Vol XV No 6 June 1955

ITF

INTERNATIONAL TRANSPORT WORKERS' FEDERATION

Volume XV · No 6 · June 1955

International Transport Workers' Journal

6

Monthly Publication of the ITF

Head Office: Maritime House, Old Town, Clapham Common, London SW 4

Telephone: Macaulay 5501–2

Telegraphic Address: INTRANSFE

Branch Offices: USA – 20 West 40th Street, 6th Floor, New York 18, NY

INDIA – 4 Goa Street, Ballard Estate, Fort, Bombay 1

Forthcoming Meetings:

Helsinki	13-14 June	Executive Committee
Helsinki	15-17 June	General Council
Stuttgart	16-18 July	Civil Aviation (Flying Staff) Conference
Berne	12-13 September	Conference on European transport problems
Berne	14-17 September	International Railwaymen's Conference

Contents

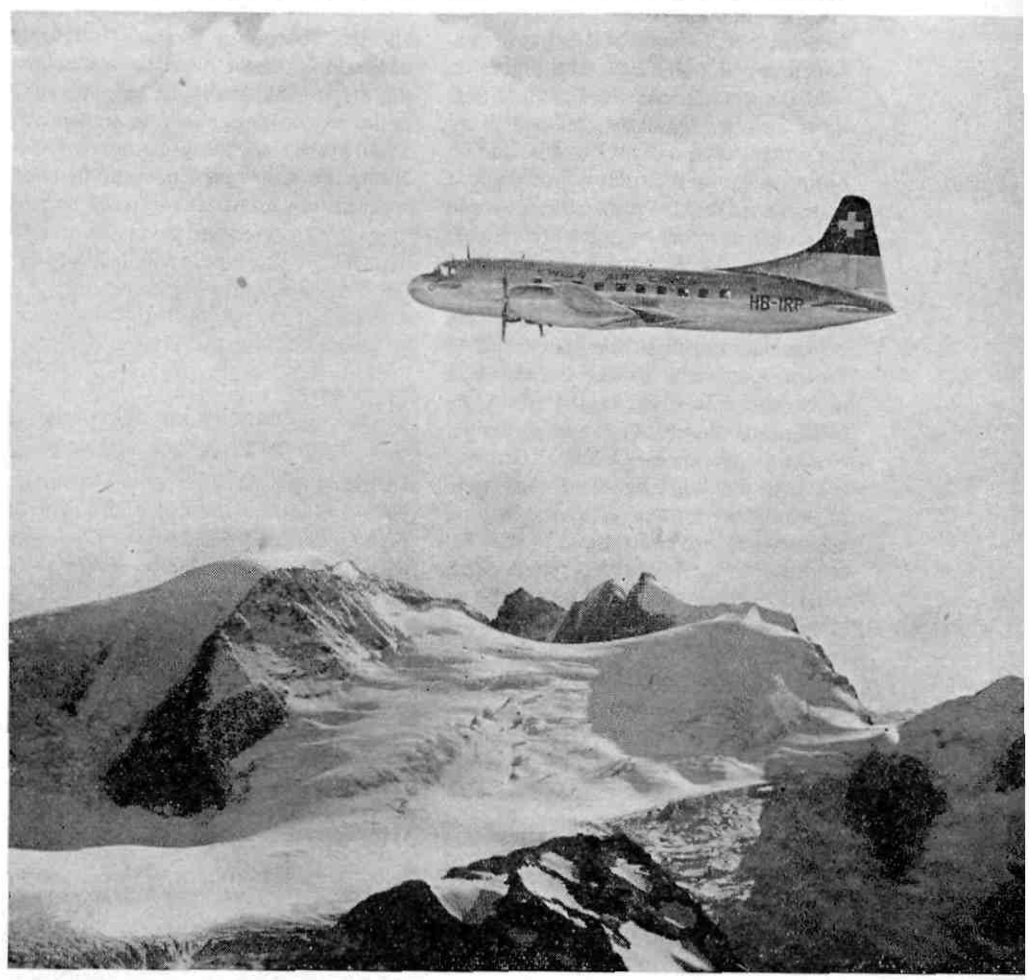
Human factors in air transport design

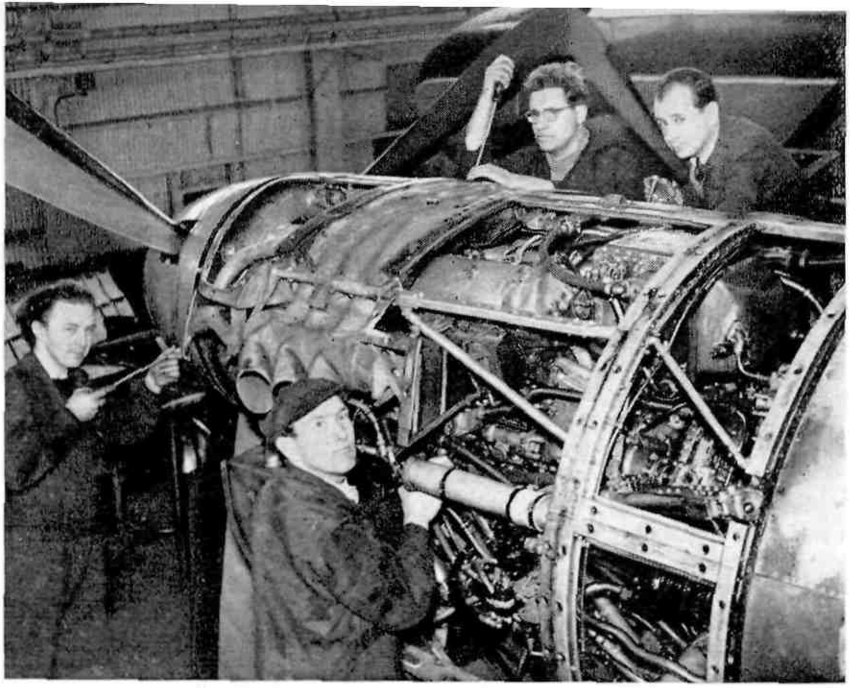
Whilst the concept of the need to adapt the machine to the man is hardly a new one, it cannot be denied that progress in this respect has lagged far behind mechanical advances. Nowhere is this more true than in civil aviation where the technical strides of post-war years have been so revolutionary that there exists the danger of overlooking that these complex craft must be operated by normal men with normal limitations. This does not imply that human factors have been ignored in their entirety, but their evaluation has been secondary to considerations of aerodynamics, structure and power plant. Happily, all is not on the debit side of the balance sheet, for from time to time isolated researches have been conducted into such questions as noise level reduction, improvements in heating systems and cockpit instrumentation layout; much good work was achieved through these independent projects, and information on the results obtained was scattered throughout the aviation press. The paramount need, however, was for a full-scale investigation into all the human factors involved in operating an aircraft, and the presentation of recommendations in handy and readable form.

Dr. Ross A. McFarland, Associate Professor of Industrial Hygiene, Harvard School of Public Health, eminently qualified to undertake the task, has performed a vital service in bringing together design engineers and other specialists in an attempt to ensure that in all future aircraft, the consideration of human problems shall be high on the list of priorities. In his constructive work, '*Human Factors in Air Transport Design*', Dr. McFarland has done much more than provide a mere compilation of facts: he has undertaken intensive research, and has co-ordinated specialist opinion in order to meet the challenge of aeronautical engineers for specific information as to the limits within which physical variables should be controlled to meet human requirements. The former lack of contact between experts had resulted in failure to apply biological data to aeronautical design; for example, the engineer early realized the effects of high altitude flying on his engines and supercharged them to meet the difficulties – the physiologist, on the other hand, was fully aware of the effects of high altitude on the human organism. But because of the delay in integrating the knowledge of these two specialists, the supercharging of the cabin lagged behind the supercharging of the engines by at least a decade. Now, specialists in a given field were called together to pool their experience and knowledge for the good of all. 'The problems raised by human limitations are of course not restricted to aeronautical engineers or their biological and medical consultants, but must also be considered by the executive and administrative personnel of the airline industry.' One might add that the views of flight personnel who spend so large a proportion of their lives operating aircraft must also be considered. Admittedly, in certain quarters, steps are being taken to ensure that their opinions are solicited, if not implemented. Such consultation is however very much in its infancy, and abundant evidence could be produced to prove that aircraft design must increasingly meet the needs of the human occupants.

Basic considerations

The author bases his main thesis on the assumption that the interaction of human and physical variables in flight is of fundamental importance in the operation of aircraft. The consider-





In many respects, human factors in air transport design have hitherto been secondary to considerations of aerodynamics, structure, and power plant (Photo by courtesy of 'The Aeroplane')

ation of this interrelationship is all the more important in the blue-print stage since it involves:

1) the safety and efficiency of airline operations as affected by the performance of the flight crews;

2) the comfort and well-being of passengers during all stages of a flight;

3) the avoidance of costly modifications by operators after delivery.

Dr. McFarland relates that he had an opportunity – albeit many years ago – to make a study of crew efficiency and passenger comfort on the initial flights of several large aircraft before they were placed on transport routes. Although, as subsequent operations have borne out, the flight characteristics of these planes were excellent, there were numerous minor defects that seriously influenced crew efficiency and passenger comfort. For example, on one transport aircraft, the working conditions were unfavourable for the navigator because the vibration of the table and the distribution of light for the detailed visual work required at that station were poorly controlled. No provision was made for shielding the pilots from the brighter lights in the control cabin during night operations – the maintenance of dark adaptation was adversely infuenced.

Typical annoyances from the passenger point of view included noise from vibrating window panels and other insecurely fastened accessories, and excessive draughts due to failure to consider distribution, temperature, and rate of movement of the air. All these defects could have been corrected by the manufacturer before delivery if the plane had been adequately flight-tested with a full complement of passengers. Improvements effected would have been less expensive for the operator and more effective for public service. 'It is only natural to raise the question as to where the responsibility should be placed for faults in the design of air transports. Should the operating companies ordering the planes provide more detailed specifications of what is desired? Should manufacturers foresee the problems and incorporate more desirable characteristics during planning and construction?' The author is convinced that the operators and manufacturers have a joint responsibility in this regard.

Effects of humidity on aircrews and passengers

Devoting considerable attention to the problems attendant on high altitude flying, Dr. McFarland deals extensively with the effects of humidity on aircrews and passengers. The lack of moisture, especially during long flights, tends to dry the mucous membrane of the nose and throat, thus lowering the resistance of these organs to infection. Dry air also greatly accentuates the irritation of the passengers caused by tobacco smoke. 'If the exposures to low humidity are frequent and of long duration as in the case of flight crews, the skin tends to become dry and scaly, and surface irritations to minor cuts and abrasions may tend to heal less quickly.' (Flight personnel entirely corroborate the author's views; in reply to an ITF questionnaire of 1953, flying staff affiliated organizations reported that a contributory factor in certain aircrew illnesses was the dry, foul air of pressurized aircraft; all operating crews experienced cracked lips, sore throats and a general dryness of the skin – features not conducive to a high level of physical fitness).

Repeated examinations in the 1940's on thirty-five pilots of Pan American Airways on inbound flights from Manila revealed a high incidence of upper respiratory infections and irritation of the ears and eyes. The author argues that if the lower and upper relative humidity limits are in the order of 25 and 50 per cent, operating experience has indicated that such a range would meet personnel requirements of aircrews and passengers without creating unusual operating problems. Linking the question of humidity to the allied problems of temperature and ventilation, he recommends that the development and testing of cabin heating systems should be under the direction of specialists in heating and ventilating, with technical aid from those in aviation medicine who have a knowledge of the operating problems and personnel complaints.

Control of aircraft noise

In spite of advances made on air transports, noise still remains one of the most annoying aspects of air travel, and its control a challenge to aeronautical and acoustical engineers. Conventional methods of sound-proofing at sea-level cannot readily be adapted to aircraft because of limitations of weight and space, differences in temperature and humidity, and effects of vibration and gravitational forces.

