

improved construction of floors are absolute requisites; elevators, hoistways, ladders, etc., must be provided with proper safeguards; all machinery must be made safe and fool-proof; all vats, pans, caldrons and all chemical containers must be properly protected. The general sanitary conditions of the factory must be improved in so far as they relate to dressing-rooms, washing, bathing and lunch facilities, etc.

Add to these fundamental improvements the proper provisions for medical supervision and educational work and there would be no reason why the chemical industries should not become comparatively safe and hygienic.

By medical supervision I mean complete medical supervision of the whole plant—its physical conditions, its sanitary features, the various industrial processes—and of all the employees, not only while they are within the shop but also while they are outside of the establishment. A medical supervision should consist of the following: (a) supervision of the sanitation of the establishment; (b) supervision of the industrial processes in so far as they are liable to harm the workers; (c) preliminary examination of all new applicants for work; (d) first aid and care for accidents and diseases of the workers; (e) periodical examination of workers; (f) supervision of the home surroundings of the workers; and (g) medical care of the workers outside of the establishment.

The educational activities which must be combined with the medical supervision are essentially those which tend to acquaint the workers with the dangers of their calling, with the perils of the various gases, fumes and toxic agents which they must necessarily handle, and education of the workers in the proper means of safeguarding themselves from the ill effects of the various perils of which the industry is so full.

With the above program for the individual employers in the chemical industry, the industry as a whole should not be content.

The organization of the Chemical Section of the National Safety Council proves that the whole industry has great common interests. In Germany the chemical industry is organized in a powerful association (Berufsgenossenschaft). There, owing to the sickness insurance laws, the industry as a whole is strongly organized and looks out for the common interests. The association exercises general supervision over all its components. It legislates for the industry; it has evolved a uniform and standardized method of safety, accident prevention and medical supervision; it appoints its own inspectors to investigate the sanitary, safety and health conditions in the establishments of its members; it punishes delinquent members by raising the rate of their insurance and it exercises general control of their safety, sanitation and health of the industry.

What has been done in Germany and elsewhere may easily be accomplished here. There is need of a greater uniformity and better methods of standardization of the safety, sanitation and health control in the chemical industry. With all their desire, individual manufacturers cannot do as much as a whole industry. Many accidents and a large number of occupational diseases are still due either to negligence or to ignorance of employers and their operatives, and to the faulty and often incompetent medical supervision in the various establishments.

Only a general control by the industry as a whole, combined in a National Association or section of the National Safety Council, may be able to standardize the industry, to improve the conditions of safety and health in the industry and to remove from the industry the stigma of the extreme menace to the health and life of its workers. Individual efforts, no matter how worthy or earnest, must give way to a general, joint, combined, uniform and standardized health supervision of industry.

Great as has been the prosperity of the chemical industry in the field of economic production, vast as have been its achieve-

ments within the last few years, enormous as has been its progress in all the various fields of its endeavor, greater progress yet awaits the industry when, by a complete and thorough safeguarding of its establishments and a complete hygienic control of the health of its workers, the industry will proudly proclaim to the world that it no more is the most dangerous of all trades, but that it has become the most humane of all the industries.

31 UNION SQUARE, WEST
NEW YORK CITY

THE GOGGLE PROBLEM IN THE CHEMICAL INDUSTRY

By J. R. DE LA TORRE BUENO

Editor, General Chemical Bulletin, General Chemical Company

The chemical protective goggle and its use presents every one of the difficulties of the goggle problem, only in a vastly more acute degree. The goggle need not be stout to resist violent impact, but it must be of a material unacted on by acids or other chemicals. It must also prevent liquids from striking or flowing into the eye; and finally, it must be ventilated to prevent blurring.

Some form of goggles must be worn in all work which demands protection of the eyes. Everywhere, the use of goggles presents a problem both material and psychological. The problem is material, in that the type of goggle must be carefully adapted to the work and its inherent hazard to afford perfect protection; it should also afford a maximum range of vision and be comfortable to wear. It is psychological, because we men are vain, far vainer than women, and so loth to wear anything disfiguring or that may expose us to ridicule; further, many men *will* take a chance. All industries have to contend with these adverse conditions and experiment and education are gradually overcoming them, by devising suitable and comfortable goggles, and by training the men in safety principles by constant instruction and reiteration.

Many goggles have been made for chemical plants; some are still used. One type consists of a frame of soft rubber with a broad piece going across the nose and other pieces projecting beyond the temples. Another has hard rubber cups fitted with pneumatic cushions along the edges to be inflated, when worn, by means of two little rubber tubes with stopcocks. Both have the defect of heat. The soft rubber ones have eyelets let in for ventilation, but in such a way that there is always danger of corrosive liquids flowing in. The hard rubber contrivance is impractical. Besides, the pneumatic binding readily gets out of order. The goggle most in vogue consists of a close-fitting, flexible rubber half mask or visor which adheres so closely to the face that liquids cannot seep under it and flow into the eye. This has a very great disadvantage, besides being unsightly—it is the extreme discomfort it produces in the wearer by reason of the heat and perspiration it induces over the entire surface of the face with which it is in close contact.

None of these types has efficiently solved the goggle problem in the chemical industry.

Let me draw the ideal goggle. First, it has only one object, to protect perfectly the eye—that organ, at once so delicate and so important to the worker. It is meant neither for comfort nor for beauty, but for safety. But in attaining its prime object, none of the collateral points should be ignored. These, then, are the objects to be attained, the marks of the ideal goggle, in the order of their importance.

