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at the

Festival of Britain

THE

BRITISH THOMSON-HOUSTON

COMPANY LIMITED · RUGBY · ENGLAND

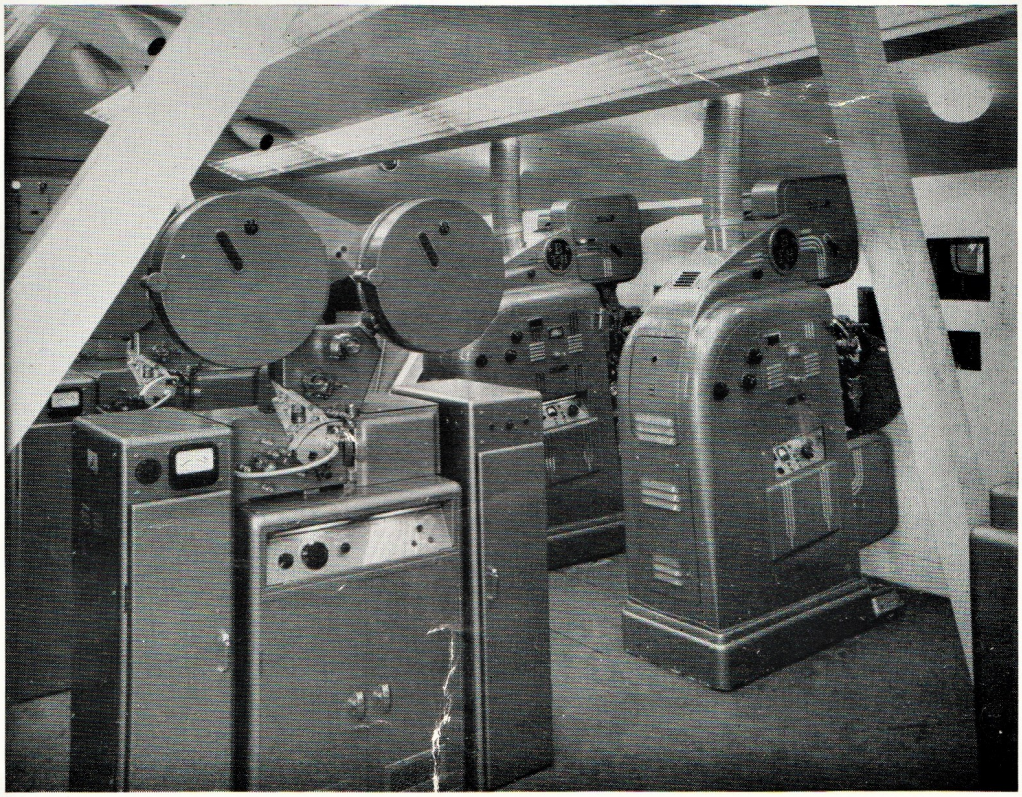
Festival of Britain

CONTRIBUTIONS by The British Thomson-Houston Company to the Festival of Britain range from the largest oil circuit-breaker ever made in this country to fractional horsepower motors and a motor cycle magneto. Mazda lamps and lighting equipment are much in evidence throughout the Festival. At Kelvin Hall, Glasgow, Mazda flameproof lighting equipment is being demonstrated in the Coal Mining Section and the floodlighting of Windsor Castle was planned and executed in its entirety by BTH as another of its contributions.

In addition, there are BTH entries selected by independent authority as representative of advanced design in British engineering which are included in in the Festival of Britain " Design Review."

A number of the BTH exhibits at the South Bank Exhibition, including the equipment in the Telecinema ; the 275-kV circuit-breaker ; the BTH-Whittle jet engine, and BTH multiple-unit train control, are described and illustrated on the following pages. Reference is also made to the Company's contributions to the Land Travelling Exhibition and the Exhibition of Industrial Power at Glasgow.

SOUTH BANK EXHIBITION
LONDON



The projection room at the Telecinema equipped for the projection of stereoscopic pictures and stereophonic sound. Another feature of the Telecinema is a projected picture surround.

Telecinema.