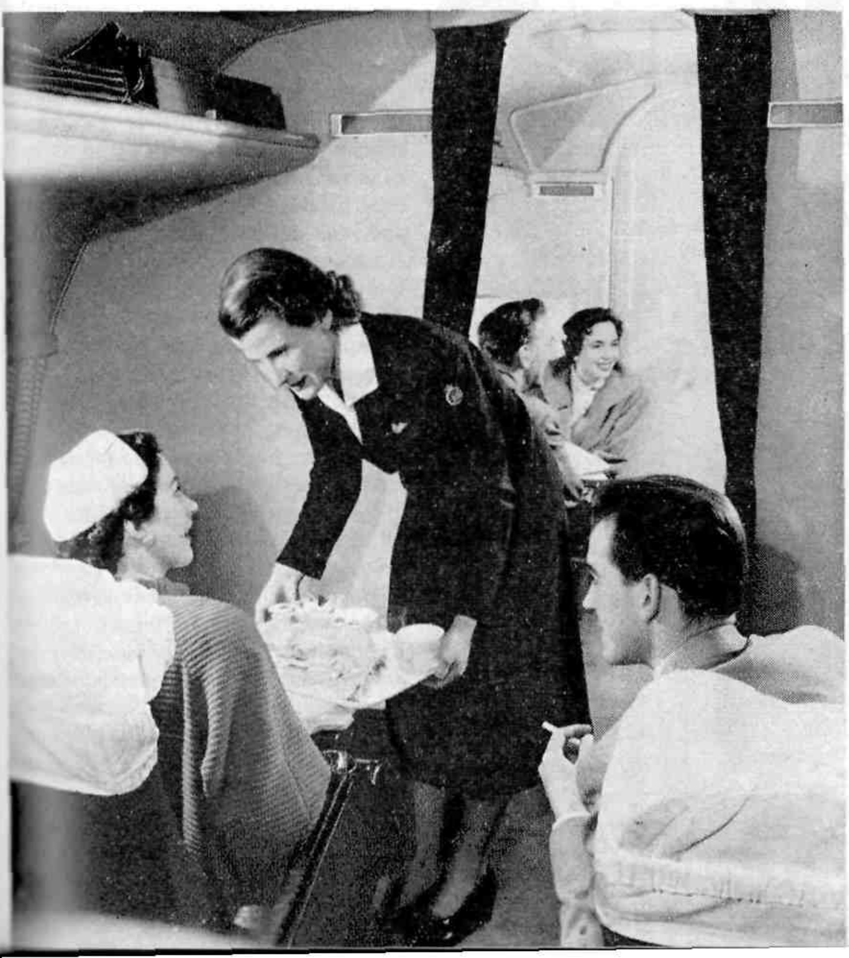
The author tackles the problem by first affording a brief description of the properties and measurement of sound and of the characteristic frequencies found on airplanes. The decibel scale and the way we perceive loudness are described, as well as the phenomenon of 'masking' and the way airplane noises may 'mask' the speech of crew and passengers, making it necessary to shout in order to be heard. Noise levels in other branches of transportation give the reader a basis of comparison with those of aircraft. Effects of noise on human performance, conversation, and auditory mechanism itself are discussed. A survey of the recorded sound levels on aircraft follows, and after the most effective methods of sound reduction and the materials likely to give the most satisfactory results are outlined, several representative designs for air transports are presented. Emphasis is placed on those aspects of the problem which will enable the aeronautical engineer to achieve the most desirable results with the least weight penalty and maximum efficiency. The final recommendations are that the reference level of 0.000200 dyne per square centimetre be adopted as standard for all acoustical measurements on aircraft; that an over-all noise level of 80 to 85 decibels and an average level of 55 to 60 decibels in the 1,200 to 2,400 cps octave band be specified for passenger comfort on long-distance aircraft; and that the design of acoustical structures in the cockpit and cabin also provide, as far as possible, for thermal insulation.

Control of vibration in modern transport aircraft

'It is interesting to compare the amount of vibration on modern airplanes with that on other modes of travel. If a quiet and stable trip is all-important, with no regard for speed, then one might prefer to travel by sailboat. Other ships, such as fast ocean liners, however, usually subject one to excessive vibration, especially in the tourist compartments near the propellers. The fastest trains perhaps have the highest noise and vibration levels of any long-distance land vehicle. The modern automobile, on the other hand, has a high comfort factor – contrast a similar ride in a jeep.

'It is not surprising that troublesome vibration should be present in an aircraft, for its structure is extremely light in relation to its engine power; it is estimated that transport aircraft have 300 horse-power per ton of structural weight. The principal sources of vibration are (1) engines, (2) propellers, and (3) aero-dynamic disturbances about the fuselage.' (Jet and turbo-propeller aircraft are less troublesome regarding vibration than conventional types).

The author was ultimately led to recommend that in addition to the usual testing of the prototype or experimental model, a thorough flight-testing programme for vibration be carried out after the plane is in production and before its delivery to the operators. This programme should include flights after the complete installation of all interior fittings, and, on several occasions at least, with a full complement of passengers. This recommendation does not seem unreasonable since it has been found on numerous occasions that the vibration characteristics of an aircraft change after major installations have taken place. It is finally recommended that reduction of noise and vibration be given adequate consideration in the original design of every aircraft type.



Importance of cockpit and control cabin layout

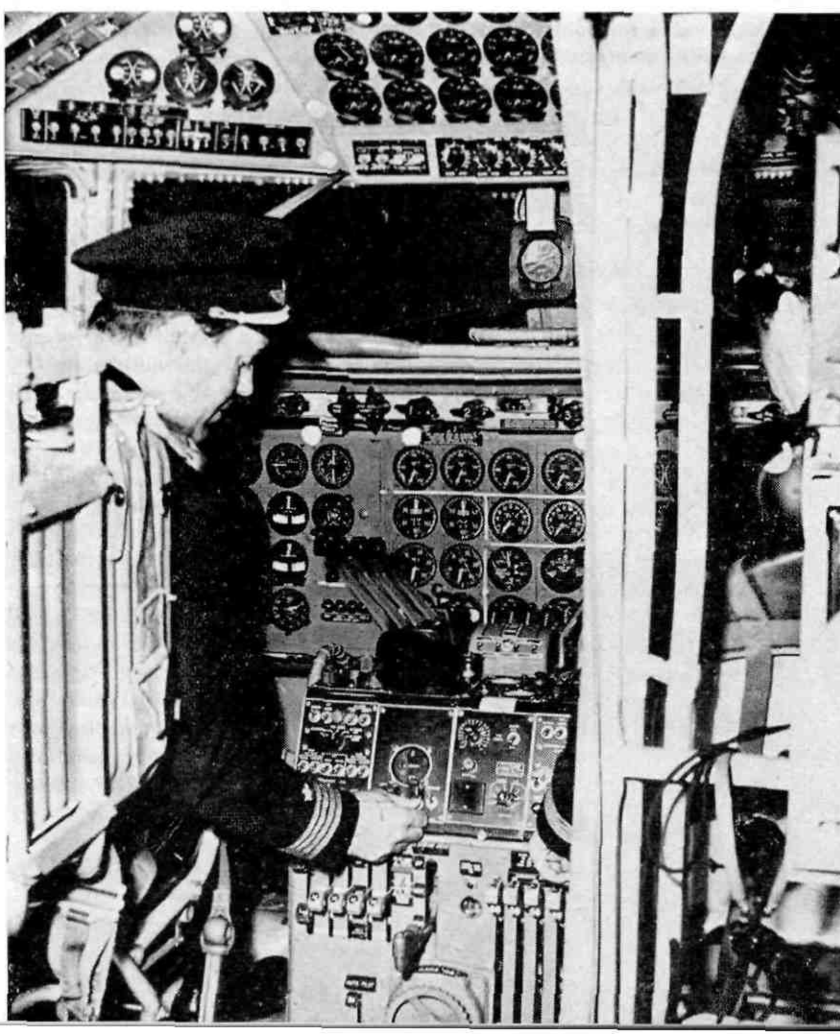
Flight personnel all over the world are justly critical of cockpit instrumentation layout, lighting, visibility, and the lack of ease of movement in the operating compartment of most modern aircraft. The results of a survey of opinion in the American Air Line Pilots' Association as far back as the 1940's indicated that the most pressing need in instrument panel design was the standardization of instrument location. Most pilots felt that the precise arrangement agreed upon was relatively unimportant so long as dials were clearly visible and location consistent from one aircraft to another. The survey indicated that the human factor had been given the barest attention, and certain airlines had, on occasion, introduced complications by the use of duplicate instruments that varied in scale marking and numbering. Other oraganizations condemn the cramped space of the crew compartment and the difficulty of functioning as a well-integrated team.

The importance of a successful control cabin, of standardization of instrument layout, of adequate seating arrangements, of improved legibility and marking on instruments, of providing uninterrupted field of view for the pilot and ready access for the flight engineer to points where engines can be observed, of the simplification of the control panel, of the elimination of gadgets of questionable usefulness – all these considerations are of paramount importance in combatting that deadly enemy of aircrew personnel, and also of the travelling public, namely, crew fatigue. The need for simplification and standardization cannot be overempha-

Although considerable attention is paid by air lines to their passenger' well-being, the same has not always been true of the aircraft designer, with the result that minor defects affecting both crew efficiency and passenger comfort have been overlooked in the designing stage (British Overseas Airways Corp. photograph) sized since flight personnel spend so arge a part of their working lives in the crew compartment. Details of design intended to minimize crew fatigue will be more than compensated by increased efficiency, improved flight technique and a corresponding increase in safety and morale.

The author analyses the over-all layout as well as the specific details of the cockpit and control cabin from the point of view of improving the safety and efficiency of air transport operations. He recommends that in future designs more emphasis be placed on human limitations than on instrumentation and aerodynamics alone, i.e., there should be an attempt to design the cockpit with regard to the abilities of the average pilot rather than one with advanced engineering training. He recommends a simplification of pilot's duties and a division of responsibility by the use of multiple specialist crews for all four-engined aircraft with an operating range of 2,500 miles or more; that essential controls be located separately, be of distinctive design, and appropriately protected; that experiments be carried out to determine the most desirable size, shape, spacing of letters and markings; that reflections and glare be reduced at the source by eliminating concentrated light sources, highly reflecting surfaces, and sloping surfaces which would direct light into the pilot's eyes; that, regarding illumination of instruments, the light should be limited to the red-orange band of the spectrum.

It would appear that certain progress is being made towards the simplification of instrumentation layout; the Boeing 707 jet transport prototype of the United States has incorporated a number of improvements in cockpit design. Thought obviously has been given to safety, comfort and convenience. Despite the sharp sweepback, outboard engines are visible from the cockpit; there are only seventy-five instruments on the panel compared with one hundred and twenty-six on the Boeing Stratocruiser; seventeen levers instead of fifty; forty-five switches instead of two hundred and four; and forty-two warning lights instead of one hundred and fourteen. The lever for the tricycle landing-gear is shaped like a wheel whilst the flap lever is shaped like a flap. This proves what can be done when the problem is systematically and scientifically tackled; it is surely within the power of commercial airlines to make a real contribution toward reducing fatigue, and the solution of those operating difficulties related to fatigue.



Prevention of aircraft accidents

After dealing with such matters as the control of insects and airborne diseases, acceleration, motion and flight performance, passenger accommodations on air transport planes, Dr. McFarland fittingly brings his work to a climax with a treatment of the all-important question of the prevention of aircraft accidents. The interrelationship between human factors and aircraft design is especially pertinent in an analysis of aircraft accidents because 'neither the operating characteristics of the plane nor the performance of the pilot can be considered as completely separate variables; only in isolated cases is it possible to apportion the causes of an accident to specific faults rather than to an accumulation of contributory factors.' Arguing that while training and selection procedures may be improved, it is unlikely that human limitations in operating aircraft can be appreciably altered, the writer pleads for a simplification of the duties of aircrew personnel and a consideration by designers of their abilities both under normal conditions and in times of fatigue and stress.

A new point of view in regard to accident analysis is developed: the usual procedure of attributing accidents to various causes after their occurrence is supplemented by another approach, namely that of an advance analysis of the possible faults in the plane as well as those in the air crew. In addition, the need for designing for the *average* pilot and the desirability of paying more attention to *near* accidents is stressed. In his advance analysis, the author considers that now survival rates in air transport crashes are approaching favourable levels, attention might well be paid to the proper stressing of structural features, including seats and their accessories, and the positioning of the passengers to reduce and distribute the impact forces on ditching or crash

(continued on page 119)

Flight personnel are justly critical of cockpit instrumentation layout, lighting, visibility, and the lack of ease of movement in the operating compartment of most modern aircraft (Photograph by courtesy Scandinavian Airlines System)

The Port Workers' Union, Rangoon

by J. F. SOARES, *Secretary, ITF Indian Regional Information Office*

DEMOCRATIC AND FREE TRADE UNIONS do not usually thrive in an atmosphere vitiated by civil strife or amidst the devastation of war. How pleasing then it is to tell of a union which, despite the handicaps such conditions impose, continues not only to maintain its freedom but to expand its many activities. In Rangoon, Burma, there exists just such a union – the Port Workers' Union – and it is therefore a pleasant task to record a short history of this organization – by all accounts, one of the very best in the country.

The Port Workers' Union is only an infant as trade unions go – being only eight years old, but the record of its achievements during this period, a record which would do credit to more mature and older unions, testifies to the zeal and ability of its officers and to the social consciousness of its rank and file.

Founded in 1946, the union had as its first president U. Win, the then president, Trade Union Congress, Burma, later the Government of Burma's Minister for Home and Religious affairs. The year 1947 also saw in the presidential chair another high government official but, early in 1948, the union by a majority decision amended its constitution, debarring from office in the union all but active workers from within the industry.

The Port Workers' Union is an industrial union organizing all the workers employed by the Commissioners for the Port of Rangoon, including managerial staff. This is an unusual feature for trade unions in the East but evidently such diverse membership has not hampered its activities or weakened its bargaining strength. Included in the membership are: dockers (longshoremen), workshop employees, ranging from 'coolies' to the Assistant Mechanical Engineers and, in fact, all employees of the mechanical engineering, marine, salvage, port survey, pilotage, civil engineering, flotilla, and traffic departments. By convention, though not by requirement of its constitution, the only employees not permitted to be members are masters of vessels and the executive heads of the thirteen departments into which the 'Commission' is divided. There is no compulsory membership except for longshoremen, who are recruited through the union's hiring hall. Nevertheless, a check-off system prevails and the dues deducted are credited to the union by the accounting sections of the various departments. The dues rate seems to be on the low side, being annas eight (9d.) a month for members drawing under Rs. 100 and one rupee (1s. 6d.) for members drawing above Rs. 100. The existing wage structure though primarily based on the recommendations of a Pay Commission has been recast by collective bargaining whereby a minimum has been laid down, which presently is Rs. 40 (£3) per month for the lowest paid employee. Cost-of-living allowances (minimum Rs. 42) are also payable.

