

Carbon Monoxide Threatens in Homes

Physiology—Chemistry

By JANE STAFFORD

Every second millions of cubic feet of poison gas are poured into the air of America. Every one of the 28,000,000 automobiles of the world at every turn of the crank shaft contributes to the deadly fumes, at the rate of one cubic foot per minute. Every chimney belches forth the death gas. Every gas stove and every gas heater in a home is a potential source of this peace-time killer. It has no odor, no taste, no color by which its victims might be warned of its presence. It strikes secretly, stealing into the blood stream and throwing out the precious oxygen without which our bodies cannot go on living. It is carbon monoxide.

Realizing that the gas is death dealing in quantity, and everpresent in small amounts in city air, experts engaged in the protection of the health of the public have wrinkled their brows over the possibility that this poison, like lead, is insidious in minute amounts if the victim is exposed long enough.

Would the machine-age poison undermine the mind of a progressing race? Would the insidious silent poison accumulate in the blood, change the brain tissues? These are questions of vast importance to the crossing policemen, the garage worker, the housewife who works over a gas cook stove. Fortunately the answer seems to be "No" so far as mental dangers from the gas are concerned. But the poison remains in our air and must be reckoned with. This deadly gas is composed of one part of carbon, a substance which is found in such friendly and harmless things as charcoal, coal, diamonds and many foods, and is an essential constituent of sugars and starches. The other part of the gas is oxygen, which by itself is an important part of the air we breathe and the water we drink. The chemical combination of these substances forms the death gas, carbon monoxide. Yet the addition of one more invisible atom of oxygen changes the death gas to the inert and harmless gas called carbon dioxide.

Every time carbon-containing fuels such as coal, wood, gasoline and natural and manufactured gas are burned without enough oxygen or air for complete combustion, carbon monoxide is formed. Plenty of oxygen must be present, either as oxygen gas or in the air, so that the carbon can pick up the atoms of oxygen and so form



WARMING UP THE ENGINE in a closed garage gave carbon monoxide a chance to do its deadly work. The son sent his mother for a doctor while he dragged his father outside and started artificial respiration

the harmless carbon dioxide. Manufactured gas may contain anywhere from 10 to 30 per cent. of carbon monoxide gas. Automobile exhaust gas contains an average of 7 per cent.

Large amounts of carbon monoxide are fatal to those who breathe it, but in small amounts it has no lasting effect on the health or mind of persons exposed to it, the U. S. Bureau of Mines and the U. S. Public Health Service have found by recent studies. From two to four parts of carbon monoxide in 10,000 parts of air is considered a safe amount for an hour's exposure. The average amount found in city streets is much less than this. Engineers recently examined the air in the streets of Chicago. They found that in residential and industrial streets the air contained an average of 0.125 parts carbon monoxide per 10,000. In traffic streets the proportion rose to 0.25 parts per 10,000, while in boulevard streets the highest concentration, 0.476 per 10,000, was found. Studies made in 14 cities by the Bureau of Mines and the U. S. Public Health Service showed an average of 0.8 parts per 10,000.

Carbon monoxide poisons its unlucky victims by suffocation due to lack of oxygen. Hemoglobin, the red

coloring matter of the blood, has a strong affinity for the deadly gas. When carbon monoxide gets into the blood stream, the hemoglobin throws out its precious oxygen in order to unite with the death gas. Then the tissues of the body get a smaller and smaller supply of oxygen from the blood and after a time they have not enough oxygen to live.

Exercise or any physical exertion increases the need for oxygen. That is why death from carbon monoxide poisoning comes more quickly when the victim exerts himself in his struggle to escape. In rescuing a person who has been exposed to a large amount of the fatal gas, carry him to safety and keep him from exerting himself as much as possible. Oxygen or fresh air if oxygen is not available should be given him to breathe, so that the impoverished tissues can replenish their supply of oxygen as the carbon monoxide is gradually driven from the blood. If the patient is found unconscious he should be given artificial respiration. This and the oxygen should be continued for at least one-half hour and as long as three hours after he has recovered.

