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Navy to Expand Coast Hospital Chain

Rear Admiral Ross McIntire, personal physician to President Roosevelt and surgeon general to the Navy, today in a press conference here announced plans for huge expansion of Navy West Coast hospital and convalescent facilities. . . .

He stated a temporary hospital will be erected at Astoria, Ore., for men in the air arm of the Navy stationed along the Oregon coast.

The Navy plans to have 60,000 hospital beds available by the end of the 1944 fiscal year, and another 20,000 by the end of 1945 fiscal year, all within the continental limits of the United States, he said.

Asked why Navy physical standards had been lowered, he said manpower for the Navy was low and that the Navy now planned on taking in men for limited duty to relieve others for sea duty.

Admiral McIntire praised the mobile base hospitals in the South Pacific, pointing out that the death rate was very low among the wounded.

He said medical cases in this war are much different from those of the last World War because of the extreme violence in the present conflict. . . . —San Francisco *News*, June 2.

WELDING FUMES AND GASES: THEIR EFFECTS ON THE HEALTH OF THE WORKER*

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IN the present war effort, particularly in the building of ships, the process of welding has become so important as to be almost indispensable. It is, therefore, timely and opportune to speak of the effects of the fumes and gases, generated in the process of welding, on the health of the welder and his associates.

DANGERS TO THE WELDER IN MODERN ARC WELDING

Now, in modern arc welding there are at least three sources of danger to the worker. The first is that from the arc itself, where the temperature may reach over 6,000 degrees Fahrenheit. Such tremendous heat may be responsible for burns which heal but slowly. Besides this, the intense ultraviolet rays generated may produce eye-flashes, which are only too common. Then there is the hazard that arises from the presence of ozone, which is formed from the oxygen around the arc. The arc is also responsible for the nitrous fumes, which are generated by the combination of the nitrogen and the oxygen of the air. These so-called nitrous fumes consist of a varying mixture of the monoxide of nitrogen, the dioxide, the trioxide, the tetroxide, and the pentoxide, as well as nitrous and nitric acids. Of these, the dioxide is the most stable.

Coming now to the second source of danger, namely, the rods and their coverings, we have to take into account the production of not only the particulate fumes of iron, but also the fumes of any other metals and substances that enter into the composition of the rods. To mention only a few of the known metals, there are manganese, chromium, cadmium, nickel, zinc, and magnesium, each of which may produce its own symptoms of poisoning. The coating of the rods introduces further possible hazards from such substances as fluorides, silicates, varnish, rubber, etc.

Finally, we must not forget the factor of oxygen deficiency, particularly if the welding is done in a confined space where the ventilation may be poor.

CLINICAL ASPECTS

Turning to the clinical side of the problem, we may ask, what are the commonest and most outstanding complaints for which welding might be held responsible? About this there still exists much difference of opinion, and I believe that the best way to answer this question is to present the histories of some of the cases of welding fume and gas "poisoning" that I was able to study during July and August of 1942. As there is a notable lack of case reports in the literature, such histories may also prove interesting.

* Paper based on a study of patients referred to the office of R. W. Stellar, M. D., at Wilmington, California. Prepared for a group of physicians, surgeons, and others interested in the health of some 40,000 shipyard workers in Southern California.

REPORT OF CASES

CASE 1.—F. D., age 34. Pipefitter at the shipyards for the last four months. His story was that last night, after he had got home from his work of cutting galvanized pipes with the electric arc, he felt an aching in his bones and in his head. He became conscious of a tight feeling in the chest, and began to cough, but was unable to raise any phlegm. Then he got a shivering chill, which was followed by feverishness. All this he ascribed to the fumes from welding galvanized pipes, because he was told by his fellow workers that those were exactly the symptoms of "galvanized poisoning." He was sure that the galvanized fumes must have been responsible, because six weeks ago, after cutting 65 feet of galvanized pipe, he also developed a dry cough and a tightening in the chest. He stated that he wore a hood at his work, but no respirator or mask. Examination showed a very muscular, stocky individual, lying in bed at home, and appearing very nervous and irritable. He had been a professional weight-lifter, and was obviously anxious about losing his cherished strength as a result of "galvanized fumes." His temperature was 100. His throat was only slightly reddened, and his heart, lungs, and blood pressure were normal. An x-ray of the chest, taken a day later, was negative. This was such a relief to him that he immediately returned to his work. You may wonder whether this man's symptoms were due to metal fume fever, or was he developing an attack of "flu" or grippe. The important point to note is how quickly he recovered from his attack. This rapid recovery is in favor of a diagnosis of metal fume fever.