Dockers in the port of Rangoon are divided into two sections: those working vessels in stream, being stevedore-recruited labour and members of the various dock workers' unions; the other section, working on wharves and jetties, being members of the stevedore unions. Of this latter section, a large percentage is on the permanent strength of the Commissioners and its paid on a monthly basis, the present wage rate being Rs. 50 with an addition of Rs. 47 as cost-of-living allowance. When the permanent working force is insufficient to meet the requirements of any particular day, the 'casual' section is called in and dockers of this section (all of whom are registered members of the Port Workers' Union) receive wages on a daily basis, at present Rs. 3/10 per working day of 7½ hours. In all the Commissioners' departments, hours of work are regulated, a 44-hour week being worked in all except the dockers', where it is a 45-hour week.

The thoroughly representative and democratic character of the General Council of the union is made possible by an elaborate election system which works somewhat as follows: the thirteen departments of the Commissioners elect a council of eighty-six. From this council is elected an executive committee of twenty-seven, from which in turn are elected the nine officials or office-bearers of the union. Of the five secretaries of the union, three are in charge respectively of 'Organization', 'Publicity and Propaganda', and 'Social and Welfare'.

In keeping with the aims and objects of the union, one of which is 'to develop the moral, intellectual, social and physical welfare of the port workers', the union's activities are canalized to provide for (a) library (b) a school teaching English, Burmese, Book-keeping, and Accountancy (c) a cooperative consumers' store (d) funds, earmarked for 'strikes', 'credit', and 'death benefits' and (e) an amenities section for hospitalized members.

Consultation machinery between the union and the Commissioners is through a Joint Board, which meets at the request of either party and to which are referred all points of dispute.

An unusual feature, testifiying to the harmonious relations existing between the union and the Commissioners, is the fact that the union is provided with free, commodious, furnished quarters within the Commissioners' premises, i.e. in the Commissioners' headquarters building. By regulations laid down in 1947, the union's officials are (a) entitled to recommend or persuade any workpeople to any course of action connected with their work, subject to compliance with the provisions and acts relating to trade disputes (b) at all times allowed to enter any part of the port area without restrictions in order to exercise their rights as union officials and to deal with matters relating to the administration and organization of the union and (c) are to be released from their duties as Commissioners' employees whenever it becomes urgently necessary for them to be so released. Such privileges, unusual in this part of the world, have instilled in the minds of union officials a deep sense of responsibility to their own obligations which are discharged in fairness and justice to employers and members alike, a factor which has conduced greatly to the union's standing and prestige as a democratic and free organization.

London's underground railway system

London's underground railway system forms part of the general passenger transport services of the London Transport Area and as such is a component of the largest urban passenger transport system in the world – covering an area of 2,000 square miles, with a population around the ten million mark. As a result of many years of agitation for the unification of this system, a public corporation, the London Passenger Transport Board, was set up in the year 1933 under the London Passenger Transport Act of 1933, to acquire the various transport undertakings in the London area under duly agreed terms of compensation. The Board was required to 'secure the provision of an adequate and properly coordinated system of passenger transport for the London Passenger Transport Area', which included responsibility for the provision of railway services in the Greater London Area (other than main-line railways) together with all other forms of public passenger transport. In 1948 under the Transport Act of 1947, the Board was succeeded by the London Transport Executive. Although since 1933 it has been under uniform management, the London underground railway system began as a number of different enterprises and some distinctive characteristics of the individual lines are still noticeable today in spite of full integration of working.

The first underground railway to be built in London was the Metropolitan Railway, a stretch of 'cut and cover', four miles long, opened to traffic on 10 January 1863. In the early stages, a number of difficulties had to be overcome. Having no trains of its own, the operating company had to borrow a number of steam locomotives. Moreover, to meet the keen competition from the horse-drawn bus which was becoming increasingly popular about that time, the railway company also had to start running its own fleet of buses within four years of opening the line.

Nor were critics of the new venture lacking, amongst the horrors predicted being suffocation from the smoke of the engines. Actually, there was some slight foundation for this charge as, at first, the only means of ventilation was by way of the staircases leading down to the platforms or by 'blow-holes' over the track. The tunnels soon became encrusted with soot, and the railwaymen were encouraged to grow beards and moustaches as a means of protection against the sulphurous atmosphere!

Air pollution no longer a problem

With the advent of electrification in 1890, however, air pollution ceased to be a problem. Nevertheless, ventilation is still necessary and the London Transport Executive's pumping installations change some 4,750,000 cubic feet of air in the tunnels every minute, with the result that a station platform on the London underground railway system is one of the few places in the world where a person can enjoy a 'change of air' (every fifteen minutes to be exact) without moving a foot – and at practically no expense.

London's first underground venture was soon followed by others: by the first 2¾ miles of the Metropolitan District Railway (now the District Line) in 1868, and by a line linking the two, the Circle Line, in 1884. Steam-operated at first, these had electrified the majority of their systems by the years 1905-6. Today, only two lines on the underground railways operate steam trains – on two sectors well out in the 'green belt'.

The year 1890 is memorable in that it saw the completion of the world's first electric underground tube railway – a section, some 4¼ miles long, of the City and South London Railway, later renamed the Northern Line following amalgamation with other underground railway companies. Today, this line, one of the seven constituting London's underground network, has a length of just over forty miles, of which one tunnel – 17¼ miles in length – is the longest continuous tunnel in the world. The years 1900 to 1906 saw the opening of the three remaining underground electric railways constituting the present system – the Central Line in 1900, followed by the Bakerloo Line and the Piccadilly Line in 1906.

Meanwhile, extensions to the existing lines were being carried out. Thus, from a mere four miles of route serving seven stations in 1963, the system has now grown to a length of 248 miles with 277 stations. Of this mileage, about one third is actually below ground, being either tube railway proper (67 miles) or sub-surface line (21 miles). The latter consists of sections of railway which pass through the central area in shallow tunnels, sometimes within a few feet of the roadway. These tunnels were mostly built by cutting a trench and then covering it – hence the term 'cut and cover'. In these tunnels two tracks run side by side, unlike the tube railways proper where each of the tracks has its own separate tunnel.

The first tube railway

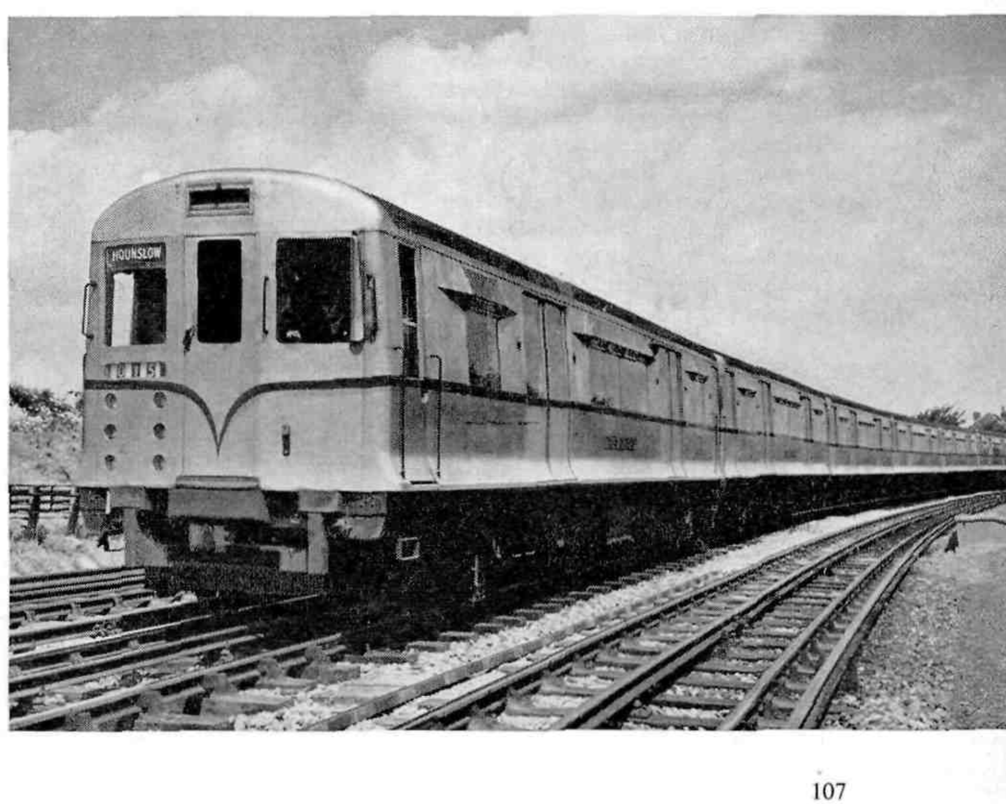
Although the City and South London Line can claim to be the first electric tube railway, the distinction of being the first *tube* railway must go to an enterprise known as the Tower Subway, a cable-drawn railway, about a quarter of a mile long, running under the river Thames near the Tower of London. It was commenced in February 1869 and completed in one year. The operating company was forced out of business, however, when Tower Bridge was built. Today, the tunnel is still used to carry hydraulic-pressure water-mains under the river.

Although the Tower Subway has thus, in a sense, come down in the world, less than justice would be done to its memory if it were not given honourable mention, for it embodied a pioneer method of underground railway construction – the 'tube' railway – which, with but little modification, has been used ever since. The method, in brief, is that of tunnelling by means of a 'shield' and lining the tunnel with cast-iron rings in segments. It rapidly superseded the older 'cut and cover' method used in the construction of certain sections of the earlier underground railways.

The honours for devising the 'shield' method of tunnelling, however, must be equally divided between an engineer, Sir Marc Brunnel (born in Normandy in 1769) and a very lowly creature called the shipworm who happened to turn up in a piece of driftwood (birthplace therefore unknown) just when the famous engineer was working at Chatham dockyard in 1812. The shipworm can claim distinction by reason of its boring habits – in wood, through which it tunnels by means of two rasp-like shells. As it progresses, it plasters the sides of the hole it has made with a secretion which sets like an egg-shell.

Its method of tunnelling is a model of efficiency, and Brunel was quick to realize the basic soundness and potentialities of this form of progress. He therefore applied the principle when constructing a tunnel under the Thames in 1825. He devised a 'shield' which, unlike its shipworm prototype, weighed 300 tons and consisted of three platforms each with twelve compartments. The whole machine, or one or more of its compartments, was driven forward by screw jacks. As the cutters dislodged the earth at the working face, workmen shovelled it back and the space was ringed with brickwork. Ahead of the brickwork, the shield itself supported the top and sides of the tunnel. This was the method of tunnelling used whem the Tower Subway came to be built in 1869, except that the lining was done in cast-iron rings in segments, as working with bricks slowed operations down. This time, too, the shield was circular, not square.

Basically, this is the method used today in constructing London's tube railways. Following a route survey, service shafts are sunk at suitable places – usually station sites. The nineteen-ton excavation shield is then assembled underground and the work of tunnelling begins. Hydraulic rams exerting a pressure of one ton to the square inch drive the shield forward. Control valves regulate the pressure on each ram in such fashion that the shield can be made to drive a straight or a curved tunnel or one sloping up or down. Work goes on at a number of points along the route throughout the day, progress being at the rate of fifteen feet of completed tunnel a day. The tunnels lie at a depth of anything from 40 to 220 feet. Since most of London's tubes are driven through a layer of clay (up to 400 ft thick) overlaying the chalk substratum, an improved type of shield has been devised, a rotary excavator, which both turns and pushes. This works at a little more than twice the speed – driving about 34 ft. of tunnel a day. It is only



A 'silver train' – one of a number of unpainted aluminium-alloy trains introduced in 1953 as an economy experiment. Lightweight cars of this type are as strong as steel and result in considerable economy in the use of current, the saving in weight being equivalent to 50 tons for a complete train (Photograph by LTE)

A good-tempered scrum – but still a scrum – boarding a peakhour train at Oxford Circus, black-spot of rush-hour traffic in the business heart of London's West End. Not only are more passengers travelling on the underground than before the war, but they are also travelling farther (Central Office of Information)

suitable for working in clay, however.

All is not quite so easy as pushing a pencil through cheese, however. At times, clay can be as hard as rock. Moreover there are pockets of water-bearing gravel and underground tributaries of the Thames to be reckoned with. In waterlogged soil, work has to be carried on in compressed air – at pressures sometimes as high as 35 lb. a square inch. Work done under the bed of the river brings the added complication of varying the pressure to conform with the ebb and flow of the tide – the Thames being a tidal river.

The twin 12-ft.-diameter tunnels are usually constructed parallel and a few feet apart, but often rise and fall independently. On occasions, one tunnel is partly over the other. On some lines each track is built on a switchback principle, according to the direction the trains are going to run on it. Approaches to stations rise one in sixty for about 200 yards, whilst trains leaving a station run downhill at a gradient of 1 in 30 for about 100 yards. Thus wear on brakes is saved on stopping and current when starting.