A very few minutes' exposure to large amounts of (*Turn to next page*)

Deadly Gas Threatens in Homes—*Continued*

carbon monoxide gas will kill a man unless he is discovered and given proper treatment at once. The amount of the blood's hemoglobin that is combined with carbon monoxide determines when death will occur. This varies somewhat with the individual, but in general a man will have a headache when 20 per cent., or one-fifth, of the hemoglobin is combined with the deadly gas. When 35 per cent. or more hemoglobin is combined with carbon monoxide he will become unconscious. Death occurs when 70 to 80 per cent. of the hemoglobin is combined. Dr. R. R. Sayers and W. P. Yant of the Bureau of Mines devised a test for determining easily and quickly the carbon monoxide saturation of the blood. This furnishes a helpful guide as to how long treatment should be continued. A drop or two of blood diluted with water and mixed with tannic and pyrogallic acids is matched against a series of colors representing known amounts of carbon monoxide saturation. If the sample of blood so treated matches the tube marked 20 per cent., that blood has 20 per cent. of its hemoglobin still combined with the gas.

Small amounts of carbon monoxide may not prove fatal, but they may cause definite symptoms and not a little distress and even disability to work. Headache across the forehead, nausea and dizziness are among the chief symptoms of carbon monoxide poisoning. Prolonged exposure or slightly higher concentrations may result in loss of consciousness. In acute cases that may result in death, loss of consciousness occurs quickly, sometimes before the victim realizes his danger.

The greatest number of carbon monoxide deaths in one series reported were due to gas from gasoline engines running in enclosed places, the running automobile in the closed garage. Imperfect connections and poor construction or adjustment of gas stoves, light burners and heaters in homes cause many deaths every year. The gas heater in a small room is a big menace because in small rooms where windows and doors are tightly closed and several people are breathing the supply of oxygen quickly becomes dangerously low. Then even a small amount of carbon monoxide is fatal, as it is lack of oxygen that really causes death, and not excess of carbon monoxide. Winter months always see a big increase in deaths from this cause. People keep their windows and doors shut tight and use gas for additional heat in their homes. They heat their automobiles from the motor exhaust. They run the engine hard, often while the car is still in the garage, to warm it up on frosty mornings. All of these are dangerous practices, particularly the last.

The latest study of the Public Health Service and the Bureau of Mines was made in an effort to determine whether long exposures to small amounts of the gas would have any ill effects on the average person or cause permanent damage to the body tissues. Traffic policemen, especially those on duty in the new Holland vehicular tunnels connecting New York City and New Jersey, would be in grave danger if small amounts of the gas for long periods of time had the same effect as large

amounts of the gas in a short time. As a matter-of-fact, the officers on duty in the tunnel complain of headache after only a few hours and at present are not able to serve longer than two hours at a time. The ventilation of the tunnel keeps the concentration of the carbon monoxide gas far below the amount considered safe. Samples of the air at frequent intervals in the tunnel are taken continuously and examined for carbon monoxide. When the concentration gets above the safe limit more oxygen is pumped into the tunnel. So the traffic officers' headaches are not due to carbon monoxide poisoning, but probably to eye strain attendant on watching closely the thousands of cars flashing by every hour.

For the study just completed six men were examined carefully by a competent physician and by two psychologists and pronounced in good physical and mental health. They were then exposed to low concentrations of carbon monoxide from a gasoline engine for from four to seven hours every day for 68 days. During the study and at its close the same physician and psychologists examined the subjects. They could not find any harmful effects, either physical or mental, due to the exposure to these low concentrations of carbon monoxide. The subjects did not lose weight nor did their appetites flag. There was no muscular weakness. The number of red cells and amount of hemoglobin of the blood actually increased during the test. The men slept well throughout the test and afterwards.

When the concentration of carbon monoxide was two parts per 10,000 half the subjects had no symptoms, such as headache or dizziness, no matter how long they were exposed. A few complained of slight discomfort and others had headache after from three and one-half to four hours' exposure at this concentration. With the concentration increased to 3 parts per 10,000 no symptoms were noted in two hours, but after three and one-half hours some complained of headache and after five hours over half (65 per cent.) had distinct symptoms. With a concentration of 4 parts per 10,000 frontal headache was had by some in from one and one-half to two hours. After from three and one-half to four hours' exposure more than 90 per cent., that is, nearly all, had distinct symptoms.

Exercise, even of a mild sort, such as walking about the room, brought on the symptoms sooner. No signs of harmful effects (*Turn to page 165*)



THE DOCTOR sent for the local fire department to bring their oxygen inhalator

Deadly Gas—*Cont'd*

on the health were found in any of the subjects after the test. On the mental side the psychologists reported that with the tests now in use no distinct effects due to the gas could be found. A slight tendency to poor performance in the prolonged steadiness test was noticed. However, the psychologists concluded that more delicate tests are needed to find any effects on the mind that may result from long exposure to such small amounts of carbon monoxide gas.

