PROCEEDINGS

OF THE

National Safety Council

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bar, is probably faster in operation, and can be operated without a man throwing himself off his balance. It, however, does not provide the leverage necessary for tightening up presses of the larger type.

A gear drive requires less effort for obtaining the necessary pressure on plates and so decreases the strain on the men and also lessens the chances of slipping and falling. It, however, is slow in operation and costs nearly as much to install as the hydraulic press.

A study of the various methods employed in operating the hand-operated press leads one to the conclusion that a gear drive operated by as large a hand wheel as the distance between the shafting and the floor will permit, seems to be the best arrangement, as the gears can be made with such a ratio that they will more than compensate for the decrease in the leverage of the wheel over the bar. This type can be used where it is impossible to install or operate a hydraulic press. In no case, excepting for the very lightest press, should a filter press be operated with a bar.

HYDRAULIC PRESSES

Wherever it is possible to install this type press, it has undoubted advantages: it is faster in operation, and acidents are eliminated in connection with its operation. There are few detracting features and those who have used it have obtained satisfactory results in labor saving, general efficiency of operation, and maximum capacity. Where a high-powered or large size press is required the hydraulic press is the most satisfactory in the long run. Its only disadvantage lies in its first cost.

CENTRIFUGAL DRYERS OR EXTRACTORS

M. F. Crass, Chairman Accident Committee, The Grasselli Chemical Company, Cleveland, Ohio

Under no circumstances should a centrifugal dryer be operated without a suitable casing. Should the extractor ever give way, the casing should be strong enough to retain the broken pieces of metal which otherwise would fly out at terrific speed endangering the lives of nearby workmen. In some cases cast iron casings have been supplied. Cast iron shatters rather readily, especially under severe blows and for this reason its use is not recommended. Casings made of steel have a much higher tensile strength and will afford almost absolute security in case the basket breaks. It is estimated that the casing should be of ⅝ inch steel when the capacity of the basket is 100 to 200 pounds. The casing should have suitable openings so the basket can be inspected without being removed. If these casings are properly constructed an operator will be practically immune from danger providing the extractors are properly operated. No operator should be allowed to lean over baskets or attempt to level off the load in the basket after the power is thrown on and the basket put in motion.

A band brake and spring designed to apply the proper safe friction in stopping the basket should be installed on each centrifugal. These

band brakes are adjustable but are equipped with
cannot tamper with them and vary the amount o
applied. The adjustment of the brakes should
by responsible men.

It is our belief that these brake regulating dev
thrown around their use are the secrets of exem
connection with the operation of this apparatus.
had by following the practice of making dai
centrifugal. This should be done by some co
department where the machines are used. T
should be checked up by monthly inspections by
at which time the inspection bars in the casings
the thorough inspection of the baskets.

Mr. Watson: I move that Mr. Crass's reports

The motion was seconded and passed.

Chairman Kershaw: Several years ago one
go and flew into several hundred pieces; one man
hasn't recovered fully yet.

Mr. Smith: There was an explosion in New
ago in a silk manufacturing plant where four
compensation costs will probably aggregate abou
damage as yet has not been accurately estim
adjusters. The cause of the explosion was at
becoming corroded. It seems that the material th
extractors was impregnated with acid. The bas
with rubber to prevent acid from corroding the
rubber cracked and the acid leaking through t
weakened the basket so that one day it ruptured
broke the casing of the extractor and flew into
the casing had been made of cast steel probably
injured.

Another point of interest is the use of interlock
Most of the manufacturers have interlocking dev
of the extractors cannot be raised while the m
We occasionally get reports of accidents result
endeavoring to shift the load in the basket while

The uneven loading of the extractor basket, o
in the basket while it is being operated cause
uneven loading of the basket causes it to vibra
vibration is such that it causes the foundation of
that loosens the fastenings of the extractor, and
job he will slow down the machine and shift hi
the extractor doesn't have the cover locking devi
hands inside before the machine comes to a st

ROUND TABLE DISCUSSIO

Chairman Kershaw: During the past year
practically all of the member companies and as

subjects for discussion at this meeting, so I will read some of the suggestions that were returned and we will discuss them if you wish. "Prevention of and remedy for irritation of skin by copper dust"; "Gas Masks". There may be some new developments along that line we have not heard of. Dr. Lewis of the Massachusetts Institute of Technology gave a very interesting talk on and demonstration of gas masks at the 1919 Safety Congress.

"The best method of protection for mechanical workers doing repair work on equipment involving fume poisoning and burn hazards." A short time ago three or four of our men started to do some repair work inside an acid tank. They first disconnected the acid lines leading to the tank and inserted slip blanks of the frying-pan variety. Just as they had finished inserting the last slip blank the noon whistle blew, so they left the tank and went home to lunch. When they came back that afternoon they found the tank nearly full of acid. It was a lucky thing the whistle blew when it did because they had planned to go inside the tank as soon as the slip blanks had been inserted. Investigation showed that one blank had not been inserted properly and an open space had been left at the edge of the blank just large enough for acid to leak through. The men should have used a slip blank as large as the full diameter of the flange. If the blank has bolt holes it can be tightened in place and thus absolutely prevent leakage. We have made it an iron-bound rule with our company that no man shall enter a tank without taking out a section of the pipe line and blanking off the dead end.

MR. VANATTA: Caustic workers claim—and it is so—that perspiration collects around the eyes where the goggles come in contact with the skin. Caustic dust causes burns there and many men prefer to take a chance on getting caustic in the eyes rather than suffer from burns that otherwise are sure to result from wearing goggles.

CHAIRMAN KERSHAW: One of the member companies developed a muslin hood with a large glass in front for the man to wear over his entire face.

MR. VANATTA: We use hoods but many men object to them also. We use almost every kind of goggle obtainable.

CHAIRMAN KERSHAW: We use King-Brayton face masks to protect men against flashes.

MR. VANATTA: Our repair men are injured oftener than the men in our caustic department. We have not had what I call a real serious accident in the caustic department since I have been there—two years. But we have had four fatalities among the men in our repair gang. One man fell from a scaffold; one was killed in a railroad accident; a third man was killed on a 220 volt electrical current.

DR. ALICE HAMILTON (Harvard Medical School, Boston): Concerning your first question I have never found any literature discussing the irritating effect of copper dust upon the skin. Is that a copper smelting plant where there might be arsenic?

CHAIRMAN KERSHAW: I don't know; the question is from the Mountain Copper Company, California.

DR. HAMILTON: Is there any new information concerning the preven-

tion of poisoning in cleaning and repairing benzole
was taken up two years ago in a meeting of this sectio

MR. CRASS: We are interested in that subject as ar
cerns in the aniline chemical field, by-product produc
very best treatise that has been issued comes from
Hamilton.

DR. HAMILTON: The only suggestion I have heard
of value is the procedure used by the Illinois Steel
new by-products plant. They specify that before a m
benzole tank, a mouse shall be lowered into it first. T
to the action of benzole much more quickly than a hu
its circulation is so much more rapid. So if the mou
man is not allowed to go in.

When I spoke on this subject two years ago before t
the British method which is to leave the tank open f
four hours after the usual cleaning out with water and
that this was too slow for American industry, so if
I should strongly advocate the use of the mouse test.

CHAIRMAN KERSHAW: There is another thing that
ing on that. Mr. Burrell has just recently developed
determining the presence of explosive mixtures of ga
small instrument which draws in a sample of the ai
where the gases might be confined. This sample is ig
indicate the vacuum thus formed. Perhaps the exp
vapors might have a direct relation to their toxic qua

The next question is: "How to prevent stoneware
jumping out of place." Our company provides bridle
"Protection of repair men required to enter chemi
paratus against chemicals entering into them." Mr. I
Pont Company several years ago said that the platform
so that the pipe would be within 18 inches of the fl
to prevent a repairman from being sprayed in the face.

"Respirators." Perhaps the most effective type of re
made of several thicknesses of gauze made in the form
around the mouth and up under the nostrils. So
little cotton between the layers of gauze. These resp
around the edges, and the men are usually willing t
snout respirators are very inefficient. The air is bou
them, and the exhaled air often blows the dust right
of the eyes.

"Rubber, leather, and canvas gloves versus prote
(paraffine, etc.) to put on the hands as protection agai
or harmful burns."