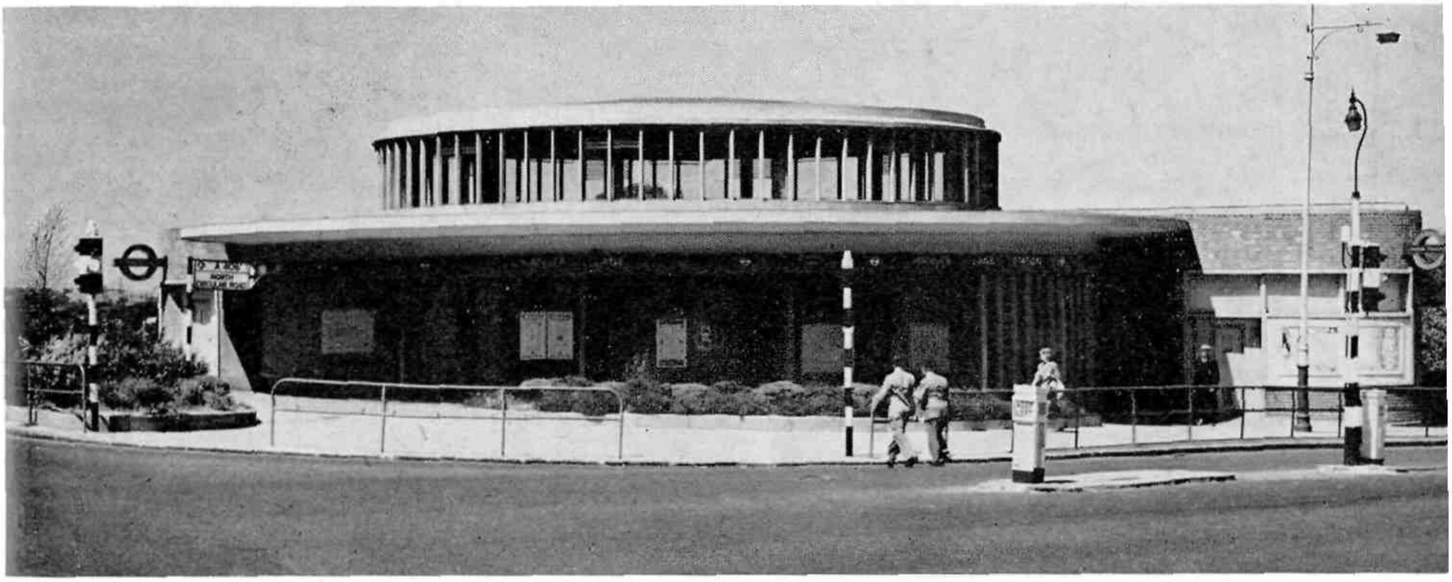
Two million passengers a day

To carry its something like 2,000,000 passengers a day the system operates about 500 trains made up of some 4,000 cars. The longest trains hold over 1,000 passengers and during peak periods follow one another at intervals of only 90 seconds. This high frequency, all the more remarkable when a stop at stations of 20 to 30 seconds is taken into account, is indicative of the expert service developed, which, begun when the first few miles of track were electrified, has continued at an increasing tempo over since. It reveals a story in which, in the interests of efficiency, safety and comfort, practically every possible mechanical device has been pressed into service – including many unique feature devised by railway engineers in answer to the challenge implicit in the travelling public's need for a rapid and reliable transport service.

One of the earliest of innovations, designed to cope with congestion at peak periods, was the substitution of escalators for passenger lifts. There are now 180 of these maintained at 57 stations. Operated during 19 out of 24 hours seven days a week, each is capable of carrying 10,000 passengers an hour in either direction at a load-carrying speed of 180 feet a minute. To reduce wear and tear, many are fitted with a 'magic eye' – a beam of light focused on a photo-electric cell which, when interrupted by a passenger stepping on to the escalator, causes it to accelerate to top speed. As soon as the passenger steps off, the escalator drops down to idling speed. During peak periods, the constant stream of passengers automatically ensures maximum speed until the rush is over.

The first escalator was installed a little over forty-three years ago. Acting on the precept that an ounce of example is worth a ton of sales talk, the railway company engaged a man with a wooden leg to ride up and down it for several days. Nowadays, London's underground passengers, on their average

For track inspection – not track records. This electricity-age version of 'a bicycle made for two' is of great help to members of the permanent-way inspectorate, two of whom are here seen going their nightly rounds (Photograph by LTE)



The stations on the 'out of town' sectors of the London underground railway system are of simple but very pleasing design

journey of nearly six miles a day, take mechanical progress for granted and are in need of no such unorthodox introductory services. Thus they accepted the substitution of automatic guard-controlled doors for hand-operated doors without so much as a comment, and even learned that they were expected to press the release button themselves at open-air stations, when the opening of all the doors by the guard would have meant unnecessary inconvenience to passengers not wishing to board or alight.

The development of mechanical devices for the rapid handling of passengers has been accompanied by the provision of an adequate train service in which emphasis has been placed on frequency rather than speed. The average speed of underground trains (including duration of stops) is just over twenty miles an hour – about twice that of a bus in the central area. A speed of 20 mph is attained in a matter of fifteen seconds. Thus the development of trains capable of rapid acceleration has been an important factor in the provision of a high frequency of service. This in turn would never have been realized but for an ingenious signalling system of automatic colour-light signals, electro-pneumatic points and automatic safety devices.

In its pursuit of safety, the system has not overlooked even the remotest contingencies. Thus the so-called dead man's handle in the motorman's cabin ensures that the train starts only when this handle is depressed. Should the motorman release his hold for any reason, as would occur in an emergency, the train stops. The system of double safety is also seen in the case of braking where the Westinghouse automatic brakes are supplemented by a compressed air system, electrically controlled In addition, some trains have a regenerative system, whereby they brake by regenerating current and returning it to the live rails, thus reducing their current consumption and, at the same time, saving brake-block wear. A modern service brake can pull a train up in 560 feet from a speed (often reached in the open) of 40 m.p.h.

For the passengers' comfort

In their search for improved techniques, underground railway engineers have not overlooked the necessity for greater comfort for the travelling public and much has been done in this field apart from improving the passenger-car installations, which admittedly are of a high order. Thus much thought has been given to the elimination of noise. Rail oilers fitted to the tracks militate against the tendency for 'squealing' to develop on sharp curves, whilst the fitting of acoustic tiles to the tunnel walls at about car-floor level reduces the amount of train noise assailing passengers' ears. The troublesome 'clicketty-clack' of steel tyres on rail joints has also been dulled by reducing the number of joints. Running rails have been laid in lengths of up to half a mile instead of the usual 60 ft., whilst cars soon to be put into service will have rubber-cushioned bogies replacing steel springs, thus further reducing the noise set up by the bogie and dampening out the vibration caused by the wheels passing over rail joints and crossings.

The men who run the trains

As highly mechanized as the London Underground system is, however, the trains still could not run but for a highly trained and efficient staff numbering some 20,000. Operating grades account for 9,394 (motormen and drivers 1,735, guards 1,922, booking clerks 1,429, porters and ticket collectors 3,396, and supervisory staff 580, with a further 332). Non-operating staff are employed in either the Mechanical Engineering Department or the Civil Engineering Department. The former has some 4,700 staff (supervisors 177, shop staff 3,154 together with 1,372 'conciliation grades'). The latter employs over 3,600, including 103 supervisors, 735 shop staff and 2,742 'conciliation grades' (Conciliation grades on the underground are railway wages grades associated with the movement of traffic and with the day-to-day maintenance of rolling stock, permanent way, and signal telegraph installations). In addition there are some 1,260 employed in the Works and Buildings Department and 2,400 in the electrical engineering department of the

LTE. These two departments, however, are not exclusively railway staff as they also do road services work.

Rates of pay on the underground railways are negotiated quite separately from those of equivalent grades on the main line railways, from which in many instances they differ. Under the latest award for LT conciliation grades – that of March 1955, taking effect on and from 2 January – the weekly rate of motormen is £9 18s. 0d. (£8 18s. 0d. the first year and £9 8s 0d. the second year of service). Guards get £8 6s. 0d. a week, starting at £7 15s. 0d. and rising to £8 after a year, reaching the maximum after two years. The wages of signalmen vary from £7 14s. 0d. to £9 17s. 0d. a week according to classification. Other grades classed as operating staff are stationmen (£7 0s. 0d. a week), ticket collectors (ranging from £7 7s. 0d. to £8 3s. 0d. a week) and station foremen, who receive £8 3s. 0d. a week.

The permanent-way section has eleven grades with wages ranging from £7 5s. 0d. a week (lengthman) to £8 9s. 0d. a week (ganger – extra gangs). The signal section has 22 grades, the lowest paid being the labourer at £7 5s. 0d. a week. Top-rate man in this section is the chief power signal lineman at £9 9s. 0d. a week. Weekly rates in the mechanical engineering department (carriage cleaners, watchmen, escalator and lift machinery attendants, etc.) vary from £7 5s. 0d. to £8 5s. 0d.

Stationmen, guards and motormen work a 44-hour week comprising eleven weekdays in a fortnight. Sunday duty is additional to the 44 hours and is paid at enhanced rates as are night duty between the hours of 10 p.m. and 6 a.m. and work on statutory holidays. These grades are entitled to 12 days' annual leave, plus two statutory holidays at standard rates on completion of one year's service.

The underground staff are covered by a contributory pension scheme introduced by the British Transport Commission on 1 October last for male weekly-paid staff. The pensions provided are additional to the State retirement pensions and range from 9s. 9d. to 30s. a week at 65, according to the period of membership of the scheme. In the case of more senior grades, such as skilled craftsmen, motormen and guards with more than five years' service, the pension works out to 40s. 0d. a week. Members pay no more than half the cost of the pensions, by means of contributions ranging from 1s. 8d. to 3s. 4d. a week.

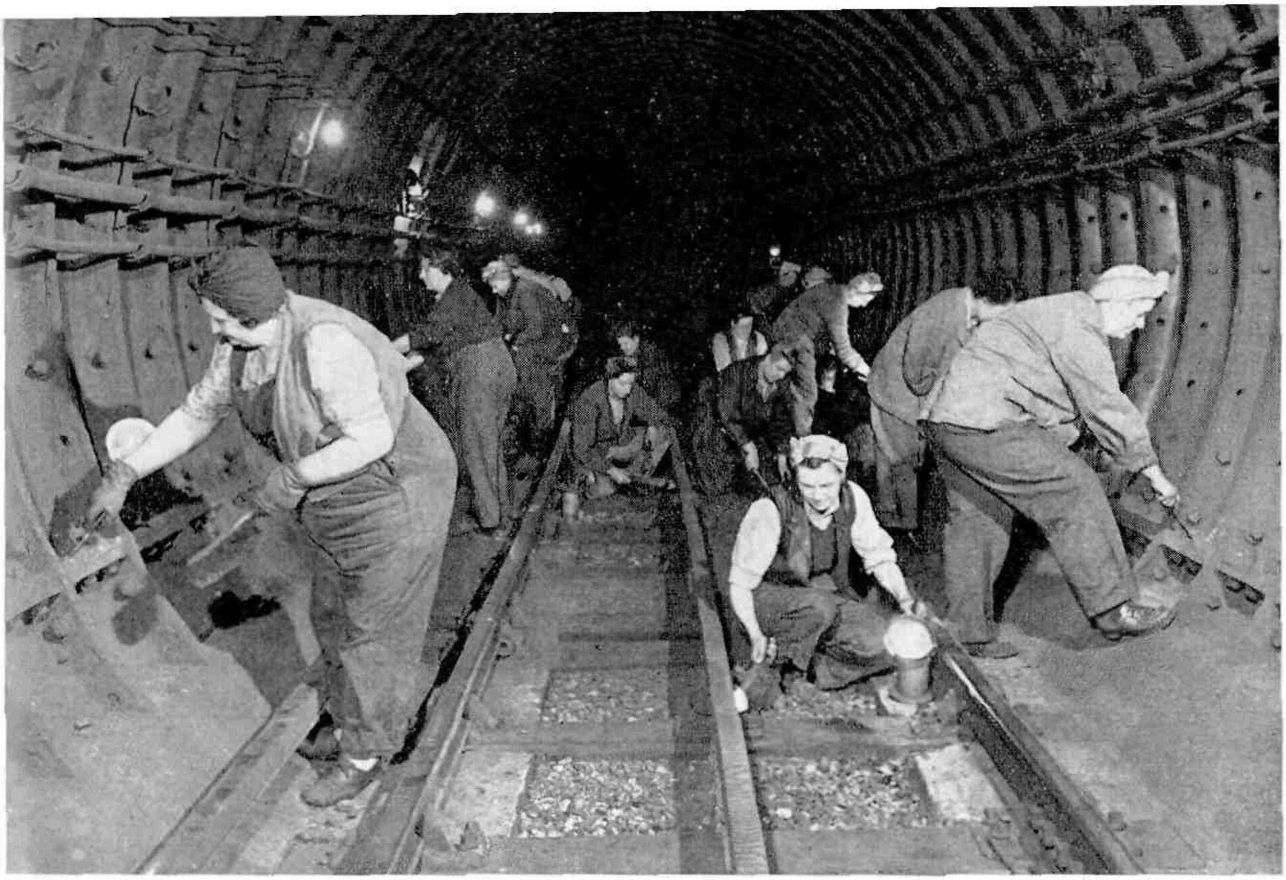
The scheme was negotiated by the Commission with representatives of the principal trade unions concerned and approved by the Ministry of Transport and Parliament. Existing staff had a six-month option to join, which ended on 31 March last. By the middle of that month, something like fifty per cent of the staff had joined the scheme.

