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Chemicals That Cause Trouble

By ALEXANDER KORBELAK

Lamp Division, Westinghouse Electric Corp.
Bloomfield, N. J.

The toxic, irritating and flammable substances that create numerous safety and health problems in the manufacture of electric lamps and electronic tubes are used in many other industrial processes.

RECOGNITION of the potential hazards of explosion, fire, and injury to health in the use of certain chemicals is a long step toward their safe handling. Strict adherence to safety regulations, with repeated reminders of the rules, will keep accidents at a minimum.

Frequently in established operating procedures, an attitude of carelessness may lead to disastrous results. One such case occurred in the use of hydrogen gas. A set of apparatus was arranged to determine the amount of gas consumed in the hydrogenation of an oil sample. The unit consisted of meters with drying towers and traps. After the test run the equipment had to be dismantled and cleaned for another run.

This experimental unit had been used every day for several years without mishap. One day, however, after the apparatus had been partially dismantled for cleaning, a chemist started to remove hardened oil from a delivery tube leading to one of the traps—a deposit which usually is removed with a small brush or swab.

In a hurry to get to other work, he used a Bunsen burner to melt the hardened oil. The hydrogen had been shut off at least 20 minutes and the apparatus dismantled for 15 minutes. A loud blast accompanied by a shower of glass occurred. Fortunately, the chemist was unhurt. Apparently the hydrogen in the trap had dissipated to an extent where an explosive mixture was formed. The damage was done by less than a liter of hydrogen gas in an explosive mixture.

A variety of gases are used in the lamp and electronic tube industry—air, both compressed and liquid; carbon dioxide in solid form (dry ice); hydrogen; nitrogen; helium,

and the rare gases. Some of the gases are handled in cylinders at pressures up to 2000 lbs. per sq in.

Any device containing materials under pressure should be handled with care. Protective caps should be supplied with all cylinders in transit to prevent the valves breaking if struck. Cylinders, when in use, should be firmly supported to prevent falling.

Air presents hazards both under high pressure form and in the liquid state. The use of high-pressure air for spraying, drying and other purposes is widespread. High-pressure air can cause particles of dust and gritty material to fly with force sufficient to cause injury to the eyes, ears, etc. A high-pressure air stream directed against the body can rupture internal organs.

The use of high-pressure air should be restricted to those areas where these hazards can be avoided, and in all cases the extra protection of goggles for operators is a wise precaution.

Liquid Air

Liquid air is used in specialized manufacturing operations and presents hazards of explosion, fire and personal injury. It should be handled in special containers designed to allow for the escape of vaporizing gas and to keep atmospheric moisture from condensing in the neck of the container. Condensing moisture will rapidly form a plug of ice which would prevent the escape of expanding gas. Internal pressure thus builds up to explosive force.

Liquid air should be kept away from combustible materials such as oil, finely divided metals, charcoal, etc., due to its oxidizing properties.

Another hazard of liquid air is the possibility of bodily injuries due to faulty handling. The hands should not be covered with gloves or rags when liquid air is poured. It will evaporate readily if splashed on the bare skin, but is trapped on gloves or rags. The evaporation rate is lowered appreciably and severe "burns" or frost-bite may result.

Carbon Dioxide

Carbon dioxide, in the solid state, commonly known as dry ice, is used either alone or mixed with alcohol to obtain low temperatures on special equipment. In this form the greatest hazard is that of severe "burn" or frost bite by bodily contact with the solid. Minor hazards are those of explosion and suffocation.

Restriction of dry ice in a closed container can result in an explosion if sufficient carbon dioxide is present in a weak-walled container, such as a glass bottle. If sufficient carbon dioxide gas is generated from dry ice in a small confined room the hazard of suffocation may result.

Precautions are fairly simple. Dry ice should not be allowed to touch any part of the body. It should not be used to cool drinks. A small piece will cause painful frost-bite in the stomach and may cause ulcer formation.

Dry ice should never be placed in tightly stoppered containers such as bottles or jars. Rapid vaporization of solid CO_2 may cause a pressure to build up to cause an explosion.

A room with a high percentage of carbon dioxide in the atmosphere furnishes evidence of its presence by the symptoms of quickened breathing, dizziness, ringing in the ears, and other unusual sensations.

First aid treatment in the case of burns is the same as for heat burns, followed by the services of a physician. Swallowing dry ice is a serious matter and a physician should be called immediately. In the case of accidental suffocation, the body

should be removed from the area and artificial respiration applied at once.

Chlorine

In one phase of the tube and lamp industry the electrolytic treatment of metals in chloride baths may cause the generating of copious quantities of chlorine gas. This gas is corrosive and irritating to the eyes and mucous membrane. Concentrations of 0.004 to 0.006 per cent by volume in air may cause dangerous illness in $\frac{1}{2}$ hour to 1 hour. Severe dosing causes suffocation, or the gas may affect the nervous system, producing unconsciousness or death.

Proper ventilation eliminates this hazard. First aid consists of removing the victim to fresh air and applying artificial respiration. The services of a physician are necessary.

The use of hydrogen gas finds many applications in the lamp and tube industry. Heat-treating ovens, brazing units and other specialized equipment involve the use of this gas. In electro-chemical operations, as in alkaline electro-cleaning, hydrogen and oxygen are liberated at the electrodes and in some cases where foam blankets on the electrolytes have trapped these gases, explosions have resulted. Operators have been showered with alkali or acid with serious injuries resulting.

Hazards of explosion and fire are ever present, and even small amounts of hydrogen gas can cause a serious accident. Following safety regulations in the use of this material will prevent a majority of accidents.

Other gases commonly used are: acetylene, oxygen, nitrogen, helium, argon, neon and illuminating gases. Mixtures of these gases are used in high temperature operations for a variety of purposes. Hazards of explosion, fire and personal injury are present with acetylene, hydrogen or illuminating gas mixtures. All compressed gases also present hazards due to faulty handling of cylinders.

Properly identified gas lines and containers properly handled and protected are requisite for operations involving gases.