DR. HAMILTON: We went into that subject very
the war in connection with the handling of tetryl an
by girls. We couldn't find any protective substance
of them increased the solubility of these nitrates.
make canvas gloves impermeable and all sorts of mi

out in Washington to keep the stuff from passing through. The canvas gloves were absolutely a failure. If any preparation did work, it made the gloves so stiff that the girls couldn't use them. We finally protected the face with a layer of zinc oxide ointment, dusted over thickly with talcum power, but we had to let the hands go.

There is a great objection to rubber gloves because if the glove has any imperfection and the powder works its way in, it meets a sweaty, macerated skin and acts much more powerfully than it would if there were no gloves at all. As you know, it is very hard to keep the rubber gloves perfectly whole. So it is probably much better to supply washing stations very liberally throughout the plant and encourage the men to wash their hands frequently and let the gloves go.

CHAIRMAN KERSHAW: Were you successful in having ordinary canvas gloves used but washed once or more each day?

DR. HAMILTON: I have seen that done and consider it quite satisfactory. The hands don't perspire as much in canvas gloves anyway.

MR. CRASS: We have discarded canvas gloves because they soil; then too, the powder does go through the glove and if a man has a break in the skin (and most of the men have hard callouses in their hands which are liable to crack) it is almost sure to cause trouble. We are using buckskin gloves. They cost about 75 cents a pair but they are impervious to dust and last longer than a dozen pair of canvas gloves; furthermore they do not get stiff when you wash them.

DR. HAMILTON: There is one objection to any glove; if a man has a fine job to do for a few minutes he takes off his glove and uses his naked hands; then with some of the material on his fingers he draws on his gloves again and is really poulticing his hands in the poisonous substance.

MR. CRASS: Yes, that is the objection to any glove. The rubber glove is all right where a man has to use acid temporarily, but where a man does work in it continuously and the hands perspire, I think it does away with them as a serviceable factor. We have tried rubber gloves and discarded them because they make the work more dangerous.

CHAIRMAN KERSHAW: In studying the toxic effect or poisoning effect of T.N.T., did you find that the most severe hazard was in the manufacturing or in the handling of T.N.T. after manufacture?

DR. HAMILTON: In the handling after manufacture.

CHAIRMAN KERSHAW: I think there must be something in the final purification of T.N.T. that has a lot to do with the poisoning effect thereafter. In our plants we made great quantities of T.N.T. during the war. Our records seem to indicate that the poisoning effect was only present where the oils were present—what we call the T.N.T. oils—but after the T.N.T. was purified and those oils were driven off, we had very few poisoning cases resulting thereafter.

DR. HAMILTON: That was the German experience. I always felt that pure T.N.T. was comparatively harmless.

ADJOURNMENT.

Construction Section

September 27, 28, 1921

L. D. WOEDTKE, Chairman
Director of Safety, Fred T. Ley and Company, Inc.

F. L. HURLBUTT, Vice-Chairman
Standard Safety Equipment Company,

A. P. GREENSFELDER, Vice-Chairman
Fruin-Colnon Contracting Company, St

F. A. DAVIDSON, Secretary
Safety Engineer, Dwight P. Robinson and Compan

TUESDAY MORNING SESSI

AFTER appointing Messrs. Bush, Webb, and W committee, the chairman introduced Mr. L. L

EXPERIENCE RATING OF CONTRAC

L. L. HALL, SUPERINTENDENT, DEPARTMENT OF SC INSPECTION, NATIONAL WORKMEN'S COMPENSA BUREAU, NEW YORK CITY

In order to understand the effect of the accident on his compensation insurance rate it is necessary general way, the making of the basic or manual various industries or trade. It is to be understood, we speak of accidents in connection with the n compensation insurance rates we are referring on provided for by the compensation laws.

As our time is limited we shall have to think manual rate for any classification or trade as b adding together the losses paid by the insurers trade under policies written during a certain period the total of these losses by the total payroll, in h the same trades and for the period of time co referred to. The resultant dividend is then, a p particular trade and when properly loaded for t business, or overhead, it constitutes a rate for i

MR. FEEHAN: It has been my experience that every instance where an adequate system of ventilation has been installed in a foundry, it has added materially to the plant efficiency and has been one of the best investments of the concern. It increases the efficiency of the workmen; it safeguards the health of the workers; it helps to eliminate accidents, and brings many other advantages.

ADJOURNMENT.

WEDNESDAY MORNING SESSION

CHAIRMAN OARTEL called the meeting to order, and introduced Mr. Marquard as the first speaker.

SAFE PRACTICES IN BY-PRODUCTS COKE PLANTS

F. F. MARQUARD, SUPERINTENDENT, BY-PRODUCTS PLANT, CLAIRTON WORKS, CARNEGIE STEEL COMPANY, CLAIRTON, PA.

(In the absence of Mr. Marquard, his paper was presented by Mr. M. L. Champion, Safety Engineer, By-Products Plant, Clairton Works, Carnegie Steel Company, Clairton, Pa.)

The modern complete by-product coke plant has many departments which are similar to departments in the steel plants. I will comment on the safety features of the various departments making up a complete by-product coke plant—coal handling, coke handling, gas handling, tar handling, ammonia and benzol recovery, distillation, refining, and shipping. I will omit hazards characteristic of boiler operation, machine shop and pipe shop operation, power house and pumping stations, etc.

COAL HANDLING

In all modern plants coal handling is done chiefly by the use of belt conveyors. In a number of plants the coal is lifted from barges but in the majority of plants it is unloaded from cars. The Clairton by-product plant, which is the largest coke plant in the world, receives practically all of its coal in barges.

One of the great hazards in hoisting coal from barges is the danger of lumps of coal falling from the hoisting bucket. There is also danger of men being injured by the bucket as it is lowered into the barge, especially during the clean-up stage. This hazard attracted our attention and we designed a bucket which enables us to clean up a barge without the use of clean-up men. Thus we not only eliminate one of the most hazardous operations in this work, but we also effect considerable economy by this elimination. The operators soon learn to clean up the barge by allowing less than a ton of coal to remain after the cleaning up period without the use of any clean-up men, and further the operators, on account of not having to watch clean-up men during the clean-up stage of the operation, are enabled to unload the barge in practically the same time as was previously done by the aid of sixteen clean-up men.

CRUSHING

In the crushing of the coal considerable dus
coal is comparatively dry. This is a hazard
well as a fire hazard where this dust gathers
have succeeded, by the introduction of a s
below our crusher, in allaying this dust cond
manner. We have also installed air lines in
are used periodically for blowing dust off
machinery.

We have discovered in our operation that
veyor belts offers a hazard that has prov
instances and we have overcome this by t
take-up tighteners which operate automatica
on the belts all the time. This safety meas
hazard of hand tightening but also enabled
tension in the belt; it improved the operatin
belts very materially, eliminating excessive
conditions encountered during cold weather.

Of course, all the usual precautions are tak
enclosing counterweights, guarding gears,
oilers, prohibiting the use of open lights ar
a signal system for starting belts, arrang
conveyor gallery for operators to stop the e
moment's notice, and installing guarded ladd

The safety records of our coal handling d
years, during which time over 12,000,000 ton
only two lost time accidents during this en
daily force of 50 men.

OVENS

Safety precautions about the ovens are a
tance. In addition to the hazard of movi
cars, pushing machines, door extractor ma
mills, etc., we have to contend with oven ga
from charging holes, dust, and hot tar spla

The larry car travels along the top of the
times. It requires extreme precaution on
avoid accidents due to the fact that ther
gaseous atmosphere and men working on to
see the larry cars approaching. These cars
ing gongs which operate continuously while
is provided so men can step aside while the

To an inexperienced person it would see
who do the charging of the ovens and luti
jected to great danger of being overcome
obliged to work during the charging proces
the men take advantage of the winds and
the open air, there is practically no dange
greatest danger about this work is the lil
fine coal is charged into the hot oven.

During the summer months particularly, the excessive heat in which the men are obliged to work makes these jobs quite undesirable. However, owing to the frequent spells that these men get during the charging operation, they have an opportunity to get into shelter places provided at the end of each battery and rest in comparative comfort during the spell intervals. Drinking fountains, shower baths and sanitary stations with locker rooms are located at various points convenient to the men.