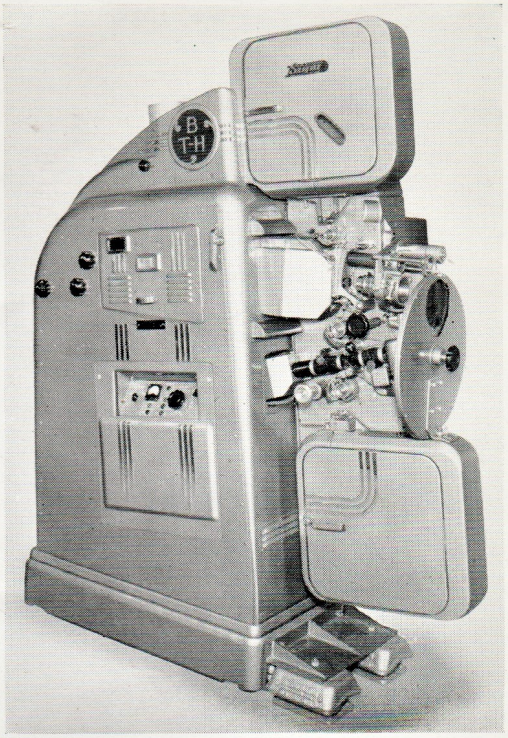
The Telecinema has been planned to demonstrate to the public the most up-to-date techniques in the motion picture and television fields and the equipment installed there may be regarded as representing some of the most advanced equipment available anywhere in the world today. From all contemporary British cinema projection equipment, standard S/U/P/A projectors were chosen for the Telecinema to demonstrate to the world the latest ideas on the projection of stereoscopic pictures and stereophonic sound. Another feature of the Telecinema equipment is a projected illuminated-surround whereby the picture on the screen is surrounded—not by the usual black frame—but by a lighter border, which changes in intensity and colour according to the relative intensity and colour of the picture being projected.

S/U/P/A equipment is of such advanced design that the special apparatus required for this new form of motion picture presentation can be incorporated in standard machines without any major alterations to existing equipment.

Present techniques have not yet reached the stage where it is possible to present a stereoscopic picture to a large audience without making some compromise between the ideal and what is possible ; this compromise involves the wearing of some form of spectacles by the audience. Two methods of stereoscopic viewing are possible by means of spectacles, the first using two-colour spectacles, and the second, perpendicularly polarized spectacles. As two-colour spectacles preclude the use of colour films, the polarized-light system has been adopted for the Telecinema.

Two images maintained in horizontal and vertical register are projected on to the screen by running two separate film projectors in synchronism with one another, the light beam from each being polarized in a suitable manner by filters carried on the projectors. The resulting images on the screen, when viewed through polarizing spectacles, give a remarkably effective three dimensional picture. Accurate synchronization of the two projectors running side-by-side is accomplished by selsyn motors.

The stereophonic sound reproduction differs from conventional cinema practice in that no sound is recorded on the films running through the picture projectors, but is, instead, recorded on a film coated with magnetic material for running through a separate sound reproducer head. A requirement of stereophonic sound is that there should be two or more completely separate sound tracks, and in this equipment, three-channel stereophonic magnetic recording is employed. A fourth sound channel is employed solely for sound-effects reproduced from speakers mounted in the main and balcony ceilings and at the back of the auditorium. The sound from the three stereophonic tracks is reproduced from behind the screen where three speaker systems for this reproduction each consist of a standard S/U/P/A combination. Each of the three stereophonic sound channels feeds one speaker combination and the sound from the screen accompanies its apparent source on the screen. The screen speakers are used not only for stereophonic sound but also for monaural sound in conjunction with normal films, television sound and interval music.



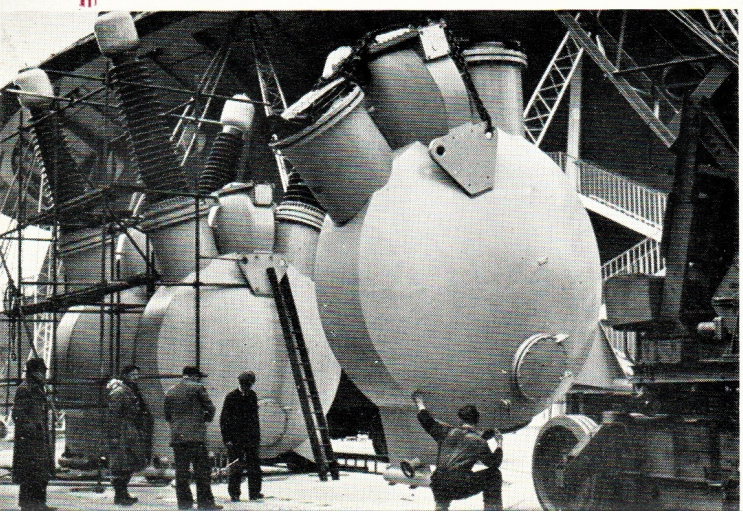
One of the two S/U/P/A projectors for the Telecinema fitted with apparatus for projection of stereoscopic pictures and BTH projected picture surround.

In the development of the magnetic recording/reproducing system, BTH worked in close collaboration with E.M.I., who provided the magnetic film, reproducer pick-up heads and preamplifiers for the scheme. To run the standard S/U/P/A projectors with separate magnetic sound reproducers, selsyn motors are again employed to maintain synchronism.