Industrial relations in LTE

The interests of London's underground railway staff are watched over by the three railway unions, the National Union of Railwaymen, the Associated Society of Locomotive Engineers and Firemen, and the Transport Salaried Staff's Association (all affiliated with the ITF). There are additionally a number of craft unions catering for workshop staff. Negotiations on matters affecting their interests are, in the first instance, by means of Staff Councils. There are nine of these, representing staff on an occupational, not territorial, basis. Staff representatives, varying in number from three to eleven, meet 'not more than a corresponding number of officials nominated by the Management'. The functions and procedure of the Staff Councils are laid down in their constitution in accordance with the London Passenger Transport Act. Provision is made for joint meetings of two or more Councils on matters of joint interest, and for reference of matters not agreed in the first instance to the Management (i.e. informal discussion between staff representatives and the Chief Officer concerned), and not immediately to the higher constitutional negotiating body. The staff side secretary need not be a member of the staff, i.e., may be a trade union official. This was one of the major victories of the British railway unions in their struggle for recognition.

Applications for a revision of agreements are referred to the Negotiating Committee, which consists of two members from each of the three unions together with six representatives of the Management. In the event of no agreement being reached, the matter is referred to a Wages Board consisting of an independent chairman and two members, one nominated by the LTE and one by the unions. They, however, must not be members or employees of

Permanent-way workers breaking up the concrete bed of the tunnel. One of the many jobs going on whilst London's ten millions are fast asleep in their beds. Essential jobs of repair, cleaning and maintenance have to be done at night during the period of five hours or so when the current is switched off and no trains are running (Photograph by LTE)



Part of the industry below ground when the trains have stopped running. Some eighteen women, called 'fluffers', are employed to clean the 132 miles of tunnel under London. They work in pairs, each pair cleaning about 70 ft of tunnel in a single night

London Transport or the trade unions. Provision is made for representatives of the parties to act as assessors.

In the case of the workshop staff, the lower stages of the negotiating machinery are 'shop' and 'lines' committees providing staff representation by departments and unions. The departmental (shop) committees discuss and settle 'questions relating to rates of pay, hours of duty and conditions of service other than matters of management and discipline'. The Lines Committee also discusses managerial and disciplinary matters.

The final stage in negotiations for all workshop staff is the Arbitration Tribunal, set up in 1940. Matters affecting railway workshop personnel are normally discussed and settled with the Joint Committee of unions for the LTE railway shop wages staff which, in addition to the NUR, includes representatives of the various craft unions involved. Matters affecting road workshop are normally discussed and settled with the LT Joint Trades Committee which comprises the craft unions concerned. Most of the latter committee's work is done by a Negotiating Committee of some eight members which includes both union and rank-and-file members. When railway workshop matters are under discussion, the latter are replaced by four lay members elected from the craft union representatives from the railway workshops. The Joint Trades Committee is allowed considerable autonomy by its constituent unions and negotiates on all common matters, including hours and wages.

Plans for the future

The history of London's underground railway system reflects a continuous fight to provide an adequate and comparatively speedy means of transport for a growing population. As a result of the Englishman's preference for building 'along instead of up', London (or rather the populated area which must be considered as London from a passenger transport point of view), now sprawls over vast distances like an enormous flattened octopus, with the tips of its tentacles (representing the limit of continuous built-up areas) stretching some fifteen to twenty miles from the business centre. More than ten million people live in this area and a large proportion of them travel up to town and back every weekday to their place of work. For many of the travelling public, the distances involved are such that travelling time represents a serious item in their leisure hours budget, so much so, in fact, that they prefer the discomforts of peak-hour travel on the underground to the comparatively greater comfort but more leisurely pace of the 'stop and start' buses. During most of the working day and at peak periods – when everybody is in a hurry – surface transport in the centre of London is reduced almost to a walking pace through traffic congestion, with the result that for many thousands of workers the underground is the most effective means of transport.

The London Transport Executive is, of course, fully aware of the need for extensions to the system. Extensions carried out since the war include 34 miles (8½ miles in tube) added to the Central Line between the years 1946 and 1948 to serve a large and growing population in outlying districts at a cost of £13 million. Plans are now under consideration for an entirely new tube railway, eleven miles in length, running in a

Part of the booking hall – also underground. The latest type of automatic machine prints, cuts and issues tickets and gives the necessary change in the space of three seconds (LTE photo)

north-easterly direction through the heart of the business area to the 'dormitory areas' of the north and north-east, and linking a number of main-line steam-train terminals. Tube railways, however, are expensive things to build, and the new eleven-mile tube, with rolling stock and installations, is estimated to cost between £50/60 millions at present-day prices. Whatever the cost, however, there can be little doubt that only a further extension of the system can supply an adequate answer to London's urgent passenger transport problem.

Dust control in handling grain cargoes

AT ITS FOURTH SESSION (Genoa, 1951), the Inland Transport Committee of the International Labour Organization adopted a resolution inviting the Governing Body of the International Labour Office to draw the attention of governments to the problem of the protection of dock workers against dust resulting from the handling of grain.

The German Ministry of Labour carried out an investigation in six inland ports. The findings of the factory inspectors who undertook the investigation are contained in a report which may be summarized as follows:

The report begins with a well illustrated description of the conditions prevailing in warehouses, silos and transport undertakings, their technical installations, the measures taken to reduce excessive dust formation, and the types of work in which workers are most exposed to dust.

The medical part of the report is based on the examination of thirty-nine workers who were particularly exposed to grain dust. Four persons were found to suffer from affections of the external ear, ten from skin affections, thirty-four from conjunctivitis, thirty-one from pharyingitis, twenty from bronchitis and thirteen from cardiovascular disorders. Complaints were made that these irritations were caused in particular by grain from North Africa and the Near East, which now has a much higher dust content than before the Second World War.

The medical findings led to the carrying out of an analysis of dust samples which proved that grain dust does not constitute a silicosis risk, on account of its very low silica content. The health hazards of grain dust appeared to be the result of the mechanical irritation of the mucous membranes by sharp pointed hairs.

The principal difficulties encountered in the suppression of grain dust are, in fact, of an administrative nature. Customs and import regulations oblige grain importers to see that no weight losses occur in the course of shipment and storage. Even the installation of de-dusting equipment requires the prior approval of the customs authorities.

On the basis of these facts, a set of nine recommendations for effective dust control is proposed, arranged in descending order of importance:

1) Legislation should provide that dust be removed at the first point of transfer (normally the seaport) of grain cargoes.

2) Customs regulations should facilitate the removal of dust.

3) Legislation should prohibit importers from making up for weight deficiencies by putting back dust previously removed during transfer operations. Dust which is unsuitable for either human or animal consumption should be otherwise disposed of.

4) Sack-filling and weighing machines should be so enclosed as to prevent the escape of dust.

5) Sack-filling and weighing machines should be provided with a mechanical exhaust system operating preferably through floor openings.

6) New installations should be provided with better-fitting ducts and joints.

7) Better facilities should be provided for regular cleaning, e.g., through mechanical exhaust systems with well distributed connections for suction hoses.

8) Respirators, already required by regulations, should be supplied and used for all work inside the compartments of silos.

9) Initial and annual medical examinations for dockworkers handling grain cargoes should be prescribed.

Television experiment in Danish port

THE FREE PORT OF COPENHAGEN is reported to be carrying out the first tests of television as an aid to port operations. At the moment it is being used to enable crane-drivers to work without the help of a look-out man below. The television camera is so sited as to give the crane-driver a wider field of vision than is normally the case and to enable him to follow the movements of the grab or hook from inside his cabin, the television screen being placed immediately in front of his operating position. It is hoped that the experiments will lead to increased safety of working, preventing accidents to dock workers and damage to cargoes.

Occupational dermatitis among railwaymen

by L. G. WYATT, *Brotherhood of Railway Carmen of America*

DERMATITIS OR INFLAMMATION OF THE SKIN is not a new problem, but it has become a very real and growing problem since the advent of dieselization. As long ago as 1500 AD salt compounds were recognized as the cause of dermatitis or inflammation of the skin. In 1700 AD there appeared a medical textbook devoted exclusively to the occupational skin diseases of that time. The US National Safety Council lists many occupational diseases such as dermatitis, blisters, abrasions, bursitis, synovitis, benzol poisoning, silica, dust, compressed air diseases, and many others, but dermatitis, the 20th century scurvy, plagues by far the greatest number of our American producers. Although there is nothing new or startling about occupational dermatitis, there is something new and refreshing in the cognizance our courts are taking of these occupational casualties, when resulting in whole or in part from the negligence of the carrier.

Occupational diseases, as well as other occupational injuries have grown with modern industry and by the year 1952 the loss from occupational dermatitis alone was estimated at $100,000,000 annually. Now this is not an astronomical sum in these days of paling prosperity, but it contributes substantially to make our total national loss from occupational injuries each year more than $2,500,000,000. The pecuniary value in pain and suffering is incalculable, but pain and suffering do have a pecumiary value in the eyes of the law.

The diesel engine, while it has increased, at least to some extent, employment hazards, has brought speed, efficiency and lower operating costs to the railroads. The diesel engine is a power-producing machine which well illustrates man's recent, rapid success in getting the 'harness on nature' for human service. The recent utility improvements in the diesel engine also illustrate the present rate of industrial progress. The general economic effect of the diesel has more than doubled the power available in our oil and shale supplies. The diesel has made a back number of the old 'iron horse' that thrilled us as kids, as we stood in awe and watched it chug away from our home town, 'belching forth its black smoke that rolled like war clouds over the prairie.' The diesel and other powered engines are a monument to the technical and productive skill of American industry. The utility of the diesel engine surpasses all preceding improvements following Abbe d'Hautefeuille's invention of the internal-explosion engine.

Known causes

The advent of diesels sparked tremendous growth in the number of cases of dermatitis among railroad workers and particularly those engaged in shop craft employment. Any examination of the facts must commence with some scrutiny of what dermatitis is and what it does to the human body. Only a small minority of the cases of dermatitis are recognizable as a disease as the term is generally known – those caused by germs. An examination of the known causes of dermatitis shows that there are three main types or categories: (1) Contact with a causative agent, (2) germs, (3) neuro-dermatitis. Neuro-dertatitis, itself, may appear independently or in conjunction with either contact or germ dermatitis.

An examination of the leading text authority on dermatitis, 'Occupational Diseases of the Skin' by Schwartz, Tulipan and Peck, indicates that approximately 25% of all known causes of dermatitis have their origin in the use of petroleum products and solvents. In view of the fact that an overwhelming majority of the known cases of dermatitis on the railroads are caused by these substances, let's see what they do and how they react.

Petroleum products include among them cutting oils, which are divided into two large groups, insoluble and soluble. The insoluble ones are used primarily as lubricants, aiding the tools in the cutting operation. The solubles are used mainly as cooling agents. To the oils are frequently added chemicals such as sulphur or chlorine.

All petroleum oils have the property of defatting the skin. All oils may plug the pores of the skin and cause comedones. Chemical additives may irritate the skin, in addition to the action of the oils, and burn the skin on their own behalf. These products will cause comedones, folliculities and acne.