Salts and compounds are another group of chemicals with hazards of fire, explosion, and injury to health. Nickel salts as used in plating operations have been known to produce a

dermatitis commonly known as "nickel itch." In the reported cases the facts indicate that some people are unaffected by nickel solutions or dust whereas others are so allergic that complete removal from areas where nickel powders or solutions are used is necessary. Ointments have been used very successfully in the control of nickel itch and similar skin conditions resulting from other chemicals.

Chromium Compounds

Chromium electroplating systems are classified by the American Standards Association as a severe hazard. Chromium compounds, such as chromic acid or chromates, are used in electroplating and in glassware cleaning operations. Due to the low cathodic efficiency of the chromium plating baths a fine mist of hydrogen gas laden with chromic acid is formed at the operating positions by the bursting of many fine hydrogen bubbles on the surface of the plating solution.

Contact of the skin or mucous membrane with the mist, dust, or solution of soluble chromates or dichromates may cause dermatitis and ulcers. Perforation of the nasal septum may occur following continuous exposure to the dust or mist of chromic acid and its derivatives.

The maximum allowable concentration of chromium as chromate or dichromate dust or as chromic acid mist, has been set at 1 milligram of chromic acid in 10 cubic meters of air for exposures not exceeding a total of eight hours daily.

Properly designed ventilating equipment, protective clothing and full instructions to operating personnel will reduce hazards of chromium compounds to a minimum. Due to the extremely corrosive nature of chromic acid, frequent inspection of exhaust systems should be made to check on incipient failures of such ventilating equipment.

Cyanides

Cyanides, generally used for metal cleaning and electroplating, have been referred to as the deadliest industrial compounds. They act as chemical asphyxiants, attacking the tissue cells, thereby retarding or stopping oxidation. Since this action within the tissue cells takes place in an atmosphere of pure oxygen, oxy-

gen therapy is of little use in cyanide poisoning.

In fatal cases there are rarely witnesses. In one case six persons were found dead in a room near the entrance and they had died without making an outcry. On the other hand chronic cases of cyanide poisoning are extremely rare. In such cases gastro-intestinal symptoms predominate.

Where cyanides are handled, operators should be carefully instructed as to their hazards. Acid storage near cyanides should be such that in case of accidental breakage the acid cannot come into contact with cyanides.

Other precautionary steps should include good ventilation at cyanide plating tanks, protective clothing for the workers, absolute prohibition against food storage or eating where cyanides are used, and instructions to operators to wash their hands thoroughly after working with cyanides.

Fluorides

In certain metal joining operations fluxes are used which contain fluorides. Toxic quantities of fumes are generated during brazing operations when fluoride fluxes are employed. The upper respiratory tract and the lungs may be affected. Blood calcium may be diminished and marked bone changes have been reported in severe cases of chronic fluoride poisoning.

Proper ventilation should be provided where fluoride fluxes are used. Since one mechanism of fluorine toxicity consists of calcium deprivation treatment is primarily designed to correct this and should be carried out under medical supervision.

In the processing of tungsten wire products molten nitrite baths are employed to remove oxide layers originating from high temperature sealing operations. Nitrous fumes may be generated at the molten nitrite pots. Copious fumes result if the nitrite is allowed to boil.

There is also the danger of splattering if wet parts are dipped into the molten bath. As a result of exposure to nitrous fumes marked edema of the lungs has been reported. Symptoms may be delayed as long as 24 and more hours. Good ventilation should be installed.

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Chemicals

(From page 38)

Phosphoric anhydride presents a health hazard if improperly handled. Its reaction with water is extremely violent. Accidents may occur either in washing the towers or drying tubes containing this material. Violent sputtering of the material will occur unless the operation is performed very slowly and carefully. Inhalation of the dust in loading a fresh tube produces a stinging or biting sen-

sation in the throat and settling of the dust on the skin causes itching.

This material should be handled only when protective goggles, respirator, gloves and aprons are worn. When emptying a tube or cylinder of the substance, a small amount of it should be carefully mixed with water before disposing of it down the drain.

Radio-active Compounds

In special manufacturing operations small amounts of radio-active compounds are used. The handling

of radio-active material presents special problems in the protection of operating personnel. Sufficient data and experience are now available so that with reasonable precautions radio-active materials can be handled over a period of years with no visible harm.

On the other hand, serious injury may result from relatively short exposure unless proper working conditions and safety regulations exist. Since injuries due to radio-active compounds may not become apparent immediately the operators may attempt short cuts and neglect precautions.

Inhaled asbestos fibers are irritating, not because they are silicates, but apparently because they are stiff fibers which mechanically irritate the lungs and result in fibrous bodies building up in the lungs. The varying susceptibilities of different persons are difficult to judge. Recent findings point out that asbestos dust is a definite health hazard, but careful handling of the material will prevent this danger.

A related condition, silicosis, is described as a disease due to breath-

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ing air containing silica, characterized by shortness of breath and increased susceptibility to tuberculosis. If dust is to exert a harmful effect it must be of a small size so as to enter the lungs. Seventy per cent of industrial dust measures less than 3 microns. Treatment by a physician is therefore of utmost importance where injury due to silica and asbestos dust is suspected.

Glass wool is used in packing of towers, traps, etc., and should be handled with care to avoid injury to the eyes, etc., that may be caused by a shower of fine glass particles such as results in the removal of the wool from containers. Itching is readily noticed if glass wool is handled without protective gloves.

Solvents

Solvents are widely used industrially, and in metal-working departments the bulk volume of solvents is used where grease and oil removal are part of the operations. Solvents are also used for a variety of other purposes such as in spray mixtures of finely divided solids and in dry-

ing operations, acetone, amyl acetate, alcohols, benzol, chlorinated solvents and ether are typical.

The hazards of acetone are those of fire, explosion and poisoning by contact with the skin or inhalation of the vapors. The fire hazard of acetone is slightly less than that of gasoline and from 2 to 13 per cent of the vapor in air forms an explosive mixture. In case of fire, water, particularly in the form of a fine spray, is a good extinguisher. Total flooding carbon dioxide systems are generally employed for protection in storage areas.