Another feature of the presentation of all the films at the Telecinema is a projected picture surround—a development for which BTH is solely responsible. It is a result of pre-war investigations by the Company into the possibility of providing an alternative to the black screen mask which, it is felt, detracts from the appearance of the picture, but which is still the standard practice of the cinema industry. For optimum presentation of picture detail and colour, the picture should be presented against a neutral background such that the highlights on the screen are always brighter than the surroundings, and the dark portions of the picture always darker than the surroundings.

In the BTH projectors at the Telecinema this is achieved, fairly simply, by making use of the light normally wasted during the pull-down period when the shutter is closed. A standard shutter, having a reflecting rear surface is employed to reflect the normally-wasted light on to a mirror and then through a special optical system on to the screen.

The scheme is completely independent of any manual control and results in a perfect background for film projection in cinemas.



BTH 275-kV three-phase "Shuntarc" oil-break circuit-breaker during course of erection at the South Bank Exhibition site.

275-kV "Shuntarc" Circuit-breaker.

An exterior exhibit for the Dome Podium at the South Bank Exhibition is a BTH "Shuntarc" oil-break circuit-breaker—the largest switchgear equipment of its type ever made in Great Britain, and as such, represents an important step forward in the design of equipment for transmission of electric power at high voltages.

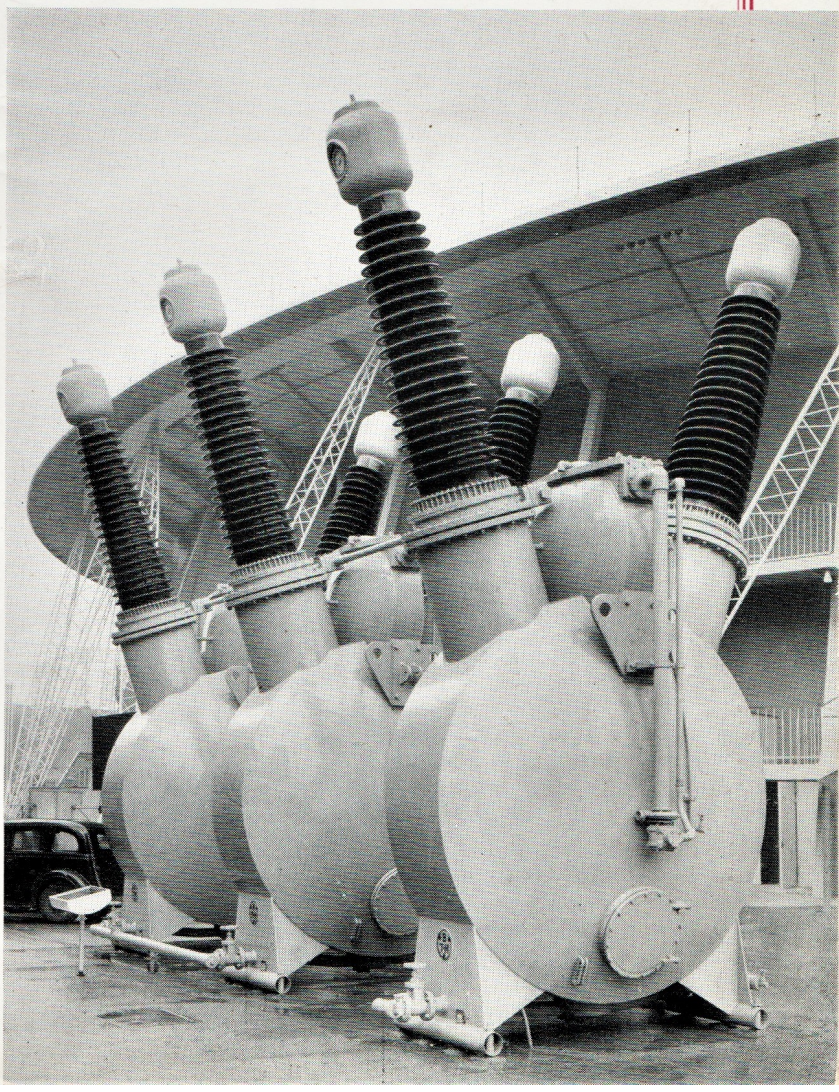
The steady expansion of electric power distribution systems in this country and in other parts of the world has led to the necessity for transmitting increasing amounts of power at higher and higher voltages ; whereas at the beginning of the century the highest transmission voltage in use was 10,000, voltages of 132,000 are quite common today and, very shortly, part of the extensive National Grid network in this country will be operating at 275,000 volts.