CASE 2.—W. N. T., age 36. Pipefitter at the shipyards for the past four months. Before this he was a pipefitter in the oilfields. He states that he has not been well for the last three months. His story is that three months ago, after a hard day's work at cutting galvanized pipes with the electric arc, he developed a shivering attack. Then he felt feverish. Next morning his throat felt very sore, and he began to have a dry cough. On the following day, he developed a cold in the head with headache and running nose. After two weeks, his throat got better, but his cough has persisted. Even now he has such violent bouts of coughing, with raising of brown phlegm, that he becomes nauseated and gets a pain in the pit of his stomach. Although his appetite is good, he says he has lost ten pounds in the last three months. On examination, coarse expiratory râles can be heard in the chest, and the x-ray film shows much peribronchial thickening. In considering the etiology of this case of bronchitis, shall we say that it is due to the inhalation of galvanized fumes, or that it is the result of an upper respiratory infection? He says that he is not subject to colds, but metal fume fever is not usually followed by a persistent bronchitis such as he has had.

CASE 3.—J. O. R., age 23. Has been a ship's painter for the last six weeks, and before that he was a buffer. A month ago he began to have night sweats, his appetite became poor, and he has been losing much weight—close to ten pounds. He has had a cough for seven weeks, and raises a reddish sputum which he thinks is due to red lead and dust. There has been no nausea or vomiting. During the past three weeks he has often felt weak and dizzy, and he sometimes sees spots before his eyes. He says he wears a respirator, but he thinks it is of no use because the filter is not thick enough. If it were thick enough, he argues, it would interfere with his breathing. In considering this case, it may be asked which was the original cause of his symptoms, his present work as a ship's painter or his previous work as a buffer? In any case, the night sweats, the loss of weight, and the cough with reddish expectoration made me suspect tuberculosis; but a chest film was quite negative, and his temperature was normal. The sputum was not tested for tubercle bacilli.

CASE 4.—K. R. C., age 33. For seven months he has been a combination welder, i. e., he welds sometimes with the electric arc and sometimes with the oxy-acetylene torch. Besides cutting galvanized pipes and welding steel plates, he also does bronze and aluminum welding. Before the war, he had a welding shop of his own. His story is that a week ago he began to ache all over, and last night he had a shivering chill which lasted three hours. He coughs little, but raises yellowish phlegm. When asked what he had taken for his prolonged chill, his answer was that he took atebran tablets. Interested, I asked him why he took those particular tablets, and his reply was that, while he was in South America, he caught malaria in 1939, and since then he has been subject to attacks, usually in the spring only, but occasionally in the fall also. If he took atebran tablets three times a day for three days he made a prompt recovery. He thought, however, that the chill he had a week ago was a little different, because he was not so feverish and did not perspire so profusely as in his usual attacks of malaria. His chest film was normal, but his liver was slightly enlarged and definitely tender. His spleen was not palpable.

CASE 5.—E. W., age 34. During the last nine months he has been a welder at the shipyards, and before that he was a house painter and paperhanger. He states that two months ago, at 4 a. m., he woke up with choking and cough, but little expectoration. This attack lasted fifteen minutes. Similar attacks occurred every night for a week, but finally ceased with the help of Brown's mixture. Three weeks later he had another series of attacks for five nights in succession. Ten days ago he developed an ordinary cold with sore throat and running nose, and two days later he began to cough and bring up yellowish-white phlegm. This cough with expectoration has peristed, and he now complains of nausea, insomnia, and soreness around the lower ribs. An interesting feature is the fact that, four months ago, he noticed that whenever his wife swept the floor, he got an attack of sneezing. During such an attack he would sneeze twenty-five to thirty times, and then discharge much thin fluid from the nose. On examination, it was found that he had a few scattered bronchial râles on both sides, but an x-ray film of the chest showed only peribronchial thickening. His pharynx, however, showed the presence of a marked postnasal discharge, and there was a deflection of the septum high up in the nose. This case illustrates the fact that any upper respiratory disease, such as nasal, sinus, or throat trouble, makes a man peculiarly sensitive to welding fumes and gases which may produce a persistent and troublesome bronchitis.