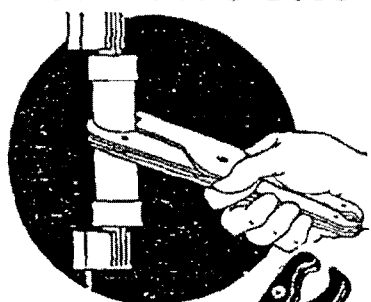
The health hazard of acetone is of a comparatively low order since it is readily liberated by the body. Prolonged inhalation of the fumes causes dryness of the mouth and throat,

slight dizziness, nausea, loss of coordinated speech, hysteria and in extreme cases, coma. Continued contact with the skin dissolves skin oils and causes a dry, irritated condition with a tendency to dermatitis.

Workrooms where acetone is used should be thoroughly ventilated. Smoking and open flames should be prohibited and explosion-proof equipment should be used. Only non-sparking tools should be used to open acetone containers, and precautions should be taken to prevent static electricity accumulations.

Amyl acetate, commonly known as banana oil due to its odor, is used in lamp and tube manufacture in a number of applications. Its hazards are those of fire, explosion and pois-

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oning by contact or inhalation. Air containing over 1.1 per cent by volume of the vapor is an explosive mixture. For fire and explosion protection the rules for handling other solvents, such as acetone, should be enforced.

Continued contact with the skin causes dryness and irritation which may develop dermatitis. Continued inhalation of the vapors causes headaches, giddiness, drowsiness and eye irritation. Vapors of chemically pure amyl acetate will not cause chronic poisoning but the vapors of commercial grades may do so because of impurities.

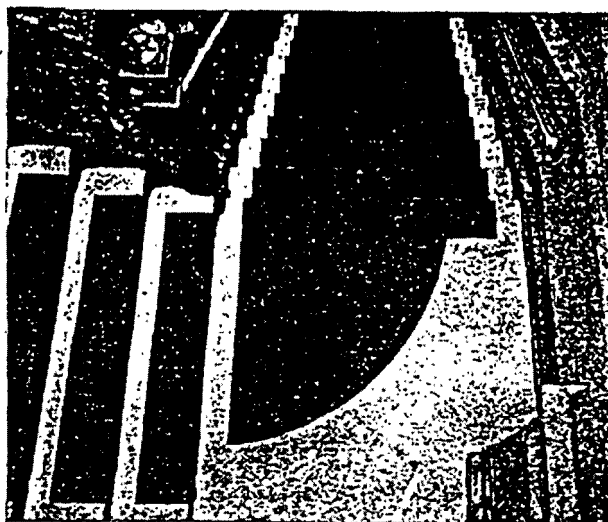
Victims of amyl acetate vapor poisoning should be removed to fresh air. The effects of inhalation tend to disappear in a few hours. For skin irritations protective creams are generally employed with success.

Alcohol mixtures find applications in drying operations. Mixtures of ethyl and methyl alcohol are the most common, and though hazard of fire in the use of these flammable liquids is ever present, the hazard to health is generally overlooked. Even ethyl alcohol ingested by the human body has resulted in death. It is readily decomposed by the body into carbon dioxide and water. On the other hand, one of the products of the oxidation of methyl alcohol is an extremely poisonous substance—formic acid.

Diagnosis of methanol poisoning is featured by the characteristic damage to the optic nerve resulting in severe blurring of vision or total blindness. Two hundred parts per million is considered the limit for a safe atmosphere. An adequate exhaust system is the best precautionary method. Substitution of denatured grain alcohol for mixtures containing high percentages of methanol is also recommended. Where methyl alcohol poisoning is suspected, the victim should be treated by a physician.

The volume of benzol used in the lamp and tube industry is not great, and the greatest hazard of this flammable liquid is that of injury to health. Benzol produces bone marrow changes. In acute poisoning the central nervous system is affected, whereas in chronic cases the blood-forming system is damaged. In a number of the acute cases reported, death has resulted.

In chronic cases, the effect of the



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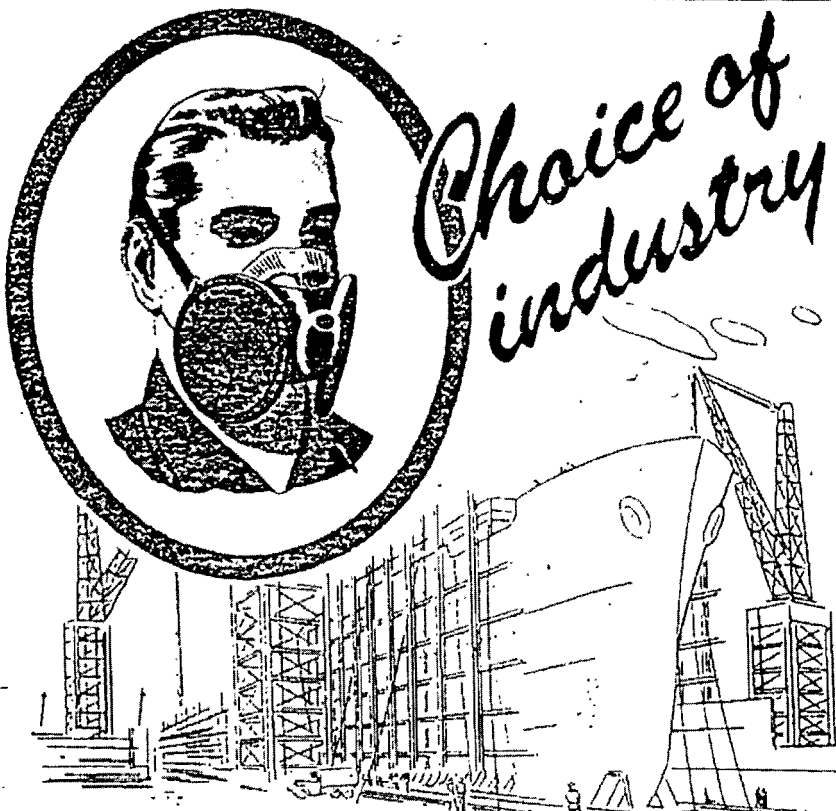
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poison on the blood may not be noticed until chances for recovery are slim. Victims are usually saved by persistent use of transfusions. Hospital confinements may run as much as two or three months.

