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Test of Model XTAQ-5 Radio Transmitting Equipment
Contractor: General Electric Company

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DATE 14 August 1939

SUBJECT FR-1553

Test of Model XTAQ-5 Radio Transmitting Equipment

Contractor: General Electric Company

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NAVY DEPARTMENT
BUREAU OF ENGINEERING

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on

Test of Model XTAQ-5 Radio Transmitting Equipment.
Contractor: General Electric Company

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AUTHORIZATION OF TEST

1. The tests herein reported were authorized by reference (a). Other pertinent data are listed as references (b) to (f).

Reference: (a) BuEng.ltr. C-NOs-62958(6-22-R6) of 26 June 1939.
(b) BuEng.Specifications RE 13A 351J.
(c) Contract NOs-62958 of July 20, 1938.
(d) Contractor's Descriptive Specification RA-1480, July 1938.
(e) Contractor's Test Report RA-7318, May 1939.
(f) Contractor's Instruction Book GEI-11716 for Model XTAQ-5 Transmitting Equipment.

OBJECT OF TESTS

2. The object of the tests was:

(a) To determine the extent to which the equipment complies with contractual requirements and basic specifications.

(b) To determine the degree of compliance with reference (d).

(c) To obtain data to permit submission of recommendations regarding any changes necessary to make the equipment more suitable for Naval use.

(d) To obtain performance data and recommendations for use in revision of basic specifications required in the purchase of additional equipments.

ABSTRACT OF TESTS

3. The tests herein reported were conducted to determine the degree of compliance of the Model XTAQ-5 Transmitting Equipment with the mechanical and electrical requirements set forth in the governing contract.

4. Specifically, tests were conducted to determine the following:

(a) Ability of the equipment to withstand shipment and movement from one location to another.

(b) Check of mechanical and physical construction and assembly, general workmanship, materials employed, corrosion resisting measures used and the adequacy of electrical circuits to withstand operation under Naval Service conditions.

(c) Power output, power input, overall efficiency and flexibility of antenna coupling circuits.

(d) Quality of emitted signals, lilt, undesirable modulation.

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(e) Check of dimensions and weights of the various component units.

(f) Determination of frequency overlap, limiting frequencies of various circuits and cycles per division of the master oscillator controls.

(g) Check of the protective circuits employed in the equipment.

(h) Frequency stability and accuracy under the following conditions:

(1) Accuracy of re-set.
(2) Lost motion and back lash.
(3) Operation of Adjust-Tune-Operate Control.
(4) Detuning of circuits.
(5) Operation of power output control.
(6) Change of vacuum tubes.
(7) Variation of supply line voltage.
(8) Variation of ambient temperature.
(9) Variation of humidity.
(10) Locked key operation for two hours.
(11) Key locked to intermittently keyed condition.
(12) Continuously keyed to intermittently keyed condition.
(13) Inclination due to roll and pitch of vessel.
(14) Vibration.
(15) Shock.
(16) Effect of dial locks.
(17) Accuracy of dial positioning devices.

5. The power equipment supplied was tested to determine voltage regulation, percentage of voltage ripple and general performance under a variety of conditions.

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Conclusions

(a) The general construction of the Model XTAQ-5 radio transmitting equipment reflects excellent design, construction and assembly. Excellent materials have been employed and the resultant operating characteristics and appearance of the equipment are in close agreement with the requirements as set forth in the governing contract and specifications. Ease of access to vital portions of the equipment has been improved as compared with earlier models of similar transmitters and the master oscillator circuit and intermediate amplifier circuit can be removed entirely from the general assembly with reasonable facility.

(b) The power output requirements of the specifications have been complied with over the entire frequency range and the output circuits are such that the equipment operates into a wide variety of antenna constants with reasonable ease and security.

(c) The frequency stability and accuracy of the equipment comply with the specified requirements in all but a few minor instances and these deficiencies are of such a nature that they should readily lend themselves to corrective action.

(d) In general, the equipment operated in a safe and satisfactory manner during the course of the tests to which it was subjected. These tests demonstrated, however, that certain specific items require some further consideration in order to attain maximum reliability and protection against overloads and misadjustments. Fuses, protective relays, warning plates, provisions for suppressing arcs and a greater degree of security in the anchoring of electrical cables require further attention.

(e) With proper corrective action applied to the various deficiencies listed, the Model TAQ-5 equipment should be capable of meeting the rigorous requirements of the Naval Service.

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Recommendations

It is recommended:

(a) That in future shipments, motor generator be enclosed in a packing case which will prevent unauthorized use of eye bolts, instead of the open crates now commonly employed. (See paragraphs 7 and 27.)

(b) That resistor clips furnished with Model TAQ-5 equipments be of such design and size as to afford a secure grip on the ferrules of the resistors. (Paragraph 30d.)

(c) That the necessary inspection and precautions be observed to insure satisfactory functioning of all interlocks. (Paragraph 32.)

(d) That the resistance value of the filament rheostat be increased sufficiently to permit a margin of safety when line voltage rises to plus 10% of normal. (Paragraphs 34 and 75.)

(e) That consideration be given to reducing the current rating of the fuses in the magnetic controller and filament supply circuits and that fuse clips of adequate design be provided. (Paragraph 41.)

(f) That the overload relay protective circuits be given further consideration with a view of providing circuits in accordance with specification requirements and that each overload reset device be labelled to designate the circuit it controls. (Paragraph 42.)

(g) That the 440 volt terminals in the transmitter be provided with protective covers, marked to indicate the potentials existing underneath. (Paragraph 43.)

(h) That, in view of their satisfactory performance during the preliminary test, the "Shakeproof" type of lock washer as furnished in the XTAQ-5 equipment be considered suitable and satisfactory. (Paragraph 51.)

(i) That, in future equipments, designers attempt to locate meters and controls in such relative positions as will improve ease of operation and adjustments. (Paragraph 54.)

(j) That the Plate Voltmeter Multiplier be provided with by-pass units of adequate voltage rating. (Paragraph 57.)

(k) That all meters in the equipment be provided with leads of sufficient flexibility and length to permit withdrawal of meter through panel opening. (Paragraph 58.)

(l) That the markings provided on the Master Oscillator dial be considered suitable and satisfactory. (Paragraph 64.)

(m) That the bottom front bolt used for securing the two units of the transmitter together be moved 4-1/2" to the rear to avoid conflict with Transformer T-103. (Paragraph 70.)

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(n) That complete and accurate marking of component parts and terminals be provided in the Model TAQ-5 equipments. (Paragraph 72.)

(o) That the necessary precautions be exercised to insure that the texture and appearance of the black wrinkle finish of the front panel be uniform and pleasing in character. (Paragraph 77.)

(p) That the corona shields and special antenna terminal, which were found necessary to prevent arc overs in the preliminary model, be included in production models and that additional loading inductance be provided in the antenna circuit. (Paragraph 87.)

(q) That efforts be made to reduce the frequency shifts incident to the operation of the power output control. (Paragraph 96.)

(r) That the operation of the transmitting equipment be considered as suitable with respect to the frequency changes caused by shifting tubes in the master oscillator circuit. (Paragraph 97.)

(s) That means be provided to prevent the falling off in power experienced during humidity and locked key tests. (Paragraph 100.)

(t) That adequate assurance be provided that all master oscillator compensating condensers of the Titanium Dioxide type will be satisfactory and free from flaws. (Paragraph 101.)

(u) That frequency variations encountered during inclination tests be reduced by providing a more rigid master oscillator assembly. (Paragraph 104.)

(v) That the P.A. neutralizing capacitor be provided with a secure locking means to prevent accidental misadjustment. (Paragraph 109.)

(w) That efforts be made to reduce the frequency shifts now encountered due to the operation of the Master Oscillator dial locking device. (Paragraph 116.)

(x) That the Bureau of Engineering consider the advisability of permitting the R.F. calibration coupling terminals to be moved to the regular bakelite terminal strips in order to avoid danger from the high voltage plate connections. (Paragraph 122.)

(y) That the necessary steps be taken to improve the wiring of the transmitter unit by the addition of more cable clamps. (Paragraph 135.)

(z) That the transformer terminal panels, or the instruction books, contain adequate information to insure correct connection of the transformers in the equipment. (Paragraph 138.)

(aa) That precautions be taken to insure that all studs for securing the shields to the transmitter frame are securely anchored. (Paragraph 141.)

(bb) That efforts be made to reduce the noise created by the operation of the keying relay. (Paragraph 159.)

[redacted]

(cc) That the Bureau of Engineering consider the advisability of providing rugged, rattle-proof protective covers over the motor generator flexible couplings. (Paragraph 172.)

(dd) That square headed dowels be provided for securing the generator and motor units to the bed plates, as required by the governing specifications. (Paragraph 173.)

(ee) That the warning plates on the high voltage generators be increased in size to approximately 2" x 4" and be colored red to make them conspicuous. (Paragraph 174.)

(ff) That the generator eyebolt be modified in order to bring the overall height within specification limits. (Paragraph 176.)

(gg) That consideration be given to reducing the current rating of the bias generator fuse to afford greater protection and that fuse clips which afford a more secure grip be provided. (Paragraph 179.)

(hh) That the ripple in the bias generator output be considered satisfactory, unless this condition can be improved by correcting the eccentricity prevailing in the commutator. (Paragraph 183.)

(ii) That the Bureau of Engineering endeavor to obtain information regarding the acceptability of the skeleton type of construction employed in the motor unit. (Paragraph 190-(1).)

(jj) That the Bureau of Engineering consider the advisability of specifying special drip proof design rather than standard designs fitted with drip proof shields in the construction of motor and generator units. (Paragraph 190-(2).)

(kk) That the necessary precautions be exercised to insure a good fit of generator brushes to prevent undue sparking. (Paragraph 190-(3).)

(ll) That efforts be made to prevent undue eccentricity of generator commutators. (Paragraph 190-(4).)

(mm) That the Power Amplifier Plate Generator be modified to provide sufficient reserve voltage and that efforts be made to reduce the decrease in potential due to temperature rise. (Paragraph 190-(5) and 100.)

(nn) That precautions be taken to prevent motor terminal studs from turning in the ceramic terminal plate. (Paragraph 190-(6).)

(oo) That the bottom cover plates on the Bias-MO generator be modified to permit complete removal of these plates. (Paragraph 190-(7).)

(pp) That the magnetic controller be provided with sufficient access openings of adequate size to permit cable entry and that unused terminals or parts be excluded; that suitable warning plate be provided to indicate presence of 440 volts. (Paragraph 190-(8).)

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(qq) That the contractor be requested to determine, if possible, the reasons for failure of motor generator to start and that the necessary corrective action be taken to prevent this phenomenon. (Paragraph 190-(9).)

(rr) That the power equipment and controller be finished in blue gray color.

(ss) That conventional wiring diagrams be supplied with the equipment rather than the types which require running lists and checking lists. (Paragraph 191.)

(tt) That Instruction Books be prepared with a view of incorporating the suggestions contained in paragraphs 192 to 195 inclusive.

(uu) That after the items referred to above have been corrected or complied with in a manner meeting the approval of the Bureau of Engineering, the Model TAQ-5 transmitting equipment be considered suitable and satisfactory for the needs of the Naval Service.

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MATERIAL UNDER TEST

6. The material under test consisted of one preliminary Model XTAQ-5 Radio Transmitting Equipment and included the following major parts:

1 - Transmitter, frequency range 175 to 600 KC; nominal rated output 2000 watts; CW and MCW. The transmitter consists of two units bolted together.

1 - Motor Generator.

1 - Motor Starter.

7. The Model XTAQ-5 equipment was received at the Naval Research Laboratory on May 19, 1939. Transportation was accomplished by means of commercial motor truck from Schnectady, N.Y. The equipment was manufactured under Contract NOs-62958 by the General Electric Company, Schenectady, New York. The transmitter unit was completely enclosed in a substantial wooden packing case. The bottom of the case was fitted with burlap covered buffers to protect the equipment against shock. Heavy wooden supports held the transmitter within the case and these members were provided with felt buffers to prevent marring the finish of the transmitter. The transmitter unit was securely bolted to the base of the packing case. The motor generator was enclosed in a wooden crate and was covered with one layer of water-proof paper. This paper was partially torn off when the equipment was received. No damage had been incurred but the packing of the motor generator was such that had the equipment been left exposed to rain for any appreciable time, some damage might have resulted.

8. All resistors were tied in place and relays were also secured with tape to prevent damage during transportation.

9. The weight of the shipment was itemized as follows:

Transmitter Unit - Gross - 1580 pounds.
Transmitter Unit - Net - 1070 pounds.

