known as 'blue stain'. Some timbers, and perhaps specially the softer types of broadleaved trees, when freshly cut from the green log, grow a fungus within a few days which gives a blue colour to the timber. The stain, as a matter of fact, has no effect on the soundness or durability of the wood, but it has not proved possible to convince the purchaser of this, and thus the price is either seriously affected or the wood becomes unsalable, and this within a very short time. Research has resulted in a cheap bath or spray becoming available with which the wood is treated before the fungus appears. In Rhodesia the spray known as 'dowicide P.', composed of a mixture of sodium tetrachlorophenoxide and sodium di-chloro-ortho-phenyl-phenoxide, is used. Since some of the tropical forest areas within the British Empire contain considerable amounts of soft-wooded hardwoods, which, if they can be marketed, would save the imports of coniferous timber at considerable cost which was so common up to 1939, the discovery of this treatment should be of assistance to various forestry departments. The author gives in his paper details of the methods of applying preservatives.

The question of imports of timbers, mostly coniferous soft woods, into Colonies which possess a certain or considerable area of forests, is considered by Mr. Finlay in a second paper published in the same journal (*Proc. Rhodesia Sci. Assoc.*, **39**, 88 ; 1942) under the title "Post-War Employment and the Timber Industry". In so far as timber products are concerned, any new industry would have an indirect subsidy for a number of years through lack of shipping space and the enormous demand on the forests of the world which the vast repairs to damaged cities and houses on the countrysides will entail. Rhodesia from its geographical position will have to be self-dependent, he considers, at any rate in soft woods. He considers this should be feasible though he makes an interesting remark on the subject of these timber imports ; the first of these are "Oak and Teak, woods of such universal popularity that there is little or no hope of their ever being eliminated from the list of imports". Yet there are those in Britain who consider the valuable hardwoods no longer worth growing.

GAMMA-RADIOGRAPHY

A PAPER on gamma-radiography was read by Mr. C. Croxson at a meeting of the Industrial Radiology Group of the Institute of Physics, held at Loughborough College, Loughborough, on February 27. Mr. Croxson explained that gamma-radiography is complementary to radiography by X-rays, the chief advantages of radiography by a gamma-ray source being due to the high penetration of gamma-rays and to the fact that a source of gamma-rays is relatively small and can therefore be used in locations quite inaccessible to an X-ray equipment. In the past, sources of up to about 250 mgm. of radium element have been used, but recent work has shown that radon (radium emanation) sources are superior for some work since, for the same source size, radon has an initial intensity sixty or seventy times greater than that of radium : with the smaller source sizes thus obtainable, source-film distances of as low as three inches become practical without serious loss in definition. The main disadvantage lies in the short half-life period of radon of about 3·85 days compared with 1,590 years for radium, but since the decay-rate is known, exposures can be readily calculated from exposure curves worked out for radium sources of known intensity. As a war-time measure, the radium is transported in a steel container, three inches thick. For use, the gamma-ray source is transferred to an exposure bomb which has an aperture for the emerging beam, the container being carefully designed to avoid scattered radiation marring any radiograph made.

In making a radiograph, the gamma-ray source is carefully positioned on one side of the specimen and the photographic film is placed on the side of the specimen remote from the source, the object-film distance being kept as small as possible to reduce geometric unsharpness and image distortion. Ordinary X-ray films are used for the work. Where maximum speed is essential despite unsharpness, calcium tungstate intensifying screens should be used with the so-called screen-type X-ray films. Somewhat lower speed but better definition is obtained by exposing the film between lead intensifying screens : in these circumstances the direct or 'non-screen' X-ray films give maximum contrast, but 'screen-type' films may be used at the expense of some slight loss in contrast. Compensation for the lower speed may be achieved by exposing two films simultaneously in a lead-screen/film/lead-screen/film/lead-screen pack : alternatively, the same technique may be used to obtain two copies of the radiograph at one exposure. Over-development, up to ten minutes, is regularly made use of to give increased film density or reduced exposure time. Curves were shown illustrating how the speed of tungstate screens varies with the thickness of the coating for X-rays generated at various kilo-voltages and for gamma-rays. Other curves showed how the speed factor of tungstate screens decreases as the thickness of metal increases—a most unfortunate property. Further increase in speed may be attained by special techniques such as hypersensitization before exposure or chemical intensification of the developed image. Owing to the reciprocity failure of the photographic materials, the exposures when using tungstate screens cannot always be calculated accurately by the inverse square law, and curves were shown from which the appropriate factors could be deduced.