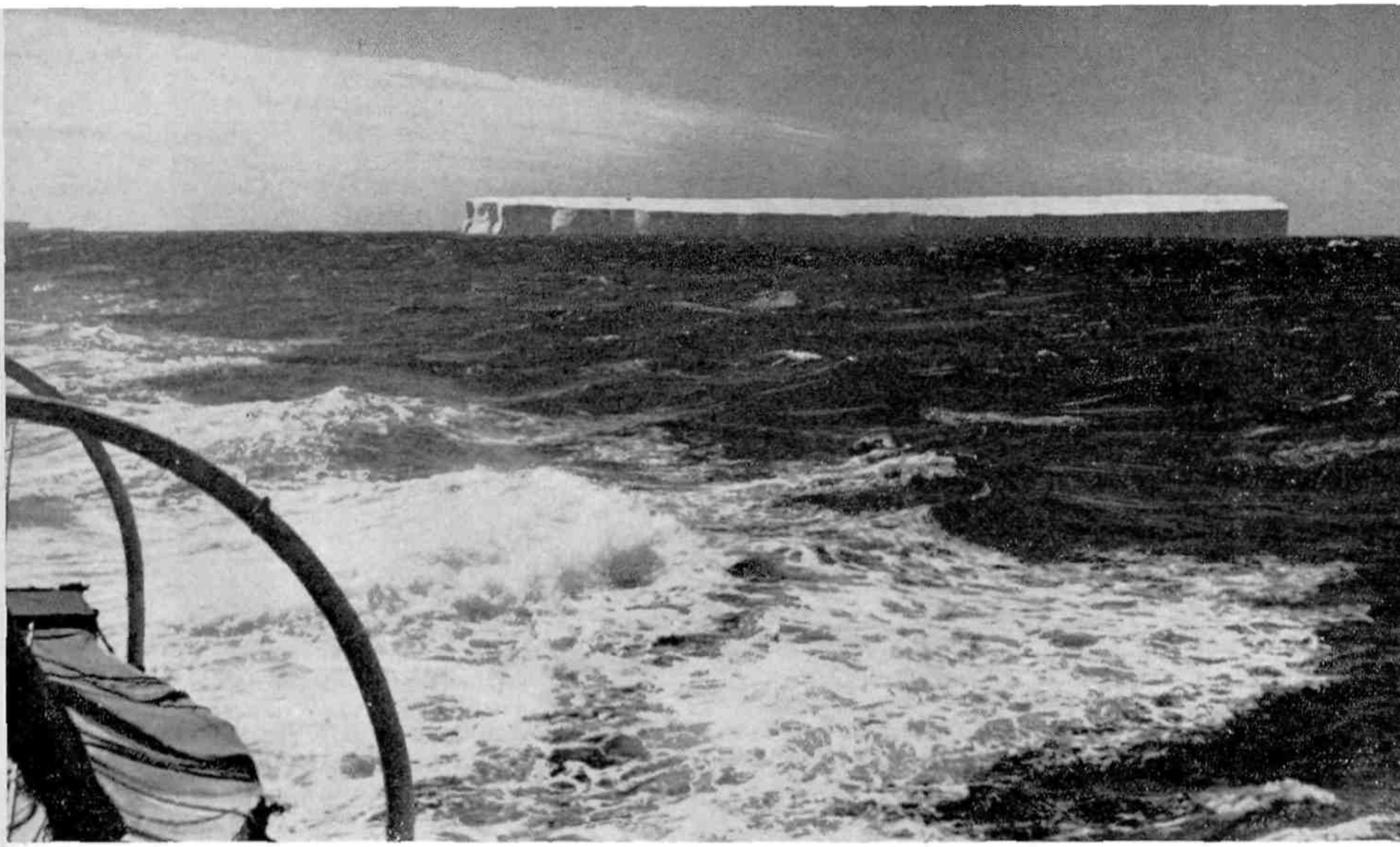
Protection needed

Prevention of dermatitis consists primarily of cleanliness of the person, of the clothes, of the machine and of the oil. Workers should be provided with adequate washing facilities, hot and cold running water and showers. They should be protected by aprons, sleeves and gloves made of impermeable materials such as synthetic resins. Cleansers should be used that do not further dry or aggravate the skin. Machines should be washed daily and oil should be changed weekly and either discarded or screened to remove impurities and slivers which aggravate existing conditions and cause lesions of their own. Protective creams, salves and ointments have been perfected and should be provided.

Solvents are particularly dangerous and seem to become more so as time goes on. They cause dermatitis by dissolving the keratin layer of the skin and then attacking the prickle cells; by dissolving and removing the fat contents of the skin. In addition, some solvents are allergens and cause allergic dermatitis in addition to primary irritation. Some damage the outer layer of the skin – some even attack the blood vessels. All solvents can cause chronic fissured eczemas if the skin comes in contact with them frequently.

Workers should not be required to immerse the hands during degreasing operations. Solvent-proof rubber gauntlets under solvent-proof sleeves closed at the wrists should be worn. Long-handled mops or brushes should be used when possible and solvent-resisting ointments should be furnished.

Prevention of dermatitis consists primarily of cleanliness of the person, clothes and materials used in the day's occupation. The worker should be provided with proper protective clothing, washing facilities and cleaners that do not further dry and aggravate the skin. The importance of good housekeeping cannot be over-emphasized in accident prevention. 'An ounce of prevention is worth a pound of cure.'



Whaling in the Antarctic

FROM THE CROW'S NEST ATOP THE MAST of a steam-driven whale catcher, plunging alone through the icy waters of the Antarctic Ocean, a lookout shrieks the Norwegian equivalent of 'Thar she blows' – 'Hvalblaast!'

A mile away, a huge blue whale, the largest creature known to man, ashore or in the sea, has surfaced to blow. Its warm breath, vaporized in the freezing atmosphere, shoots upward like a waterspout.

Aboard the catcher, one of nearly three hundred whaling ships, large and small, operating in the Antarctic, sixty-year-old Captain Lorens Basberg, the gunner, races along the ice-coated catwalk toward the bow and his swivel-mounted harpoon gun.

Captain Basberg, a whaler for four decades, a gunner with nearly six thousand whales to his credit since 1928, is not the skipper of the catcher from which he works (though most gunners combine the two jobs). Now, however, with a whale in sight, he gives the orders.

As the catcher surges forward, Captain Basberg hand-signals the bridge for one manoeuvre after another, conning the vessel toward a position from which he can make his shot. The catcher's speed mounts to sixteen knots. Freezing spume clouds the gun platform as waves break across the bow. Each time, his feet firmly planted against the pitch and roll of the deck, the Captain emerges, dripping, from the spray. His beard and eyebrows are matted with icy particles. But though the deck beneath him tosses wildly, he keeps his gun swinging in slow arcs, doggedly tracking the whale through the simple rifle sights on the barrel.

The whale, alarmed by the drumming of the driving catcher's powerful screws, dives, then surfaces again, now two hundred yards away. The catcher ploughs relentlessly after. Again the whale dives deep. Minutes later it surfaces closer.

The Captain, his soaked woollens freezing on him like iron, eyes his target narrowly. The whale looms large inside the 'V' at the end of the short stubby barrel of the gun. With one hand, the Captain signals. The vibration of the engines lessens; the catcher slows perceptibly and, for a moment, steadies.

Shoot!

Out of the smoke of the blast arcs the stumpy harpoon, trailing a rope which traces a wavering line against the sullen Antarctic sky.

The hit is square. Seconds later, deep in the whale's body, a grenade in the harpoon's nose explodes. Heavy barbs, like fishhooks, snap open, anchoring the harpoon fatally.

Though the whale runs, thrashes, tries to dive deep, its end is certain. By manipulating a winch and by manoeuvring with rudder and engines so as to exert constant pressure on the whale, the catcher plays its huge prize at the end of a six-inch manila line with a slightly smaller nylon leader, much as a stream fisherman plays a trout with a slender fly rod and delicate tackle. Fifteen minutes later, perhaps several miles from where the harpoon first struck home, the whale is dead.

For Captain Basberg, as for all whale gunners, such successful battles as this, against the gigantic baleen whales, are personal triumphs. For in an era of mechanization, in an ancient trade where machines now are more conspicuous than men, prideful harpooners remain indispensable individuals in any whaling expedition.

No longer, of course, do they spear whales by hand from small, open boats. The introduction of the harpoon gun, almost a century ago, and of power vessels to chase the whales, changed that. Now, too, observers in helicopters scout far for the catchers, reporting weather and ice conditions, as well as the location and movements of whale herds. Even sound ranging apparatus, similar to that used to hunt submarines, is being employed to track whales beneath the surface. Where the old-time whaler used to stalk his quarry, hoping to come close enough to sink the iron before the whale took alarm, the modern steam (or diesel) powered catcher makes no attempt at stealth but relies on speed and manoeuvrability to run the whale down.

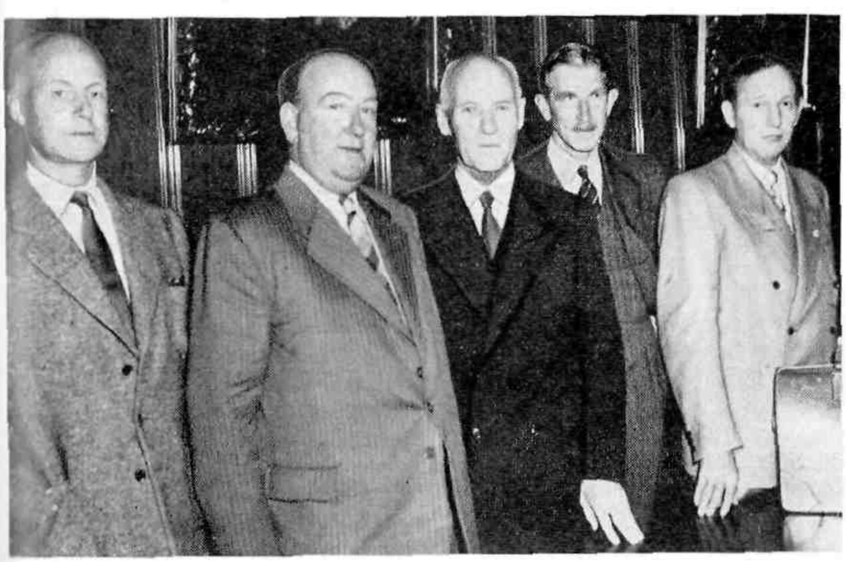
In the end, though, no mechanical device by itself can shoot the whale. That remains today, as it always has been, the skilled job of the harpooner.

For that reason gunners, most of whom are Norwegians, are whaling's highest paid men. They earn an average of $10,000 a season, and thus constitute an elite group in income as well as in pride and tradition of craft.

But if the harpooner's role, except for the modernization of his equipment, has changed little, the whaling industry as a whole has little resemblance to the whaling of the days when names like Nantucket and New Bedford were magic words in the trade.

In that golden era, which lasted most of the last century, whalers roamed the seas of the world, hunting from Baffin Bay to the Magellan Straits, from off Kamchatka to the Tasman Sea. They sought mainly the sperm whale, whose inedible oil was in demand as an illuminant until kerosene displaced it. Today sperm whales are still hunted, although sperm oil, used in special purpose lubricants and in soap-making, accounts for a relatively small part of today's whale oil production.

Baleen whales, whose oil competes with vegetable oils, butter, lard and tallow, are the most sought after today. Now far more valuable commercially than sperm whales, they are found almost exclusively in the Antarctic. Whereas sperm whaling is controlled only by the imposition of a four-month closed season and a minimum size of 'legal' whale, baleen whaling is more strictly regulated, as a conservation measure, by a commission established under an international agreement. Two inspectors – the game wardens of the Antarctic – accompany every whaling expedition to report how the commission's regulations are observed.



The commission has set up a 'unit' system based on the blue whale, the largest of the baleens. A blue is one unit. Two fin whales, two-and-a-half humpback whales or six sei whales equal one blue.

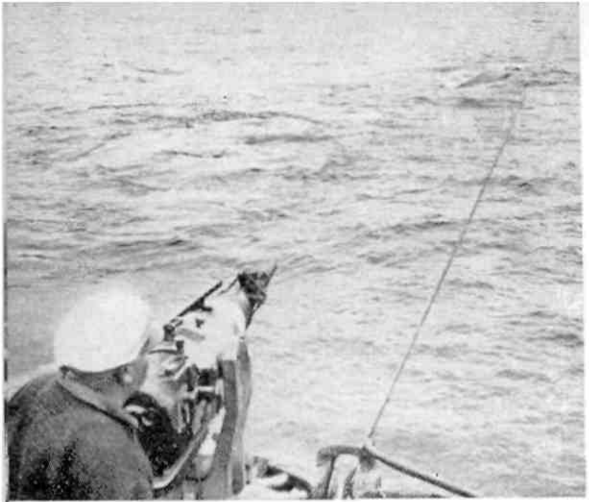
The limitation of the annual baleen whale catch has intensified competition within the industry in a curious way. Once the season opens, it is a furious race between the numerous expeditions at sea to capture whales as fast as possible. This is because the Committee for International Whaling Statistics, at Sandefjord, Norway, on the basis of its periodic radio reports from each expedition, will declare the season at an end whenever the total catch reaches the predetermined maximum. An expedition which falls behind the others cannot keep on whaling in order to secure its proportionate share of the catch.

Back in the days when New England's ship masters and owners were growing rich on sperm oil, whaling was a fairly simple enterprise. The whaler was a sailing vessel which carried a hold full of wooden casks for its oil, and on its deck a primitive try works for boiling oil out of blubber. This ship, with its complement of small boats, constituted an expedition.

Today, a whaling expedition is as intricate in its make-up and movement as a naval task force. At its core is the factory ship, the expedition's headquarters, full of tanks and specialized equipment – huge, ungainly and efficient. Operating with this seagoing refinery are a dozen or more catchers, generally 130 to 180 feet long, fuelled and provisioned whenever necessary from the factory ship. These catchers cover vast areas, often searching several hundred miles from the factory ship. Supporting the catchers and factory ship are tugs and tankers. A factory ship carries a complement of about 300 men; each catcher, about sixteen.

All this makes modern whaling a costly and speculative venture. An expedition's ships alone cost more than $10 million to build. To outfit and operate the expedition for a single season may cost an additional $3½

The whaling industry is unique in that wage disputes affecting it are settled by international arbitration. Both Norwegian and British employers and trade unions were represented on the arbitration commission which is shown here



After the whale is sighted, the gun crew sets the range and fires the harpoon, to which is attached a long cable. Harpoon head carries a powder charge (Photograph: Hamilton Wright Organization)

million or more. But if costs and risks are great, so are returns. In a single season, with luck and skill, an expedition may gross as much as $7 million.