Motor Generator - Gross - 1313 pounds.
Motor Generator - Net - 1164 pounds.

Miscellaneous parts - Gross - 200 pounds.
Net weight of parts - 142 pounds.

METHOD OF TEST

10. The equipment, when received, was carefully examined to determine whether adequate precautions had been observed in preparing the material for shipment and whether any damage had been incurred during the process of transportation.

11. The equipment was then wired up and placed into commission.

12. Power output measurements were made by means of suitable dummy antennas composed of essentially non-inductive resistors (Ward-

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Leonard plaques) and low loss capacitors (Dubilier Type PL-52).

13. Frequency changes and drifts were checked by means of Model LK frequency indicators, Serials No. 1 and 4. The transmitter was operated at full power output whenever the governing specifications required this method of operation.

14. Frequency range, overlap, kilocycles per division of dial marking and the adequacy of the calibrating circuits of the transmitter were determined by means of Model LD-2x equipment Serial No. 1.

15. The entire equipment was placed in a test chamber and subjected to variations in ambient temperature between the limits of approximately 50 degrees Centigrade and zero and variations in relative humidity between the limits of 30% and 90% at 40 degrees Centigrade.

16. Measurements of the ripple voltage present in the outputs of the various generators were made by means of an output voltmeter.

17. Model RAA receivers were employed for determining the quality of the emitted signal.

18. The ability of the equipment to withstand vibration and roll and pitch of a vessel was determined by mounting the entire equipment, including motor generator, on the laboratory test stand which is capable of producing the necessary conditions.

19. Shock tests were conducted by subjecting the equipment to blows from a 20 pound weight suspended in the manner prescribed by the governing specifications.

20. The degree of amplitude modulation present in the CW output of the transmitter was determined as follows. A half wave rectifier, with tuned input, was coupled to the output of the transmitter. The output of the rectifier was adjusted to the proper voltage across a load circuit. The d.c. was blocked off by means of a large capacitor and the audio component was measured by means of a suitable voltmeter.

21. The voltage furnished for calibrating purposes was measured at the far end of a 50 foot concentric line of approximately 40 ohms impedance. A Model "OF" Ferris Interference Locator and a Model LN Signal Generator (in substitution method) were employed to determine the voltages available.

22. The percentage of modulation on MCW operation was determined by means of a Model OB audio analyzer (positive and negative peak method).

DATA RECORDED

23. Complete data were recorded during all tests conducted and this information is included in this report as Tables No. 1 to 57 inclusive and Plates 1 to 37 inclusive.

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PROBABLE ERRORS IN RESULTS

24. Precautions were taken to minimize errors in the results obtained during the tests; where necessary or desirable, duplicate tests were conducted to insure accuracy.

25. In determining the radio frequency output power of the transmitter all reasonable precautions were observed. A precision type radio frequency ammeter was employed whose calibration was verified previous to use. The necessary correction factors were applied to the current readings to insure maximum accuracy. Dummy resistors and capacitors were so employed as to prevent overloading and serious heating. The power factor of the capacitors employed was fixed within the limits stated by the manufacturer and the losses thus determined were incorporated into the final results. Heavy conductors of minimum length, with special precautions with respect to the grounds employed, were used. The resistance of each individual dummy antenna set up was checked by means of a Wheatstone Bridge.

26. All meters employed in the tests were of the precision type and used under conditions to insure maximum accuracy.

RESULTS OF TESTS

27. Inspection of the equipment, when received, revealed that one of the lifting eyes provided for handling the plate generator as an individual unit, had been bent. No other damage resulted. Apparently, during the process of transportation, these lifting eyes had been employed to lift the entire motor generator unit. As pointed out in paragraph 7 above, the motor generator had been shipped in an open crate while the generator was covered with waterproof paper. In the interests of safety, and to prevent equipment from being damaged enroute when consigned to commercial carriers, it is recommended that all items be shipped in completely enclosed packing cases. This would prevent the unauthorized use of the lifting eyes.

28. In the following report reference is made to the various sections and paragraphs of the governing specifications RE 13A 351J under which the equipment was constructed.

29. Section I. The general construction and design of the Model XTAQ-5 equipment conforms with this introductory section of the governing specifications. The transmitter covers the range of 175 to 600 kilocycles and is designed for CW or MCW operation. The succeeding paragraphs of this report discuss in detail the construction and operating characteristics of the equipment.

30. Paragraph 2-2. The component parts which go to make up the complete assembly were examined to the extent possible without resorting to complete disassembly or destruction of the various parts.

(a) The vacuum tubes employed in the equipment have received Navy Type approval.

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(b) Numerous units of standard design are used in the equipment. Special design of parts is resorted to where necessary to meet the requirements of the governing contract.

(c) Table No. 1 appended hereto lists the results of several meter checks. Those meters in the equipment, the accuracy of which would affect power output tests, etc., were checked against precision instruments. It will be noted that satisfactory agreement exists.

(d) Table No. 2 lists the resistors used in the equipment together with measured values at which the various units operate. It will be noted that the resistors furnished comply with the requirements of the governing specifications. A description of the various wire wound rheostats used in the equipment forms a part of Table No. 2. The resistor clips, particularly those employed on the larger resistors, do not grip the ferrules in a positive manner. The insertion of the ferrule spreads the clip considerably and provides an insecure mounting. Resistor clips furnished with other equipments are more satisfactory and it is recommended that more suitable clips be provided in the XTAQ-5 equipment.

(e) Various other component parts used in the equipment, and which are covered by the reference specifications of paragraph 2-2(4) of the governing specifications, are discussed in detail under appropriate paragraphs of this report.

31. Paragraph 2-3. Light weight aluminum alloys have been used in the construction of the transmitting equipment in the interests of weight reduction. The construction is such that a rugged and strong assembly results.

32. Paragraph 2-3-1. Only one instance of contact trouble was experienced during the course of these tests. The interlock-contact on tuning control "G" failed to function and the transmitter could not be keyed. A small adjustment remedied this difficulty. Care should be exercised in the assembly of production equipment to insure a maximum of reliability in the operation of all interlocks.

33. Paragraph 2-3-2. All multi-position switches are of the self-positioning type and the operation is of a decisive character. The contacts are of the wiping or self-cleaning type.

34. Paragraph 2-3-3. All variable resistors employed in the equipment are of the wire wound type. The characteristics of these units are listed in Table No. 2. While conducting tests wherein the line voltage was varied over the limits of minus to plus 10% it was noted that the filament voltage could not be reduced to less than 11.2 volts while the transmitter key was open and the applied line voltage was 484 volts. Normal filament voltage is 11.0 volts. While this is a small difference it would appear desirable to increase the resistance of the filament rheostat slightly in order that ample leeway is provided for all conditions of operation. The operation of the filament rheostat is illustrated in Table No. 53 attached hereto.

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35. Paragraph 2-4. In general, the Model XTAQ-5 transmitter reflects excellent workmanship and design. A few specific items which require some further consideration are discussed in detail under appropriate paragraph headings in this report.

36. Paragraph 2-5. The entire transmitting equipment was subjected to a number of cycles of temperature ranging between zero and 50 degrees Centigrade and humidity variations from 10% to 90%. No operational failures were noted during these tests and no signs of serious overheating were observed.

37. Paragraph 2-6. The corrosion resisting measures employed in the equipment proved to be adequate during the course of these tests.

38. Paragraph 2-7. The use of iron and steel, for purposes other than magnetic uses, has been reduced to a practical minimum. Steel is employed in the construction of certain items for reasons of strength, such as the transmitter pedestal, but adequate corrosion resisting measures have been applied.

39. Paragraph 2-8. Good quality ceramic insulation has been used throughout the equipment where required by good engineering practice. Special phenolic insulation is employed for coil forms and supports, although micalex has been used in various radio frequency circuits to insure maximum protection against voltage breakdowns. Since no circuits in the equipment operate at frequencies in excess of approximately 600 KC, the use of phenolic insulation does not violate the specification requirements.

40. Paragraph 2-9. Wood has not been employed in the construction of the Model XTAQ-5 transmitter.

41. Paragraph 2-10. The design of the electrical circuits is such that during the course of these tests no failures of any parts were noted. Through the use of interlocks, overload relays and fuses, protection has been afforded for safe and satisfactory operation. A few items which may require further consideration are noted under appropriate headings elsewhere.

(1) Fuses are provided in two of the three incoming power lines. These are located in the magnetic controller. A fuse is provided in one of the leads to the filament transformer and another in the controller contactor coil circuit. These last mentioned fuses are in the 110 volt circuit. Nameplates are provided giving fuse rating in all cases except the one in the filament circuit and in this case the proper designation is stamped on the terminal board. All fuses are of the renewable type. The following tabulation lists complete fuse data:

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Position of fuse	Type of fuse	Voltage rating	Current Rating	Voltage of circuit	Actual current through fuse
Motor* leads	GE Cat. No.1034	250**	60 Amp	440 V	88 Amps#
Filament Supply	GE Cat. No.1022	250 V	15 Amp	110 V	5.3 amps.
Magnetic Controller	GE Cat. No. 1024	250 V	10 Amp	110 V	0.65 amps.

* denotes two fuses used.
** Paragraph H-2 of Specs. 17F2g permits use of 250 volt fuses in 440 volt circuits.
# Motor starting current; key locked running current approximately 12 amperes.

It is recommended that consideration be given to reducing the current rating of the fuse used in the magnetic controller circuit and a somewhat lighter fuse could be used in the filament supply circuit. The clips supplied with the filament and controller fuses are too small to provide secure holding qualities and more suitable clips should be provided.

(2) For a complete discussion of the fuses used in the motor generator circuits, refer to paragraph 179 of this report.

(3) Two vacuum tube overload relays are provided. Tests show that they are capable of being adjusted from full load value to 25% overload. For a more complete discussion of these relays refer to paragraph 42 of this report.

42. Paragraph 2-11. Two vacuum tube overload relays are provided in the equipment, together with a five second relay. The latter relay opens the keying circuit if the remote key is held closed for periods in excess of five seconds.

(a) A study of Schematic Diagram T-7660851 and of the actual circuits in the transmitter reveals the following:

Main Plate Overload Relay K-103 (coil) carries the following currents:
- I.P.A. Plate Current
- A.O. Plate Current
- P.A. Plate Current
- P.A. Generator Bleeder Current

The low power stage overload relay coil K-102 carried the following currents:
- M.O. Plate Current
- M.O. Screen Current
- M.O. Rectified Control Grid Current
- I.P.A. Plate Current
- I.P.A. Screen Current
- I.P.A. Rectified Control Grid Current

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(b) Thus, the I.P.A Plate current passes through both relays and the Audio Oscillator plate current passes through the Main Plate relay. Because of the normally large current passing through the Main Plate overload, little protection is provided for the Audio Oscillator Tube.

(c) The resulting combination of circuits does provide overload protection for the various tubes but a rather complex circuit results which may present difficulties to the average operator when servicing is required. The governing specifications state "Where different types of tubes are employed as in the power amplifier stage and preceding stages of the transmitter unit, a separate overload relay should be provided for the power amplifier stage and additional relays for the master oscillator and intermediate stages or for the combined master oscillator and intermediate stages, as necessary to provide adequate tube protection. Consideration will be given to other arrangements where necessary to provide adequate protection and improved performance."

(d) The contractor's descriptive specifications, reference (d), indicated the circuit which is actually incorporated in the transmitter. It is believed, however, that the contractor should give further consideration to the overload circuits with a view of attempting to simplify the circuits and provide operation which is more in line with the requirements of the governing specifications.

(e) The manual re-set devices on the panel of the transmitter are labeled "Overload Reset". It would be helpful and more descriptive if these reset devices were labeled "Low Power Stages" and "Power Amplifier".

43. Paragraph 2-12. The design of the equipment is such that the outside cases and frames of all units are at ground potential. All access doors are provided with interlocks which are connected in the 110 volt AC circuit.

(a) Immediately after the access doors are opened, the only potentials to which the operator is exposed are the residual voltages of the generators and in the case of the lower right hand access door, an AC potential of 440 volts on Terminal Board No. 7. In the interests of safety it is recommended that the 440 volt terminals be provided with an insulating cover plate to prevent contact with these terminals. The cover should be marked to indicate the presence of 440 volts beneath.

(b) With respect to the residual generator voltages, the potentials drop almost immediately to the values listed below. The voltages drop to these values before an operator could come in contact with them through the access doors.

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Main Plate Generator - 125 volts
Master Oscillator Plate - 50 volts
Bias Generator - 10 volts

The above voltages gradually decrease until the machine stops, which requires 1-1/2 minutes. It is considered that little hazard is present from this arrangement.