CASE 6.—R. R., age 57. Chipper. When I first saw him on July 15, he was obviously nervous, irritable, and antagonistic, but I was able to elicit the following story. On March 17, after one of the burners had been using an acetylene torch in the first watertank, he himself settled down to do his work of chipping. After working 2½ hours he began to feel dizzy. He, therefore, got out of the tank, sat outside for fifteen minutes, and then walked over to the field hospital. After receiving oxygen for one hour, he ate his lunch, sat in the sun, and slept for two hours. Then he returned to the field hospital where he inhaled more oxygen. At the end of the shift, at 4:30 p. m., he drove home in his car, a distance of some forty miles, ate his supper and went to bed. At 11 p. m. he suddenly woke

up with shortness of breath and a rattling noise in his throat. Excitedly he told me, "I have heard that rattling in the throats of men before death, and I was scared, so I called my doctor." He was sent to the hospital where an x-ray of the chest showed a diffuse, soft, bilateral, and patchy infiltration of the lungs. An electrocardiogram, taken later, showed some depression of the T waves. Now, four months later, he complains of a shooting pain across the anterior chest, especially in the third intercostal space on the right, but shifting from place to place. He feels weak, perspires easily, feels nervous, is unable to sleep, and has become impotent. His only important previous illness was in December, 1940, when he was in the hospital for a month with double pneumonia. Examination showed a nervous, middle-aged man with coarse tremors of the fingers. His heart was only slightly enlarged to the left, but the rate was 110, and two minutes after exercise it was 124. There were occasional extra-systoles. His blood pressure was 170/98. A new film of the chest showed only peribronchial thickening. As it was known that his blood pressure had been normal a short while before, a diagnosis of neurocirculatory asthenia could be made. An electrocardiogram, taken again, showed signs of only mild coronary sclerosis. He was much relieved to know that his heart was not as bad as was thought. After taking a mild sedative, his blood pressure came down to 150/92, and the rate of his heart dropped to 100, and only 110 after exercise. He still had slight pain across the anterior chest on deep inspiration. By July 30, there was only a dull ache across the second and third interspaces, the cardiac rate was 90, and the blood pressure 140/90. He is now very coöperative, does not seem or feel nervous, and is going back to work. I suggested a lighter job, but he prefers his old job of chipping. In this case, I believe we may make a diagnosis of acute pulmonary edema due to the inhalation of a dangerous concentration of nitrous fumes. When he came to see me he had long recovered from this, but he had developed a distressing neurocirculatory asthenia with cardiac neurosis.

COMMENT

If we make a general analysis of these sample case histories, we can differentiate at least one general reaction to welding fumes and one local reaction to welding gases. The general reaction has been known for a long time, because it produces a definite and clear-cut picture. It is now known as metal-fume fever, but was formerly known as "metal ague," "zinc chills," or simply the "shakes." It is caused by the inhalation of the fumes of zinc, or rather the oxide of zinc. Thus, it is known that, in cutting galvanized pipes or welding sheets with the electric arc or the acetylene torch, a certain proportion of the operators and their helpers will develop metal-fume fever, because the galvanized coating contains over 95 per cent zinc. This is particularly liable to happen if the work is carried on in confined areas, such as tanks, boilers, or double bottoms of ships, where proper ventilation is difficult and often quite imperfect.