Avoiding exposure to carbon monoxide gas is difficult because in the concentrations usually found the gas cannot be detected by its odor. "However, in its occurrence from most sources carbon monoxide is associated with other gases having distinctive odors, and thus warning is given of a dangerous atmosphere," advises a bulletin from the Bureau of Mines. "Removal of the odorous constituents from illuminating gas in scrubbing the gas is often the cause of poisoning to users through absence of warning odor. The odors coming from domestic gas stoves may or may not be a criterion for judging the presence of carbon monoxide. Mice and birds are more quickly affected than men by carbon monoxide and may be used for detecting dangerous atmospheres. Birds are preferable because they show symptoms earlier and are easier to observe."

Although this gas appears as one of our modern killers, it has been a source of danger for ages and was even known as a killer in very ancient times. "The human race has probably been exposed to this gas since men first began using fires in confined or sheltered places," stated a report of the Bureau of Mines. "A number of cases described in the ancient literature indicate that carbon monoxide was a frequent cause of death by accident, suicide and as a means of punishment or torture. Aristotle, who lived from 384 to 322 B. C., stated that 'animals collapse from harmful odors, as man gets a severe headache and often dies through charcoal vapors'. The Romans knew that smoke was poisonous and used the greenest, most smoke-producing wood to put persons to death. The occurrence of carbon monoxide poisoning has increased in frequency through the years until at the present time it is found in the home as well as in many industries."

Common sources of carbon monoxide gas given by the Bureau of Mines to illustrate its universal occurrence are: Mine fires (*Turn to next page*)

New Name for Vitamin

Physiological Chemistry

In the old days when vitamins were strange and little known, scientists called them, for convenience, by the letters of the alphabet. But since the vitamins have been split up into twins and triplets the matter of names has become somewhat involved. Vitamin B, for instance, might mean any of three definite factors, according to what you were talking about. Scientific literature was becoming confused and the public was very much bewildered.

Now an effort is being made to settle the matter, as far as vitamin B is concerned. A committee of the American Society of Biological Chemists considered the matter and after deliberation has recommended three separate names for the three different factors formerly known as vitamin B.

Bios, a term suggested by British workers, is to denote the factor or factors encouraging the rapid growth of yeast cells. The antineuritic factor which is easily changed or destroyed by heat will retain the old family name of B. The more heat-stable, water-soluble, dietary factor which has to do with maintenance and growth, known also as P-P or the pellagra preventive, is to be called G.

The committee also recommended that when more vitamins or other dietary factors are discovered, they should not be given other than descriptive names, such as pellagra-preventive or antirachitic, until their identity is established beyond question.

To avoid future complications, the committee recommended that the American Society of Biological Chemists appoint a committee on vitamin nomenclature, to act in cooperation with the British and other European committees as a clearing house for information on vitamin terminology and with power to name new dietary factors when they are discovered.

Science News-Letter, March 16, 1929

Traffic congestion costs New York more than \$1,000,000 a day, it is estimated.

Women of Greenland still wear hoods similar to headdresses of the middle ages.

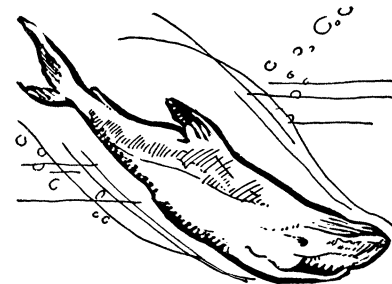
The number of children born in London fell off from 78,825 in 1926 to 73,263 in 1927.

An Arabian legend says that the ostrich traces ancestry back to the camel and the dodo bird.

NATURE RAMBLINGS

By FRANK THONE

Natural History



Sharks

Timid souls vacationing at southern or southwestern beach resorts will lose a lot of fun unnecessarily if they refuse to go into the water for fear of sharks. Statistically considered, one's chances of being bitten by a shark are considerably less than one's chances of being struck by lightning, and infinitely less than the chances of being struck by a flivver. There are some authentic shark-bite stories on record, but most of the scares are nothing but just what the name implies. Even the six-foot sharks that are frequently seen in the water at bathing beaches are almost without exception harmless scavengers or fish-hunters. The real man-eaters are occasional wanderers from tropical waters, and are two or three times that length.