(c) The magnetic controller is fitted with an electrically operated latch which prevents opening the cover while voltage is present. (Note: This requirement is being abrogated by the Bureau of Engineering - See reference (a).)

44. Paragraph 2-13. During the course of these tests no evidence of overheating or lack of ventilation was noted. The equipment does not employ any motor driven fans or blowers. Natural circulation of air is facilitated by the use of perforated shields on the sides, rear and top of the transmitter unit. Access doors in the front panel are also perforated as an aid to ventilation and vision. As an additional precaution against the effects of high temperatures, the row of meters in the top compartment of the right hand section of the transmitter has been enclosed in a phenolic shield. This shield is rectangular in shape and is painted white. This precaution was considered desirable since the power amplifier tubes are located almost directly beneath these meters. In the opinion of the Naval Research Laboratory, the inclusion of this shield in the design of the transmitter is a worthwhile feature.

45. Paragraph 2-14. During the course of these tests, wherein the equipment was subjected to temperatures as high as 50 degrees Centigrade, no evidence of compound leakage was noted. Since no component parts were submitted separately, it was impossible to subject parts containing compounds to temperatures of minus 32 degrees Centigrade to determine whether or not the material used would crack at low temperatures.

46. Paragraph 2-15. The equipment was subjected to numerous locked key tests for periods of two to eight hours duration without any visible signs of failure or serious overheating. During a number of these tests the temperature of the plate choke used in the power amplifier circuit was observed. (See Tables Nos. 30, 33, 34 and 35.) This choke showed a tendency to assume rather high temperatures, although normal operation was obtained. In order to prevent the possibility of failure in this connection, a representative of the manufacturer procured and installed a replacement choke of more ample proportions. This replacement choke functioned satisfactorily and showed no evidence of serious overheating. Additionally, the equipment was keyed, under full power conditions, for a period of one hour at 100 words per minute without showing evidence of brush discharge, corona or sparking. Other keying tests, at various rates of speed, were conducted over a period of several hours and the transmitter continued to function in a normal and satisfactory manner.

47. Paragraph 2-16. The transmitter was tuned to 200 and 600 KC, full power output. Then, with the key closed, the antenna circuit was

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repeatedly short circuited and open circuited. No damage was incurred by the transmitter during these tests. In all cases the power amplifier plate currents decreased to a safe value and the antenna current was reduced to approximately zero.

48. Paragraph 2-17. The design of the equipment is such that the vacuum tubes employed operate within the limits imposed by Navy Tube Specifications.

49. Paragraph 2-18. In general, the design of the Model XTAQ-5 transmitting equipment is such that safe operation and satisfactory performance are assured. A few items which failed to produce entirely satisfactory operation were noted:

(a) P.A. Plate choke (See paragraph 46 of this report).
(b) M.O. Titanium Dioxide Compensating Capacitor (See paragraph 101 of this report).
(c) Arcing occurred on antenna loading system (See paragraph 87(f) of this report).
(d) P.A. Plate generator does not possess sufficient voltage reserve. (See paragraph 190(5) of this report).
(e) Front panel of master oscillator unit appears to lack sufficient rigidity. (See paragraph 104 of this report).
(f) Filament rheostat lacks sufficient reserve resistance. (See paragraph 34 of this report).
(g) Switch interlock failed to function satisfactorily. (See paragraph 32 of this report).

Some of these items were corrected during the course of the tests by a representative of the contractor, and other items have been taken under advisement by the contractor with a view of correcting the difficulties. In general, most of the discrepancies were not of a serious nature but these points should receive due consideration in order that the entire equipment may be made as satisfactory and reliable as possible.

50. Paragraph 2-19. The design of the XTAQ-5 equipment is such that it fulfills the demand that the equipment, when secured at the base only as under service installation conditions, operates successfully and without damage on a moving platform inclining up to 45 degrees from the vertical in any direction. The equipment was bolted to the inclination table by means of the eight bolts provided for service installation. Numerous inclination tests were conducted and the transmitter showed no signs of failure or weakness. For a detailed discussion of the effect of inclination upon the frequency stability of the transmitter, see paragraph 104 of this report.

51. Paragraph 2-20. The equipment was subjected to vibration and shock, as outlined in the governing specifications, and withstood such tests without damage or faulty operation. Nuts and machine screws are secured by means of "shakeproof" lock washers. These washers functioned successfully during the tests. (Note: During previous tests of transmitting equipment fitted with "shakeproof" lock washers, a great deal of difficulty was experienced in keeping nuts and screws tight. However, during the tests of the XTAQ-5 equipment no difficulty was experienced on

this score. It is possible that the difference lies in the number and size of machine screws used to secure a given item, or that the washers used in the XTAQ-5 are of more resilient material which resists deformation to a greater degree. The General Electric Company, through its representatives, states that they have found the use of "shakeproof" washers eminently satisfactory. In view of these considerations it is recommended that the lock washers furnished with the XTAQ-5 equipment be considered as satisfactory.) All wires connected to terminals are secured in such a manner that the conductor is soldered to the terminal and the insulation is firmly crimped in the terminal. Water-proof fibre washers are employed to absorb stress which might damage ceramic insulators. In general, the construction employed is such as to provide an assembly of rugged characteristics which is cleancut in appearance and workmanship.

52. Paragraph 2-21. All vacuum tubes in the equipment are flexibly mounted to protect them against shock and vibration. The two power amplifier tubes are mounted in a framework which in turn is supported at the four corners by means of Lord flexible mountings. The Master Oscillator, Intermediate Power Amplifier and Audio Oscillator tubes are individually mounted on specially designed shock mounts of such a nature that the tube socket is floating on a heavy rubber sheet. All mounting performed satisfactorily during the shock and vibration tests to which the equipment was submitted. None of the mountings are flexible enough to permit great movement and thus endanger the tubes, while the flexibility provided is sufficient to protect the tubes.

53. Paragraph 2-22. The design and control of the circuits in the XTAQ-5 equipment is considered as simple as possible within the requirements of the governing specifications.

54. Paragraph 2-23-1. All indicating instruments and controls for the operation and minitoring of the equipment are located on the front panel. A list of all controls and meters appears in Table No. 3 attached hereto. The arrangement is symmetrical and, in general, meters which are associated with certain controls are located in the vicinity of such controls. However, in the case of the rheostats which control filament and plate potentials and the meters which register such potentials, closer proximity between controls and meters would be desirable. The controls are located near the bottom of the panel and the meters are arranged along the upper portion. The inconvenience thus caused is not of a serious nature, however.

55. Paragraph 2-23-2. A nameplate of suitable characteristics has been affixed adjacent to each control to designate its purpose. The markings provided are listed in Table No. 3.

56. Paragraph 2-24. All control shafts and bushings have been grounded in the interest of safety and all handles and knobs have been insulated in an approved manner.

57. Paragraph 2-25. All electrical indicating instruments provided are of the 3.5 inch diameter, flush type, with bakelite cases and have been provided with anti-glare glass.

(1) The antenna ammeter, which is of the external thermocouple type, is located in the low potential side of the antenna circuit.

the power realized is equal to or greater than that called for by the governing specifications, with one exception. The power output listed under Column No. 2 of Table 5 reveals that the output at 175 KC was somewhat deficient. However, a check run made the same day is shown in Column No. 1 of Table No. 6, and here the specification requirements have been exceeded slightly. It is believed that the values in Table No. 6 should be used, since these adjustments were arrived at after the operating personnel had gathered some additional experience in the operation of the equipment.

(f) During the course of the power output tests at 175 KC a few intermittent arc-overs occurred within the transmitter in the vicinity of the loading inductor assembly. These arcs were, as stated, of an intermittent nature and caused no real damage. It was felt, however, that if this condition persisted, real harm might result. The manufacturer's representative who was present arranged to have corona shields fabricated and applied to the portions of the circuit which were giving trouble. On June 26th corona shields were applied to the antenna loading coil assembly over the securing nuts on Taps 13, 14 and 15. A large shield was applied to the center of the switch terminal board covering the end of the main shaft. Two small shields were also placed over the screw heads on the side of the terminal or switch mount facing the coil. A special extension was also provided for the antenna lead where it emerges from the top of the transmitter. This is in the form of a large diameter conductor, fitted with a corona shield, which can readily be screwed into that portion of the antenna lead which is permanently connected to the transmitter. This additional fitting extends above the top of the transmitter, and hence must be removed during shipment. It is recommended, however, that production equipments be fitted with this improved device and that during shipment the part be tied to the antenna circuit within the transmitter. Instructions describing its purpose and method of installation should accompany the unit.

(g) After these modifications had been accomplished the transmitter was adjusted for operation at 175 KC into a dummy antenna of 919 uuf capacity and 3.2 ohms resistance. With a temperature of 25 degrees C. and a relative humidity of 30% two flash-overs occurred during the tuning up process. Continued operation, however, failed to cause a recurrence of these flash-overs. They may be attributed to some stray dust or dirt which was removed by the arcs. The temperature of the test room was then raised to 30 degrees and the humidity was increased to 90% and held at this condition for one hour. The set was operated alternately key locked, hand keyed, CW and MCW. One flash-over occurred under CW locked key conditions but

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89. Paragraph 3-4-2. The amplitude of carrier hum, ripple or other undesired modulation was found to be too small to measure. It is well within the allowed value of 2% at maximum power during CW transmission.

90. Paragraph 3-5. Tables No. 5 to 14 inclusive also list the results of tests conducted to determine MCW operation. It will be noted that in the majority of instances the MCW power is 50%, or greater, of the CW power. In those instances where the percentage values fall below 50%, the specification requirements are still complied with based on 50% of the guaranteed power. The modulation frequency was measured as 780 cycles, which is within 2-1/2% of the specified value of 800 cycles. Specifications permit a variation of 5%. The percentage of modulation averages in excess of 70% (negative peaks) and in those few instances where the measurements indicated slightly less than 70%, the deficiency is of such a small magnitude as to fall almost within the limits of error of measurement. The modulation percentage is considered satisfactory. Selection of CW or MCW emission is accomplished by means of a two position switch on the front panel of the transmitter. Satisfactory keying when using MCW emission was obtained at keying speeds in excess of 50 words per minute. At 100 words per minute on MCW each dot was not completely modulated, due to a slight lag in the starting of the audio oscillator. This effect was noted to a much less degree at 90 words per minute and was completely missing at speeds of 80 words and less. The specifications require MCW keying at speeds up to 50 words per minute.

91. Paragraph 3-6. The transmitter is so designed and constructed that the frequency is continuously variable over the specified range by means of panel controls and satisfactory operation is obtained over the range of antenna constants specified.

92. Paragraph 3-7-1. Accuracy of reset to previously calibrated frequencies. Table No. 15 shows the results of tests conducted at 200 and 600 KC to determine the accuracy of reset. In all cases the accuracy of adjustment is well within the specified limits and the time required to make the adjustments is less than 60 seconds.

93. Paragraph 3-7-2. Lost Motion, Back Lash and Torque Lash. Reference to Table No. 16 reveals that the Model XTAQ-5 transmitter complies with the requirements of this paragraph of the governing specifications.

94. Paragraph 3-7-3. Operation of Adjust-Tune-Operate Control. The effect upon frequency of the Adjust-Tune-Operate control at eight different frequencies is illustrated in Table No. 17. It will be noted that in all cases the requirements of the governing specifications have been complied with. The maximum effect occurs in the region of 225 and 250 KC.

95. Paragraph 3-7-4. Detuning of Circuits. Table No. 18 shows that the circuits subsequent to the frequency establishing circuit may be detuned as required by the specifications, without causing the master oscillator frequency to vary beyond the specified limits.

96. Paragraph 3-7-5. Operation of Power Output Control. The power output of the transmitter may be varied, by means of the plate generator field rheostat, between the limits of 100% and approximately 4.5%.

The frequency change which occurs when the power is thus varied is illustrated, for a number of frequencies, in Table No. 19. Paragraph 3-7-5 states that "The variation in frequency resulting from a change in power output from full power operation to operation at reduced power, at any point within the range of the control, shall not exceed 0.005%." Paragraph 3-23 of the governing specifications states in part: "It must be possible to vary the power output of the transmitter from the maximum value specified to a minimum value not in excess of 10 per cent by means of a single control....". Reference to Table No. 19 reveals that the specification limit of 0.005% frequency change is exceeded slightly for the 10% values at 200, 250 and 600 KC. The frequency change which occurs at minimum voltage is somewhat greater. The degree of non-compliance at the 10% power value is exceedingly small, amounting to 1 cycle at 200 KC; 5.5 cycles at 250 KC and 3 cycles at 600 KC. These values fall almost within the error of measurement and on this basis the action of the equipment could be considered satisfactory. However, if the literal meaning of paragraph 3-7-5 is accepted, the discrepancies become somewhat larger at values of 4.5 or 5% of full power and it would appear that efforts should be made to produce more stable operation at reduced power.