SYMPTOMS

The onset is acute, and the symptoms resemble an attack of "flu" or grippe. A typical attack begins after the man has left his work and gone home, *i. e.,* several hours after exposure to the fumes. Sometimes, even during exposure at his work, he may notice a metallic taste in the mouth and a dryness in the throat, as well as a feeling of nausea and tightness in the chest, which he may report at the time or before going home. After reaching home and going to sleep, he awakens with a shivering chill which often lasts one or two hours. He then feels feverish and breaks out in a profuse perspiration. His temperature is usually found to be between 100 and 102 degrees Fahrenheit. At the end of the attack he aches all over and feels exhausted. Such an attack is typically short-lived, and lasts only twenty-four to forty-eight hours.

An interesting feature is that these workers often develop a certain immunity or resistance if they continue at the same work. If, however, they get away from welding for a time, they rapidly lose this immunity. Thus, it happens that many of the older workers, having had one attack early in their career, never have another unless they leave this work and then return to it after an interval.

Such an attack may so resemble the onset of influenza that it is sometimes difficult to be sure whether we are dealing with metal-fumes fever, or an attack of "flu" or grippe. Of course, there is the history of exposure to zinc fumes, but not all workers thus exposed suffer an attack of zinc chills. As a matter of fact, the majority do not. It has been estimated that out of 100 workers regularly exposed to galvanized fumes, about 75 do not suffer at all. About 20 out of the 100 have chills occasionally, and only five have frequent attacks. Often there is no typical attack at all, but the patient complains of an annoying soreness of the throat, or of a dry, hacking cough that tends to persist. Sometimes the chief complaint is nausea, with or without vomiting, and loss of appetite. A common and very uncomfortable condition is a feeling of constriction or tightness in the chest, when every breath becomes an effort. Not infrequently the chief trouble is that after an acute attack the patient is left tired and weak, with no pep or ambition, but with a sense of nervousness which makes him feel unfit or indisposed to return to work for many weeks. Physical examination is usually negative, but the morale seems to be lowered. For want of a better name, I refer to these men as cases of *"welding-fume neurosis."*

REACTIONS TO GASES

Leaving the subject of metal-fume fever, which is an acute, general, and transient reaction to welding fumes, we now turn to the gases, and especially the nitrous gases, which are responsible for a local reaction in the lungs. This pulmonary reaction may be serious and even lead to death. What happens is this: After exposure to these welding gases, the worker has an acid taste in his mouth and begins to cough. If he then goes out into the fresh air, his condition may improve considerably; but five or six hours later the cough returns in a more intensive form, with shortness of breath, cyanosis, and a feeling of pressure in the chest. The patient thinks he is having an attack of asthma. This may be followed by acute pulmonary edema with profuse expectoration of foamy, yellowish, or pinkish fluid. Heart failure and death may follow in forty-eight hours. If the amount of nitrous gases inhaled is smaller, the patient may develop, not pulmonary edema, but pneumonia or acute bron-

chitis. An x-ray of the chest is useful in the diagnosis of pneumonia or of acute pulmonary edema, the latter of which shows a diffuse, generalized, and bilateral infiltration of the lungs with indefinite outlines, *i. e.,* the infiltration is of the soft exudative type.

The effects of nitrous gases may be so serious that it becomes important to ascertain how frequent is this hazard. Are many workers affected by it, or is it only a rare occurrence? And besides the immediate effects, what about the chronic results? Are these workers likely to suffer later on, in the course of years, from the slow but cumulative effects of the products of welding?

GASES: REFERENCES TO THE LITERATURE

In order to find a ready answer to these questions we had better turn to the literature, but here we find quite a diversity of opinion. Some writers believe that the hazard is both frequent and lasting, and go to the extreme of ascribing to welding almost any disease that may be found in a welder. They include a multitude of diseases as possible consequences of the welding hazard, such as tuberculosis and cancer of the lungs, ulcer of the stomach, lesions of the nervous system, aplastic anemia, and other dyscrasias of the blood. Even atrophy of the sex glands has been linked with welding. It is not surprising, therefore, that some physicians and, therefore, many patients, blame the fumes and gases for almost everything. However, it is obvious that these opinions are only speculations, and are certainly not supported by any scientific or experimental evidence. On the other hand, some firmly believe this occupation to be quite harmless, and one German writer convinced himself that welders are in better health than other workers in the same factory.