The problem of switching power at such high voltages has occupied the attention of engineers for many years and as a result of extensive testing and research, the development of successful switching equipment has not only kept pace with the projected increase in transmission voltages, but has gone ahead of it.

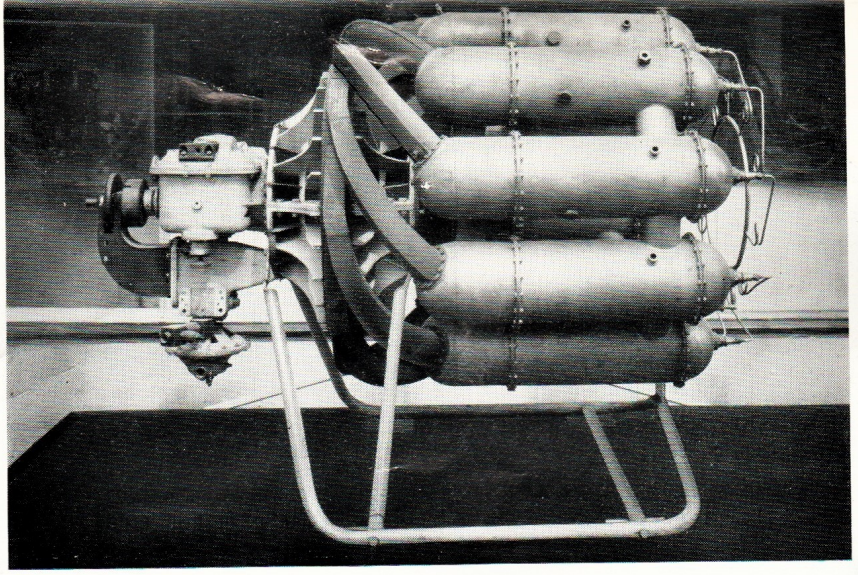
Engineering foresight and productive technique is clearly illustrated in the BTH 275/300-kV "Shuntarc" oil circuit-breaker. This massive switch, each pole of which stands 24 feet high, weighs over 60 tons when filled with oil. At 300,000 volts it is capable of interrupting, if need be, power equal to nearly ten times the full output of our largest generating station, or approximately half the total generating capacity of Great Britain. Such is the speed of operation and efficiency of the contacts and arc control devices, that this tremendous power could be cut off in six-hundredths of a second—less time than it takes to blink !

The complete circuit-breaker, which is operated by compressed air, consists of three identical single-pole units which are coupled together by operating rods and links to form a three-pole equipment. An entirely new shape of tank has been adopted, this design achieving a reduction in the oil volume of some 30% over the conventional cylindrical tanks used hitherto. To achieve such a rapid operation with such large and bulky apparatus all linkages in the internal mechanism have been made as simple as possible, ball-bearings and stainless steel pins being used freely throughout. Full use has also been made of high-tensile steel, special laminated wood, and light alloys to reduce weight yet maintain high mechanical strength.

The six terminal bushings of the circuit-breaker are oil-filled and each weighs approximately 3 tons. The head of the bushing contains an expansion chamber for the oil and a magnetic-type oil-level gauge.



The completed 275-kV "Shuntarc" oil-break circuit-breaker at the South Bank Exhibition.



BTH-Whittle jet engine shown in the Transport Pavilion.

BTH-Whittle Jet Propulsion Engine.

Although the development of the gas turbine to the stage of commercial application is an achievement of recent years, British Thomson-Houston began work in this field in 1933.

The 10,000-kW steam turbo-alternator set built by BTH in 1929 for the Detroit Edison Company of the U.S.A., was an important advance on previous steam turbine practice. The success achieved led to the realization that the further advance of 100-200°F (55°-110°C) necessary to make the gas turbine an attractive proposition was then within sight.

During 1933 BTH made a comprehensive study of the possibilities of the gas turbine as an alternative to established types of prime movers, and the preliminary design for a 5000-kW gas turbo-alternator was prepared. However, it was considered that the time had not yet come to develop the gas turbine, so the project was delayed.