97. Paragraph 3-7-6. Change of Tubes. The data collected during these tests are shown in Tables 20, 21, 22 and 23. The tests were conducted at frequencies of 200 and 600 KC. It will be noted that the specification requirements are complied with in all cases except when changing tubes in the master oscillator circuit at 200 KC. Here the discrepancy is exceedingly small amounting to a value of 2 or 3 cycles in 200 KC. Due to the nature of these tests and the tendency of the output frequency to drift somewhat with time, it is recommended that the action of the XTAQ-5 with respect to tube changes be considered as complying with the specification requirements.

98. Paragraph 3-7-7. Variation of Supply Line Voltage. The Model XTAQ-5 transmitting equipment operates from a supply of 440 volts, 3 phase, 60 cycles. Hence, by the terms of this paragraph, the equipment should be subjected to a line variation of plus and minus 5%. The results of such tests are outlined in Table No. 24 attached hereto. The line voltage was varied in a period of one minute and additionally in a time of five minutes. Under both conditions and at two frequencies, 200 and 600 kilocycles, the frequency variations noted are within the limits imposed by the governing specifications. Paragraph 6-3 requires that the equipment withstand 10% line voltage variations without damage to tubes or equipment. While conducting this test the effect upon frequency was recorded as shown in Table No. 24.

99. Paragraph 3-7-8. Variations in Ambient Temperature. Tables 25, 26 and 27 show the results of tests conducted wherein the ambient temperature was varied between the limits of 50 and zero degrees Centigrade, while a low relative humidity was maintained within the temperature test room. Previous to these tests considerable difficulty had been experienced due to a defective compensating condenser in the master oscillator circuit. As a result of this defective device, overcompensation resulted and the transmitter was subject to undesirable frequency drift. (See more detailed discussion under paragraph 101 of this report.) Previous to the test illustrated in Table No. 25 and Plate No. 1, a new compensating condenser had been installed and had been found to give satisfactory

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performance. However, during the first temperature variation test an abrupt frequency jump occurred. Subsequent inspection revealed no definite reason for this phenomenon and it is believed that in the process of installing the new compensator certain parts of the circuit had been placed under a strain. After all parts had been loosened and re-tightened, no further abrupt changes occurred. Hence, in arriving at the temperature coefficient of the transmitter, the abrupt change of 90 cycles was eliminated from the calculations. Plates 1, 2 and 3 show the results of these tests in graphic form. It will be noted that in no instance are the specification requirements exceeded.

100. Paragraph 3-7-9. Variation in Humidity. Tables 28 and 29, together with Plates 4 and 5, cover the results of humidity tests conducted at 200 and 600 KC. It will be observed that the frequency changes occurring during these tests fall well within the limits imposed by the governing specifications. It will be noted, however, that the decrease in power output during the tests is in excess of that permitted by the specifications. The data indicate that the falling off in power may be attributed to the falling off in voltage of the plate motor generator rather than to the effects of humidity. This is shown clearly in Plates 4 and 5 where the power output remains at low levels in spite of the fact that the humidity at the end of the test was in the region of 20%. As will be discussed in more detail under that section of the specifications devoted to power equipment, all throughout the tests of the Model XTAQ-5 the plate motor generator failed to produce the desired voltage when the machine had been running for any considerable length of time and the windings had opportunity to heat up. This falling off in power was excessive at times and the necessary steps should be taken to correct the difficulty.

101. Paragraph 3-7-10. Locked Key Operation for Two Hours. During the course of tests conducted to determine compliance with this paragraph of the governing specifications, results were obtained which failed to comply with specification requirements and which were in disagreement with the data presented by the manufacturer in reference (e).

(a) The test shown in Table No. 30, conducted at 200 KC, CW operation, gave a frequency variation of 0.0775% whereas the specifications limit the variation to 0.03%. It was further noted that the frequency showed a tendency to increase, whereas the data in reference (e) indicated that such small changes as did occur were in a negative direction.

(b) It was, therefore, decided to recheck this test and the data in Table No. 31 were obtained. In this test the transmitter was adjusted for MCW operation at 200 KC. Again the frequency drifted upward for a total variation of 0.072%.

(c) Since both of the previous tests had been conducted on the test floor where no definite control of temperature and humidity was available and since the humidity on the days in question was rather excessive, it was decided to transfer the scene of operations to the temperature controlled chamber where humidity and temperature could

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be controlled. Another test was conducted at 200 KC, CW operation, the results of which are listed in Table No. 32. The humidity was maintained at values below 30% and the temperature was maintained at 25 degrees Centigrade within narrow limits. The control of these factors appeared to have little bearing on the results, since a frequency change of 0.0695% was revealed and again the frequency drifted upward.

(d) Previous to moving the equipment into the temperature controlled room, 2 hour locked key tests were conducted at 400 and 600 KC, as shown in Tables No. 34 and 35. At these frequencies the variations were found to fall within the limits of the governing specifications.

(e) After conducting the test illustrated in Table No. 32 the master oscillator compartment was removed from the transmitter and a thorough check of the component parts was made. This visual check disclosed no defective parts. It was decided, however, to thoroughly check the Titanium Dioxide Compensating capacitor which forms a part of the master oscillator frequency establishing circuit. The appearance of the unit was normal and no clue could be obtained from a visual inspection. The capacity of the unit and the power factor were then determined by means of a Q-meter. The results of the measurements, made at a frequency of 359 KC, indicated the following:

Capacity - 59 uuf.
"Q" - 60.5
Power factor - 1.65%

The loss values thus indicated appeared to be extremely high for a condenser which forms a part of the master oscillator circuit.

(f) The master oscillator unit was then re-installed in the transmitter but the compensating capacitor was left out. Tests under these conditions, wherein the temperature was held constant for a period and then varied, indicated that greater frequency stability could be obtained without the use of the compensating capacitor. Additionally, the frequency always drifted downward, or rose but slightly, which is a more normal condition. The compensating capacitor was then thoroughly cleaned by bathing it with carbon tetrachloride after which the surfaces were painted with "glyptol". It was then re-installed in the master oscillator circuit and short tests were conducted at 600 and 200 KC to determine its action. The frequency again showed a decided tendency to drift upwards.

(g) The contractor's representative, who was present during these tests, obtained a replacement unit for the

apparently defective compensating capacitor. This unit was painted with glyptol and measured before being installed. The measurements indicated a "Q" of 1000 at 700 KC. An additional spare compensating capacitor was also furnished by the contractor and measurements indicated "Q"s of 852 at 350 KC and 904 at 700 KC. In an attempt to obtain additional data, a compensating capacitor which had been in service for over a year in the Model XTAJ-6 transmitter (General Electric Company, manufacturer) was subjected to measurements. This unit was found to possess a "Q" of 863 at 350 KC and 911 at 700 KC. These latter results indicate that capacitors of this type can withstand aging without deleterious effect. (Verbal information was later received from the contractor that the original capacitor had been carefully examined at the factory and was found to contain a flaw. A crack had appeared in the dielectric which apparently became progressively worse with time and accounted for the erratic operation.)

(h) The replacement capacitor which showed a "Q" of 1000 was then installed in the master oscillator circuit. After this had been accomplished the test shown in Table No. 33 was conducted. Comparison with previous two hour locked key tests at 200 KC reveals immediately that the operation of the equipment with respect to frequency stability had been greatly improved. The frequency change during the first five minutes was only 3 cycles and the drift during the remainder of the two hour test was only 5 cycles.

(i) The conclusions drawn from this series of tests and investigations indicate that the Model XTAQ-5 equipment performs satisfactorily and the frequency drifts remain well within the limits imposed by the governing specifications when a normal compensating capacitor is used. It is further indicated that extreme care must be exercised in the inspection of these units before they are placed into service.

102. Paragraph 3-7-11. Change from Key Locked to Intermittently Keyed Condition. Table No. 36 contains the results of tests conducted in conformity with this paragraph of the specifications. The equipment complies fully with the specification requirements. It will be noted that improved operation results when the filaments remain lighted.

103. Paragraph 3-7-12. Change from Continuously Keyed to Intermittently Keyed Condition. As illustrated in Table 37 the equipment complies with the requirements of the specifications, the maximum frequency changes noted being 0.0058% whereas the specification limit is 0.01%.

104. Paragraph 3-7-13. Inclination Test. Tables No. 38 and 39 show the results of inclination tests conducted at 200 KC. while Plates 6 and 7 show these data in graphic form. Tables 40 and 41 and Plates 8 and 9 show similar data obtained at 600 KC. It will be noted that at 200 KC

the maximum frequency change during both tests, when inclination was from side to side and also in a fore and aft direction, was somewhat in excess of 0.005%. The change during any inclination cycle, however, was less than 0.005%. At 600 KC side to side inclination caused no frequency change greater than 0.0027% but the maximum change during fore and aft inclination was 0.0068%. Reference to Plates 6, 7, 8 and 9 reveals that the transmitter has a tendency to drift and this drift is apparent even though the transmitter rests on an even keel (i.e., no inclination or roll). During the inclination tests, particularly at 600 KC, the roll of the test table caused rapid lilts in the emitted signal. These lilts were of such a nature that it appeared that the set was being keyed, although oscillographic tests showed that the carrier remained on steadily and the lilts were caused by a rapid shift in frequency. Further investigation indicated that this unstable condition was caused by some slight distortion of the master oscillator compartment, particularly the front panel of this unit. This is further borne out by the data listed in Table No. 49 which indicate that the action of the dial locking device on the Master Oscillator control causes an appreciable frequency shift. It is recommended that the manufacturer be requested to investigate this matter with a view of strengthening this portion of the transmitter in an effort to avoid the effects discussed above.

105. Paragraph 3-7-14. Vibration. The entire equipment, including transmitter, motor generator and magnetic controller, was mounted on the vibration table and subjected to vibration of varying frequency and amplitude. Table No. 42 and Plates 10 and 11 cover tests conducted on 200 and 600 KC. Vibration had a negligible effect upon the frequency of the transmitter and no parts suffered damage during the tests. The flexible tube mounts are of a rugged and satisfactory design and, in general, the design and construction are such as to offer maximum protection against the adverse effects of vibration. Inspection at the conclusion of the tests revealed that a few nuts and bolts could be tightened a fraction of a turn but this condition had no apparent effect upon the operation of the equipment.

106. Paragraph 3-7-15. Shock. With the transmitter secured to the deck by means of the regular base fittings, shocks were applied to the equipment in the manner designated by the governing specifications. Table No. 43 attached hereto covers the results of tests conducted at 200 and 600 KC. The frequency changes noted were well within the limits imposed by the specifications and no damage resulted from the shocks.

107. Paragraph 3-7 (general). For purposes of information and comparison a summary of all frequency stability tests, as outlined in paragraph 3-7 of the governing specifications, is presented in Table No. 44. The values listed for each specific test are the maximum values obtained during those tests. The totals listed are the arithmetical sums of the various tests, no account being taken of whether the variations were plus or minus.

108. Paragraph 3-8. Provision has been made for energizing the master oscillator filament during the periods in which the main equipment is shut down. Power for this purpose is obtained from the supply lines through a suitable step-down transformer. By means of the master relay, the filament supply is switched from the operating condition to the stand-by condition, when the equipment is shut down, and vice versa. In addition,

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a switch is located on the front panel by means of which it is possible to energize the filament or de-energize it when the equipment is shut down.

109. Paragraph 3-9. Neutralization is provided for the final or power amplifier stage by means of neutralizing capacitor C-131. Neutralization is not required elsewhere since all tubes other than the P.A. tubes are of the screen grid type. The instruction book should contain more complete information as to the best means for arriving at optimum neutralization adjustments. It may prove necessary to re-neutralize the circuit when tubes are changed or in the event the setting of the neutralizing capacitor is accidentally changed. During the process of shipment the neutralizing capacitor became unlocked and had to be re-set prior to tests. It is considered that a more positive locking means for the neutralizing capacitor should be provided.

110. Paragraph 3-10. The design of the circuits is such that all tubes cease to oscillate when the key is open. Observations made at keying speeds ranging up to 100 words per minute indicated that all R.F. emission ceased when the key was open.

111. Paragraph 3-11. The frequency range of the transmitter is divided into seven bands which may be selected by means of tap switches "A", "C" and "E" located on the front panel. In the case of the Master Oscillator and Intermediate Power Amplifier, the same positions of their respective switches are employed in tuning to a given frequency. The Power Amplifier band switch does not always follow in like manner for its setting is influenced to some extent by the antenna constants into which the equipment is operating.