Many items comparatively small have been introduced in varfous ways to eliminate hazards about the ovens, such as special made bars for men to open standpipe lids without danger from the flash, wooden soled shoes for the men who work on top of the ovens, leather frame goggles for the men who work around hot places on dusty days, portable lighting poles suspended from collector rails to facilitate the luting of oven doors at night, the interlocking signal system in the pushing of ovens, a safety tunnel to prevent men passing over the quenching tracks, the equipment of all moving machinery with automatic gongs, the provision of plenty of light for night operation, the construction of racks in proper places for keeping tools off the floors, warning signs placed in conspicuous places throughout the plant, and personal educational work especially with new men who are being broken in on their jobs.

A good lighting system is a very important safety measure about a by-product coke plant where continuous operation is necessary, especially along benches which we find impossible to guard with hand railings; also in the alleyways beneath the benches where there is danger of being burned by gas ignition if an open flame is used. Broad walkways and platforms along gas collecting mains are necessary in order that gas inspectors and tar chasers may be able to work in safety away from flashes.

The total number of lost time accidents about the ovens during the past three years, in the coking of over 12,000,000 tons of coal with a daily average of over 300 men, amounts to 64 cases, 38 of which occurred during the first year of operation.

COKE HANDLING

The coke handling department takes charge of the coke after it has been quenched and dumped on the wharf. The fine coke dust resulting from the handling and screening operation makes it necessary for the men who are working in these places to wear goggles and dust protectors, especially on windy days. Most of our eye injuries happen to new men. We have practically no eye cases from older men, even though they do not wear goggles. Dust protectors and goggles are provided to the men free of charge.

The conveyor belts carrying the steaming hot coke up the incline and over the screens are subjected to very severe treatment and quite often it becomes necessary to stop them for repairs. To overcome danger of accident being caused by someone starting the belt while repairmen are working on same, all starting switches are locked before repairmen start on the belt.

Another important feature in connection with the development of the large Clairton by-product coke plant is the use of combination electric

storage battery and third rail electric locomotive
under the coke loading station. These locomotive
by the loader stationed at the point of loadin
necessity of men working about the cars or lo
case where rope haulage is used for spotting c
station. In addition to the safety feature of the
their flexibility makes their operation very econo
Sanitary stations, drinking water fountains, showe
considerably to the comfort and satisfaction of th
dusty place, and I wish to emphasize the necess
tions so that men are able to utilize them at interv

During the last three years, in the handling of 7
coke; 720,000 tons of coke dust, and 300,000 tons of
average force of 42 men we have suffered only 5 los
occurred during the first year of operation.

C. S. LONDLIN

The successful installation of a by-product coke
careful design of pipes handling the gases from th
apparatus and the accurate control of the moven
hot gases, approximately 600° F., traveling throu
travel at a rate of approximately 4 feet per secon
tion mains at approximately 20 feet per second.
signed as to condense a certain portion of the
prevent pitch stoppages. Very careful control of
as temperatures is a most essential factor in the
a by-product coke plant.

Many dangerous and disagreeeable duties are
plant where this important factor in by-product
not efficiently managed; such as, overcoming pitch
mains and damper boxes, carbon stoppages in asce
lene stoppage in condensing apparatus. All of
sarily must take place along the hot mains in con
hot tar.

In the processes of condensing tar and ammo
benzol vapors, it is found necessary from time to
and for the purpose of cleaning out apparatus, to
as tar extractors, ammonia saturators, benzol oil s
case where it is found necessary to open up a pie
which gas has been passing, after the valves
apparatus is thoroughly cleaned out. Where t
completely we have often found it necessary to
connections to be absolutely sure that there is n
apparatus where the men are obliged to work.
lowered into places which might be suspected
serves in many cases as a good index of the atm

Reliable gas masks are kept in good conditi
spicuous places ready for immediate use and
thoroughly drilled in the proper use of same.

It is a routine duty to drain out drip pots in underground gas lines, and oftentimes after the liquor has been drained there is an escape of gas which overcomes the men. We have a rule that the man in charge must always be accompanied by a helper during this operation; in fact, at all places where repair work takes place inside of gas handling apparatus there is a strict rule to the effect that a man must be accompanied by his helper or foreman while he is working in same, and proper provision must be made for his immediate exit if he shows any indication of being gassed.

The by-product building, in which most of the ammonia and gas handling apparatus is located, is equipped with an overhead crane. However, on account of gas leakage in this building it is not safe to operate this crane by electric drive; this crane should be operated either by hand, or preferably by compressed air.

Many safety features have been installed in the gas piping and apparatus in connection with the safe handling of the gases; pressure gauges at specific locations, keeping a close continuous record of the gas pressures at definite places; thermometers placed at definite points along the travel of the gas to keep a perfect continuous record of the temperatures. These continuous recording charts enable the operator at a glance to see irregularities creeping into the operation and enable him to check same before any dangerous condition is developed.

Walls have been placed in trenches to prevent fires from traveling into the buildings through the underground trenches; effective ventilators are provided for taking fumes out of the building; vapor-proof globes are used for all lighting; all electric switches are on the outside of the building; all doors open towards the outside; rooms are well lighted; as much apparatus as possible is painted a light color so as to detect any leaky condition of same, and this last at the same time increases the effectiveness of the lighting of the operating room.

AMMONIA

In the operation of a by-product coke plant the ammonia from the gas is recovered primarily in two forms: one in the form of ammonium sulphate, a white salt, and the other in the form of ammonia liquor. Most modern plants effect the recovery of ammonium sulphate by passing the gas through lead lined saturators containing a 5 per cent solution of sulphuric acid. The ammonia is combined with the sulphuric acid forming ammonium sulphate and the gas passing through this acid solution is freed from its ammonia content. This salt, in the form of a slushy mass of crystals settles in a cone bottom saturator and is syphoned by an air ejector upon a lead lined table. In this operation the fumes which are lifted up with the sulphate crystals and mother liquor are very pungent, being highly contaminated with phenols and pyridine vapors. These fumes in many plants have been allowed to discharge directly in the building, thus contaminating the air and in general making the operating conditions very bad.

In recent construction these fumes are collected in a large lead lined pipe and conducted through the comb of the building out into the

atmosphere. This safety feature has made the
much more agreeable in the ammonium sulphat

The slushy salt crystals which are unloaded
velocity of 700 revolutions per minute. The stea
these centrifugal dryers are practically all of
and have been the cause of numerous accident
stopped and started frequently; this the operat
tions, by moving the flywheel with their feet
has been turned on. This habit has been overco
a crank handle fastened to the shaft, similar
This is a very successful safety feature, comple
from this operation.

In the sulphate recovery department it requir
for the production of a ton of ammonium sulpha
ators have to do considerable handling of co
This acid is delivered in tank cars and is unload
overhead storage tanks. The men in charge of
to wear goggles, rubber gloves, and rubber apr
by acid spillages which occur during this unlo

In the production of ammonia liquor the ch
ammonia fumes which have filled the room, d
veloped in the piping and in the apparatus.
but a waste in the operation, and strenuous eff
struction of this apparatus to see that the pip
paratus are well constructed; the slightest lea
ately attended to.

Another hazard in the ammonia house is the
lime; frequently the milk of lime is splashed i
men and in handling the bulk lime the lime d
of the workmen. These workmen are supplie
protectors free of charge. All the buildings
and well lighted, and apparatus should be pain
as possible to enable the operator to detect the
to assist in the lighting of the building.

In the handling of the gas from the coking
we have had but 13 lost time accidents durin
the first year; 7 the second year, and one to da

BENZOL

The benzol department consists of three dis
sorption stage; second, light oil distillation; a
fining stage. In the absorption stage the gas
been extracted, is passed through large towe
wooden grids over which petroleum oil, of ce
culated until this oil becomes saturated to th
benzol, after which it is passed through steam
and the benzol vapors are driven out and cond
oil. The petroleum oil, which is only the car
turned to the scrubbing towers to again be satu

ous process. In this operation it is important to observe the regulating of the circulation so that the oils are not excessively saturated to a point where benzol vapors are allowed to escape and form an explosive mixture in the base of the scrubbing tower.

In the cleaning out of these towers it is absolutely essential that large volumes of steam and water be used, not only to remove all gases in the tower, but to wash out the benzol sludges which form gases when disturbed by the workmen in their repair work.