Here, then, we have the two extremes, and it must be admitted that this diversity of opinion is very confusing. This difference of opinion is due to the fact that conditions in different plants vary so much that there is no standard by which to measure or compare the results. Besides, the composition of the rods and their coatings may be very different. For this reason no one clinical investigator can speak with complete authority on this complex subject.

ANIMAL EXPERIMENTATION

So we had better turn to animal experimentation, where the conditions can be fixed or varied at will and the animals sacrificed afterwards, in order to find any changes in the tissues on postmortem examination.

It must be said at the outset that the number of experimental investigations is not great. It was, indeed, not until 1935 that the first experimental work on animals was done by Drinker [1] and his associates at the Harvard School of Public Health. This group of investigators exposed cats and rabbits to the welding fumes of bare uncoated iron rods and found that they all developed a severe inflammation and hemorrhage of the mucous membrane of the respiratory tract which, in some cases, resulted in fatal pulmonary edema. These effects were not due to the fume particles of iron oxide, which could be filtered out, but to the gases generated by the arc, namely, nitrogen dioxide and ozone. It must be remembered, of course, that the animals that died had been exposed to more than three times the concentration of gases found around a welder even in a poorly ventilated shop. It was concluded, therefore, that acute pulmonary edema, or pneumonia, is caused only when the concentration of gases is very high.

More recently, in 1940, Harrold, Meek, and McCord,[3] at the Industrial Hygiene Laboratories in Detroit, again investigated the simplest form of arc welding with washed bare iron rods, and found that the danger from nitrous gases was not as great as was formerly thought. They were not able to produce acute pulmonary edema in their animals, although they exposed them repeatedly for prolonged periods, but some developed pneumonitis. It was also found that the iron, and even the manganese, fumes were not specifically harmful, and that ozone, known to be irritant, was not present in the surrounding atmosphere in sufficient quantity to cause harm. Thus, the entire absence of pulmonary edema speaks well for this simple type of arc welding, so long as it is not carried out in confined spaces where the ventilation is imperfect.

As, however, no investigations had been carried out with coated rods, Hamm and Groom [4] of Ohio State University, undertook an experimental investigation of the pathological effects of coated or shielded rods on various animals in order to discover which coatings were toxic and which were not. They found that the incidence of serious lesions was relatively low, and that over 50 per cent of their animals survived without any harmful effects at all. Some of them became pregnant during the welding experiments and bore healthy litters. They did not lose weight, and showed no disturbances in their living habits. The low death rate of the animals, even when exposed to high concentrations of welding fumes and gases, can be taken as evidence of the low toxicity of the welding products; and at industrial concentrations, which are much lower than in these experiments, the hazard from modern welding with coated rods cannot be great. Some rods, however, namely, those containing fluorides, were found to be more toxic, and that is one of the reasons why the U. S. Navy has discouraged the use of such electrodes.

COMMENT

These investigators, therefore, drew the conclusion that in modern welding, which is usually done with coated rods, if precautions are taken to prevent the inhalation of high concentrations of fumes and gases, the risk to health is not great. There may be some irritation of the throat and bronchial tubes, but there need be no serious hazard to health even from prolonged and repeated exposure, so long as ordinary precautions are taken.

That exposure to welding fumes and gases, over a period of many years, produces no permanent functional impairment in welders was proved by Sanders of Milwaukee,[5] who, in order to contro-

vert the conclusions of some English investigators, examined twenty-six welders with an average of nineteen years' work. As a result of his investigation, he was able to show that the lungs of welders do not appear to be more susceptible to tuberculosis. He also noticed that, as a group, welders are less susceptible to ordinary colds than other workers.

More recently, Gardner and McCrum[6] of Saranac Lake devised experiments to determine whether the susceptibility of animals to tuberculosis is increased by the fumes and gases of arc welding. They found that, even in guinea pigs, repeated exposures to ordinary concentrations did not increase the normal susceptibility of the animals, nor did such exposures reactivate any preëxisting, partially healed, pulmonary tubercles, or produce progressive tuberculosis.