In the last century, when the United States alone had nearly 1,000 vessels and and 70,000 men engaged in whaling, the industry produced about 15 million gallons of oil in its peak year. Today, a fleet less than a third that size in number of ships, and with perhaps 13,000 men, produces annually more than five times that amount of whale oil, not counting the sizable whale catch of shore stations. In additions, it produces valuable by-products, such as vitamins, fertilizers and animal food.

Mechanization, plus almost total utilization of the whale itself, are largely responsible for the increase.

This amazingly efficient ocean-going production line, self-contained and self-sustaining for months on end at sea, begins when a whale is killed.

Unlike the sperm whale, which floats when dead, the baleen whale soon sinks. Therefore the catcher inserts hollow tubes into the carcass and pumps air through them until the whale floats like a balloon. Then the catcher resumes its lonely hunt, leaving the whale tagged with the expedition's distinctive flag. No other expedition's ship will touch that whale, for stealing a flagged whale is the lowest crime that a whaler can commit. A 'whale transmitter', a tiny radio emitting a fixed signal, may also be fastened to the whale, so that it can later be located by a radio direction finder.

Presently a tug, alerted by radio to the location, tows the whale to the factory ship. Gigantic steam winches, which can handle a 125-ton whale as easily as the gear aboard on ordinary vessel lifts a lifeboat, pull the monster up an open slipway in the stern to the flensing ('skinning') deck. Here the red flow of the whale's blood, the whine and roar of the winches, the raucous shouts of the flensers wielding their formidable knives amid shrouds of escaping steam all combine to create an atmosphere straight from Dante's Inferno. The blubber and meat are stripped from the carcass, cut into chunks and dropped through wells in the decks into cooking vats, where live steam under pressure dissolves out the oil. When the oil is piped out of the vats, for further refining, the residue goes through still another process by which more oil is extracted. What is left after that is dried and ground into a meal, which is sacked to be sold chiefly as animal feed.

Meanwhile, the whale's liver and pituitary glands have been saved for special purposes. Oil from the liver has a very high vitamin content, while the pituitary yields the hormone ACTH.

A small fraction of the whale meat is frozen or salted. The Japanese, in particular, consider whale meat a delicacy. They consume quantities of it. The British and other Europeans have used some whale meat as food. But with other meat products now more plentiful, there is little demand for whale meat for human consumption.

In the old days whalebone was generally thrown away, only small amounts being in demand for such items as buttons and corset stays. But now the factory ship cooks oil out of all bones except the baleen or mouthbone of baleen whales, increasing the yield from a single whale by as much as one third. (Experimentally, amino acids are also being extracted from whalebone.)

Even the 'stick water', the liquid left in the vats after the oil is boiled from the blubber and meat, goes through separators which salvage the last of its oil content.

A typical factory ship, such as the 560-foot *Thorshavet* operated by A/S Thor Dahl of Sandefjord, can, if called on to do so, send to the cookers two whales of moderate size in an hour. A whale some 90 feet long and weighing about 120 tons may yield as much as 250 barrels of oil, although the average is lower. Its tongue alone will weigh three and a quarter tons, its liver another ton.

By mid-season, many of the factory ship's tanks have been emptied of their fuel oil – often taken aboard at Aruba on the long voyage south – and refilled with whale oil. The two products, of course, are never allowed to mix. Tanks which have held fuel are thoroughly cleaned before whale oil is stored in them.

When the expedition's tanker reaches the whaling grounds with a fresh load of fuel, she pumps it, tank by tank, into the factory ship, at the same time cleaning her own emptied tanks and filling them with whale oil from the factory ship. When this transfer is complete, the factory ship has sufficient fuel to last the season out, and the tanker returns home with whale oil for the market.

The principal use of baleen whale oil is as a natural fat in the making of margarine. The market for it is almost exclusively in Europe, because it cannot be imported at a price competitive with vegetable oil in the United States. Sperm oil, however, is imported into the United States for a variety of purposes. Reacted with sulphur, it is used as an extreme pressure additive in machinery lubricants and cutting oils. It is used to make long-burning candles, as an agent in the tanning of leather, in the manufacture of soap, waxes and shoe polishes. It sometimes lubricates the tumblers of sensitive safe locks. Sperm whale teeth, bigger than a man's two fists, are exported in limited quanitities by a London broker to the Fiji Islands, where the natives use them as money.

Ambergris, occasionally found in the body of the sperm whale, or floating in the sea, where it has been discharged, once was a veritable treasure. More than one whaling expedition made its expenses with a single find of ambergris. This fatty, smelly substance, formerly indispensable to manufacturers of perfume, no longer has much value, because synthetics have replaced it in the perfume industry.

Norway's ascendancy in the whaling world started in 1865 when a Tønsberg sea captain, Svend Foyn, perfected the the harpoon gun. Foyn mounted his gun on a small steam vessel and was able to chase and kill the elusive fin and blue whales, which travelled too fast to be hunted successfully from sailing vessels or oared boats. Obtaining an exclusive franchise to hunt such whales off Norway's northern coasts, he exploited his new invention into a thriving trade, licensing a few others to participate in it.

When Foyn's franchise expired in 1884, nearly two dozen other Norwegian companies, most of them chartered in Tønsberg or Sandefjord, moved in to follow the profitable trail he had blazed. Most of the companies then were family outfits and some of these, like Thor Dahl, are still in business. Mainly, though, today's huge and expensive whaling expeditions are widely held stock company ventures. Whaling company stocks are among the most heavily traded in Scandinavian stock markets.

As Norway moved into the lucrative whaling trade, the early development of US petroleum resources threatened the commercial demand for the sperm oil then being provided, chiefly for lighting, by New England whalers.

The Norwegians were among the first to recognize that the traditional uses of sperm oil were on the decline. They concentrated their efforts on baleen whales. At the same time they pioneered in the mechanization of the industry. They were among the first to put petroleum products to work for them. Today, a single expedition will use well over 200,000 barrels of petroleum products in a single season. Petroleum, far from being a competitor of whale oil today, is rather an ally, making possible the mechanization by which modern whaling exists.

Having switched from sail to steam, the Norwegians pioneered also in exploring the Antarctic. The British were quick to follow Norway's lead. Chr. Salvesen & Co., of Leith, Scotland, commenced whaling in the Antarctic in 1909 and still sends its expeditions there. It also maintains a shore station on South Georgia, an island at the top of the Antarctic Ocean, some 1,200 miles east of Cape Horn.

Pelagic or oceanic whaling, using catchers based on a sea-keeping factory ship, was another Norwegian innovation. They introduced it in the early 1920's when they sent the floating factory ship *Lancing* to the Antarctic. The *Lancing* was the first ship to be equipped with a slip or ramp through which the whole could be hauled on deck and butchered while the vessel was in the open sea. Before that, whales killed at sea had to be towed to shore stations or to factory ships located in protected waters.

As expeditions began engaging in this new kind of whaling, Antarctic whales began to diminish alarmingly in numbers. As a result, the International Whaling Commission was organized at a conference in Washington, D.C., in 1946. Its principal aim was to effect and enforce regulations which would conserve dwindling whale stocks. A top limit of 16,000 blue whale units annually was established, though even this limit may be reduced.

By thus policing itself, by using all available resources of science and technology to increase its efficiency, and by finding new markets through product research, the whaling industry hopes to enjoy continued success. It is a minor paradox that petroleum, the commodity which caused the decline of whaling in the old style, is an indispensable servant of the men who hunt the whale today.

Reproduced by kind permission of
Esso Petroleum Company

US rail Brotherhoods defend Ohio labour rights

US RAILROAD BROTHERHOODS, 'genuinely concerned over the growing evidence of anti-worker sentiment in the Ohio legislature, to the detriment of positive and constructive social legislation for the common welfare', have taken a prominent part in the formation of a United Labor Legislative Committee established by Ohio trade unions. The Committee, representing 1,250,000 organized workers in the State, is composed of officials from railroad, American Federation of Labor, Congress of Industrial Organizations and Mineworkers' Brotherhoods.

The Committee, in an official statement, has said that 'more than 1,250,000 Ohio workers and their families look to this committee to protect their interests in the State capital. Labor will not meekly and quietly sit by while their voices are muffled and silenced by discriminatory legislation. Ohio workers are looking to this committee to assist in the badly-needed humanization of social legislation for the benefit of our economy'.

The whale claw ready to grip the whale. Gigantic steam winches will pull the monster up an open slipway in the stern to the flensing deck for processing

Democracy at work

AN INTERESTING EXAMPLE of democratic procedure at work is provided by a ballot carried out recently on the German Federal Railways. True, the matter on which passengers on the railway were asked to express an opinion had no great political significance. As a matter of fact, it had none at all, but the idea behind the ballot was a good one and its possible extension to other countries and situations might well be recommended. Passengers directly concerned were asked to vote on what for them at least was an important issue: should their early morning train leave earlier or should it remain as scheduled? It was just a question of the railway authorities wanting to satisfy their customers, having learned that a number of 'regulars' found the train got them in to their work too late. The only way in which the time of the train could be put forward to fit in with the railway time-table would be to run it 35 minutes earlier. Asking one's customers to get out of bed 35 minutes earlier is obviously a serious matter, at least the German Federal Railway authorities in Nuremberg thought so, and to resolve their difficulties decided to ask the travelling public what it thought about it. Ballot papers were printed, notices appeared in the local press, and, after what one can only assume to be lively discussion amongst those affected, the ballot was held. Result? 54 were prepared to get up earlier; 266 were not in favour. The train will continue to run at its usual time.

Our photographs show ballot papers being distributed at the barrier and a group of voters before handing in their ballot papers.

Was their journey really necessary?

A 'DELEGATION' OF BREMEN SHIPYARD WORKERS recently undertook the journey from Bremen to Rostock in Soviet-occupied Eastern Germany. The occasion was the all important one of the signing of the first collective agreement covering merchant marine personnel in Eastern Germany, concluded between the 'publicly-owned' Deutsche Seereederei Rostock and the crews of the 'Rostock', the 'Wismar' and the motor-vessel 'Stralsund'. This 'first collective agreement' was obviously a big occasion, and quite an impressive ceremony was arranged to mark it. Without doubt, stirring speeches were made, and a good time had by all. In the general jubilation, the terms of the collective agreement itself, however, may have been overlooked. They are: 'costs to be reduced by DM 500,000' and the shipping company will 'spend over DM 35,200 on labour safety measures'. Not a word about wage rates, hours of work, overtime payments, holidays, health or pensions – all seemingly irrelevant matters in a collective agreement in Communist countries. All the so-called collective agreement contained, apparently, was an undertaking to reduce costs (who will take the rap there, we wonder?) and a promise to spend money on labour safety measures, presumably bringing the standards of crew safety on Soviet-controlled vessels somewhere near those long accepted as the barest minimum in other merchant fleets.

And for all this a 'delegation' of Bremen shipyard workers travelled something like 200 miles. Was their journey really necessary? But then maybe they just went for the ride. And maybe again, on arrival, they learned just who is being taken for a ride – merchant seafarers in Eastern Germany, judging by this example of a collective agreement.

United Nations flag goes to sea

THE BLUE AND WHITE FLAG of the United Nations flew at sea for the first time recently when two deep-sea fishing trawlers sailed from Hong Kong for Pusan, Korea. They were the first of ten modern trawlers which have been built in a Hong Kong shipyard for the United Nations Korea Reconstruction Agency (UNKRA), and were thus entitled to fly the flag of the world organization until handed over to their new owners as part of the Republic of Korea's fishing fleet.

The ten seventy-seven ton trawlers have been built for UNKRA at a total cost of about $500,000 to speed the recovery of the Korean fishing industry. The end of the recent fighting found Korea, formerly one of the six leading fishing countries of the world, almost stripped of boats, gear and fish-packing equipment. Only seven per cent of the boats that did survive were powered craft, the remainder being either sail or hand-operated.

Few were seaworthy enough to venture beyond the little bays and inlets of Korea's coastline.

Nearly 600,000 fishermen and persons directly employed in the fishing industry were practically destitute, and some 250,000 engaged in subsidiary industries were unemployed.

To meet this urgent need, UNKRA launched a programme of aid that helped every branch of the industry. Nets and equipment were bought to enable fishermen to go to sea. Canneries and ice plants were repaired. Small business concerns were subsidized and fish markets rehabilitated. The new trawlers will enable Korean fishermen to extend their operations to rich fishing areas up to 1,000 miles offshore. They have an overall length of seventy-five feet and are equipped with British-built 160 h.p. marine diesel engines, capable of speeds up to nine knots.

Smaller vessels are also being built in shipyards along Korea's coastline, again with the assistance of UNKRA.

(continued from page 104)

landing more evenly over the body, particular consideration being given to escape facilities. 'Finally, the role of an alert management in sponsoring advance analysis in the interests of safety can hardly be overemphasized in air transportation. It is therefore recommended that the safety of the large air transports of the future, rather than the saving of weight alone or short-term revenue gains, should form the basis of decisions.'

Although modern aircraft may meet present operating requirements reasonably satisfactorily, basic research in human factors cannot be neglected. Increasingly complex machines impose greater stresses on the human organism, and it would be desirable, therefore, to have biological scientists available for consultation and research, not only to the project engineers but also to the designers responsible for the development of new transport types. In the final analysis, no matter how much engineering talent has been applied to the development of an air transport plane alone, the aircraft is safe and dependable only to the degree that its control does not exceed the abilities of the people who operate it.