- (1) Perfect protection to the eye
- (2) Large field of vision
- (3) Comfort
- (4) Sightliness

PERFECT PROTECTION can be secured only by making the goggle of a material unaffected by chemicals and by making it fit so closely that neither above nor below nor at the sides may the least drop of a corrosive liquid penetrate to the eye, either by

dashing against the goggle or by seeping under it. It must be therefore flexible in order to conform closely to the contour of the face.

LARGE FIELD OF VISION is a solved problem; it works against a deep eye-cup, which tends increasingly to limit the angle of sight with increasing depth.

COMFORT depends on two elements: the weight of the goggle, and its ventilation to prevent excessive perspiration. In the nature of things, as the chemical goggle is practically a half mask, its weight can be but little reduced, except by making it of aluminum and of light construction, two possible points of improvement. Excessive heat is overcome by ventilation and by reducing the surface in contact with the face.

SIGHTLINESS is immaterial, given the necessity for perfect protection with a maximum of comfort.

To meet the conditions set forth, the goggle frame or mask should be of flexible wire netting; shaped to the face but dished sufficiently to keep it from contact except along the edges which should be bound with a soft, resilient rubber tubing. The edges should be made flexible, so that they may be bent to conform with the facial contours to avoid undue pressure at one spot or being too far away at another. The rubber setting for the large glasses should afford a wide range of vision and be perforated near the lenses to allow the escape of heated air, thus preventing condensation of moisture and clouding. The openings should be on the slant of the frame so that in case acid flows down the face to the glass-settings, it will not readily leak into them; but if it does, they must be so close to the glass that any acid would flow down the inside of the lenses. The mask should be coated with a flexible acid-proof varnish to make it impermeable and at the same time to preserve it from the corrosive action of the fumes about a chemical plant.

This goggle would overcome three of the difficulties—it would give effective protection with maximum sight, together with a large degree of comfort. This is offered as an approximate solution of the goggle problem in the chemical industry.

25 BROAD STREET, NEW YORK CITY

CARE OF WORKMEN EMPLOYED IN THE MANUFACTURE OF ANILINE AND BENZOL PRODUCTS

By A. B. MITCHELL
Benzol Products Company

On account of the effects on the men employed in the manufacture of Nitrobenzol, Aniline and their kindred substances through coming in contact with the compound being produced either by inhaling the gases evolved or absorption through the skin, the following safeguards have been adopted and facts noted in the operation of the plant of the Benzol Products Company.

THE PLANT is of modern construction, brick and steel, and is designed throughout on the gravity system. The maximum amount of air possible is obtained by means of large windows, sliding doors and shutters, and all buildings are fitted with monitors the entire length of the roof. Electrical power is used wherever practical. A locker room is attached to the entrance gate and is provided with steel lockers, showers, toilets and lunch room.

EMPLOYEES—The workmen employed on the processes are all American with the exception of the Aniline House where most of the labor is Polish who from experience have been found to stand this work well. An applicant is inspected by a doctor and examined by him for lungs and heart. Blood pressure is taken and physical defects noted on a card which with the Doctor's recommendation is returned to the office. If the man is employed he is examined monthly—any defective development being reported on the cards.

SAFETY RULES

The following rules are issued to foremen and workmen—the foremen being required to sign a receipt that they have carefully read the instructions. The instructions are printed in English, Polish and Russian and posted around the works, and are as follows:

BENZOL DEPARTMENT

- 1—Benzol is very inflammable and floats on water. It explodes when mixed with air and lighted.
 - 2—Never use an extension light—use an electric Bull's Eye.
 - 3—If you smell Benzol, open doors and windows before going into shop.
 - 4—Remember Benzol vapor is heavier than air.
 - 5—Never enter any tank, pit or well which has contained Benzol without first blowing it out with air, then ask foreman.
 - 6—If you spill Benzol on your clothes go outside into the fresh air until it blows off.
 - 7—If you feel any effect such as sleepy feeling or light head go into the fresh air at once and send for foreman of shop.
- REMEMBER—Fresh Air—Keep Clean—and Benzol will do you no harm.

NITRO SHOP

- 1—If you spill Nitro on your hands wipe it off at once.
- 2—Never work over hot Nitro—allow it to cool first.
- 3—Wash before eating.
- 4—Never enter a nitrator until it has been washed out and air blown in and you have leave to do so by your foreman.
- 5—If you feel sick, report at once to foreman of shop.

ANILINE

(Also printed in Polish and Russian.)

Keep Clean

Keep Clean

Safety First

- 1—Leaks, spills or trouble are to be reported to the foreman of the Aniline House.
- 2—If you spill Aniline on your clothes, change them.
- 3—If you get Aniline Oil on your hands, wash it off at once.
- 4—You must wear clogs.
- 5—Do not wear gloves soaked with Aniline.
- 6—Wash your face and hands before eating.
- 7—If you are feeling bad, tell your foreman at once.
- 8—Aniline and "Booze" are bad, keep them as far apart as possible.

Keep Clean

FOREMAN

Keep Clean

Safety First

- 1—Look after your men.
- 2—Keep them away from Aniline gas as much as possible.
- 3—See that they have clogs on.
- 4—Never let them work over spilled Aniline—especially if it is hot.
- 5—See that they get all the fresh air that is possible.
- 6—If they look "blue" send them out into the air and keep an eye on them.
- 7—Work them slowly on hot days.
- 8—Make them change their clothes if Aniline is spilled on them.
- 9—Don't let them wear gloves (cotton) with Aniline on them.
- 10—Order them to wear mouth protectors if you are in doubt.
- 11—See that the sponges in the protectors are cleaned every day.
- 12—In any case of doubt send for the General Foreman—he will help you night or day.
- 13—If a man gets sick, report it at once to the "First Aid" Department.
- 14—KEEP YOUR MEN CLEAN.