Periodic physical examinations and adequate ventilation are important precautionary measures.

First aid for victims of acute trichlorethylene poisoning should include removal to fresh air and removal of benzene-saturated clothing since absorption through the skin may contribute to death even though a person was originally saved from a fatal dose.

Carbon tetrachloride and trichlorethylene, commonly used degreasing solvents, account for a large percentage of solvent consumption. They are commonly referred to as safe or practically non-flammable and non-explosive. Carbon tetrachloride was one of the first chlorinated hydrocarbon solvents employed in metal degreasing operations in liquid baths.

Vapor degreasing operations involve high temperatures and may result in injuries if improperly handled. Carbon tetrachloride has been classified as highly toxic and trichlorethylene slightly less so. These solvents have anesthetic properties and heavy concentrations cause coma.

Disturbances of metabolism and blood chemistry result from exposure to carbon tetrachloride. Frequent handling tends to result in drying of the skin and dermatitis. Sudden severe exposure possibly results in depressive action on the heart so that when deaths occur they may be due to failure of the heart or ventricular fibrillation rather than respiratory failure.

Chronic exposure has been shown to result in damage to the liver and kidneys. Adequate ventilation to keep vapor at a concentration below 100 parts per million per working day of eight hours or 500 parts per million in instances of short infrequent exposures is good practice. Lubricating skin creams are recommended for dry skin as a result of exposure.

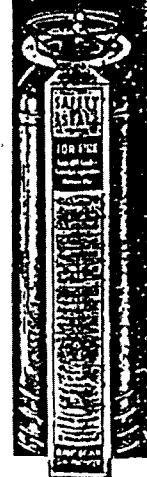
Trichlorethylene has been more recently substituted for carbon tetrachloride in vapor degreasing of metal parts because of operating advantages. Inhalation of its vapors causes dizziness, nausea and prolonged breathing of excessive quantities will cause persons to lose consciousness.

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Two hundred parts per million in air has been established as a safe limit for trichlorethylene vapors over an eight-hour day. Ventilation should be designed, therefore, to maintain vapors of this solvent at or below the established safe limit.

Phosgene may be liberated when trichlorethylene comes into contact with flame and care should be exercised in its use near open fires.

Frequent handling of trichlorethylene tends to produce drying of the skin and dermatitis. Lubricating or protective skin creams are being used with success.

Ether is used to a rather limited extent in special rapid drying applications. It is a highly volatile liquid, giving off even at comparatively low temperatures vapors which form flammable and explosive mixtures with air or oxygen. Spontaneously explosive peroxides sometimes form on long standing or exposure of bottles to sunlight. The vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back. It is classed as more hazardous than gasoline.

When inhaled, ether usually produces an initial symptom similar to alcoholism and called the "ether jag." Inhalation of a concentration of 35,000 parts per million causes unconsciousness in about a half an hour. Continued inhalation of such concentrations can result in death due to failure of respiration. Susceptibility to pneumonia is increased by exposure. Chronic exposure affects chiefly the digestive and nutritive organs. Operators who have been exposed to ether inhalation may be rendered "dead drunk" by a single drink of whisky.

Precautions against fire and explosion include explosion-proof lighting, electrically grounded equipment. Storage of ether in rooms where temperatures are normal will prevent internal pressures from rising and rupturing the containers with explosive violence.

Persons with severe colds, or bronchitis should avoid exposure to ether vapor. Adequate ventilation, preferably at the point of vapor origin, is also important.

Too much of even harmless chemicals can cause serious disturbance of the body chemistry. The use of common salt tablets to combat heat

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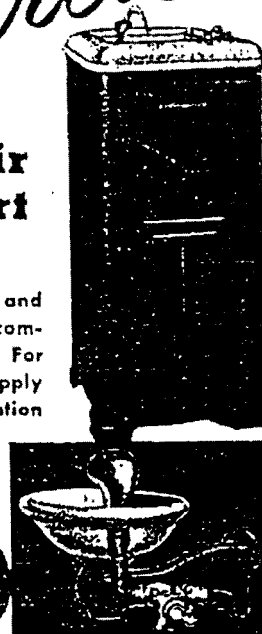
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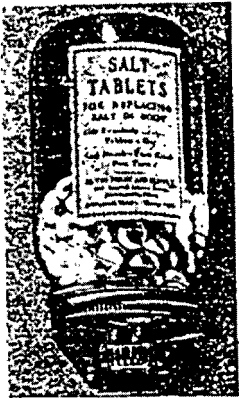
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\$2.00 Per M.	\$1.75 Per M.
(in 10 M lots)	(in 10 M lots)

WRITE FOR SAMPLE!
Elco tablet dispenser—\$1.50
(State tablet size)



NO. 1 KIT.....\$11.95
Wall or portable green metal box 18 1/4" x 12 1/4" x 4 1/4".
Other kits \$4.25 to \$28.50. Special kits to order.

CONTENTS FOR NO. 1 KIT

2—3-in. Gauze Bandage	6 only Economy Pads	1—1-yd. Gauze
4—2-in. Gauze Bandage	1—1-oz. Tincture of Mercuric Iodine	1—1x10-yd. Adhesive Tape
4—1-in. Gauze Bandage	1—4-oz. Grease and Adhesive Remover	1—1/2 x 10-yd. Adhesive Tape
2—1 1/2-in. Gze. Bandage	1—1-ounce Elco Antiseptic Solution	1—2-oz. Boric Acid Solution
25—3/4 x 2 1/2 Mediplasts	1—Cotton Picker	100 Aspirin Tablets, 5 Grain
8—1 x 2 1/2 - Inch Mediplasts	1—Eye Snare	1—2-oz. Spirits of Ammonia
1—1-oz. Bumol	1 pair Surgical Scissors	1—4-oz. Tincture Green Soap
100 Cotton Applicators	1 Insta Aid Chart	1 roll Quick Tape
1 pair Sliver Forceps	1 Triangular Bandage	1 Green Metal Box, No. 1
1 Tourniquet		

ELVIN FIRST AID SUPPLY
327 2nd Ave., N. Minneapolis 1, Minn.

fatigue is an illustration. Most people suffer no ill effects, but there are some who become nauseated after swallowing one.