Book reviews

KADERPARTIET: KOMMUNISTISK STRATEGI OG TAKTIKK
by Haakon Lie
Fram Forlag – Oslo, pp. 92; price kr. 2.50

DE KOMMUNISTISKE DEKKORGANISASJONER by Haakon Lie
Fram Forlag – Oslo, pp. 48; price kr. 1.50

THE FIRST OF THESE TWO BOOKLETS written by the Secretary of the Norwegian Labour Party became the centre of a controversy almost as soon as it was published. It was attacked not only by the Communists, against whom it is primarily directed, but also by a section of Norway's Liberal Press, headed by the leading Liberal daily newspaper, *Dagbladet*. The reason for the latter's attacks was Lie's description of the non-Communist *Dagbladet* as 'the most effective mouthpiece today for the Norwegian Communist Party' on the grounds that 'practically all its activities – legal and illegal alike – find support in that paper'. The second booklet in fact contains a separate section enlarging on the reasons which prompted the author to make his original assertion.

The aim of *Kaderpartiet* (The Cadre Party) is an ambitious one for such a small brochure. Haakon Lie has tried, within the compass of less than 100 pages, to provide a guide to Communist strategy and tactics for those workers who are engaged in the day-to-day struggle against Communism.

The title sets the keynote for the whole book. Lie points out that the members of the Communist Party are at the same time its cadres, i.e. the permanent staff of leaders who train the recruits needed to transform the party into a mass movement. To adopt the military analogy used by him, they are the professional soldiers who are kept at the ready in peacetime to serve as a basis for the army in time of war. They are the key men, the vanguard of the Communist revolution, and consequently no pains are spared in their training.

However, Communist cadres cannot be the product of theoretical training alone. They must also must also be tried and tested in the struggle for political power. Their training ground is in fact the political arena.

The Communist Party concentrates its members in other organizations, especially in the trade union movement, where the task set them is to take over the leadership and defeat existing opposition to Communism. The aim of the Party in setting its members such tasks is thus a dual one: to increase the Party's influence in the political sphere – which by Communist definition means virtually every important sphere of human activity – whilst at the same time steeling individual Communists in battle, testing their reliability, and binding them ever more closely to the party.

Basing himself on secret reports of meetings held by an industrial cell of the Norwegian Communist Party during the period 1945-50, Haakon Lie shows, for instance, how the Communist infiltrators work in the trade union movement. The main points which emerge from these reports, which have since fallen into non-Communist hands and been published, provide confirmation of much that was already known or suspected. They show, for instance, that:

1) in all important situations, Communists in the trade unions act upon orders received from the industrial committee of the Norwegian Communist Party.
2) Communist officials in the trade unions only act in their official capacity after having discussed trade union affairs with the Union's Communist cell.
3) Communist trade union officials do not scruple to supply Party cells with union documents, reports of negotiations, etc.
4) Communist cells choose candidates to be supported for election to positions in local branches, cooperating organizations, national unions, and the TUC.
5) they draw up resolutions to be supported in all these bodies. Where congresses of national unions and the TUC are concerned, such resolutions are often worked out by the industrial committee of the Norwegian Communist Party.
6) The Communist cells so organize discussions in advance of actual trade union meetings as to be able to set their stamp upon them from start to finish.

The author also deals at some length with the technique of creating Communist front organizations. He describes how a group of reliable 'non-political' friends of the Communist Party – or secret members of it – form a committee which takes the initial steps towards setting up the organization and drawing up a programme for it which has been approved in advance by the Party. Then

AUSTRIA'S FIRST TRAINING SHIP at its moorings in Linz on the Danube. Built for and maintained by the Danube Steamship Company, it has training facilities for some 26 youths aged 14 to 16. Training for service with the Company's vessels plying on the Danube lasts three years. The winter months are primarily devoted to theoretical subjects, instruction being given in shipbuilding, business management, navigation and the law in relation to inland waterway traffic. Trainees are also given lessons in arithmetic, languages and geography. Practical training includes instruction in splicing, throwing lifelines, handling boats, cleaning ship, swimming (including life saving) and handling ropes. This training ship (the first of its kind since the days of the monarchy) is at present being run as a private establishment, but it is hoped to secure recognition for it as an accredited technical training school. For the present, trainees pay no fees and no charge is made for their board and lodging. These charges, including pocket money, are being borne by the steamship company. *(Photo and text: 'Verkehr' – Vienna)*

attempts are made to interest as many well-known public figures as possible in the organization and to seek their support for its programme before making approaches to the general public.

The next step is to choose – again in advance of the organization's official creation – a General Secretary who, in nearly every case, is a member of the Communist Party. On the other hand, the post of President is generally entrusted to a non-Communist public figure – preferably one who is unable to cope, for one reason or another, with the actual running of the organization. That is left to the General Secretary and the Committee, who know exactly what the Party wants. At this point, with the stage well and truly set, the first public announcements of the organizations' creation can safely be made.

In his second booklet, Haakon Lie enlarges on some of the points made in *Kaderpartiet*. Much of it is concerned with the Communist front organizations already dealt with in more general fashion. Concrete instances are given of how these have consistently followed the Communist line and how in Norway they are linked to the Communist Party through national officials and representatives. In the section concerning *Dagbladet* referred to at the beginning of this review, mention is also made of the recent Norwegian spy trial involving Asbjörn Sunde (an article dealing with this appeared in the April 1954 issue of the ITF Journal) and the Communist-inspired strike at Torp Brug last year, which Haakon Lie describes as the greatest victory won by the Norwegian Communist Party since its temporary electoral success in 1945.

Although both *Kaderpartiet* and its companion volume are intended primarily for a Norwegian audience, much of their contents is of general application. It is therefore a matter for some regret that their circulation will probably be confined to Scandinavia by the barrier of language.

THE BRITISH TRADE UNION MOVEMENT by Herbert Tracey
ICFTU – Brussels, pp. 105*; price* 5s. *or* 70 *cents*

THE SECOND IN THE SERIES OF ICFTU MONOGRAPHS on national trade union movements is devoted to the British trade union scene. Its writing has been entrusted to Brother Herbert Tracey, who was for many years the Publicity Officer of the British Trades Union Congress. That choice alone is a sufficient warranty for the excellence of the product.

Written in simple style but without over-simplification of the subject and with thought for those aspects of British trade unionism which might seem puzzling to the foreign reader if not explained, *The British Trade Union Movement* succeeds very well in measuring up to the aim which the ICFTU has set itself in the publication of this series, namely, that of producing a collection of reliable and concise guides to national trade union movements for an international audience.

Running through Brother Tracey's study is an emphasis on the fact that British trade unions and their methods of organization and activity are not the result of conscious planning, do not fit into any preconceived scheme of ideas, and cannot be covered by standard definitions.

As the author points out in a summing up of British union achievements, the size of their responsibilities and the extent of their influence are a tribute to the success of an empiricism which is native to the people of Britain. That fact explains such seemingly puzzling features as the coexistence of pigmy unions with giants such as the T & GWU; of highly-specialized craft organizations with industrial and general unions; and the infinite variety of administrative and organizational arrangements which exist in British trade unions. It explains too why the traditionally insular British have played, and are still playing, so vital a part in the furtherance of closer relations between the workers of many countries within the international trade union movement.

International Transport Workers' Federation

President: A. DEAKIN
General Secretary: O. BECU
Asst. General Secretary: P. TOFAHRN

7 *industrial sections catering for*

RAILWAYMEN
ROAD TRANSPORT WORKERS
INLAND WATERWAY WORKERS
DOCKERS
SEAFARERS
FISHERMEN
CIVIL AVIATION STAFF

- Founded in London in 1896
- Reconstituted at Amsterdam in 1919
- Headquarters in London since the outbreak of the Second World War
- 160 affiliated organizations in 54 countries
- Total membership: 6,000,000

The aims of the ITF are

to support national and international action in the struggle against economic exploitation and political oppression and to make international working class solidarity effective;

to cooperate in the establishment of a world order based on the association of all peoples in freedom and equality for the promotion of their welfare by the common use of the world's resources;

to seek universal recognition and enforcement of the right of trade union organization;

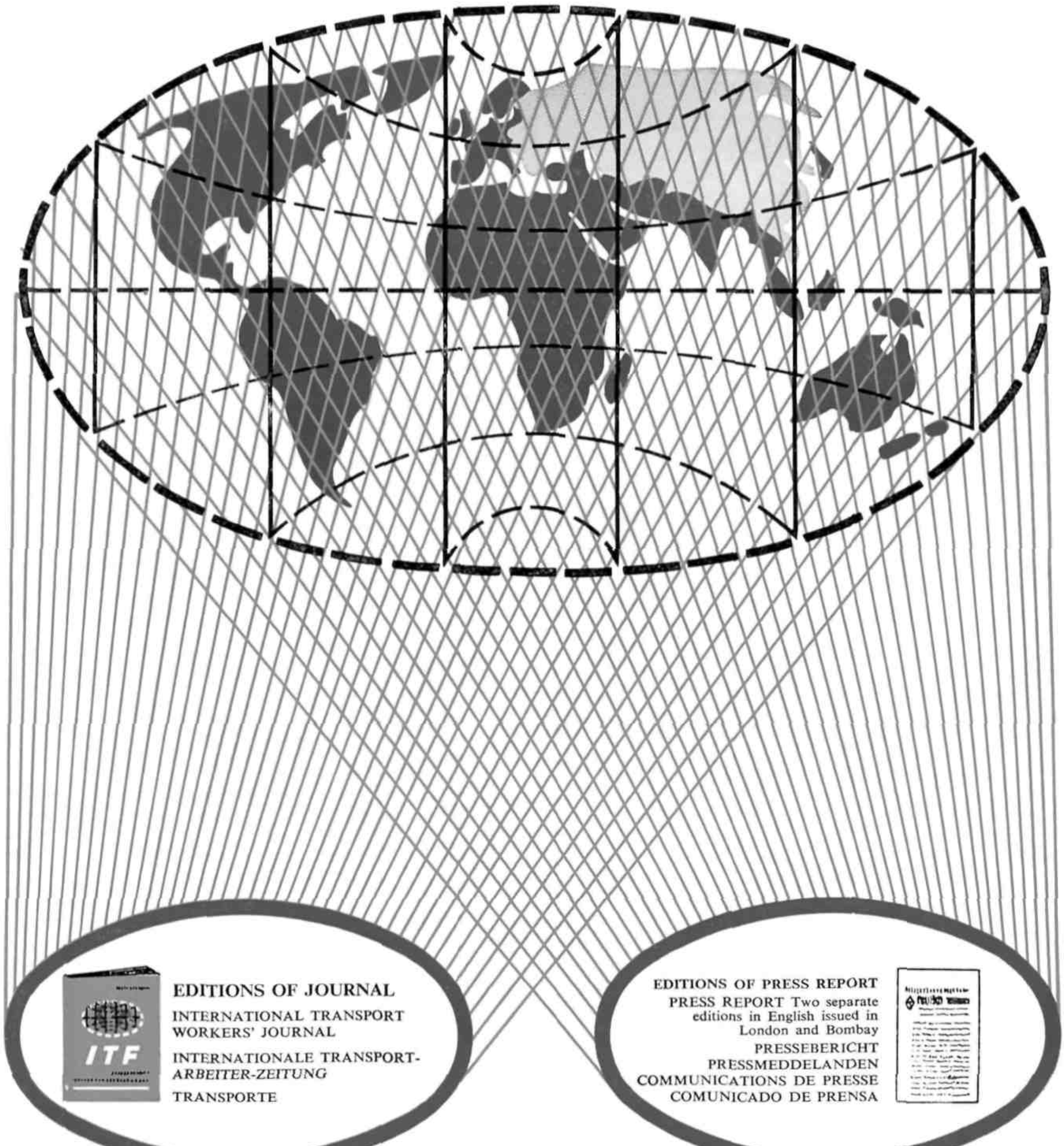
to defend and promote, on the international plane, the economic, social and occupational interests of all transport workers;

to represent the transport workers in international agencies performing functions which affect their social, economic and occupational conditions;

to furnish its affiliated organizations with information about the wages and working conditions of transport workers in different parts of the world, legislation affecting them, the development and activities of their trade unions, and other kindred matters.

Affiliated unions in

Argentina (Illegal) • Australia • Austria
Belgium • British Guiana • Canada
Chile • Columbia • Cuba • Denmark
Ecuador • Egypt • Estonia (Exile) • Finland
France • Germany • Great Britain
Greece • Grenada • Hong Kong • Iceland
India • Israel • Italy • Jamaica
Japan • Kenya • Lebanon • Luxembourg
Mexico • The Netherlands
New Zealand • Nigeria • Norway
Nyasaland • Pakistan • Poland (Exile)
Republic of Ireland • Rhodesia
Saar • St. Lucia • South Africa
Spain (Illegal Underground Movement)
Surinam • Sweden • Switzerland
Syria • Trieste • Trinidad • Tunisia • Uruguay
United States of America



Printed in the Netherlands by Coster, Amsterdam