For routine work, the ideal exposure time is about fifteen minutes : these short exposure times are attained by reducing the source-film distances, but a limit is imposed by the degree of definition necessary.

The short wave-length of gamma-rays, which incidentally correspond in penetration to X-rays generated at 200–2,000 kV., renders them highly suitable for the radiography of heavy metals, and Mr. Croxson reported that they have been used effectively in the radiography of tungsten steels, tungsten carbide, stellite and lead alloys in addition to their well-known application in the inspection of ferrous, copper and brass specimens. The low radiographic contrast obtained in gamma-radiographs makes the technique ideal for the inspection of specimens having wide ranges of thickness. Moreover, the effect of scattered radiation is not so serious as when X-rays are used : the chief precaution necessary is to back the cassette with lead about 1 mm. thick to avoid back-scattered radiation reaching the film.

For these reasons, gamma-radiography is very suitable for the detection of hot tears, shrinkage defects, blowholes, sand inclusions and cracks in heavy and often complex castings. Several slides were shown illustrating the characteristic appearances of these defects as revealed in the gamma-radiographs. The method is of particular value in the critical examination of pilot castings in indicating the soundness of the foundry technique. Since such heavy castings are usually costly, the defective regions are often cut out and afterwards welded. Further radiographic examination will reveal the soundness of the repaired section. Welded repairs of this kind may show cracks in the weld or parent metal at the edge of the weld, and Mr. Croxson pointed out that, since these cracks are tortuous and not necessarily in the same plane as the incident gamma-ray beam, great care must be taken in interpreting the radiograph. If any suspicious shadow is seen, another radiograph should be taken in one or more other directions to ensure that the presence of a crack is either confirmed or refuted. Similarly, gamma-radiography may be used for the examination of all types of welds, and the method has advantages over radiography by X-rays when cylindrical objects are being examined: apart from the fact that the radiographic inspection of welds reveals defects, the knowledge that the method will be applied has the moral effect of making welders even more careful in their work.

In concluding, Mr. Croxson said that his experience of gamma-radiography justifies high confidence in the rapid extension of this specialized inspection technique.

STALIN PRIZES FOR SCIENCE, INVENTIONS AND INDUSTRIAL TECHNOLOGY

THE following have been awarded Stalin Prizes (first class) for outstanding achievements and inventions and for improvements of the technology of industrial production in 1942. First Class prizes carry an award of 200,000 roubles each (150,000 roubles in the "outstanding inventions" section):

Physics and Mathematics: P. A. Alexandrov, for studies in mathematics; P. Kapitza, for research on helium.

Technical Sciences: L. S. Leibenzon, for studies on the theory of elasticity and oil mechanics; M. A. Pavlov, for research in the technology of iron smelting.

Chemical Sciences: A. N. Nesmeyanov, for researches on metallo-organic compounds.

Geology and Geography: F. N. Krassovsky, professor of the Moscow Institute of Engineering, Geology and Cartography; P. I. Stepanov, for geological researches on the Donets Basin, summed up in his work "Geology of the U.S.S.R.".

Biology: P. M. Zhukhovsky, for his work "Botany" and for his discovery of new varieties of wheat and rye and the development from them of hybrid varieties of great economic value; V. A. Engelgardt and M. N. Lubimova, for researches on muscles.