The cooling of the gases is effected by circulating large volumes of water before the gas enters the oil scrubbers. The circulation of this water over the cooling tower makes it necessary on frequent occasions for workmen to clean out distribution pipes on top of these towers, and it has been found that the contaminated atmosphere created by the air passing through this cooling tower is extremely poisonous, and therefore great caution must be exercised when performing this work. It was discovered in this work that the cleaning of these distributing lines could be done with much less risk if the work was done before the sludge had an opportunity to dry, and also if the operators took the added precaution of performing this work with the hose type gas mask, permitting them to breathe the outside air while working in these cooling towers.

In the past three years, in the coking of over 12,000,000 tons of coal, this process has caused but one lost time accident.

The washing, refining, distilling, fractionating, and shipping of benzol products involve a multitude of small operations; the opportunities for benzol vapor to escape into the air through leaky pipes and apparatus are very numerous; however, we maintain rigid supervision and education of the operators and well constructed distillation buildings; in addition, there is ventilation for light vapors through the roof and forced ventilation for the heavy vapors through pipe trenches on the floor.

This plant has operated practically full capacity during the past three years, having recovered over 36,000,000 gallons of benzol without a single lost time accident, making the benzol department, from a hazard point of view, one of the safest departments in the by-product coke plant.

A number of precautions should be observed in the operation of the benzol plant—first, the benzol plant should be enclosed completely by a solid brick or concrete fence so as to prevent firing of small oil leaks that might escape and run out into the open and become ignited by passing engines and follow back into the plant; second, all storage tanks and all apparatus where explosive mixtures might occur should be grounded; third, a system of fire protection should be installed, which system would enable a fireman to extinguish oil flames by flooding the oil surface with a light fluffy alum and soda solution, thus eliminating the air and smothering the flames. Fourth, all wiring should be permanently installed in conduit and lights equipped with vapor proof globes, and all switches placed on the outside of the building. Fire escapes and exit doors should be placed at convenient places for operators. No matches, smoking, or open lights should be allowed inside of the benzol plant. Fifth, the foremen should all be well trained in the use of pulmotors and in the prone pressure method of resuscitation and thoroughly educated

in the method of completely eliminating benzol
making repairs. Air hose masks should be used
cleaning or repairing benzol tanks. No man sh
repair work in dangerous places without bein
or foreman.

In general it is well to keep in mind that ow
smoke, gas, and dust about a by-product coke p
psychological effect on the workmen that such
not conducive to good health. This is purely p
come this feeling it has been found very desir
coke plant kept in the pink of condition; gr
roads covered with crushed limestone; ample sa
baths; cool drinking water; ample lighting; an
inspection and removal of any refuse should
minds of the men. At all times a rigid campai
conducted through periodic safety meetings in a
discussion and rigid examination of causes a
should be made not only of the local plant, bu
ducting similar operations.

DISCUSSION

MR. H. J. WEEKS (American Steel and Wir
Have you experienced any trouble with the ele
tem for the handling of cars when snow piles
the winter time?

MR. CHAMPION: No.

MR. WEEKS: How do you protect the motors
system from dust? Are they isolated in a separ
ventilated or a gas-proof type?

MR. CHAMPION: We have the air system arou
galleries and at certain intervals during the day
air. Furthermore, I believe there is ventilatio
is passed continuously over the motor, keeping
the dust out. We also inject steam in our cr
end of the belt where the coal transfers from o
helps considerably in keeping down the dust.

MR. WEEKS: The coal handling system in o
is operated by solidly-encased motors, with two
side of the building—an inlet and an outlet. I
ings we have the gas-proof type motors, which
factorily.

MR. CHAMPION: There is one trouble with t
the men, when through working, instead of ru
the end of the building walk the rail. There
fall, particularly if they are a little bit dopey.
why we began to look around for some other wa
We have now installed compressed air and it is
the cranes back to the landing platform. Late
a walkway down the center of the building, so
and off at any point along the runway.

MR. J. A. VOSS (Inland Steel Company, Indiana Harbor, Ind.): Several years ago we had an overhead electric crane traveling from the by-product building into the gas-engine room. While removing a part from a gas-engine a spark from the electric crane caused an explosion and fire and one man was killed. Since then we have put a brick wall up to the roof between the gas-engine room and the by-product building, and we are now using the electric crane in the by-products room only; there is a hand operated crane in the engine room.

MR. NORTHWOOD: What is your scheme for tightening the conveyor belts?

MR. CHAMPION: It is a weighted take-up which keeps tension on the belt at all times.

MR. VOSS: Do you provide safety cables on those weights?

MR. CHAMPION: The weights are so situated that there is no chance of anybody getting under them.

MR. VOSS: We have found it necessary to provide an extra cable that we call a safety cable. We have an eight-ton concrete weight; sometimes the clamps become loose, so we put on a safety cable to prevent the weight from dropping through the floor.

MR. WOLTZ: In cleaning your tanks, do you do more than just steam them?

MR. CHAMPION: We steam them from twenty-four to thrity-six hours before we allow anybody in.

MR. WOLTZ: Then do you fill them with water, after steaming them?

MR. CHAMPION: No; we use white mice to test in there; lately we have also been using the hose type gas mask, with about 150 feet of hose.

REPORT OF NOMINATING COMMITTEE

MR. WOLTZ: We present the names of the following persons to be considered for your officers during the coming year:

For chairman, Mr. J. R. Mulligan, Bethlehem Steel Company.

For vice-chairman, Mr. J. A. Northwood, Cambria Steel Company.

For secretary, Mr. Walter Hart, Jones & Laughlin Steel Company.

(Upon motion, duly seconded, the report of the nominating committee was accepted, and the secretary instructed to cast a unanimous ballot for the men suggested.)

SAFE PRACTICES IN ROLLING MILLS

FRED JOHNSON, SUPERINTENDENT OF ROLLING MILLS, SOUTH WORKS, AMERICAN STEEL AND WIRE COMPANY, WORCESTER, MASS.

Our discussion will be based on several years' experience in the rolling mills of the American Steel and Wire Company at its South Works plant, Worcester, Mass. Our roller mill equipment includes 34-inch two high reversing blooming mill; 20 inch three high merchant mill; 16 inch continuous billet mill; three 10 inch to 12 inch rod mills, and roll turning shop.

All these mills, including furnaces, engines, c
turning shop are located under practically one roo
We consider that the physical arrangement of our
degree to the normal rolling mill hazard.

The operation of these mills requires about 2
auxiliary employees such as machinists, boilerme
ployees, etc. About 30 per cent of these men are
30 per cent are semi-skilled, and the remainiing 40

The following table gives our accident record
including all "lost time" accidents which have
mills. A "lost time" accident is any injury which
lose more than the balance of the day on which h

ACCIDENTS IN ROLLING MILL

Nature of Injury	1912	1913	1914	1915	1916	YEAR 1917
Burns on body	3	4	1	4	7	..
Burns on hand	2	1	2	..	..	..
Burns in eye	3	..	..	..	..	2
Body injury	5	1	1	1	2	1
Foot injury	6	6	1	3	9	9
Arm injury	4	2	1	3	3	1
Hand injury	10	7	6	4	9	4
Leg injury	2	4	3	3	2	2
Scalp wounds	5	3	1	1	3	..
Eye injury	2	2	2	1	1	1
Fractured skull	..	3	..	1	1	1
Sprains	4	3	2	3	2	1
Strains	3	1	..	3	7	1
Septics	4	1	2	3	4	1
Hernia	1	..	1	2	1	..
Fatalities	1	..	..	..	..	1
Total	55	38	23	32	51	25
South Works, Accidents	351	422	204	237	300	143
Rod Mill Entitled To (Per Cent)	8	8	8	8	8	8
Has Had (Per Cent)	15	9	11	13½	17	17½

The description of safe practices as applied to t
rolling is somewhat difficult, but I will try to pictu
things we do.

COBBLES

I shall use the term "cobble". A cobble in our
bar of hot steel fails at any stage of the rolling pr
normal course through the mill. From the time
inch billet practically all our equipment is what
that is, the stands of rolls are set tandem, and
passes automatically from each stand of rolls to
and each succeeding stand of rolls revolves at a ra
increased to take up the elongation of the bar res
tion in sectional area in the previous stand. This
speeds as the bar nears the finishing end of the
one instance we reach a speed of 1,000 revolutio
means that the bar is being delivered from the rol
3,000 feet per minute.

made more effective by attaching a canvas curtain to the back of the mill and keeping the curtain down at all times.