Uses and Hazards of Chemicals

ACETONE—Spray mixtures and drying operations. Fire hazard slightly less than gasoline; 2 to 13% of vapor in air forms explosive mixture. Toxicity fairly low. Use of water or carbon dioxide extinguishers for fire protection preferred.

ACETYLENE—High temperature, metal-joining operations. Explosive and flammable gas. Cylinders should be properly handled and identified.

AMYL ACETATE—Spray mixtures. Over 1.1% vapor in air is explosive mixture. Toxicity fairly low. 400 parts per million considered maximum safe concentration. Explosion-proof electrical fixtures and non-sparking equipment desirable.

ASBESTOS—Insulation. Inhalation of dust can cause asbestosis.

ARCON—Gas filled devices. Cylinders should be properly handled and identified.

BENZOL—Carbonizing and solvent operations. Vapors flammable and explosive. Human tolerance to benzol fumes is extremely low. Adequate ventilation necessary. 100 parts per million considered maximum safe concentration.

CARBON DIOXIDE (Dry Ice)—Low temperature operations. Hazards of frost bite.

Double Safety Work Gloves

Stanzails

of Liquid-Proof
Red Neoprene-
Coated Fabric

All the handiness of a good cotton work glove *plus* being able to wear it in handling dangerous liquids *plus* the extra safety of bright red to warn the wearer when his hands are exposed to moving machines *plus* extra long wear... these add up to unusual glove value for your money. The red oil-and-acid safe neoprene is tightly bonded to fabric, won't peel, resists abrasive use. Standard size, R-26, knit wrist; R-27, gauntlet. Write today for the bargain story.



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OVER 25 YEARS OF QUALITY GLOVE MAKING



No. 324 **Sellstrom**

**PIVOT—SHATTERPROOF—SHIELD
FOR EYES—FOREHEAD—CHIN**

A sturdier headgear of medium weight and specially formed fibre for top and bottom—protects forehead and chin. Scientifically designed to provide utmost safety plus full freedom of head and widest vision.

Write for FREE catalog of
Sellstrom Specialized Safety
guards for head and eyes.



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explosion and suffocation. Avoid contact with skin.

CARBON TETRACHLORIDE—Metal degreasing. Vapors highly toxic: 100 parts per million considered maximum safe concentration.

CHLORIDE—Occurs as byproduct of special operations. Corrosive and irritating gas. Proper ventilation will remove hazards.

CHROMIUM COMPOUNDS—Electroplating and glassware cleaning. Extremely corrosive. One milligram of CrO_3 in 10 cubic meters of air considered maximum safe concentration.

COMPRESSED AIR—Spraying and drying operations. High pressure of air stream may direct metal particles with sufficient velocity to cause injury. Can rupture internal organs if directed against the body. Spray booths for high pressure operations should be in isolated areas, and horseplay with air hose strictly prohibited.

CYANIDES—Electroplating and metal cleaning. Deadly poison. Store away from acids. Avoid inhalation of dusts. Good housekeeping and thorough instruction of personnel in its hazards required. Prominent warning notices desirable. Ventilation needed where spray mists occur in plating.

ETHER—Drying, etc. Fire and explosion hazards greater than those of gasoline. Anesthetic. Explosion-proof equipment, adequate ventilation required. 440 parts per million considered maximum safe concentration.

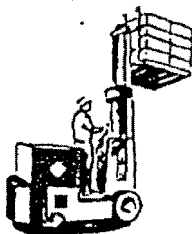
ETHYL ALCOHOL—Drying, etc. Flammable.

Industrial LOGISTICS

Safety—first of all! With Elwell-Parker Electric Truck and Crane Systems you reduce the hazards of injury to men—and protect valuable loads in transit.

Furthermore, you reduce your costs at every step, by moving *bigger loads faster*—and by eliminating needless manual transportation of materials. Handling increases costs but adds little to value.

Give your materials-handling program a fresh going-over—look for new places where Industrial Logistics can aid in reducing your costs in preparation for tougher selling. The Elwell-Parker Materials-Handling Consultant will join in planning Electric Truck Systems engineered for your Plant. Send for him—today.



Established 1893
THE ELWELL-PARKER ELECTRIC CO.
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Safe-Hi PRODUCTS

SAFE-HI The Universal Ladder Shoe



Fits any ladder; holds on any surface, under all conditions. Cord holds on wet floors; rubber on dry floors. Self-sharpening spike holds on snow and ice. Approved by Underwriters Laboratories.

SAFE-HI Shoes now have "High Visibility Yellow" on them, to comply with new Safety Color Code for Industry.

Price: \$2.50 per pair.

SAFE-HI Pole Grips and Wall Grips hold the top of your ladder securely. Write for descriptive literature, and prices.

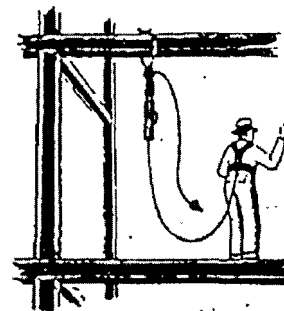
ROSE Manufacturing Co.

SAFE-HI Safety Belts



Safe-Hi Construction Belt

Fully meets Federal Specifications 406-C. All hardware tests 5,000 lbs. without distortion. Write for literature and prices on various types of SAFE-HI Belts.



SAFE-HI

Shock Absorber for Safety Belts
Eliminates hazardous jolt and rebound. Makes workmen really safe on high work. Literature and prices on request.