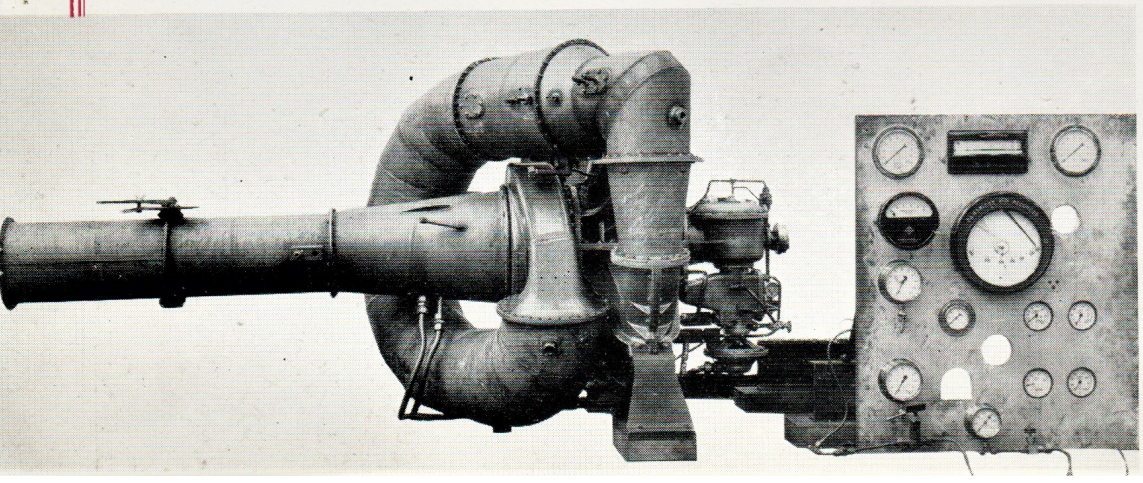
In 1936 BTH was approached by Flight-Lieut., now Air Commodore Sir Frank Whittle, K.C.B. with regard to the development of his ideas for a jet-propulsion engine for aircraft. With the experience of extra-high-temperature steam and the knowledge of gas turbine possibilities, it was considered that an engine of the type suggested by Whittle had a very good chance of successful development. The Company accordingly co-operated with him in the design and manufacture of a jet engine.

The first experimental jet engine—the "WU" engine—was completed in April, 1937. After undergoing tests until August of that year, it was modified and again severely tested.

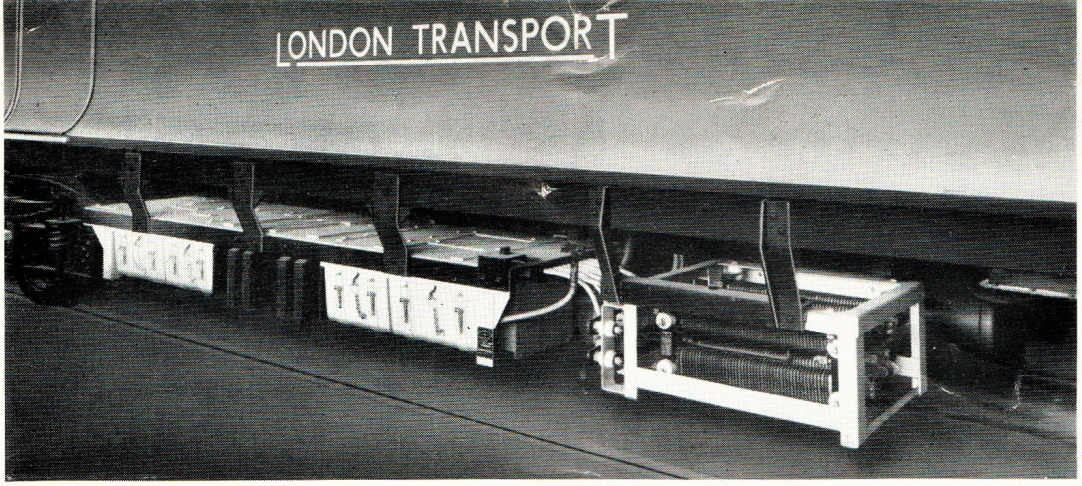
Further modifications were then made, and this, the third version of the "WU" engine, was subjected to rigorous testing from October 1938 until February 1941. This actual unit, illustrated at the top of this page, is a prominent exhibit in the Transport Pavilion at the South Bank Exhibition.

The tests on the "WU" series of engines had proved so satisfactory that in 1939 an order was placed with BTH by Power Jets, Ltd. for an engine for flight purposes. This new engine, designated "WI," was fitted into an aircraft built by the Gloster Aircraft Company and made the first successful jet propulsion flight in the world in May, 1941.

The "WI" engine is now in the Science Museum, South Kensington, while the sister engine, which had also flown, was presented to the Smithsonian Institution, Washington, U.S.A.



The first experimental jet engine—the "WU" engine—completed and tested in 1937.



BTH traction control equipment on one of the new coaches for London Transport Executive.

BTH Multiple-unit Electric Train Control.

Occupying a prominent position in the Transport Pavilion is a prototype railway coach, of which ninety are on order for London Transport Executive. The coach is fitted with BTH Type PCM control equipment, generally similar to the 1080 sets already in service on London Transport trains.