(a) Table No. 45 summarizes overlap data taken in connection with the master oscillator circuit. It will be noted that the specification requirements of 3%, calculated in the manner set forth in paragraph 3-11-2 of the governing specifications, are complied with throughout the entire band.

(b) Table No. 46 covers overlap data as applied to the Intermediate Power Amplifier Circuit. Satisfactory agreement with the requirements of the specifications is shown.

(c) Table No. 47 lists the data obtained in connection with the power amplifier circuit. Compliance with the governing specifications is demonstrated.

(d) No tabulated data are presented covering the overlap characteristics of the antenna circuit. The antenna circuit was adjusted for operation into a wide variety of constants as called for by the governing specifications throughout the entire frequency range of the specifications. Satisfactory adjustments could be obtained in all instances. However, as pointed out in paragraph 87(h) above, an increase in the value of the antenna loading coil would be beneficial when operating into antennas of low capacity.

apparently defective compensating capacitor. This unit was painted with glyptol and measured before being installed. The measurements indicated a "Q" of 1000 at 700 KC. An additional spare compensating capacitor was also furnished by the contractor and measurements indicated "Q"s of 852 at 350 KC and 904 at 700 KC. In an attempt to obtain additional data, a compensating capacitor which had been in service for over a year in the Model XTAJ-6 transmitter (General Electric Company, manufacturer) was subjected to measurements. This unit was found to possess a "Q" of 863 at 350 KC and 911 at 700 KC. These latter results indicate that capacitors of this type can withstand aging without deleterious effect. (Verbal information was later received from the contractor that the original capacitor had been carefully examined at the factory and was found to contain a flaw. A crack had appeared in the dielectric which apparently became progressively worse with time and accounted for the erratic operation.)

(h) The replacement capacitor which showed a "Q" of 1000 was then installed in the master oscillator circuit. After this had been accomplished the test shown in Table No. 33 was conducted. Comparison with previous two hour locked key tests at 200 KC reveals immediately that the operation of the equipment with respect to frequency stability had been greatly improved. The frequency change during the first five minutes was only 3 cycles and the drift during the remainder of the two hour test was only 5 cycles.

(i) The conclusions drawn from this series of tests and investigations indicate that the Model XTAQ-5 equipment performs satisfactorily and the frequency drifts remain well within the limits imposed by the governing specifications when a normal compensating capacitor is used. It is further indicated that extreme care must be exercised in the inspection of these units before they are placed into service.

102. Paragraph 3-7-11. Change from Key Locked to Intermittently Keyed Condition. Table No. 36 contains the results of tests conducted in conformity with this paragraph of the specifications. The equipment complies fully with the specification requirements. It will be noted that improved operation results when the filaments remain lighted.

103. Paragraph 3-7-12. Change from Continuously Keyed to Intermittently Keyed Condition. As illustrated in Table 37 the equipment complies with the requirements of the specifications, the maximum frequency changes noted being 0.0058% whereas the specification limit is 0.01%.

104. Paragraph 3-7-13. Inclination Test. Tables No. 38 and 39 show the results of inclination tests conducted at 200 KC. while Plates 6 and 7 show these data in graphic form. Tables 40 and 41 and Plates 8 and 9 show similar data obtained at 600 KC. It will be noted that at 200 KC

units. Access to these boards is provided by doors (interlocked) in the front panel. The bottom edges of the terminal boards are 5-3/8" above the deck. The arrangement is such that all cables may enter the transmitter on the same deck level and may be introduced on either the right or left hand sides. The clearance space under the transmitter for cable access is 4-3/16". Suitable lugs were provided for connection of external wiring. Two types of lugs were provided. For use with the screw type terminal boards, cup lugs were provided and for the stud type of terminal board, a flat type of lug was provided. Both types were satisfactory. While the cup type of lug is one which may be used without solder, it was noted that all cables provided with this type of lug were carefully soldered.

(4) The renewal of vacuum tubes and adjustment of relays and other auxiliaries may be accomplished through access doors in the front panel.

(5) The keying relay is mounted behind the access door provided in the upper left hand section of the panel. Contact operation may be viewed through the door perforations.

(6) The antenna lead connects at the top (through the top shield) to a suitable terminal. (See paragraph 87(f) of this report for a complete description of the antenna terminal facilities provided.)

141. Paragraph 3-36. The access doors, sides, back and top of the transmitter are provided with perforations 3/8" in diameter with 424 holes per square foot. The top shields are secured by means of round head machine screws while knurled head nuts are used to secure the side shields, which are readily detachable. Inspection revealed that five of the knurled head fasteners will come off if given a little more twist than usual. Precautions should be taken to insure adequate protection against this defect. Additionally, one of the shield securing studs can be screwed out of the frame. All studs should be securely staked into position. The maximum length of any detachable shield is 40".

142. Paragraph 3-37. No access doors are employed on the sides of the transmitter, all access doors being in the front panel. The doors are provided with rugged continuous type hinges. The hinge plates are non-magnetic but the hinge pin is of magnetic material. Both are plated against corrosion. All doors, except the two bottom doors, are provided with stops to prevent the hinges from being damaged. No stops are required on the bottom doors since they drop forward against the panel and provide better access than they would if stops were provided.

143. Paragraph 3-38. The access doors provided are of suitable dimensions. The size of each door is listed below:

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Access Door to:	Opening Width	Opening Height	Door Size Width	Door Size Height
P.A. Tubes	20"	15"	20-3/8"	15-1/2"
Relays	20	15	20-3/8	15-1/2
IPA and AO tubes	9	4-1/8	9-1/2	4-3/8
MO Tube	9	4-1/8	9-1/2	4-3/8
Term.Bds. 13 and 14	13-1/2	5-1/8	14	5-3/8
Term.Bds. 6,7,8 and 9	13-1/2	5-1/8	14	5-3/8

All doors, except the two which give access to the terminal boards, are provided with perforations. All doors are of the overlapping type of construction.

144. Paragraph 3-39. A suitable type of hand rail, of sturdy construction, is secured to each side of the front panel. Relevant dimensions are as follows:

Outside diameter of rail: 1-1/8"
Overall length: 20"
Top of hand rail to deck: 44-5/8"
Side of set to center of rail: 1"
Front panel to center of rail: 1-7/8"

145. Paragraph 3-40. The design of the circuits is such as to prevent high voltage d.c. from reaching the antenna. Condenser C-132 blocks the d.c. from the antenna circuit. If this condenser failed, Drain Coil L-109 would afford additional protection by short circuiting the d.c. supply, causing the protective circuits of the generator to operate. Inductor L-109 also prevents the accumulation of static charges on the antenna except when Control I is on Tap 15, which places the series antenna capacitors in the circuit.

SECTION V

146. Paragraph 5-1. The transmitter, as submitted, is adapted for use with the Navy standard 4-wire remote control circuit. A potential of 110 or 115 volts is used on all relay circuits, some operated with A.C., others on D.C. A.C. power for relay circuits is furnished through transformer T-103. D.C. power is obtained from the 115 volt bias-exciter generator.

147. Paragraph 5-2. The control system furnished provides:

(1) A remote, single pole switch which when closed starts the transmitter and when open shuts down the transmitter.

(2) A system capable of being keyed by a single circuit telegraph key.

(3) The use of one or more indicator lights, 2 CP, 115 volt, Navy Type CS-5, which are connected across the master solenoid.

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148. Paragraph 5-3. All solenoids and relays were subjected to numerous key locked tests for periods as long as 7-1/2 hours without signs of injury or faulty operation.

149. Paragraphs 5-4 and 5-5. Not applicable to the A.C. operated Model XTAQ-5 transmitter.

150. Paragraph 5-6. The keying relay is integral with the transmitter and all monitor and control lines connect to a suitable terminal board in the transmitter. The keying relay adequately controls the emission of the transmitter for telegraphic signalling.

151. Paragraph 5-7. Essentially, the keying control circuit is so arranged that the keying relay will not be energized before the motor generator has attained normal operating speed, and the performance provided is considered satisfactory. However, for information and record it may be pointed out that as the generator voltages rise to normal somewhat after the MG set has attained full speed, it is possible to key the transmitter slightly before it had full power output. The key relay power is furnished by the bias generator and sufficient voltage is present to operate the key relay when this voltage reaches approximately 60 volts. Data are listed below illustrating the time required for voltage build up after starting the equipment. It will be seen that keying could start approximately one second before full output could be realized.

	Time to attain voltage after closing start switch.	
	Half Voltage	Full Voltage
Bias Generator	2.5 sec.	3.5 sec.
M.O. Plate Generator	2.5 sec.	3.5 sec.
Main Plate Generator	2.5 sec.	4.3 sec.

Motor generator reaches full operating speed in approximately 1.8 seconds after closing start switch.

152. Paragraph 5-8. The keying relay operates satisfactorily at speeds up to 100 words per minute. Observations, at various operating speeds, were made by means of a cathode ray oscillograph. Data collected during these tests are present in Table No. 54. The keying relay operates from a source of 115 volts d.c. and the potential is applied through a 625 ohm series resistor. The current drawn by the relay coil is 105 milliamperes; thus the actual potential drop across the relay coil is approximately 50 volts under normal conditions. This is the value of current (105 MA) broken by the remote key, as only the keying relay current passes through it.

153. Paragraph 5-9. An indicator light is provided on the transmitter panel in parallel with the master starting contactor. The indicator is labelled "power" and terminals are provided on Terminal Board 14 for connection of remote control lines. They are numbered 1 to 4 inclusive. Other terminal boards in the transmitter have similar numbering so reference to a wiring diagram is necessary to completely identify the remote control leads. The remote control light functions only when the transmitter is in "Remote" position.

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(3) Degree of Enclosure: Semi-enclosed; drip-proof. (An umbrella type cover added to conventional motor to attain requirements.)
(4) Method of Cooling: Self-ventilated.
(5) Speed Classification: Constant.
(6) Duty Classification: Continuous.
(7) Frequency: 60 cycles.
(8) Voltage: 440/220 volts, 3 phase.
(9) Classification (3-phase): Squirrel cage induction.
(10) Sub-classification, squirrel cage induction motors: Normal torque, normal starting current.
(11) Type of bearings: Ball bearings.
(12) Rated speed: 1750 RPM.
(13) Rated H.P.: 10 H.P.

186. Paragraph 6-34. The data on the alternating current controller are listed below:

(1) Ambient Temperature of reference: 50 degrees Centigrade.
(2) Class of Insulation: Not determined.
(3) Degree of Enclosure: Protected drip-proof.
(4) Degree of Shock-proofness: Withstood shock and vibration tests to which equipment was subjected as a whole.
(5) Control Functions: Motor starting.
(6) Type of Construction: Magnetic controller.
(7) Operation of Control Circuit: Semi-automatic.
(8) Type of Master Switch: Toggle.
(9) Proximity of Master Switch: Distant master control.
(10) Duty Period: Heavy starting (this is an across-line type of starter.
(11) Kinds of protection:
  (a) Main line fuses in two leads.
  (b) Thermal overload protection.
  (c) Under voltage release if voltage drops to 350 volts (approx); if voltage is restored to normal motor starts again immediately.
(12) Starter Dimensions: (See Table 51).

187. Paragraph 6-35. The high voltage filters (capacitors) are located within the transmitter frame.

188. Paragraph 6-36. The doors of the starter cabinet are mounted on hinges with removable pins. The pins are secured against loss by means of short chains.

189. Paragraphs 6-37 to 6-66. These paragraphs do not apply to motor generator type of power equipments.

190. General comments on power equipment. The following comments in connection with the motor generator equipment are the result of detailed inspection and observations during the course of the tests conducted:

(1) The motor has a skeleton frame of 3/16" pressed sheet steel. Motor supports are 1/4" pressed steel welded to frame. End bells are 3/16" pressed steel. Bearing housings are

was encountered in understanding the explanations and that while the new system might be superior from a manufacturing point of view, it was felt that it offered no advantage to the man who was installing and servicing the equipment.

192. The changing requirements of the specifications under which transmitting equipments are constructed and the new forms of construction which are employed necessitate, it is believed, that certain concise and definite statements appear in the instruction book. With constantly shifting personnel of varying degrees of experience and ability, situations may arise in Service where full advantage of improvements incorporated in the equipment may not be realized. Explanations and instructions covering items of the following nature should be included under the section devoted to maintenance:

(a) Instructions for the removal of the Master Oscillator compartment; leads to be disconnected, precautions to be observed, etc.