1731 Arapahoe St.
Denver 2, Colorado



Here's Protection Against Burned-out Motors

with PIERCE Balanced Lag Renewable Fuses

● PIERCE Fuses with their Balanced Lag place more of the lag within the low overload working range where it belongs. Thus, unnecessary blows and shut-downs are avoided. BUT, they do blow when shorts or grounds cause current surges at the higher ranges, and when failure to blow is dangerous to equipment.

Pierce Superiorities Mean More Protection
Among them: *Screen Ventilation* avoids storing of heat, permits instant escape of gases, and prevents after-blow; tubular *Arch-Bridge* construction for long life and easier replacement of the scientifically designed Pierce Balanced-Lag-Link.



FREE

SAMPLE LINK

Send for your inspection, together with complete data on renewable fuses. Just mail the coupon.

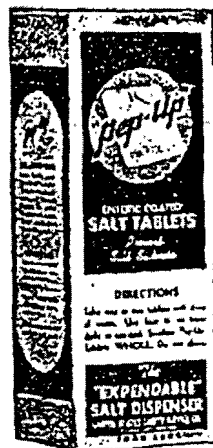
**PIERCE
RENEWABLE FUSES, INC.**
BUFFALO 7, N. Y.

PIERCE RENEWABLE FUSES, INC., DEPT. E-14
211 HERTEL AVENUE, BUFFALO 7, N. Y.

Please send me complete data on renewable fuses, and FREE Sample of PIERCE Balanced Lag Link as checked at right.

YOUR NAME ☐ 30 Amps.
POSITION ☐ 60 Amps.
COMPANY ☐ 100 Amps.
ADDRESS ☐ 200 Amps.
P. O. STATE ☐ Voltage

"PEP-UP" SALT TABLETS



DO NOT CAUSE NAUSEA

"PEP-UP" Salt Tablets with an exclusive, patented coating reach the intestinal tract before dissolving—so the system gets the salt direct and the stomach doesn't suffer from nauseating salt irritation.

The medical profession definitely recognizes that the body requires extra salt in hot summer months or on jobs where employees are working in excessive heat.

Keep "PEP-UP" Salt Tablets handy for all your workers—order them in safe, sanitary "EXPENDABLE DISPENSERS."

Ask your local supplier for prices or write us direct.



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Branches: Tulsa, St. Louis, Houston, Dallas

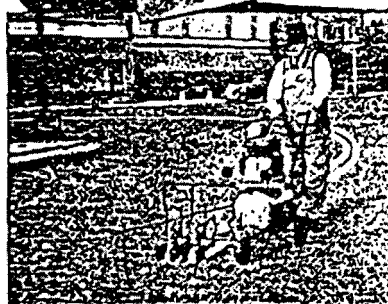
SAFETY on the Home Front



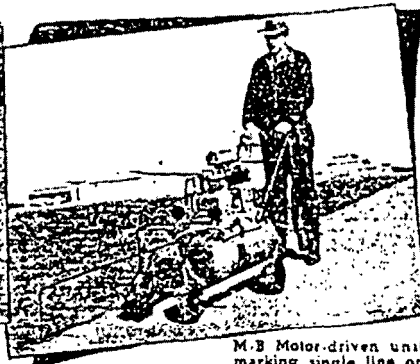
M-B Motorless Marker striping factory aisle.

Reduce accidents to a minimum, both indoors and outdoors, by systematically striping designated traffic lanes. M-B MARKERS simplify the job. They handle ANY type of striping job — factory aisles, street centerlines, crosswalks, etc. Also handy for marking airports, athletic fields, tennis courts, playgrounds, etc. Quickly convertible to all-purpose paint sprayer for painting park benches, guard rails, traffic signs and other municipal equipment. Two types — motor-driven for all purpose painting and motorless for striping only. Write for literature.

Mell-Blumberg Corp., Box NS-5, New Holstein, Wis.



M-B Motor-driven Marker pulling down double line at street intersection.



M-B Motor-driven unit marking single line on airport runway.



MARKERS

ble. Adequate fire-protection equipment necessary.

FLUORIDES—Contained in brazing fluxes. Toxic fumes may be generated in use. Adequate ventilation required.

GLASS WOOL—Miscellaneous uses. Danger of injury to eyes from splinters. Use of goggles and masks recommended.

HELIUM—Protecting atmosphere operations. Proper cylinder handling necessary.

HYDROGEN—Brazing, baking, etc. Form highly explosive mixture with air or oxygen. Proper handling of cylinders, furnaces, etc., and identification of gas lines essential.

ILLUMINATING GASES—Sealing, fire, etc. Form explosive mixture with air. Hazard of suffocation. Carbon monoxide may be present in manufactured gas.

LIQUID AIR—Low temperature operations. Highly volatile, explosive if restricted in closed containers. Causes severe frost bite. Avoid contact with combustible material, such as oil.

METHYL ALCOHOL—Drying, etc. Flammable. Toxic if absorbed by the body, generally causing damage to optic nerve. Adequate ventilation necessary; 200 parts per million considered maximum safe concentration.

NICKEL SALTS—Electroplating. Dermatitis may result in some cases. Where skin sensitivity is evident simple skin protection is usually sufficient.

NITRATES—Molten salt pots. Toxic nitrous fumes may be formed. Temperature controls and fume hoods should be provided.



**CUTS ACCIDENTS
STIMULATES SAFE
PRACTICES
REWARDS CAREFUL
WORKERS
EFFECTIVE RESULTS
AT LOW COST**



Robbins' SAFETY AWARDS

To keep accidents down to a minimum and encourage safety habits among employees are the two sides of a problem confronting every industrial plant.

Helping solve that problem are Robbins' Safety Awards, used with great success by companies large and small throughout the country. These firms report that a Robbins' Safety Award System pays huge dividends in making employees safety conscious and curtailing accidents by rewarding careful working habits.

The Robbins Company, creators of ideas in metal for over fifty years, will be happy to help you plan a safety award system for your business. Estimates and design suggestions submitted without obligation.



The Robbins Company
ATTLEBORO, MASS.
"IDEAS IN METAL"

NITROGEN—Inert atmosphere applications. Proper cylinder handling needed.