Aluminium has been used wherever possible in the construction of the coach, and the builders, Messrs Metropolitan-Cammell, have achieved a reduction of 6½ tons in the tare weight to which BTH has contributed by constructing the frames and covers for the control equipment in aluminium. Additionally, a reduction in weight has been obtained by the use of BTH edgewise-wound strip resistances, Type RP—replacing the cast-iron grid-type previously employed.

These lightweight Type PCM control equipments used on the aluminium coaches are being fitted to other L.T.E. stock—the number of these equipments on order at the present time being 203.

Mazda Lamps and Lighting Equipment.

Mazda lamps and lighting equipment are used extensively in many of the activities connected with the Festival of Britain—not only at the South Bank Exhibition, but in numerous towns and cities throughout the country where local celebrations are being held during the Festival months. Quite apart from all the equipment supplied for lighting purposes, Mazda flameproof lighting equipment has been selected for demonstration at the Exhibition of Industrial Power at Kelvin Hall, Glasgow.

At South Bank, the floodlighting of the South-east section covering an area of approximately one-quarter of the total site, is entirely by BTH, and other lighting equipment has been provided by the Company for special lighting effects in the area.

The "Skylon," although not within the BTH area, is lit from inside by more than 400 Mazda lamps of various wattages in an arrangement executed by the main contractors for the vertical feature—British Insulated Callender's Construction Co., Ltd.

Among the numerous installations of Festival lighting in other parts of the country, one of particular interest is that at Windsor Castle. Selected parts of this historic building are illuminated by Mazda floodlights in a scheme undertaken by BTH as a contribution to the year's festivities.

Mazda floodlighting at Windsor Castle—view of North Terrace and Round Tower.

LAND TRAVELLING EXHIBITION

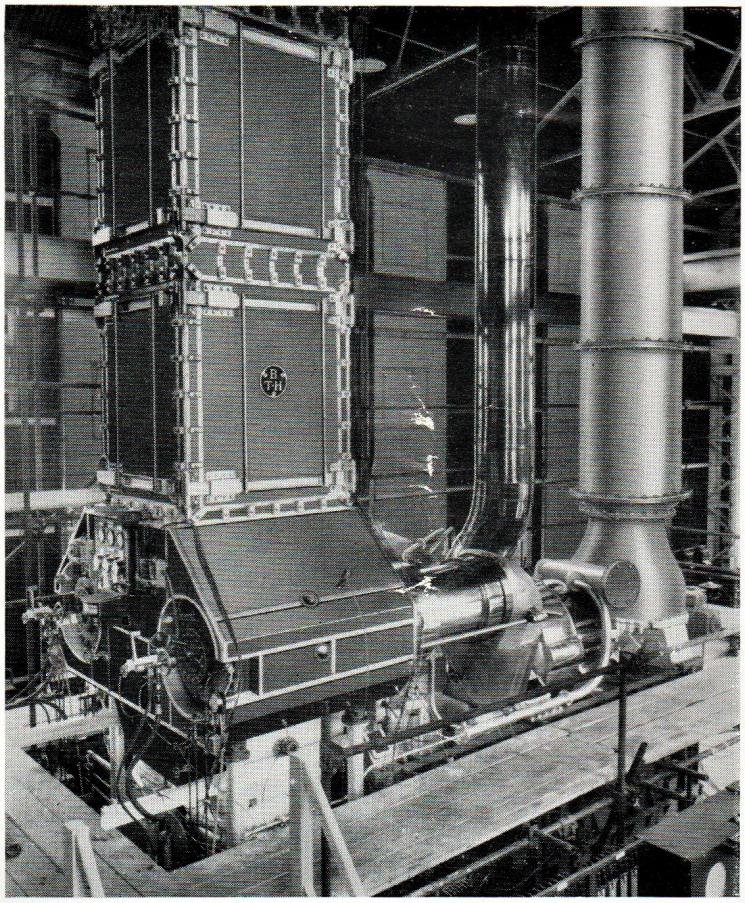
at

MANCHESTER : May 4—May 26 **BIRMINGHAM :** Aug. 4—Aug. 25
LEEDS : June 23—July 4 **NOTTINGHAM :** Sept. 15—Oct. 6

BTH Gas Turbo-alternator Set.

Of particular interest to turbine and marine engineers visiting the Land Travelling Exhibition, is a model of the BTH 1200-s.h.p. gas turbine-alternator set which has been built for the purposes of obtaining operating experience with a main propulsion gas turbine set under service conditions at sea.