Sharks are as a whole among the most successful of animal families. They appeared in the world very early, being indeed the oldest of fishes, and the fossil record shows that during all the many thousands of years since their coming they have held their own against all later comers. There are some limestone beds that are as full of the teeth of extinct sharks as a cake is of raisins. For the most part, the teeth, and sometimes the skin scales, are all that is left for the scientists to study; for the skeleton of all sharks is wholly cartilaginous, so that the bones that form the most important parts of most fossil remains, are lacking or at most very imperfectly preserved in the shark records. But some of these old sharks must have been monsters, for four-inch teeth are nothing uncommon in the deposits.

Science News-Letter, March 16, 1929

The carved staff carried by a bishop of the thirteenth century was recently unearthed in Greenland in the ruins of a medieval cathedral.

Wave Mechanics—*Cont'd*

points where the Bohr model breaks down; it always gives the right number of energies or "orbits" to provide one orbit jump for each observed spectral line.

It is, however, an advantage not to pass from wave-frequency to classical energy at this stage, but to follow the course of events in the sub-aether a little farther. It would be difficult to think of the electron as having two energies (i. e. being in two Bohr orbits) simultaneously; but there is nothing to prevent waves of two different frequencies being simultaneously present in the sub-aether. Thus the wave-theory allows us easily to picture a condition which the classical theory could only describe in paradoxical terms. Suppose that two sets of waves are present. If the difference of frequency is not very great the two systems of waves will produce "beats". If two broadcasting stations are transmitting on wavelengths near together we hear a musical note or shriek resulting from the beats of the two carrier waves; the individual oscillations are too rapid to affect the ear, but they combine to give beats which are slow enough to affect the ear. In the same way the individual wave-systems in the sub-aether are composed of oscillations too rapid to affect our gross senses; but their beats are sometimes slow enough to come within the octave covered by the eye. These beats are the source of the light coming from the hydrogen atom, and mathematical calculation shows that their frequencies are precisely those of the observed light from hydrogen. Heterodyning of the radio carrier waves produces sound; hetrodyning of the sub-aetheral waves produces light. Not only does this theory give the periods of the different lines in the spectra, but it also predicts their intensities—a problem which the older quantum theory had no means of tackling. It should, however, be understood that the beats are not themselves to be identified with light-waves; they are in the sub-aether, whereas light-waves are in the aether. They provide the oscillating source which in some way not yet traced sends out light-waves of its own period.

Science News-Letter, March 16, 1929

There are nine states which have less than half a million people apiece.

The Cuban humming bird, weighing less than a gram, holds the record for the world's smallest bird.

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Deadly Gas—*Cont'd*

and explosions, the gaseous products of combustion of powder and dynamite and other explosives, blast-furnace stack gas, coke-oven gas, coal gas, producer gas, gas ranges and room heaters burning natural and manufactured gas, automobile exhaust gas, smoke from burning buildings, and railroad locomotive stack gas.

Automobile exhaust gas can be dangerous outside of garages, although it is always lack of oxygen that is the real cause of death, so that small closed spaces are danger spots in which to run motors. However, two truck drivers recently met death from exposure to carbon monoxide poisoning out on the road. They had stopped their truck but left the engine running, presumably to warm the driver's cab, which they had closed tight. They were found unconscious. The fact that the police did not at once recognize them as victims of carbon monoxide poisoning signed their death warrants. For they were locked up in jail where the scanty supply of oxygen in the air finished the job begun by the deadly gas from their truck's exhaust. Restorative measures taken some time later failed to revive them.

Allowing motors to idle while in traffic is one way to increase the amount of carbon monoxide in the air. This is particularly true because while waiting for the traffic control to change drivers often use the accelerator several times to keep their engines from stalling. This practice yields relatively high amounts of carbon monoxide and smoke, the Bureau of Mines found.

To avoid death from this poison gas, a plentiful supply of oxygen or of fresh air must be maintained at all times. In addition, correct adjustment of automobile carbureters, and careful attention to tubes and connections on domestic stoves, etc., should be made.

Fresh air, or oxygen from an oxygen tank, and absolute rest are the essentials of treatment for carbon monoxide poisoning. Both these measures should be prolonged for several hours, because it takes a long time to drive all the carbon monoxide out of the blood.

Science News-Letter, March 16, 1929

There is no plant life in the sea below the point where sunlight can penetrate.

The longest jumping that a flea can do is about 13 inches horizontally and about six inches vertically.

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FOR

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