OXYGEN—High temperature gas mixtures. Explosive mixtures formed with certain gases. Proper handling of cylinders and certification of gas lines essential.

PHOSPHORIC ANHYDRIDE—Moisture absorption. Violent reaction with water. Use in disposal of large quantities.

RADIO-ACTIVE COMPOUNDS—Specialized applications. Permanent damage may follow prolonged exposure. Strict enforcement of handling rules extremely essential.

SILICA—Miscellaneous uses. Excessive dust exposure may result in silicosis. Adequate ventilation needed.

TRICHLOROETHYLENE—Metal degreasing. Toxic if inhaled for prolonged periods. Hydrogen generated on contact with flame. 50 parts per million considered maximum safe limit.

Fire Losses Continue to Rise

Estimated fire losses in the United States during February, 1946, were \$51,759,000, or 25 per cent higher than in February, 1945, and 4 per cent higher than the preceding month of January, 1946.

Losses in the 12-month period ending February 28, 1946, were \$470,570,000, as compared with \$433,800,000 for the previous 12-month period, an increase of 8.6 per cent. The estimates are based upon incurred losses reported to the National Board of Fire Underwriters by member companies, plus an allowance for unreported and uninsured losses.



ARMOR-PLATE THE NON-SKID PAINT for FLOORS, STEPS, RAMPS

Insurance against falls and injury—wherever feet may slip. Just brush a coat of Armour-Plate on dangerous surfaces, and save limbs and lives. Abrasive texture like No. 3/0 emery cloth. For metal floor plates, stair treads, ramps, corridors, airplane wing "steps," ship decks, gangplanks, truck running boards, stepladders—wherever wet, oily or slippery surfaces hamper production and threaten life. Rust-inhibiting. Sticks to wood, metal, concrete, slate, and glass. Cost applied, less than 1c per sq. ft. Jobs of rich, dark neutral gray or red, brown or green.

FREE—Report No. 419-5 applied sample attached

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Export Division WASHINGTON INTERNATIONAL SALES, WASHINGTON, D.C.
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AND SAVE MONEY!



There's no need to pay a premium to protect workers against eye accidents. Eye-Gard Goggles and Spectacles provide the finest in eye protection, yet cost no more than ordinary types. No. 25 Goggle illustrated is made of impact compression material with large comfort-fitting cup, and adjustable rims. Keeps out light and sparks but allows abundant ventilation. Has adjustable fit rubber-covered ball-chain bridge and many other features. Make a memo now to order Eye-Gards. . . Test them yourself and see that you get top quality at real savings. If your distributor cannot supply you, write direct.

Send for free new Eye-Gard Catalog of Safety Products including Leaf Selector Chart



AMERICAN INDUSTRIAL SAFETY EQUIPMENT CO.
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DIVISION OF THE BURDETT OXYGEN COMPANY • CLEVELAND, OHIO

FROM ANY ANGLE..... Hillyard Floor Treatments



THE HILLYARD COMPANY
DISTRIBUTORS...HILLYARD CHEMICAL CO....ST. JOSEPH 1, MO... BRANCHES IN PRINCIPAL CITIES

370 Turk St., San Francisco, Calif.

1947 Broadway, New York, N.Y.

Two hundred parts per million in air has been established as a safe limit for trichlorethylene vapors over an eight-hour day. Ventilation should be designed, therefore, to maintain vapors of this solvent at or below the established safe limit.

Phosgene may be liberated when trichlorethylene comes into contact with flame and care should be exercised in its use near open fires.

Frequent handling of trichlorethylene tends to produce drying of the skin and dermatitis. Lubricating or protective skin creams are being used with success.

Ether is used to a rather limited extent in special rapid drying applications. It is a highly volatile liquid, giving off even at comparatively low temperatures vapors which form flammable and explosive mixtures with air or oxygen. Spontaneously explosive peroxides sometimes form on long standing or exposure of bottles to sunlight. The vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back. It is classed as more hazardous than gasoline.

When inhaled, ether usually produces an initial symptom similar to alcoholism and called the "ether jag." Inhalation of a concentration of 35,000 parts per million causes unconsciousness in about a half an hour. Continued inhalation of such concentrations can result in death due to failure of respiration. Susceptibility to pneumonia is increased by exposure. Chronic exposure affects chiefly the digestive and nutritive organs. Operators who have been exposed to ether inhalation may be rendered "dead drunk" by a single drink of whisky.

Precautions against fire and explosion include explosion-proof lighting, electrically grounded equipment. Storage of ether in rooms where temperatures are normal will prevent internal pressures from rising and rupturing the containers with explosive violence.

Persons with severe colds, or bronchitis should avoid exposure to ether vapor. Adequate ventilation, preferably at the point of vapor origin, is also important.

Too much of even harmless chemicals can cause serious disturbance of the body chemistry. The use of common salt tablets to combat heat

Not merely built, but

*Engineered
for Utmost Safety*

● The very dangers which most often threaten life, limb and load simply don't happen when you use ACLC Safety Hoist Hooks.

Makeshift mousing gives place to automatic mousing. Snagging can't occur because no protruding point "asks" for it. Hook straightening and load slippage are avoided because the patented shoulders and lip LOCK the load in perfect alignment.

Time saved—men spared—cleaner jobs, hence more profit. Send for details Now!

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ACLC Safety Hoist Hooks are Manufactured in three models—Eye Type, Shank Type, Shackle or Clevis Type.

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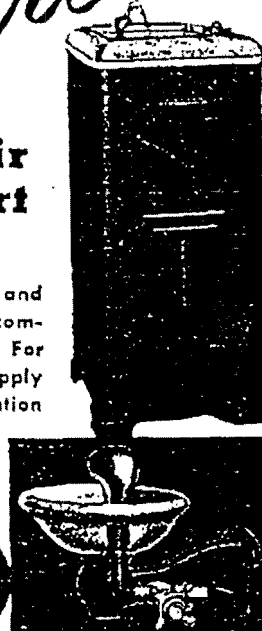
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to their
comfort

The installation of Halsey-Taylor Coolers and Drinking Fountains is a direct contribution to the comfort and convenience of the workers in any plant. For years these modern fountains have helped supply cool water that is always free from contamination and health-safe, due to practical automatic steam control and hygienic drinking mound. Write for catalog!

