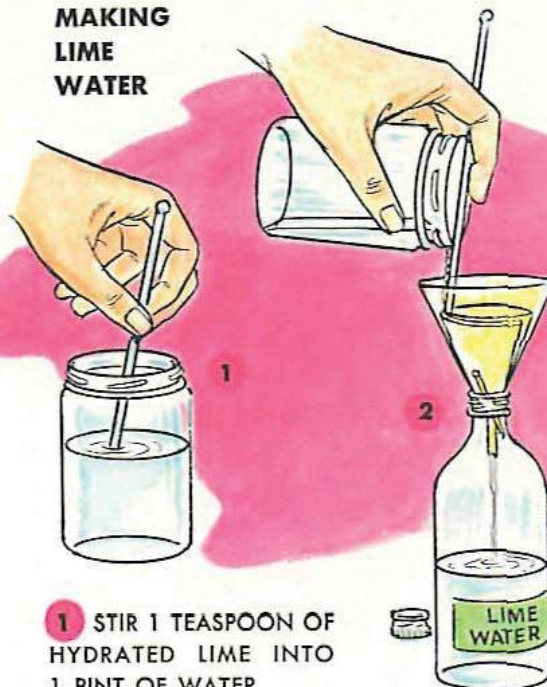
CO₂ IS HEAVIER THAN AIR AND DOES NOT SUPPORT BURNING. YOU CAN PROVE BOTH POINTS:



1 PLACE 1 TEASPOON OF BAKING SODA IN A PITCHER. POUR A SMALL AMOUNT OF WHITE VINEGAR OVER THE SODA.

2 HANG A LIGHTED CANDLE IN A JAR BY A WIRE. POUR THE CARBON DIOXIDE FORMED IN THE PITCHER INTO THE JAR THE WAY YOU WOULD POUR WATER. WHEN THE CARBON DIOXIDE REACHES THE TOP OF THE CANDLE, THE FLAME GOES OUT.

MAKING LIME WATER



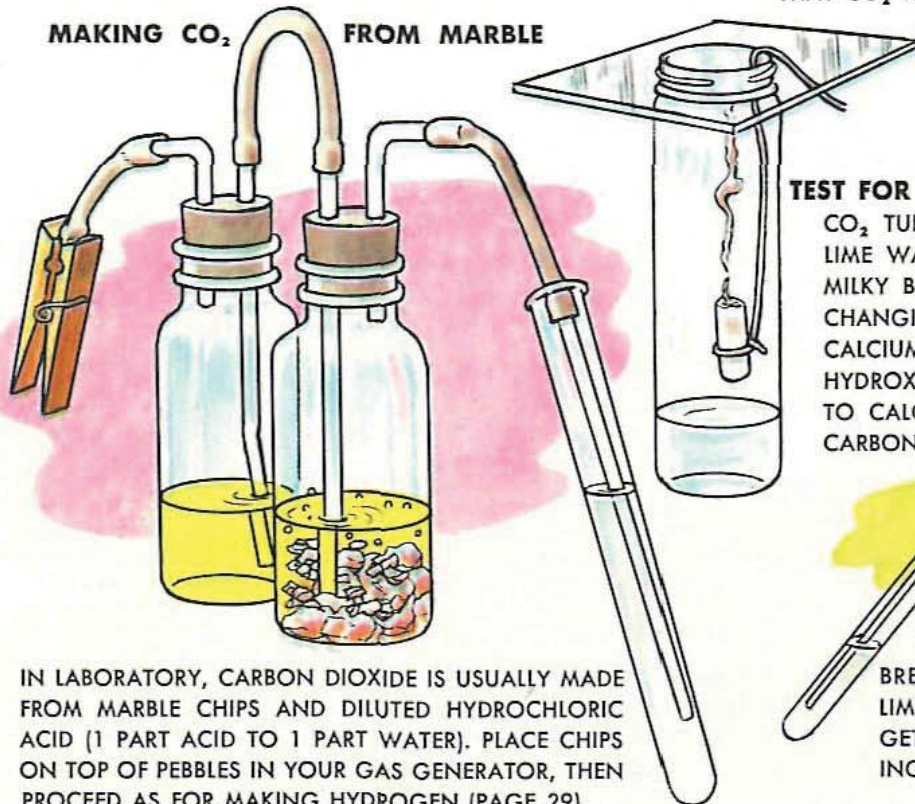
1 STIR 1 TEASPOON OF HYDRATED LIME INTO 1 PINT OF WATER.

2 LET STAND UNTIL LIME SINKS TO THE BOTTOM. FILTER LIQUID INTO A BOTTLE. CLOSE BOTTLE TIGHTLY.

BURNING PRODUCES CARBON DIOXIDE

HANG BURNING CANDLE IN JAR CONTAINING A FEW ml LIME WATER. COVER TOP WITH A GLASS PLATE. WHEN CANDLE HAS GONE OUT, SHAKE LIME WATER UP WITH THE AIR. MILKINESS PROVES THAT CO₂ HAS BEEN PRODUCED.

MAKING CO₂ FROM MARBLE



IN LABORATORY, CARBON DIOXIDE IS USUALLY MADE FROM MARBLE CHIPS AND DILUTED HYDROCHLORIC ACID (1 PART ACID TO 1 PART WATER). PLACE CHIPS ON TOP OF PEBBLES IN YOUR GAS GENERATOR, THEN PROCEED AS FOR MAKING HYDROGEN (PAGE 29).

TEST FOR CO₂

CO₂ TURNS LIME WATER MILKY BY CHANGING CALCIUM HYDROXIDE TO CALCIUM CARBONATE.

BREATHING PRODUCES CO₂

BREATHE THROUGH GLASS TUBE INTO LIME WATER IN TEST TUBE. LIME WATER GETS MILKY. THIS SHOWS THAT BREATHING IS A BURNING PROCESS.