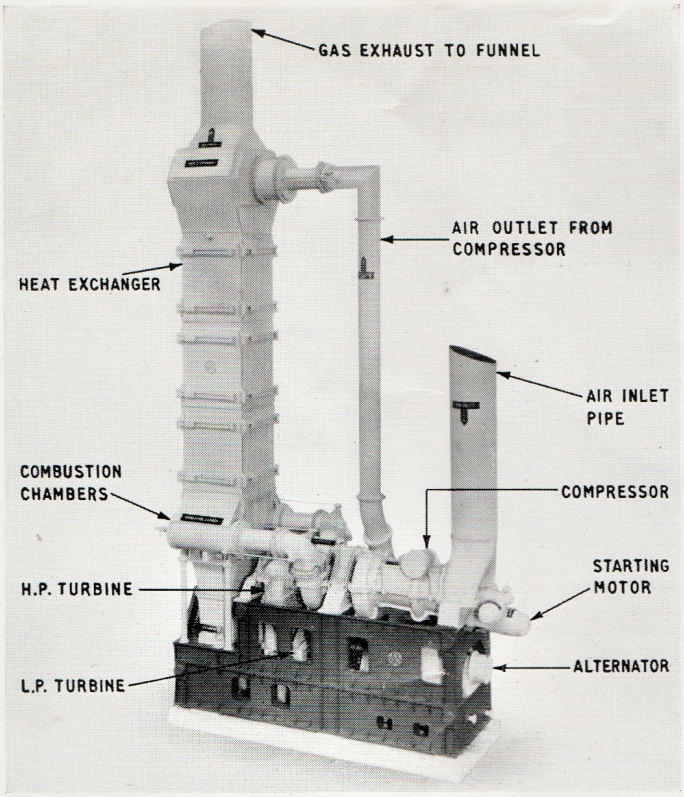
D.E.S. *Auris* was built specially by The Anglo-Saxon Petroleum Company for the purpose of



BTH gas turbo-alternator set for Anglo-Saxon Petroleum Company's tanker D.E.S. "Auris," on test in Rugby Works.

installing an experimental gas turbine set. Her present machinery comprises four diesel engine-driven 880-kVA alternators which supply current for a BTH main motor driving the propeller. One of the diesel sets will be removed, and replaced by the gas turbine unit. The space available is sufficient for the installation of a gas turbine set of adequate size for the purpose, the ship having been specially built with this in view. This space, particularly the narrow width, however, had a considerable influence on the general arrangement of the set, and led to the adoption of vertical compounding, and also restricted the heat recovery in the heat exchanger.

Testing of the gas-turbine set was started 26th June, 1950. From that date until 22nd December, the gas-turbine set was operated on gas-oil for a total time of 124 hours, of which 46 hours were at



light load ($\frac{1}{4}$ load or less) and 78 hours at higher loads. The various runs with the gas-turbine set during this period were carried out in order to obtain preliminary performance figures for the set, and establish good combustion at all loads. In addition, investigations were carried out regarding casing distortions, and adjustments made to running clearances in both H.P. and L.P. turbines. An analysis of the noise from the set was also made.

After the performance and endurance testing, satisfactorily carried out during the early part of this year (1951), the gas turbine alternator set was despatched for installation in the *Auris*.

Model of 1200-s.h.p. gas turbo-alternator.

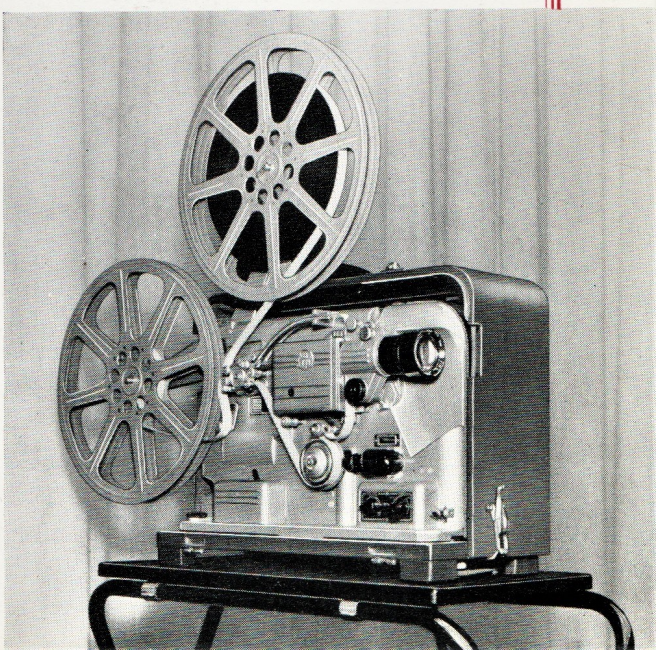
16 mm. Sound-film Projector.

Since 1931, when BTH produced the first 16 mm. projector in the world, the Company has continually devoted a considerable effort towards the improvement and perfection of 16 mm. projection equipment. Today, with twenty years experience in this field, BTH 16 mm. sound-film projectors are the finest of their class.