(b) Instructions for the removal of the Intermediate Power Amplifier compartment. When removing the IPA unit from the transmitter frame, if the IPA and Audio Oscillator tubes were left in place, it would be possible to injure these tubes if the unit were tilted upward slightly during the removal process. Additionally, if the IPA unit were withdrawn quickly and carelessly, the insulated stud which projects through the bottom could be damaged. These points should be stressed in the instruction books.

(c) Methods to be employed when readjusting the Power Amplifier neutralizing circuit.

(d) Attention to be directed to and instructions given regarding the use and operation of the calibration facilities supplied.

(e) Attention directed to the fact that meters can be removed from the equipment through the front panel.

(f) Attention directed to the fact that switches are so mounted that they can be removed from the front panel.

(g) Call attention to the fact that the locking devices supplied should be used regularly after each change in transmitter settings.

(h) Describe the purpose and use of the filament (M.O.) stand-by switch.

193. Under the section of the instruction book devoted to installation procedure, definite instructions should be given covering all points which the designing engineer considers necessary to permit full utilization of all the features which are incorporated in the equipment. For example:

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(a) Definite instructions and warnings relative to the importance of avoiding sharp bends, marred places, etc. in connection with the antenna system in order to prevent corona, brushing, and so forth. (Call attention to corona shields provided.)

(b) Include complete instructions covering the fact that four-wire and six-wire alternative control systems are provided.

(c) Emphasize the necessity of keeping shields tight; the importance of maintaining good contact between frame sections, ground, etc. in order to realize maximum power output and frequency stability.

194. The section devoted to adjustment and calibration should be particularly complete with respect to the best procedure for obtaining optimum antenna circuit adjustments. It is realized that definite data cannot be presented due to the large variation of antenna constants encountered but every detail of adjustment which is helpful should be listed. For example, in the XTAQ-5, proper manipulation of the power amplifier variometer is required in order to obtain optimum antenna coupling. This should be explained fully and in detail.

195. The schematic diagram furnished has numerous numerical notations which refer to terminal boards, giving the number of the board and the terminal number. These are distinctly helpful, but an explanation should appear on the drawing to indicate what these notations mean and how to make use of them. The schematic diagram as originally submitted lacked a connection between terminal 5 of Switch S108 and terminal 4 of Switch S107. This should be corrected. In connection with Switch S105, the right hand section of this switch should be drawn to show the "off" positions for taps 13, 14 and 15.

196. Plates 12 to 37 inclusive are various views of the XTAQ-5 transmitting equipment. Attempts were made to show as much detail as possible and with this end in view the transmitter was dismantled to as great an extent as was reasonable. Shields were removed, the two units which comprise the complete assembly were separated and the removable master oscillator and intermediate power amplifier units were withdrawn. In addition, close-up views of important component parts are presented.

197. A summary of the defects noted and such items as do not comply with the requirements of the governing specifications are listed below. The numerals enclosed in parentheses refer to the paragraphs of this report under which these items are discussed in detail.

(a)(7 and 27) Greater care in packing of motor generators is indicated.

(b)(30d) Resistor clips furnished do not afford sufficiently secure grip on ferrules of resistors.

(c)(32) Interlock contact on control "G" failed to function during tests.

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(d)(34 and 75) Resistance value of Filament Rheostat should be increased.

(e)(41) Insufficient protection afforded by fuses in magnetic controller and filament supply circuits; fuse clips provided are inadequate.

(f)(42) The overload relay protective circuits are not in strict accordance with specification requirements; overload reset devices should be labelled specifically.

(g)(43) 440 volt terminals should be provided with protective covers.

(h)(57) By-pass unit on P.A. Plate voltmeter multiplier is operated at voltage in excess of rating.

(i)(58) Wiring to meter studs not sufficiently flexible to permit withdrawal of meters.

(j)(70) One of the bolts used for securing the two units of the transmitter together should be re-located.

(k)(72) More complete and accurate marking of component parts and terminals is indicated.

(l)(77) The grain or texture of the black wrinkle finish applied to the front panel is not of uniform texture and appearance.

(m)(87) Arc-overs occurred in the antenna circuits of the transmitter; need for additional loading inductance indicated.

(n)(96) Operation of power output control causes frequency shift beyond specification limits.

(o)(97) Tube changes cause frequency changes slightly in excess of specification requirements.

(p)(100) Power decrease during humidity tests is in excess of specification requirements.

(q)(101) Master Oscillator compensating capacitor proved to be defective.

(r)(104) Frequency variations during inclination test in excess of specification requirements, apparently due to front panel construction of M.O. unit.

(s)(109) Locking means provided on neutralizing capacitor not sufficiently secure.

(t)(116) M.O. locking device affects frequency unduly.

(u)(122) R.F. calibration coupling terminals are located in dangerous proximity to high voltage plate terminals.

(v)(135) Certain improvements in wiring technique are indicated.

(w)(138) Additional information should be supplied to indicate the method of connecting transformers.

(x)(141) Several shield securing studs were not firmly anchored.

(y)(159) Efforts should be made to reduce the noise created by the keying relay.

(z)(173) Dowels in motor generator are not of square head type required by the specifications.

(aa)(174) Warning plates on motor generator should be larger in size and conspicuously colored.

(bb)(176) Generator eye-bolt causes the height of the machine to exceed specification limits.

(cc)(179) The protective fuse in bias generator is considered of too high a rating; fuse clips do not securely grip the fuse ferrules.

(dd)(183) Bias ripple slightly in excess of specification requirements.

(ee)(190-(3)) Main plate brushes sparked considerably due to poor fit.

(ff)(190-(4)) Bias/MO Plate generator commutator shows considerable eccentricity.

(gg)(190-(5) and 100) P.A. Plate generator lacks sufficient reserve voltage.

(hh)(190-(6)) Terminal studs of motor have tendency to turn in ceramic terminal board.

(ii)(190-(7)) Bottom cover plates on Bias/MO generator cannot be removed due to interference of securing devices.

(jj)(190-(8)) Magnetic controller provided with insufficient access openings for cables; unused terminal and contactor in cabinet; no warning plate on cover.

(kk)(190(9)) Motor generator failed to start on two different occasions; cause not discovered.

(ll)(191 to 195 incl.) Recommendations submitted relative to wiring diagrams and instruction books.

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CONCLUSIONS

198. The general construction of the Model XTAQ-5 radio transmitting equipment reflects excellent design, construction and assembly. Excellent materials have been employed and the resultant operating characteristics and appearance of the equipment are in close agreement with the requirements as set forth in the governing contract and specifications. Ease of access to vital portions of the equipment has been improved as compared with earlier models of similar transmitters and the master oscillator circuit and intermediate amplifier circuit can be removed entirely from the general assembly with reasonable facility.

199. The power output requirements of the specifications have been complied with over the entire frequency range and the output circuits are such that the equipment operates into a wide variety of antenna constants with reasonable ease and security.

200. The frequency stability and accuracy of the equipment comply with the specified requirements in all but a few minor instances and these deficiencies are of such a nature that they should readily lend themselves to corrective action.

201. In general, the equipment operated in a safe and satisfactory manner during the course of the tests to which it was subjected. These tests demonstrated, however, that certain specific items require some further consideration in order to attain maximum reliability and protection against overloads and misadjustments. Fuses, protective relays, warning plates, provisions for suppressing arcs and a greater degree of security in the anchoring of electrical cables require further attention.

202. With proper corrective action applied to the various deficiencies listed, the Model XTAQ-5 equipment should be capable of meeting the rigorous requirements of the Naval Service.

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Table 1

Model XTAQ-5 Transmitting Equipment
Check of Meters Used in Transmitter

Test as per paragraph 2-2 of Specifications RE 13A 351J

Ammeters in the transmitter were checked against Weston Model 45 Millivoltmeter #41999 and Weston Rotary Shunt Type 8, No. 289.

GE Type DO41, Model 8DO41 #82921 (M-103)	True Current (standard)
4.0 Amps.	3.92 Amps
3.0	2.86
2.0	1.9
1.0	0.97
GE Type DO41, Model 8DO41 #82918 (M-107)	
2.0 Amps.	2.12 Amps.
1.5	1.56
1.0	1.03
0.5	0.52
GE Type DO41, Model 8DO41 #82919 (M-106)	
2.0	2.14
1.5	1.57
1.0	1.04
0.5	0.52

Voltmeters in the transmitter were checked against Weston Model 45, Serial 40640 (2500 volt range used).

GE #82920, 0-3000 V dc	Standard
0.12 KV	140 volts
0.98	965
2.0	1980
2.27	2250
2.46	2455

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Table 2

Model XTAQ-5 Transmitting Equipment
Check of Resistors Used

Test as per paragraph 2-2-1 of Specifications RE 13A 351J

Res. No.	Rated Ohms	Style	Type No.	Permitted by Specs. Watts	Volts	Max.R	Measured Watts	Volts	Res
R-101	25,000	C	E	28	775	25,000	0.048	35	25,60
R-102	30,000	B	63160E	60	1200	50,000	2.99	300	30,10
R-103	5,000	C	63026E	28	775	25,000	2.84	120	5,07
R-104	5,000	C	63026E	28	775	25,000	0.93	69	5,10
R-105	7,000	A	63214E	80	1650	75,000	13.6	310	7,06
R-107	400	A	63195E	80	1650	75,000	9.1	61	40
R-108	400	A	63195E	80	1650	75,000	8.92	60	40
R-109	400	A	63195E	80	1650	75,000	8.7	59	40
R-110	400	A	63195E	80	1650	75,000	8.92	60	40
R-111	400	A	63195E	80	1650	75,000	9.0	60	40
R-112	400	A	63195E	80	1650	75,000	8.9	60	40
R-113	500	A	E	80	1650	75,000	16.2	90	49
R-114	50	(PA grid Supp. resistor - not Navy Std.)							5
R-115	50	(PA grid Supp. resistor - not Navy Std.)							54.
R-116	15,000	A	63218E	80	1650	75,000	26.0	620	14,78
R-117	15,000	A	63218E	80	1650	75,000	26.7	640	15,32
R-118	25,000	C	E	28	775	25,000	1.6	200	24,80
R-119	450	B	63134E	60	1200	50,000	8.15	60	44
R-120	625	B	63609E	60	1200	50,000	6.95	65	61
R-121	3	A	63172E	80	1650	75,000	33.3	10	
R-122	10,000	A	63217E	80	1650	75,000	2.68	162	9,80
R-123	35,000	A	63221E	80	1650	75,000	15.6	750	36,10
R-124	2	E	63243E	10	350	6,000	(key supp.)		2.0
R-125	35,000	A	63221E	80	1650	75,000	14.6	730	36,40
R-126	35,000	A	63221E	80	1650	75,000	14.1	700	34,60
R-127	10,000	A	63217E	80	1650	75,000	18.0	420	9,81
R-128	300	A	63193E	80	1650	75,000	20.9	78	29
R-129	5,000	(See Note No. 1)							4,94
R-130	4	(See Note No. 2)							4.0
R-131	300	(See Note No. 3)							30
R-132	660	(See Note No. 4)							66
R-133	30	B	63117E	60	1200	50,000	10.1	17	28.
R-134	7,000	B	63151E	60	1200	50,000	1.55	105	7,11
R-135	625	B	63609E	60	1200	50,000	0.46	16	61
R-136	450	B	63134E	60	1200	50,000	0.11	7	44

The voltages across the resistors were measured in the manner which produced the greatest potential drop, i.e., key up, key down, CW or MCW, and the voltages recorded are the highest obtained under the various conditions.

Resistors used are of Ward-Leonard manufacture.

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Table 2 (Cont.)

* Denotes that this resistor is within the specification limit of 5% tolerance.

Note No. 1.

R-129 is the audio oscillator output control
Ohmite variable resistor, Model J
Maximum Amps: 0.1
Diameter: 2-1/4"
Resistance: 5,000 ohms

Note No. 2.

R-130 is the filament rheostat (ribbon wound)
Ohmite variable resistor, Model N
Maximum amps: 8.6
Resistance: 4 ohms
Spec. No. 0653
Insulated for 600 volts
Diameter: 6"

Note No. 3.

R-131 is the bias and M.O. plate generator field rheostat
Ohmite variable resistor, Model N
Maximum Amps: 1.0
Resistance: 300 ohms
Spec. No. 0664
Insulated for 600 volts
Diameter: 6"

Note No. 4.