PREVENTIVE MEASURES

However, most investigators caution that welding of any type should not be done in confined spaces, even for short periods of time, without taking certain precautions. We may now ask, what are these precautions? They are mainly a problem for the engineer, but the principle is simple. The fumes and gases must be prevented from reaching the worker. If possible, welding operations should be carried on in a closed process, or if that is not practicable, then a system of exhaust ventilation with hoods must be fitted over the process. A portable exhaust ventilator may also be used to remove the fumes at the source, and this ventilator can be carried along with the work from place to place. This is very convenient if the welding is done in confined or poorly ventilated places, such as tanks, boilers, or double bottoms. Special attention to ventilation is necessary in working with materials that have a high zinc content, like galvanized pipes, or if the steel contains cadmium, which is very toxic, or if the flux contains fluorides.

Respirators should be worn by the operators, particularly if the exhaust blowers are not quite efficient, or if, for some reason, they cannot be used. Apparently, for one reason or another, some of the men do not like to wear any respirators. It would be well, therefore, if talks could be given to the men, and particularly to the foremen and leadmen, in order to obtain their intelligent coöperation in the use of these safety measures. It is also important to remember that where metal sheets are covered with lead paint and have to be cut by the acetylene torch or by the electric arc, there is a serious danger of acute lead poisoning. These lead fumes, even if the concentration is small, must be kept away from the workers by blower and respirator and mask. For, while zinc oxide is promptly eliminated from the body and, therefore, produces no cumulative effects, lead is stored in the body and the effects are definitely cumulative.

DIAGNOSIS AND TREATMENT

And now a final word about diagnosis and treatment. As we have seen from the case histories, it is not always possible to make a diagnosis from symptoms and signs alone. In most cases very few signs can be found, even on thorough examination. Nor does an x-ray of the chest often show anything unusual. The physician will, therefore, have to make up his mind from a careful and critical consideration of the history given him by the patient. Often he will have to discount the inaccuracies, the exaggerations, and the misleading statements that creep into the patient's story. Only by obtaining his occupational history, as well as the exact nature and circumstances of his exposure, and then harmonizing these with the meager findings on examination, can the physician hope to make a fair and satisfactory diagnosis of the condition before him. Then he will have to treat not only the condition, but also the patient.

As for metal fume fever, which so mimics an attack of "flu" or grippe, there is no specific remedy, but the treatment may be similar to that of the "flu." Thus, aspirin, grains 10, may be given every four or six hours for the aches and pains; and, if there is a distressing dry cough, codein, grain one-half to one, may be added. In same cases, the inhalation of steam with tincture of benzoin compound seems to take the rawness out of the laryngeal, tracheal and bronchial mucous membranes. Patients have told me that such an inhalation seems to "touch the spot!" Occasionally, patients expressed a firm belief that a weekly steam bath, Turkish or Russian, helped them to get rid of the effects of the fumes on the chest. Morphine, however, should not be given, because of its depressant action on the respiratory center. Hot drinks are indicated, and fruit juices are useful unless the stomach is very irritable. Of course, the milder cases will not need any treatment, unless the patient shows much nervousness or anxiety about his condition.

Those patients who have possibly been exposed to nitrous gases in high concentration, such as may happen in small enclosed spaces, should be kept quiet for twenty-four hours, with medical attention easily accessible. This is necessary in case a serious emergency arises six or more hours after exposure. The inhalation of ammonia vapor obtained from the carbonate of ammonia has been recommended, but the inhalation of 5 per cent bicarbonate of soda mist seems more desirable. In anticipating pulmonary edema that might set in, it is well to maintain good oxygenation by giving oxygen for ten or fifteen minutes every hour or so. If pulmonary edema has developed, and the patient's face appears cyanosed, or the fingernails are definitely blue, a venesection of 500 cubic centimeters of blood may be life-saving. Transfusions or infusions should not be given, for fear of increasing the edema of the lungs. Morphine with atropine used to be a favorite and effective treatment for acute pulmonary edema. The result was often a cessation of the profuse watery and bloody expectoration, followed by a dramatic recovery; but it is now felt that morphine may depress the respiratory center to a dangerous level. Codein and barbiturates are considered safer. As for cardiac stimulants, it is best to do without them, or use them sparingly. Besides, oxygen and venesection will be found more useful. Even when the acute

pulmonary edema has subsided, the patient has to be kept under observation for a few weeks, because of the possible late onset of pneumonia or the development of inflammation of the smaller bronchial tubes known as bronchiolitis obliterans.