THE HALSEY W. TAYLOR CO.,
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**HALSEY
TAYLOR**

**DRINKING
FOUNTAINS**



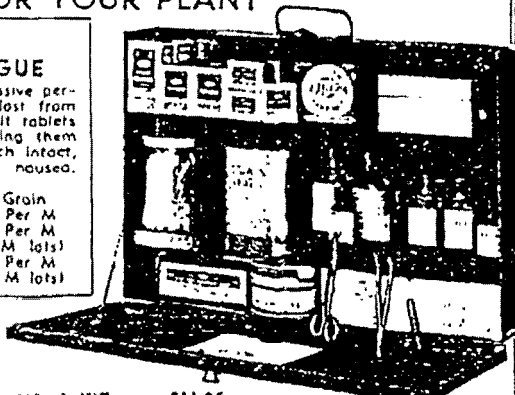
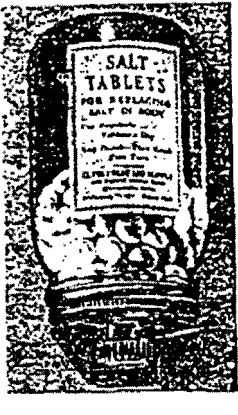
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BEAT THE HEAT AND REDUCE FATIGUE

Reduce fatigue due to excessive perspiration and replace salt lost from the body. Enteric coated salt tablets dissolve more slowly, allowing them to pass through the stomach intact, reducing the possibility of nausea.

10 Grain	7 1/2 Grain
\$2.50 Per M.	\$2.25 Per M.
\$2.25 Per M.	\$2.00 Per M.
(in 5 M. lots)	(in 5 M. lots)
\$2.00 Per M.	\$1.75 Per M.
(in 10 M. lots)	(in 10 M. lots)

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(State tablet size)



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1 pair Silver Forceps	1—Triangular Bandage	1—Green Metal Box, No. 1
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Double Safety Work Gloves

Stanz oils

of Liquid-Proof
Red Neoprene-
Coated Fabric

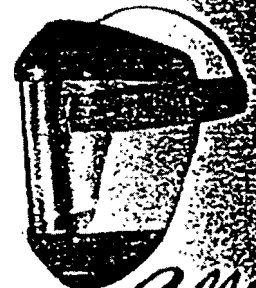
All the handiness of a good cotton work glove *plus* being able to wear it in handling dangerous liquids *plus* the extra safety of bright red to warn the wearer when his hands are exposed to moving machines *plus* extra long wear... these add up to unusual glove value for your money. The red oil-and-acid safe neoprene is tightly bonded to fabric, won't peel, resists abrasive use. Standard size, R-26, knit wrist; R-27, gauntlet. Write today for the bargain story.



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A sturdier headgear of medium weight and specially formed fibre for top and bottom—protects forehead and chin. Scientifically designed to provide maximum safety plus full freedom of movement and widest vision.

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injection and suffocation. Avoid contact with skin.

CARBON TETRACHLORIDE—Metal degreaser. Vapors highly toxic; 100 parts per million considered maximum safe concentration.

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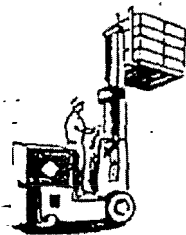
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Furthermore, you reduce your costs every step, by moving *bigger loads faster*—and by eliminating needless manual transportation of materials. Handling increases costs but adds little to value.

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The Elwell-Parker Materials-Handling Consultant will join in planning Electric Truck Systems engineered for your Plant. Send for him—today.



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SAFE-HI The Universal Ladder Shoe



Fits any ladder; holds on any surface, under all conditions. Cord holds on wet floors; rubber on dry floors. Self-sharpening spike holds on snow and ice. Approved by Underwriters Laboratories. SAFE-HI Shoes now have "High Visibility Yellow" on them, to comply with new Safety Color Code for Industry.

Price: \$2.50 per pair.

SAFE-HI Pole Grips and Wall Grips hold the top of your ladder securely. Write for descriptive literature and prices.

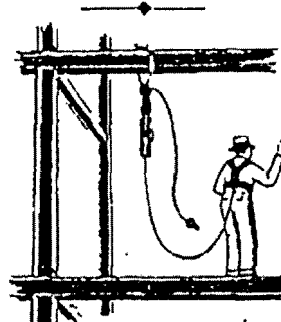
ROSE Manufacturing CO.

SAFE-HI Safety Belts



Safe-Hi Construction Belt

Fully meets Federal Specifications 406-C. All hardware tests 5,000 lbs. without distortion. Write for literature and prices on various types of SAFE-HI Belts.



SAFE-HI

Shock Absorber for Safety Belts
Eliminates hazardous jolt and rebound. Makes workmen really safe on high work. Literature and prices on request.

1731 Arapahoe St.
Denver 2, Colorado



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Balanced Lag
Renewable Fuses

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Pierce Superfuses Mean More Protection Among them: Screen Ventilation avoids storing of heat, permits instant escape of gases, and prevents after-blow; tubular Arch-Bridge construction for long life and easier replacement of the scientifically designed Pierce Balanced-Lag-Link.



FREE SAMPLE LINK

Sent for your inspection, together with complete data on renewable fuses. Just mail the coupon.

**PIERCE
RENEWABLE FUSES, INC.**
BUFFALO 7, N. Y.

PIERCE RENEWABLE FUSES, INC., DEPT. E-14
211 HERTEL AVENUE, BUFFALO 7, N. Y.

Please send me complete data on renewable fuses, and FREE Sample of PIERCE Balanced Lag Link as checked at right.

YOUR NAME ☐ 30 Amps.
POSITION ☐ 60 Amps.
COMPANY ☐ 100 Amps.
ADDRESS ☐ 200 Amps.
P. O. ☐ Voltage
STATE