R-132 is the PA plate generator field rheostat
Ohmite variable resistor, Model R
Maximum Amps: 0.145
Resistance: 660 ohms
Insulated for 600 volts
Diameter: 8"

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Table 3

Model XTAQ-5 Transmitting Equipment
List of Controls and Meters

Data as per paragraph 2-23 of Specifications RE 13A 351J

Control Letter	Control Marking	Dial Marking	Direction of rotation
A	M O Band Change	7 points	Clockwise
B	M O Tuning	0-900	Clockwise
C	IPA Band Change	7-points	Clockwise
D	IPA Tuning	0-100	Clockwise
E	P A Band Change	7-points	Clockwise
F	P A Tuning	0-100	Clockwise
G	Antenna Coupling	4-points	---
H	Antenna Tuning	0-100	Clockwise
I	Ant. Band Change	15-points	Clockwise

- - - - - - -

Test Key	(Down: Momentary contact (Horizontal: Off (Up: On
Control Switch	(Horizontal: "Remote" (Down: "Local"
MG Switch	(Down: "Stop" (Up: "Start"
MO Filaments	(Down: "Transformer" (Up: "Line"
Tone Switch	(Down: "MCW" (Up: "CW"
Emergency Switch	(Down: "Stop" (Up: "Operate"
Tune-Operate Sw.	(Tuning Step No. 1 (Tuning Step No. 2 (Operate

Bias and MO Plate Voltage Rheostat
PA Plate Voltage Rheostat
Filament Voltage Rheostat
Frequency Meter Audio Output Jack
Overload Relay re-set for PA circuit
Overload Relay re-set for MO and IPA circuits
Tuning Chart
Power Indicator Light - red
Bias Indicator Light - blue
Plate Indicator Light - red

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Table 3 (Cont.)

METERS

MO Plate Current; 0-100 MA
IPA Plate Current; 0-300 MA
1st PA Plate Current; 0-2 Amps.
2nd PA Plate Current; 0-2 Amps.
PA Total Plate Current; 0-4 Amps.
AO Plate Current; 0-300 MA
Antenna Current; 0-50 Amps. R.F.
MO Plate Voltage; 0-4 Kilovolt
Bias Voltage; 0-150 Volts
Plate Voltage; 0-3 Kilovolts
Filament Voltage; 0-15 Volts AC
Filament Hours, Time Meter; 99999 hours.

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Table 4

Model XTAQ-5 Transmitting Equipment
Name Plate Data

Data as per paragraph 2-26 of Specifications RE 13A 351J

TRANSMITTER UNIT

(1) (Size: 4" wide; 4-1/2" high)

Radio Transmitting Equipment
Model XTAQ-5 Serial X-95
Frequency Range: 175 to 600 Kcs
Output: 2 Kw Supply: 440 V 3 phase 60 cycles

Equipment consists of following units:
Type CG - Radio Transmitter
Type CG - Magnetic Controller
Type CG - A. C. Motor
Type CG - D. C. Generator,
Type CG - D. C. Generator

See Patent Data Plate
Navy Department
Bureau of Engineering
Contractor: General Electric
Schenectady, N. Y. Made in U.S.A.
Contract NOs-62958 Contract Date 21 Sept. 1938

(2) (Size: 3" wide; 2" high)

Radio Transmitter
Type CG -
Frequency Range: 175 to 600 Kcs
Weight: 1070 lbs. Serial X95
Manufactured for:
Navy Department
Bureau of Engineering
by
General Electric
Schenectady, N. Y. Made in U.S.A.
Contract NOs-62958 Contract Date: 21 Sept. 1938

(3) (Size: 3" wide; 3/4" high)

Date Accepted by Government: 5-13-39
Date Placed in Service:
See Instruction Book Regarding Guarantee.

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MOTOR GENERATOR UNIT

(4) (Size: 1-1/2" x 3")
General Electric
Model No. 12A823

(5) (Size: 2" x 3")
Motor-Generator Set
Power Supply 440 volts 3-phase, 60 cycles
Weight: 1164 lbs. Serial X95
A unit of Model XTAQ-5 Equipment
Manufactured for:
Navy Department
Bureau of Engineering
by
General Electric
Schenectady, N. Y. Made in U.S.A.
Contract NOs-62958 Contract Date: 21 Sept. 1938

(6) (Size: 3-7/8" x 1-1/2")
General Electric
Motor - A.C.
Model 5K324B408
Type K
Frame 324
H.P. 10
Cycles - 60
Amps. 13/26 Volts 440/220
Phase 3
Full Load Speed - 1750
No. AT1195
Date: 1939
Continuous duty 40° C.

(7) (Size: 3-7/8" x 1-1/2")
General Electric
Generator: D.C.
Model 49A524 Frame 75
Winding: Compound
Volts: 2250 KW: 5.2 Amps: 2.3
Speed: 1750
No. 1753945
Continuous duty 40° C.
Date: 1939
Excitation at 115 volts

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Table 4 (Cont.)

(8) (Size: 3-7/8" x 1-1/2")
General Electric
Model 5BY111A1
Compound Winding
Type BY
Frame 111
750/115 volts
0.325 Kw
0.125/2 Amps
1750 RPM
No. 1753881
Continuous duty at 40° C.
Date: 1939

(9) (Size: 2-1/2" x 1-1/8")
This eyebolt must not be used when hoisting the entire set. Use only for hoisting the individual unit.

U. S. Navy
(Motor and PA Generator provided with these nameplates.)

(10) (Size: 2-1/2" x 1-1/8")
Lubricate this machine with grease which is in accordance with Navy Spec. 14G1

U. S. Navy
(Motor, 2250 volt and 750/115 volt generators are equipped with these nameplates.)

(11) (Size 1" x 1-7/8")
High Voltage
Do not operate this machine with cover off.

(Both generators equipped with this nameplate.)

(12) (Size 1" x 2-1/16")
ROTATION
(arrow)
(This nameplate secured to 750/115 volt gen.)

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MAGNETIC CONTROLLER

(13)

(Size: 1-1/2" x 3")
General Electric
Magnetic Controller
No. 266211 Cat. 6930064
Service -
CR 5140-B4 HP 10
Volts 440 Amps. - Cyc. 60 3 Ph.
Year of Manufacture: 1939; Contract:
Schenectady, N. Y., U.S.A.

(14)

(Size 2" x 3")
Magnetic Controller
Type CG -
10 HP 440 volts 3 phase 60 cycles
Weight: 76.25 lbs. Serial X95
A unit of Model XTAQ-5 Equipment
Manufactured for:
Navy Department
Bureau of Engineering
by
General Electric
Schenectady, N. Y. Made in U.S.A.
Contract NOs-62958 Contract Date: 21 Sept. 1938

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Table 5

Model XTAQ-5 Transmitting Equipment
Determination of Power Output

Test as per paragraph 3-3 of Specifications RE 13A 351J

Column No:	1	2	3
Control or Meter	175 Kc	175 Kc	175 Kc
A	1	1	1
B	182	182	182
C	1	1	1
D	31.5	32	32
E	2	2	2
F	58	50	44
G	2	3	3
H	32.5	22	22
I	1	1	1

	CW	MCW	CW	MCW	CW	MCW
Spec. Ant. Res.	3.0	3.0	7.0	7.0	5.0	5.0
Dummy Ant. R (dc)	2.93	2.93	6.95	6.95	5.35	5.35
Cap. loss Res.	0.4	0.4	0.4	0.4	0.4	0.4
Total Dummy Ant. R	3.33	3.33	7.35	7.35	5.75	5.75
Spec. Ant. Cap.	900	900	900	900	900	900
Measured Ant. Cap.	919	919	919	919	919	919
M.O. Ip (MA)	38	39	38	39	38	38
I.P.A. Ip (MA)	81	46	81	47	80	45
#1 P.A. Ip (Amps)	1.1	0.8	1.07	0.82	1.09	0.80
#2 P.A. Ip (Amps)	1.04	0.79	1.02	0.82	1.04	0.80
Total P.A. Ip (Amp)	2.1	1.6	2.08	1.68	2.1	1.65
Ant. I (set) (Amps)	27.8	19.5	21.0	15.0	23.0	16.0
Bias Volts	116	117	115	115	115	114
M.O. Ep	760	760	750	750	750	740
P.A. Ep	2260	2290	2250	2260	2260	2250
Fil. volts	11	11	11	11	11	11
Aud. Osc. Ip (MA)		127		126		126
% Mod. Pos. Peaks		-		-		-
Neg. Peaks		84		82		78
% MCW to CW Power		47.3		53		51.6
Ant. Cur. External	23.4	16.1	17.2	12.5	19.5	14.0
Watts Output	1825	863	2170*	1150*	2180	1127
Watts Req. by Specs.	1760	880	2300	1150	2170	1085

* Note: See Column No. 1 of Table No. 6 for repeat test under similar conditions wherein the specified power output is obtained.

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Table 6

Model XTAQ-5 Transmitting Equipment
Determination of Power Output

Test as per paragraph 3-3 of Specifications RE 13A 351J

Column No.	1		2		3	
Control or Meter	175 Kc		175 Kc		175 Kc	
A	1		1		1	
B	182		182		182	
C	1		1		1	
D	32		32		32	
E	2		2		2	
F	50		41		50	
G	3		3		3	
H	22		46		46	
I	1		7		7	
	CW	MCW	CW	MCW	CW	MCW
Spec.Ant.Res.	7.0	7.0	5.0	5.0	7.0	7.0
Dummy Ant. R(dc)	6.9	6.9	5.35	5.35	7.13	7.13
Cap. loss Res.	0.4	0.4	0.24	0.24	0.24	0.24
Total Dummy Ant. R	7.3	7.3	5.59	5.59	7.37	7.37
Spec. Ant. Cap.	900	900	1510	1510	1510	1510
Measured Ant. Cap.	919	919	1560	1560	1560	1560
M.O. Ip (MA)	38	39	38	39	38	39
I.P.A. Ip (MA)	80	50	82	45	80	45
#1 P.A. Ip (Amps)	1.09	0.85	1.1	0.85	1.09	0.86
#2 P.A. Ip (Amps)	1.03	0.84	1.05	0.85	1.04	0.85
Total P.A. Ip (Amp)	2.1	1.70	2.1	1.72	2.1	1.75
Ant. I (set) (Amps)	21.5	16.0	24.5	18.0	21.9	16.0
Bias Volts	115	115	115	115	115	115
M.O. Ep	750	750	750	750	750	750
P.A. Ep	2270	2300	2270	2280	2270	2270
Fil. Volts	11	11	11	11	11	11
Aud. Osc. Ip (MA)		130		130		129
% Mod. Pos. Peaks		-		-		-
Neg. Peaks		76		75		75
% MCW to CW Power		53.4		56.0		55.6
Ant.Cur.External	17.9	13.1	21.1	15.8	18.8	14.0
Watts Output	2340	1250	2490	1395	2600	1445
Watts Req. by Specs.	2300	1150	2470	1235	2550	1275

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Table 7

Model XTAQ-5 Transmitting Equipment
Determination of Power Output

Test as per paragraph 3-3 of Specifications RE 13A 351J

Column No:	1		2		3	
Control or Meter	175 Kc.		175 Kc.		175 Kc.	
A	1		1		1	
B	182		182		182	
C	1		1		1	
D	32		32		32	
E	2		2		2	
F	53		69		24	
G	2		1		2	
H	54		62		24	
I	7		7		5	
	CW	MCW	CW	MCW	CW	MCW
Spec.Ant.Res.	3.0	3.0	1.0	1.0	1.0	1.0
Dummy Ant. R (dc)	3.11	3.11	0.8	0.8	0.806	0.806
Cap. loss Res.	0.24	0.24	0.24	0.24	0.31	0.31
Total Dummy Ant. R	3.35	3.35	1.04	1.04	1.116	1.116
Spec.Ant.Cap.	1510	1510	1510	1510	1180	1180
Measured Ant.Cap.	1560	1560	1560	1560	1179	1179
M.O. Ip (MA)	38	38	38	40	38	39
I.P.A. Ip (MA)	80	45	80	46	84	48
#1 P.A. Ip (Amps)	1.08	0.80	1.1	0.8	1.09	0.72
#2 P.A. Ip (Amps)	1.02	0.80	1.04	0.79	1.04	0.71
Total P.A. Ip (Amp)	2.08	1.62	2.1	1.6	2.1	1.42
Ant. I (set)(Amps)	29.5	20.9	40.8	28.0	38.2	26.0
Bias Volts	115	114	115	116	115	115
M.O. Ep	750	740	750	760	750	750
P.A. Ep	2270	2260	2270	2300	2260	2290
Fil. Volts	11	11	11	11	11	11
Aud.Osc. Ip (MA)		126		130		130
% Mod. Pos. Peaks		-		-		-
Neg. Peaks		74		76		82
% MCW to CW Power		50.2		46.9		44.4
Ant.Cur. External	25.8	18.3	36.5	25.0	33.3	22.2
Watts Output	2230	1120	1385	650	1240	550
Watts Req. by Specs.	2040	1020	1240	620	1000	500