DISPOSITION OF MATERIAL COLLECTED BY SWEEPERS

Dirt and dust can be controlled to a great extent by marking the different spaces around calenders for stock trucks, liners and shells. Keep all stock for warming mills on platforms off floor. Waste cans for paper, strings and torn or used tags are provided at each calender.

Some of the material gathered up by the sweepers—is disposed of as follows:

1. *Rubber and fabric.* Removed from rubbish and placed in special containers which are emptied and contents cared for by the scrap clearance department.

2. *Calender and mill pits.* Cleaned when machines are idle, at present by hand, using pails and barrels. Oil and grease are transferred to a specially constructed, movable, metal tank (250 gal.) and are re-used for lubricating purposes where an inferior grade of oil will serve. The rubber in the pits is sent to the washroom to be reclaimed. The residue in the pits is placed in heavily constructed barrels and carried to a dumping ground.

3. *Tube room.* Tube transfers and worn out cloth wraps are placed in rubbish and burned at incinerator. Soapstone deposit in the bobbin machines is removed by the department and sent to dump.

4. *Mill, motor, and heater bases.* Grease is mixed with dry sawdust and removed with hoes, shovels, scrapers and stiff brooms. Where the oil runs down the side of the mill bases a bank of sand is made to prevent the oil from spreading about the floor.

5. *Elevators.* Pits not provided with drains are equipped with ejectors by which surplus water is removed, the residue is then mixed with dry sawdust and removed to a dump. Pits with drains are flushed with steam or water as often as necessary. Elevator shaftways are cleaned as often as condition requires, usually on a holiday or when the plant is shut down. This is usually a long, tedious job, especially if the shaftway is not entirely enclosed, for as dust is loosened it flies about and settles in all spaces adjacent to the shaftway which means that they, too, must be cleaned after the elevator is finished. An elevator operator is furnished and the cleaners, some with long handled brushes, some with cloths, ride on top of the elevator cage. All men are furnished with goggles and respirators.

6. *Tunnels and drains.* In the absence of an ejector, the surplus water is bailed and the residue is then mixed with dry sawdust and removed to a dump. In some large drains, screens are present which are cleaned by means of a steam hose. After cleaning, all pits and drains are disinfected.

7. *Conveyors.* Small conveyors are usually cleaned by hand by means of small bench brushes with dustpan. Large conveyors, when attachments can be made, are blown out with compressed air and the dirt is swept up later. This can be done only when the plant is shut down.

8. *Large quantities of paper or wood.* Usually handled as salvage and

taken care of by the foremen in the departmen
department for disposal. (Paper bags used for
room are considered worthless and are bundled
incinerator.)

9. *Metal chips.* These are placed in speci
sweepers, and foremen in department where th
delivered to the salvage department.

10. *Water in basements.* When necessary to m
is pushed into elevator pits by means of stiff bro

11. *Cleaning machines.* These are taken care
own departments under direction of their own

12. *Box shop.* The litter here is either woo
and is handled in this department. Here the
dangerous nature it is deemed best to keep ou
with it.

13. *Oily waste and other fire hazards.* Thes
from maintenance departments work Sundays or
are placed in yard at several entrances to bui
material of this kind place it in cans when thei
are emptied by yard men.

TYPE OF HELP BEST SUITED FOR A SANITA

Experience has shown that young men are
kind of work, and men well advanced in life are
To build up an efficient sanitary department eve
to secure middle aged men who are physically fi
a considerable portion of the day, doing a gre
ladder climbing, hauling cans of rubbish, etc. S
plant, with intelligent supervision, will maint
reduce cost of sweeping, increase plant efficiency
accidents.

I may say that I got some figures before I lef
this accomplished in dollars and cents. In the
the cost for cleaning per 10,000 square feet of f
the same month in 1921, with production about
cost was made to about $4.00.

CHAIRMAN FITZGERALD: The next paper is by

PRACTICAL PLANS FOR MEDICAL RUBBER PLANTS

DR. ROBERT S. QUINBY, SERVICE MANAGER, HOOD
TOWN, MASS.

It is a pleasure to preface these remarks wit
rubber industry occupies a position well to the
of industrial medicine. A recent report of the
ference Board indicates that the per capita amo
pervision in the rubber industry is well above

tries. In the nine rubber manufacturing plants included in this investigation, the average yearly per capita amount spent was $5.41, as against an average of $4.43 in the other industries reported. I have been in personal contact with a great many of the industrial physicians in the rubber industry and know that they are doing a type of medical work which demands high recognition.

In considering plans for medical supervision, we may do so under the following three headings:

I. Physical equipment
II. Personnel.
III. Functions.

Conditions in different plants are so variable that it is needless to attempt to definitely suggest the physical equipment, but I would like to point out several important features in this connection. It is of primary importance that the plant dispensary be so located as to be easily and quickly accessible to all parts of the factory. In a relatively small plant, one dispensary centrally located is sufficient, whereas in large plants it has been found desirable to have several branch dispensaries so located as to be easily accessible to all workers. Frequently a person will neglect or delay treatment because of the inconvenience or loss of time necessary to go to the hospital, and the most obvious way to eliminate this condition is to so locate the dispensary that it will be convenient to all the workers.

DISPENSARY SHOULD NOT BE TOO ELABORATE

A frequent mistake is made by having a dispensary too elaborate. A workman often feels hesitant and uncomfortable to visit a medical department which gives an appearance of being "highbrow." Cleanliness and all requisites of good medical work may be obtained without any extra frills, and I would warn against needless expense and frequently bad effects of unnecessary equipment. We are apt to fall into the same error in connection with drugs and surgical instruments. Relatively few standard drugs and instruments are necessary. This economy will meet with the approval of the management as well as patients who are treated.

The personnel of an industrial medical department will vary again with conditions. In the beginning, a nurse and a doctor on call were in most cases all the staff considered necessary, but with the development of industrial medicine the desirability of full-time medical supervision as well as nursing service has become recognized. I believe that a plant employing 500 or more people justifies one full-time physician. The ratio of doctors to employees in larger plants should probably be an additional physician to each 1,500 workmen. The number of nurses required will vary with the functions attempted in different medical departments. If nurses are used to visit absentees as well as take care of hospital routine, it will be necessary to have more, but I believe that ordinarily one nurse to each thousand employees is a fair ratio.

"CHEAP" DOCTORS OR NURSES NOT FITTED

Before leaving the subject of medical personnel, I would like to emphasize the fact that a "cheap" doctor or a "cheap" nurse is a very poor in-

vestment. A doctor and nurse who have been succ
tice, everything else being equal, will be successful
and while we are able to deal more directly an
authority in a factory than we can in private prac
tremely careful not to exercise needless authority,
that the success of industrial work requires as mu
skill as does private practice.

The question of delegating first-aid treatments t
instructed in the rudiments of such work will deper
in general it is not desirable. A competent physi
with years of experience is all too likely to have p
creasing this likelihood by intentionally placing t
of those comparatively unskilled. In the long ru
prove to be false economy.

SUGGESTED PROGRAM FOR HEALTH SUPE

An adequate program of health supervision sho
ing functions:

I. Physical examination and necessary re-exa
and those already employed.

II. Dispensary treatment of sicknesses, accid
many cases dental, ocular, and other conditions.

III. Supervision of factory sanitation and elimi
ards.

IV. Home nursing and medical supervision of s
advisable.

V. Education in matters of health and personal

Physical examination forms the foundation of a
gram of health supervision; it is the inventory of h
the basis of a preventative and constructive indu
Until a very few years ago physical examination c
upon by the majority of industrial managers as a
ing, but at the present time, at least in most of
plants, it is a well-recognized part of both emplo
medical supervision.

Consider for a moment the physical defects we
any given group of individuals applying for work
shown the following approximate percentages of so
tant defects:

Grossly defective dental conditions.....
Grossly defective eye conditions.....
Grossly defective lung conditions.....
Grossly defective heart conditions.....
Herniae .....

These percentages will vary somewhat from the
because of the variation in methods of classification,
array of physical defects among an average group
sizes the importance of these conditions in the cor
ment and the placement of workers.