Three models are available—Type 301, Type 301M and Type 301S, the two latter equipments being modified designs of the basic machine, Type 301. The 301S is designed particularly for use in schools and the 301M projector is fitted with the recently developed mercury arc lamp, making it admirably suited for professional exhibitors and static installations.

The Type 301 exhibited in the Land Travelling Exhibition is already well known for its proved reliability, brilliant screen illumination and faultless sound reproduction. Its excellent all round performance is combined with a remarkable degree of simplicity and portability. A 750-watt projector lamp is used with a high efficiency optical system, and exceptional picture steadiness and complete freedom from flicker have been achieved in the design of the intermittent mechanism.

Ease of film threading is a special feature of the equipment, the wide opening picture-gate allowing easy access for film-threading ; there is only one sprocket to negotiate, and this is a feature that is unique among sound-film projectors. The complete equipment is housed in two cases, one containing the projector, and the other (which forms an effective baffle for the speaker when the equipment is in use), the 12-inch permanent magnet speaker, the mains transformer and 50 ft. of speaker cable.



Type 301 16 mm. projector.

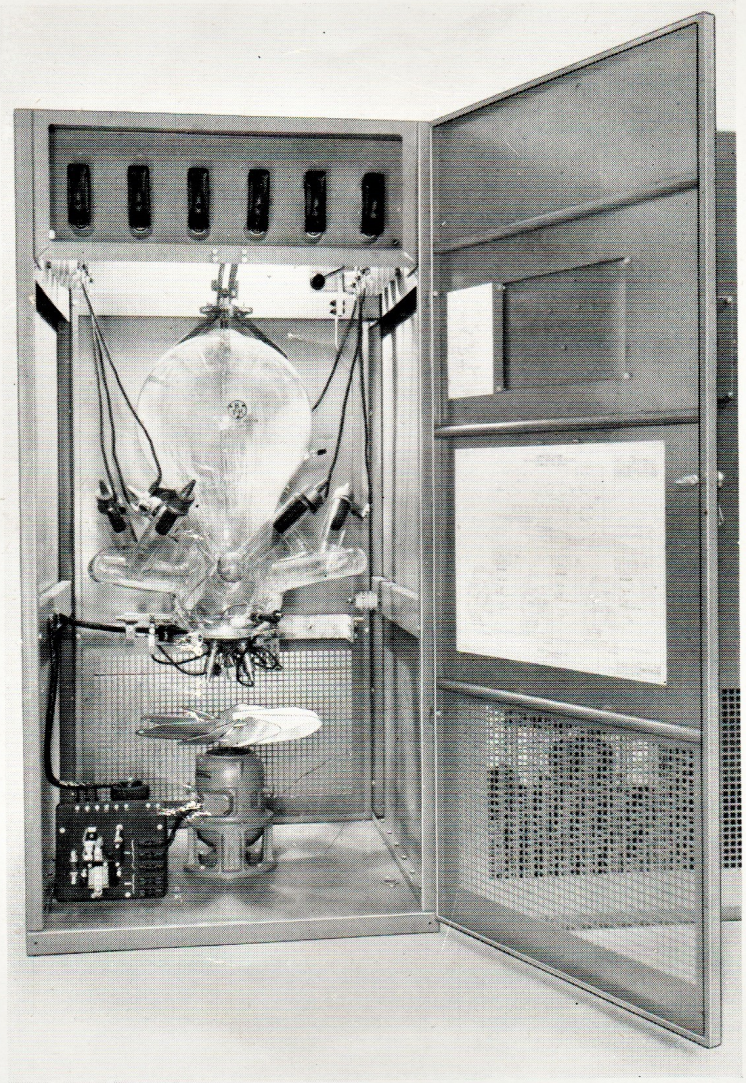
EXHIBITION OF INDUSTRIAL POWER
Kelvin Hall, Glasgow

Mercury-arc Rectifier.

A BTH mercury-arc rectifier rated 350 amperes, 600 volts, is shown at this exhibition as a "working" demonstration.

BTH manufactured the first steel tank rectifier to be made in this country and today, BTH mercury-arc rectifiers of both the glass bulb and pumpless steel-tank types are installed in many rectifier substations all over the world.

BTH rectifiers are made in a wide range of sizes but where the required output exceeds the capacity of a single rectifier, this can be obtained by operating a number of rectifiers in parallel from one transformer. Units up to 4500-kW capacity have been manufactured by BTH, and even larger equipments are in hand.



BTH mercury-arc rectifier rated 350 amperes, 600 volts, exhibited at the Exhibition of Industrial Power at Glasgow.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