Agriculture: T. L. Lysenko, V. P. Mosolov and a group of scientific workers, for development and introduction of a method of using tops of potato tubers for cultivation.

Medical Sciences: V. N. Shevkunenkoz, lieut.-general of the Medical Service, professor of the Military Medical Academy of the Red Army; A. N. Maxinenkov and A. S. Vishnevsky, professors of the same Academy, for the scientific work "Atlas of the Nervous and Venous System".

Philosophy: G. Alexandrov and B. E. Bykhovsky, M. B. Mitin, P. F. Yugin, O. Trakhtenberg and V. Asmus, for the work "History of Philosophy", in three volumes.

For many years' outstanding work in Science and Technique: M. J. Averback, First Medical Institute; A. A. Baikov, Leningrad Polytechnical Institute; B. E. Vedeneyev, Assistant Commissar for Electric Power Stations; V. I. Vernadsky; S. N. Dzhanashya, member of the Georgian Academy of Sciences; B. D. Grekov, the University of Leningrad; I. I. Meshchaninov, director of the Speech and Thought Institute, Leningrad; V. F. Mitkevich, Leningrad Polytechnical Institute; S. S. Nametkin, director of the Institute of Combustible Minerals; A. E. Forai Koshits, "Lensoviet" Leningrad Chemico-Technological Institute; N. P. Chizhevsky, K. I. Shenfer.

For outstanding Inventions and Improvements of Production Methods: N. Blokhin, chief engineer of the Central Board for Special Steels; A. Sheremetyev, director of the Board, and a group of engineers of various works and scientific institutes, for the elaboration and introduction into industry of a new technological process of steel smelting for war industry. V. Grabin, lieut.-general of Engineering Troops; Ivanov, lieut.-general of the Artillery Engineering Service, and the assistants of the chief constructor of the Central Artillery Designing Bureau; P. Nazarov and D. Sheffer and others, for designing new types of ordnance. A. Derkach, engineer of Works No. 695, and a group of engineers of Scientific Research Institute No. 20, for designing new types of radio equipment. Z. Yermolyeva, director of the Department of Biochemical Bacteriology, All-Union Institute of Experimental Medicine, and L. Jakobson, director of a laboratory of the Institute, for the development of a new method of early diagnosis and phagocytic-prophylaxis of contagious diseases. S. Ilyushin, aircraft designer, for modifications and improvements in design of warplanes. Y. Kozhevnik, head of the central board for production of steel tubing; J. Ossadchy, director of Works No. 703, and a group of engineers for improvement of the technology of production of mortar barrels and ammunition parts. V. Kotelnikov, head of a group of engineers of the Central Research Institute of Communications, for designing new communications equipment. J. Kotin, chief constructor of the Kirov Works; S. Makhonin, chief engineer, L. Troyanov, assistant chief constructor, F. Petrov, chief constructor of Works No. 9; S. Gurenko, chief constructor of Work Nos. 172, for designing a new type of artillery; N. Kuznetsov, major-general of the Artillery Engineering Service: A. Semenov, lieut.-colonel engineer, and a group of military engineers, for designing new types of arms. S. Lavochkin, aircraft designer, for modification and improvement of warplanes; H. Lurye, chief engineer of Ballbearing Works Nos. 4, 3 and 1, for organization of mass production of special bearings; B. Malinin, senior scientist of Central Research Institute No. 45, and a group of the staff of Central Designing Bureau No. 18, for designing a new type of warship; I. Maslennikov, director of the Experimental Research Institute for Metal-Cutting Machine Tools, and a group of the staff of the Bureau for Machine Tool Aggregates of the same Institute, for designing new highly efficient machine tools for war industry; N. Polikarpov, aircraft designer, for designing a new model of warplane. N. Rubtsov, Moscow "Baumann" Machine Building Institute, and a group of engineers and staff members, for improvement in the technology