DEFECTIVE EMPLOYEES MUST BE CAREFULLY PLACED

The great majority of these defective workers may be satisfactorily employed because of the diversity of operations in the ordinary plant, but it is of vital importance both for the protection of the individual and his employer that such defectives be placed in occupations for which they are best qualified, and can contribute most to production.

The examination of drafted men indicated that about one-third were sufficiently defective to cause their rejection from the army. In industry it has been the experience that it is not necessary to reject any such high percentage of applicants, and such rejections should be only for the following reasons:

I. That employment would be a menace to the individual.
II. That employment would be a menace to fellow-workers.
III. That employment would be a menace to property.

As an instance of the first condition, we might cite an individual with advanced organic heart disease; of the second, an individual with active tuberculosis; and of the third, an individual mentally unbalanced. In general, we find in the vicinity of 15 or 20 per cent who require, because of physical conditions, selected employment under more or less frequent medical supervision.

Physical examination should, and, if properly done, will bring about a more intelligent placement of applicants for work, the discovery and subsequent correction of many physical conditions which would be prone to become more serious and affect the productivity of the individual, the elimination of persons who because of physical defects are unfit for employment, the transferring of certain persons already engaged to occupations for which they are better adapted physically, and lastly, the closer acquaintanceship between the worker and the physician and therefore opportunity for advice and instructions in matters of health.

TREATMENT OF HEALTH DEFECTS

The second function of an industrial medical department, which is ordinarily considered as the first, has to do with the treatment of different abnormal conditions. Industrial dispensaries were primarily established for the purpose of treating wounds resulting from industrial accidents, but it very quickly became apparent that disability due to sickness was as important as that due to accident, and for that reason we should provide facilities for taking care of disease as well as injury.

The factory dispensary should provide insofar as possible for the remedying of defects found as a result of physical examination; it should provide for treatment and giving of necessary advice to such workers as are taken sick during work, and should provide for the earliest possible treatment of accidental injuries.

Without detracting from the great credit due to the work of safety departments, it is fair to say that much of the accident disability reduction has come about through the early treatment of trivial wounds. Infections are ordinarily the cause of a high percentage of accident disability, and the safety director working with the foreman to bring the injured man

immediately to the dispensary for treatment ha
large amount of lost time from infections. The ea
of wounds is the most important feature of this t

GOOD TEETH AN IMPORTANT FACTOR I

As has been indicated, dental defects are very
men and are the cause of much discomfort and los
general health of such conditions are being broug
clearly, and it has been found practical in many f
service in connection with the dispensary work.
erable degree true of eye defects, nd at slight c
these services may be maintained and furnish su
man at a very nominal cost and a minimum an
work.

Generally speaking, the factory dispensary shou
ment of as many different types of cases as faci
such cases as it seems impractical to furnish trea
pensary the clinic should serve at least as a cle
such individuals as to where and how they ma
ment. In other words, if it is not practical to pro
all cases, it should be the function of the medical
and follow up all such cases and see that the desi

SUPERVISION OF PLANT SANITAT

The third function of the medical department h
vision of factory sanitation and elimination of di
this work may come within the jurisdiction of eith
engineer, but the direct effect of working conditi
employees demands that much consideration be g
the industrial physician. We are coming more a
importance of ventilation, light, heat, toilet facili
sary that these subjects be given due consideratio
program.

ELIMINATION OF OCCUPATIONAL DISEAS

The elimination of occupational disease hazard
within the realm of the industrial physician's w
person best acquainted with such conditions and
edge of how either to eliminate entirely or at le
ards. The rubber industry offers several chemica
benzol, aniline, and urotropin. As has been demo
it is possible to either eliminate entirely or at le
ful effects of these chemicals to a negligible haza
of this end requires the knowledge of the source
chanical safeguarding, frequent physical examina
posed, transferring of susceptible individuals to oth
intelligent medical treatment in such cases as re
interest to state that during the last four years n
ity due to occupational disease has occurred in ou

Even when we have created a satisfactory health program for the workers within the factory, we must still realize that these people spend hardly more than a quarter of their time in the factory, and that, if we are to create the greatest possible constructive influence on health, we must seek to improve home and community conditions, in some cases co-operating with other agencies, and in others working directly.

IMPROVING HEALTH CONDITIONS IN WORKERS' HOMES

Probably one of the most direct methods of improving health standards in the home and of minimizing lost time on account of sickness and injury is visiting such cases by means of nurses, and when necessary supplementing their visits by the services of a physician. Ordinarily about one-third of industrial absenteeism is due to sickness or injury, the other two-thirds to personal reasons. A nurse is usually more competent to investigate absences, because she is familiar with and able to deal with the cases of sickness and injury, and should, if properly trained, be equally competent to deal with such cases as are absent for personal reasons. Then, too, a nurse's visit is less apt to be resented and considered as "policing" than is a visit by an ordinary investigator. A competent nurse, properly acquainted with the factory and the workers, discovers many conditions important from both an employment and a health standpoint, and forms a relationship between the home and factory which is of inestimable value. She is in a position frequently to give helpful service and advice relative to the improvement of health conditions, and will, if the work is competently done, materially reduce absenteeism from all causes.

INSTRUCTION OF WORKERS IN HEALTH MATTERS

Throughout the whole program as it has been outlined, constant attention should be given to the matter of education in health and personal hygiene, concerning which the average individual knows little. Much more can be accomplished by individual than by group instruction in such matters, although the constant individual effort of the doctors and nurses may well be supplemented by different types of articles and printed information relative to matters of health.

RESULTS OF HEALTH CAMPAIGN

In the Hood Rubber Company we have succeeded in reducing lost working time as our medical and allied activities have become more comprehensive and better co-ordinated. Our experience in medical work has covered a period of over ten years. We have probably the oldest factory dental clinic, as well as one of the first ocular and X-Ray clinics. A number of years ago we recognized the importance of physical examination, and shortly after instituted home visiting of absentees by nurses, later supplemented by medical supervision of those disabled by disease or injury. The benefit plan, providing for sickness, non-industrial accident, and death benefits, has been effective since January 1, 1919, while we have conducted our own compensation insurance company since August 1, 1920.

During the last twelve months, in spite of the fact that 35 per cent of

our workers are women (and the female absence
cent that of males), our average amount of worl
only 3.9 per cent. Two per cent of this was due
per cent to sickness, 0.13 per cent to industrial
cent to non-industrial accidents.

Translated into working days lost, this means th
averaged a loss of 11.76 days from all causes, of wh
personal reasons, 5.13 days to sickness, 0.39 days
and 0.24 days to non-industrial accidents. Compare
statistics, which indicate a loss of anywhere fron
on account of sickness alone, our record of 5.13 da
would seem, too, that our industrial accident dis
would represent a minimum.

INDUSTRIAL PHYSICIAN SHOULD AIM AT PREVENTIO

In industrial medicine, as nowhere else, we have
venting or at least minimizing disability due to sic
should always keep this preventive element of th
our minds. It is not well to attempt "to make his
larly when dealing with the human element, and
in industrial medicine. From a modest beginning,
the giving of good service, credit with your work
and the community at large will gradually be develo
to the development of this credit, definite, useful,
plished.

DISCUSSION

MR. ROSE: Dr. Quinby would not advise the crea
pensaries without trained attendants?

DR. QUINBY: That is correct; at least have a trai

MR. ROSE: Would you get the same service in the
in the dispensary?

DR. QUINBY: I should say one nurse covering two
a day to each. This would be preferable to an u
whole day. That is, the nurse will not necessarily
but will take care of such as she is capable of doing
to the main dispensary where the physician is in
be worked out in detail to suit conditions, and may

MR. ROSE: Then you would not advise the use of
is a trained attendant?

DR. QUINBY: I would not.

MR. SCHOTT: I would like to speak of the co-oper
tor can give to the safety man. As a rule, the fac
entirely ignorant of factory operation, except that
plant once or twice a year.

DR. QUINBY: The answer to that is to educate the
charge should arrange for proper co-ordination of t
of those activities. It happens in a great many plant
in some cases, the employment manager in others, a

heads up the entire activities, and the amount of co-operation or co-ordination between your different activities will, to a degree, depend on the relative importance in his mind of those different activities. I think it is easy, if you have a full-time physician, to co-ordinate his work with that of the safety manager's work.