PSYCHOLOGIC REACTIONS

Having treated the patient's illness, what about the patient himself? As I pointed out at the beginning, the patient seems to look upon galvanized fumes as a pernicious and sinister agent. He has, somehow or somewhere, been imbued with a deep suspicion and an exaggerated fear of the consequences of welding fumes. He will not do well or recover fully unless we can exorcise this exaggerated fear. If we fail to allay his fears, he is apt to develop what, for want of a better name, we can call a "fumes neurosis," and he will continue to feel exhausted, without pep or ambition. He will then become more and more indisposed to return to work. Although we call this condition a neurosis, strictly speaking it is most often a sort of hysteria. It is really an hysterical reaction to an accident by a person with an underlying neurotic personality makeup. In other words, the patient makes unconscious use of the accident or illness to solve his personality difficulties. I repeat that the patient is not aware of this trick, or alibi, played by his subconscious mind. It seems as if the accident brings to a head those inner and outer complexes which he has been unable to solve normally or face squarely. The accident is, indeed, a cause of this hysterical reaction, but only a precipitating cause, for the ground is prepared by his personality makeup.

It is also true that the expectation of compensation plays a rôle, but it is not the chief rôle; and it is important that the physician realize this, for such patients are sensitive and touchy. The approach to them must be psychological. It is not wise to declare bluntly that there is nothing wrong with them, for such a statement is neither convincing nor complimentary. It is better to take an x-ray film of the chest, because in most cases the patient has a lurking fear that the fumes have damaged his lungs. This film should be shown to the patient, and the heart and lungs pointed out, in order that he may be convinced that the fumes have not damaged those "vital organs." If he is still unconvinced, he should be shown a normal film side by side with his own. That should convince him, because "x-rays don't lie." A nerve sedative will do the rest.

IN CONCLUSION

We may conclude this paper by repeating that welding is not really a hazardous occupation, provided the concentration of fumes is kept at a low level. It may also be stated that although, after many years of welding, the lungs may show certain fibrotic or nodular changes which, in an x-ray film, may remind one of early silicosis, there is neither the shortness of breath nor the tendency to tuberculosis which is seen in silicosis. It is important that the physician realize the essential harmlessness of these so-called "spots on the lungs," so that he may be able to explain away the fears of his patient and reassure him honestly and effectively.

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HEALTH CONTROL IN WELDING*

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IN the contract shipyards of the Maritime Commission and Navy we have today over a million employees. The yards themselves vary in size from a few thousand to 40,000. In many cases they are built on made land, and the workers are drawn literally from all walks of life. A maritime yard is lucky if it has more than a few per cent of workers who were shipbuilders before the war—the vast majority are green workers who have learned all they know about shipbuilding right in our yards since 1941. Jobs, such as welding, are about the same in all Maritime Commission yards, for there is little difference, from the health standpoint, in the way a freighter is built in Portland, Maine, in Houston, Texas, or in Portland, Oregon.

PRE-OCCUPATION EXAMINATIONS

On the East Coast, the Gulf, and on the Great Lakes, it is usual for new workers to be given preplacement physical examinations. In general, check-up examinations of men working on cranes, trucks, and the like are given at regular intervals; also jobs with possible occupational disease risk are checked from time to time. On the West Coast, however, the labor contract,[1] page 14, governing most of the region stipulates that:

"There shall be no doctor's physical examination nor age limit, except as required by law."

The Maritime Commission fully recognizes the validity of obligations existing under collective

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* Guest speaker, presented at the seventy-second annual session of the California Medical Association at Los Angeles, May 3, 1943.

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