There is one other thing I want to speak of, and that is to take a little out of our friend, Dr. Weber. It was my unfortunate experience to sit in at the death of four individuals, presumably cau ed by benzol, at a time when there was practically no medical literature on the subject of benzol available. In this country there had been report d, through Johns Hopkins, the death of several girls in connection with the cementing of cans, where benzol was the solvent. There was some German literature and, I believe, some English literature in that connection. I suppose we were the last people in the world who were willing to admit that the cause of the deaths was benzol. We brought in such men as Edsoll, Leary (Medical Examiner of Suffolk County), Harvard Medical School's chemical faculty, and anyone else we could think of, to say nothing of the whole staff of one of the large hospitals. Eventually we were forced to admit that the deaths were probably due to benzol.

There have been, as I say, in this country, numerous fatalities due to benzol. I talked with Dr. Flagg, who is in charge of the hospitals of Great Britain, and he attributed the difficulties to ventilation. I think to a degree he was right, but the clinical picture, Dr. Weber, is a very different one from any other. I think we have got to admit certain of these cases. I think we must consider it a serious chemical hazard in the rubber industry. We have stopped using it.

DR. WEBER: As I said an hour ago, I am prepared to argue on either side. The point which I wish to make is that there has been a tendency to regard benzol as being of a highly poisonous nature on the part of the factories that have not a highly developed industrial medical staff. There are certain materials used in the industry which are very poisonous. Some manufacturers do not like to acknowledge that they use these poisonous materials; others do not know they are poisonous. When there is a fatality, they are inclined to ascribe it to benzol, and it is that point that I particularly wished to draw attention to. Perhaps, I fell over the other side and gave you the impression that I think benzol is safe material. I do not want to argue that way, but I do want to argue that it is foolish, it is unwise, to bury your head in the sand and ascribe the fatality to benzol unless you have definitely assured yourself that nothing else can be at fault.

MR. SCHOTT: There is one point I think might be of interest to us. At the Engineering Section meeting yesterday there was a discussion on the handling of volatile solvents by Dr. Lewis, of the Massachusetts Institute of Technology, and he made the point that he thought it highly desirable, in a mixing mill using benzol or other volatile solvents which might be injurious, that instead of the draught being up above the mill, the draught be at the back of the mill, or down. But as a rule, when you have the draught down, it is difficult to design a proper mixing mill which will work 100 per cent at all times, due to the fact that the compound might

drop through. However, I think it might be w
home to us that there is a possibility of developing
for the mixing mill down towards the bottom, and
air coming in and going past the operator's head
him toward the back, with the ventilator carrying

DR. QUINBY: That was Dr. Flagg's entire conte
ish to try and lift a substance heavier than air,
tilate downward; that by that method and an de
culation they would be able to eliminate a certain

I know of another factory which found that o
had forty or fifty cases of benzol poisoning in
which had already died, and they closed up that b

DR. WEBER: I would be perfectly willing to adm
be a contributing factor; that the organic accelera
cause, but benzol alone will not bring about such
ticularly wish to make is this: that there is a ten
regard benzol as a very serious offender, and I d
alone deserves that reputation.

ADJOURNMENT.

FRIDAY MORNING SESS

CHAIRMAN FITZGERALD: The first report i
committee. I received a telegram from Mr. M
saying that he was sick and in the hospital, and th
the Firestone Tire and Rubber Company, Akron, Oh

SAFE HANDLING OF VOLATILE LIQU FACTORIES

REPORT OF ENGINEERING COMMITTEE, RUBBER SECTION
ELLA, B. F. GOODRICH COMPANY, AKRON, OH

The principal volatile liquids used in rubber fac
benzol. These are considered in various rules an
mable liquids as being in class No. 1, which covers
point. The discussion will be confined to the hand
line and benzol. The usual handling and uses of th
follows: Receipt in tank cars or small containers;
through factory; cement mixers; spreading and cen
and cleaning stock in process of manufacture.

The discussion on handling these solvents will
very thoroughly discussed and recommendations
Safety Council's Safe Practices pamphlet No. 34, en
plosion Hazards"; also in the regulations of the N
Underwriters, and in the pamphlet entitled, "Insta
Gasoline and Similar Oils," issued by the Inspecti
Associated Factory Mutual Fire Insurance Companie
tions on methods not covered by the above pamphl

Cements and other materials containing solvents are too numerous for discussion here, so all materials other than rubber cement will be omitted.

THAWING FROZEN BENZOL IN TANK CARS

Recommendations for receiving and unloading railroad tank cars are presented very completely in the regulations of the Bureau of Explosives in their folio No. 25-16-242-2. One important point, however, is not covered in their recommendations, viz., the thawing of frozen benzol in tank cars before it can be discharged into storage tanks. Evidently there is no method in use which may be considered entirely free from fire and explosion hazards. Perhaps the best method is to run the car into a heated shed constructed of fireproof materials, and with a roof which will easily be lifted without undue damage from any explosion that may occur. The tank car is heated by passing air through steam coils and delivered by a fan, located in a separate room, to the ceiling above the car,, and thence downward over the car to the floor and outward through openings in the walls at the floor line to the outside air. This circulation will free the shed from gases which may lie upon the floor. The heated air should not be recirculated, as this may build up an explosive mixture. This method seems preferable because the circulation of air produces perfect ventilation, while furnishing sufficient heat to thaw out the frozen liquid. Thrusting hot steam coils down into a frozen tank of benzol will produce explosive vapors very rapidly and is a very dangerous operation. There have been tank cars fitted with steam coils within the tank,, but these coils could not be kept in good repair, and the plan has been abandoned.

CONCRETE PIT UNDER [illegible]NK CAR UNLOADING TRACKS

It is recommended that a concrete pit be constructed under the railroad track where a tank car will stand while being emptied, so that in case of not being able to make a proper connection to the outlet underneath the tank, the contents or leakage will drop into the pit instead of flowing over the surrounding territory. From this pit there should be a sufficiently large pipe discharging into an underground tank of a capacity as great as the tank car. Proper construction of underground storage tanks and methods for storing in metal containers are very well specified in the above mentioned pamphlets.

DISTRIBUTION PUMPS [illegible]D UNDERGROUND STORAGE TANKS

The safest method is to store these liquids in underground storage tanks and distribute from these tanks by pumps through pipes leading directly to points of usage. The underground storage tanks should be at the lowest point of the entire system, and all pipe mains should be laid to drain back to the top of these tanks. An extra drain tank with by-pass connections should be provided for draining the mains; so that if the main storage tanks are full or if there may be a break in one of the underground lines which would carry back sediment, the liquids may be drained into this extra tank. There should be no gravity feed from the storage tanks

to any point of distribution, for in case a break
the mains, the entire contents of storage tanks m

The pumps should be located above the storag
than one solvent or oil to be distributed, there sh
to reduce contamination and also a spare pump t
other emergencies, and the valves and headers c
tribution should be so arranged that any pump n
the liquids. The pumps should be set a sufficient
of pump room so that sparks resulting from an
ings, etc., will not ignite the heavy gases lying o

TH[illegible] MOTOR RO[illegible]M

The motor and controls should be in a room s
room by a fire wall, the motor being preferably di
this wall with a stuffing box or packing around th
ing in the wall. A pressure regulator should be p
mum pressure carried in the mains will slightly
quired to distribute the liquids at the highest po
regulator ought to be constructed with electric s
will stop when the maximum pressure is reached.
pump room to show which drawoff valve has beer
engineer in charge that it is proper for the corre
operation. Instances have been cited where a fa
has caused a pump to start, which produced a pre
circulation through the by-pass to such an exte
ously overheated. This might have gone on to th
the motor or breaking one of the pipe lines, with

DISTRIBUTING MAINS

The distributing mains to outlying draw-off sta
underground below frost line in a bed of sand w
stone above to prevent the pipes being broken by a
making excavations. Benzol, which freezes at 42°
mains insulated. This is probably most simply ac
extreme temperatures are not encountered, by enc
another pipe, allowing sufficient air space around
solvent mains are located within buildings, suspen
to upper floors, each main should be enclosed withi
any leakage in the main pipe will be carried by th
pits outside of the building.

Each draw-off at outlying stations should be ope
trol valve, fitted with an electric switch, so that wh
corresponding pump motor will start. The valve o
so that it will close when workman removes his
so that the handle cannot be blocked or tied open.
vice may also be arranged in conjunction with a
that at the option of the workman any pre-determ
discharged, and then the flow be automatically st

especially desirable where solvent pipes are directly connected into tanks or mixers.

It is recommended that solvents used in mixers or similar equipment be carried directly into the equipment instead of drawing off the liquid into small containers. Where it is necessary to draw off solvents in small containers, the draw-off valve should be located within a fireproof enclosure, with an automatic closing fusible link controlled door and steam jets inside for smothering a fire. A sheet metal cabinet will make a very satisfactory and light weight enclosure and can easily be placed outside of the main building wall, if desired. The floor of this enclosure should be fireproof and drained into a sand pit outside of the building, and should always be free of trash and cotton waste.

CEMENT MIXERS

Cement mixers should be operated preferably by a gear drive and not by transmission belts, which cause static sparks. The mixer tanks should be tight, so as not to leak the liquid or gas, with the exception of an air vent leading to a point above the roof. The feed openings should be fitted with quick opening and closing doors. The openings into mixer tanks should not be left open when this equipment is not in use. Cement drawn from mixers should be placed in closed vessels. Cement is often placed in open tanks where articles are dipped into the cement and then placed in racks to dry. These open tanks should be placed within fireproof enclosures or cabinets with fusible link control doors. There should be plenty of ventilation from the surface of the cement to draw gases away from the workmen. The dry racks should be placed in a fireproof room with plenty of ventilation to carry away gases at the floor and explosive mixtures.

Gasoline and benzol are often kept in open vessels, such as tin cups, on work benches to be used for washing and cleaning stocks and for various other purposes. These vessels should be covered with a self-closing tight lid. Usually at the end of a work day or week, there remains a considerable quantity of solvent or cement in small containers, and it may not be possible or advisable to return them to the storage tanks. These containers should be stored in a fireproof room or preferably, in an outside shed, and not allowed to remain in the factory work rooms.

SOLVENT RECOVERY

Solvent recovery is carried out in a variety of ways in the rubber industry, among the most common being:

(1) Direct condensation by cooling.

(2) Condensation by compression and cooling.

(3) Absorption of vapors in proper absorbing agent.

The difference in handling solvent vapors when they are to be recovered and when they are not should be carefully noted. Where solvent vapors are to be recovered with greatest economy, the vapor concentration must be as high as possible, since the higher the concentration the higher the percentage of recovery. Where solvents are not recovered the very minimum vapor concentration will assure less fire and explosion hazard.

The great hazard in solvent recovery is due to th concentrated vapors are gathered in an enclosed ves leakage into the vessel will form an explosive mix results.

CONDENSATION

Direct condensation by cooling is used principally where impregnating is done in a small enclosed ve solvent is required. The vapors are drawn from the forced at low pressure through coils cooled by water

Condensation by compression and cooling is proba This method consists in enclosing the impregnating compartment through which the fabric passes. Th drawn off by a compressor, which increases the pre that little of the vapor remains after the compress some installations gas, which will not support comb the compartment and allowed to pick up the solven ing on to the compressor and cooling coils. This ga gas producers. There is a hazard in this type of e concentration of the gaseous vapors is high and air sels will form explosive mixtures. Within the last y this nature have occurred, one of which resulted in

ABSORPTION OF VAPORS

Absorption of vapors in oil is accomplished by pa pors through a petroleum oil of proper gravity. By vents can be recovered. This method is not so h which the gas is compressed.

The greatest precaution in solvent recovery is to m a saturation considerably above or below the explosiv mit air to mix with the vapors and build up an expl

FIREPROOF ROOMS ESSENTIAL

It is essential that all equipment handling gasoli cements be housed in fireproof rooms. These rooms supplying fresh air and exhausting gas-laden air fr Usually a pressure can be set up by forcing air into ing it to escape with any gases through openings in line and above outside grade. All door sills should to prevent the flowing of any liquids that may be rooms or areas.

FLOOR DRAINS

Floor drains as well as drains from mixer tanks, e to carry away the liquids as rapidly as required by insurance regulations. These drains should be carr the entering pipe below water level. Recommend tion of these cisterns are given in the pamphlets pre

FIRE EXTINGUISHING EQUIPMENT

It is important that plenty of fire extinguishing equipment be placed in rooms where flammable liquids are used. It is sometimes advisable to install a water sprinkling system within such rooms with the pipes dry inside of the room and controlled by a quick-acting valve placed outside of room. This would prevent water from the sprinkler heads flooding the floor and carrying volatile liquids to other areas, and it would also allow the water to be turned on if advisable. Sufficient hand extinguishers, etc., should be provided for small fires. Perhaps the best method of extinguishing fires from these liquids is by steam quenching, but this cannot be accomplished except in a tightly enclosed room. A worthy scheme for closing the windows and doors automatically is by fusible links which also open the steam valve. Another excellent extinguisher distributes foam which contains an inert gas. This foam forms a blanket over the burning and flammable materials. A quantity of sand, soapstone or other nonflammable material should be placed in such rooms for absorbing liquids which might otherwise flow to other areas.

While it is positively compulsory to prohibit fires and sparks near solvents and cements, it must be admitted that hazards resulting from their presence are due in a great measure to equipment and poorly designed housing. Proper equipment would handle these volatile materials in tightly enclosed vessels with no openings for contact with sparks, and providing proper workroom ventilation to avoid explosive mixtures.

CHAIRMAN FITZGERALD: We will now have the report of the health hazards committee:

REPORT OF THE COMMITTEE ON HEALTH HAZARDS

C. F. HORAN, HOOD RUBBER COMPANY, WATERTOWN, MASS., CHAIRMAN

I have wondered, after hearing Dr. Weber the other day, whether the members of this Section would be interested in receiving an outline of the symptoms of the dangerous materials that we use. It will take a little time and some work to get out a book on the diagnosis of rubber industry occupational diseases, but if the members felt that it might be of some assistance to them, I know the committee would be glad to get busy and get out such a report.

Because of the fact that the work of this committee has had to deal with new and untried fields, plus the responsibility of dealing in many cases with secret processes of the various members, it has been considered advisable to render individual reports to the members, rather than publish general bulletins.

During the past year studies have been made of the following materials used in the rubber industry and problems: Xylol, toluol, benzol, solvent naphtha, lead, antimony, thiocarbanalide, aniline, dangers from vapor cures, sulphur chloride, hexamethylene tetramine, carbon tetrachloride vs. disulphide, soapstone dusts, and dermatitis from shoe stains.

The reports concerning these investigations have been filed with the members requesting specific information.

DANGERS OF LEAD POISONING

Inquiries have been received from several mem
dangers of lead poisoning to employees who han
is mixed, and who are not exposed to the dust ha
compounding rooms. The committee has undertal
experiments along the lines outlined and has con
cally impossible for a cutter, or boot-maker or oth
to the hazards of mixing, to contract lead poiso
occupation. The liability to lead poisoning fro
seem to depend greatly on the degree of acid or
individual's sweat: persons with either greatly
sweat may receive an occupational poisoning fr
possibilities of finding employees whose sweat is
so remote as to justify the opinion that danger fr
normally exist.

Your committee has co-operated with the Rubb
in publishing a resumé of literature on the matte

ORGANIC ACCELERATORS IMPROV

Quite a decided improvement has been n
in the matter of organic accelerators. Your com
mental in obtaining some direct action by manuf
especially manufacturers of the aniline group. A
ous accelerators of this type are now being place
is to be expected that these new accelerators wil
more dangerous compounds now being used.
these newer accelerators is akbar, which has
Fisk Rubber Company. As I understand it this
compound and is not purchasable by other rubb

RESEARCH WORK FOR COLLEGE Y

The department of biology and public health of
ern colleges has accepted the subject of: "The
From a Public Health Standpoint," for research
bacteriologist will be assigned to this work by t
periments will be conducted under the supervision
is to be hoped that this research will indicate wh
carbuncles may be caused by raw rubber.

Members of the section who are confronted wi
industrial hygiene are invited to make use of th
committee has to offer them.

CHAIRMAN FITZGERALD: I feel that this section
pliment Mr. Horan on the work of the committee
offer to get out such a pamphlet to our concerns.

(The reports of the bulletin, membership, and pro
presented and unanimously approved.)

CHAIRMAN FITZGERALD: We will now have the p
Whittelsey.