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Table 8

Model XTAQ-5 Transmitting Equipment
Determination of Power Output

Test as per paragraph 3-3 of Specifications RE 13A 351J

Column No:	1		2		3	
Control or Meter	175 Kc.		215 Kc.		215 Kc.	
A	1		2		2	
B	182		310		310	
C	1		2		2	
D	32		33		33	
E	2		4		4	
F	61		50		55	
G	1		1		1	
H	38		61		61	
I	8		10		10	
	CW	MCW	CW	MCW	CW	MCW
Spec. Ant. Res.	0.7	0.7	0.6	0.6	1.1	1.1
Dummy Ant. R (dc)	0.515	0.515	0.515	0.515	0.97	0.97
Cap. loss Res.	0.211	0.211	0.178	0.178	0.177	0.177
Total Dummy Ant. R	0.726	0.726	0.693	0.693	1.147	1.147
Spec. Ant. Cap.	1725	1725	1760	1760	1600	1600
Measured Ant. Cap.	1670	1670	1670	1670	1670	1670
M.O. Ip (MA)	38	40	36	38	36	37
I.P.A. Ip (MA)	85	50	85	50	82	48
#1 P.A. Ip (Amps)	1.07	0.76	1.1	0.76	1.1	0.81
#2 P.A. Ip (Amps)	1.02	0.75	1.04	0.76	1.05	0.80
Total P.A. Ip (Amp)	2.09	1.52	2.1	1.52	2.1	1.62
Ant. I (set) (Amps)	46.0	32.2	50.0	33.8	44.0	30.8
Bias Volts	115	116	115	116	115	114
M.O. Ep	750	760	750	760	750	750
P.A. Ep	2270	2300	2270	2300	2270	2270
Fil. Volts	11	11	11	11	11	11
Aud. Osc. Ip (MA)		130		130		127
% Mod. Pos. Peaks		-		-		-
Neg. Peaks		80		87		78
% MCW to CW Power		47.8		46		49.6
Ant. Cur. External	41.2	28.5	44.4	30.1	38.65	27.2
Watts Output	1235	590	1365	628	1710	848
Watts Req. by Specs.	1170	585	1100	550	1380	690

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Table 9

Model XTAQ-5 Transmitting Equipment
Determination of Power Output

Test as per paragraph 3-3 of Specifications RE 13A 351J

Column No:	1		2		3	
Control or Meter	215 Kc.		215 Kc.		215 Kc.	
A	2		2		2	
B	310		310		310	
C	2		2		2	
D	32.5		32.5		32	
E	4		4		4	
F	50		48		39	
G	3		2		2	
H	52		58		58	
I	7		7		7	
	CW	MCW	CW	MCW	CW	MCW
Spec.Ant.Res.	9.0	9.0	3.0	3.0	2.0	2.0
Dummy Ant. R (dc)	9.2	9.2	3.0	3.0	1.65	1.65
Cap. loss Res.	0.3	0.3	0.3	0.3	0.3	0.3
Total Dummy Ant. R	9.5	9.5	3.3	3.3	1.95	1.95
Spec. Ant. Cap.	1000	1000	1000	1000	1000	1000
Measured Ant. Cap.	972	972	972	972	972	972
M.O. Ip (MA)	36	36	36	36	36	36
I.P.A. Ip (MA)	85	50	85	50	85	48
#1 P.A. Ip (Amps)	1.1	0.88	1.1	0.83	1.1	0.80
#2 P.A. Ip (Amps)	1.05	0.80	1.05	0.82	1.05	0.79
Total P.A. Ip (Amp)	2.1	1.75	2.1	1.68	2.10	1.60
Ant. I (set)(Amps)	20	15	30.2	21	35.5	24.8
Bias Volts	115	112	115	114	115	114
M.O. Ep	750	740	750	745	750	740
P.A. Ep	2270	2250	2270	2270	2270	2250
Fil. Volts	11	11	11	11	11	11
Aud. Osc. Ip (MA)		125		127		126
% Mod. Pos. Peaks		-		-		-
Neg. Peaks		79		82		78
% MCW to CW Power		54.4		50.4		49.2
Ant. Cur. External	16.3	12.0	25.4	18.0	30.1	21.1
Watts Output	2520	1370	2125	1070	1765	868
Watts Req. by Specs.	2460	1230	1920	960	1620	810

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Table 10

Model XTAQ-5 Transmitting Equipment
Determination of Power Output

Test as per paragraph 3-3 of Specifications RE 13A 351J

Column No:	1	2	3
Control or Meter	355 Kc.	355 Kc.	355 Kc.
A	5	5	5
B	61	61	61
C	5	5	5
D	15	15	14
E	6	6	6
F	39	56	54
G	2	1	2
H	66	67	66
I	12	12	12

	CW	MCW	CW	MCW	CW	MCW
Spec.Ant.Res.	2.0	2.0	0.8	0.8	4.0	4.0
Dummy Ant. R (dc)	1.65	1.65	0.698	0.698	4.11	4.11
Cap. loss Res.	0.155	0.155	0.155	0.155	0.155	0.155
Total Dummy Ant. R	1.805	1.805	0.853	0.853	4.265	4.265
Spec. Ant. Cap.	1150	1150	1150	1150	1150	1150
Measured Ant. Cap.	1150	1150	1150	1150	1150	1150
M.O. Ip (MA)	34	35	34	35	34	34
I.P.A. Ip (MA)	82	60	105	56	82	58
#1 P.A. Ip (Amps)	1.07	0.9	1.1	0.82	1.1	0.91
#2 P.A. Ip (Amps)	1.02	0.9	1.05	0.80	1.05	0.90
Total P.A. Ip (Amp)	2.05	1.82	2.1	1.75	2.1	1.85
Ant. I (set)(Amps)	39.0	31.0	50.0	37.5	30.5	23.0
Bias Volts	115	116	115	115	115	114
M.O. Ep	750	750	750	750	750	740
P.A. Ep	2270	2270	2270	2270	2270	2260
Fil. Volts	11	11	11	11	11	11
Aud. Osc. Ip (MA)		127		127		126
% Mod. Pos. Peaks		-		-		-
Neg. Peaks		73		75		75
% MCW to CW Power		61		55.4		59
Ant. Cur. External	32.0	25.0	41.5	30.9	24.4	18.6
Watts Output	1850	1127	1470	815	2540	1475
Watts Req. by Specs.	1650	825	1030	515	2180	1095

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Table 11

Model XTAQ-5 Transmitting Equipment
Determination of Power Output

Test as per paragraph 3-3 of Specifications RE 13A 351J

Column No:	1		2		3	
Control or Meter	355 Kc.		355 Kc.		355 Kc.	
A	5		5		5	
B	61		61		61	
C	5		5		5	
D	16		14		15	
E	6		6		6	
F	55		51		49	
G	1		3		1	
H	51		64		61	
I	13		12		13	
	CW	MCW	CW	MCW	CW	MCW
Spec.Ant.Res.	1.0	1.0	7.0	7.0	0.8	0.8
Dummy Ant. R (dc)	0.97	0.97	7.5	7.5	0.69	0.69
Cap. loss Res.	0.106	0.106	0.155	0.155	0.092	0.092
Total Dummy Ant. R	1.076	1.076	7.655	7.655	0.782	0.782
Spec. Ant. Cap	1700	1700	1150	1150	2000	2000
Measured Ant. Cap.	1670	1670	1150	1150	1975	1975
M.O. Ip (MA)	34	35	34	37	34	34
I.P.A. Ip (MA)	105	58	105	60	106	60
#1 P.A. Ip (Amps)	1.1	0.9	1.1	0.95	0.91	0.74
#2 P.A. Ip (Amps)	1.06	0.89	1.05	0.92	0.86	0.72
Total P.A. Ip (Amp)	2.1	1.8	2.1	1.88	1.6	1.45
Ant. I (set)(Amps)	48.5	37.0	25	20	52	39.1
Bias Volts	115	115	115	115	115	114
M.O. Ep	750	750	750	750	750	740
P.A. Ep	2270	2270	2270	2280	2270	2270
Fil. Volts	11	11	11	11	11	11
Aud. Osc. Ip (MA)		130		129		126
% Mod. Pos. Peaks		-		-		-
Neg. Peaks		72		74		67
% MCW to CW Power		59.4		62.6		58.6
Ant. Cur. External	42.5	32.7	19.7	15.6	46.0	35.3
Watts Output	1940	1150	2970	1860	1655	970
Watts Req. by Specs.	1570	785	2500	1250	1450	725

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Table 12

Model XTAQ-5 Transmitting Equipment
Determination of Power Output

Test as per paragraph 3-3 of Specifications RE 13A 351J

Column No:	1	2	3
Control or Meter	355 Kc.	565 Kc.	565 Kc.
A	5	7	7
B	61	489	489
C	5	7	7
D	15	44	44
E	6	7	7
F	47	61	67
G	1	1	3
H	73	48	57
I	13	14	14

	CW	MCW	CW	MCW	CW	MCW
Spec.Ant.Res.	*	*	0.5	0.5	8.0	8.0
Dummy Ant. R (dc)	0.729	0.729	0.445	0.445	8.34	8.34
Cap. loss Res.	0.076	0.076	0.098	0.098	0.08	0.08
Total Dummy Ant. R	0.805	0.805	0.543	0.543	8.42	8.42
Spec. Ant. Cap.	*	*	1100	1100	1350	1350
Measured Ant. Cap.	2358	2358	1150	1150	1365	1365
M.O. Ip (MA)	34	35	32	34	33	33
I.P.A. Ip (MA)	106	61	108	61	120	65
#1 P.A. Ip (Amps)	0.85#	0.70	0.87	0.70	1.09	0.91
#2 P.A. Ip (Amps)	0.81#	0.68	0.84	0.70	1.04	0.90
Total P.A. Ip (Amp)	1.59#	1.36	1.67	1.40	2.1	1.85
Ant. I (set)(Amps)	51	39.5	51	39	22.2	17.0
Bias Volts	115	115	115	115	115	114
M.O. Ep	750	750	750	750	750	740
P.A. Ep	2270	2270	2000**	2000	2270	2250
Fil. Volts	11	11	11	11	11	11
Aud. Osc. Ip (MA)		127		110		125
% Mod. Pos. Peaks		-		-		-
Neg. Peaks		68		72		74
% MCW to CW Power		59.8		60.5		63.4
Ant. Cur. External	46.2	35.8	42.1	32.7	17.7	13.6
Watts Output	1710	1035	960	580	2640	1560
Watts Req. by Specs.	*	*	800	400	2410	1205

Note: (*) denotes that specifications do not specifically require tests under these antenna conditions.
(#) denotes necessary to reduce plate current to keep set antenna ammeter on scale.
(**) denotes necessary to reduce plate voltage to keep set antenna ammeter on scale.

Table 13

Model XTAQ-5 Transmitting Equipment
Determination of Power Output

Test as per paragraph 3-3 of Specifications RE 13A 351J

Column No:	1		2		3	
Control or Meter	565 Kc.		565 Kc.		565 Kc.	
A	7		7		7	
B	489		489		489	
C	7		7		7	
D	44		44		44	
E	7		7		7	
F	67		71		72	
G	3		1		1	
H	52		53		55	
I	15		15		15	
	CW	MCW	CW	MCW	CW	MCW
Spec.Ant.Res.	8.0	8.0	1.3	1.3	1.4	1.4
Dummy Ant. R (dc)	8.34	8.34	1.24	1.24	1.54	1.54
Cap. loss Res.	0.05	0.05	0.05	0.05	0.05	0.05
Total Dummy Ant. R	8.39	8.39	1.29	1.29	1.59	1.59
Spec. Ant. Cap.	2250	2250	2400	2400	2620	2620
Measured Ant. Cap.	2358	2358	2358	2358	2530	2530
M.O. Ip (MA)	33	34	32	34	33	34
I.P.A. Ip (MA)	120	69	120	69	120	66
#1 P.A. Ip (Amps)	1.1	0.94	1.1	0.95	1.1	0.94
#2 P.A. Ip (Amps)	1.04	0.91	1.04	0.94	1.04	0.92
Total P.A. Ip (Amp)	2.1	1.9	2.1	1.9	2.1	1.9
Ant. I (set)(Amps)	22.0	17.5	42.1	33.6	38.8	30.5
Bias Volts	115	115	115	115	115	115
M.O. Ep	750	750	750	750	750	750
P.A. Ep	2270	2270	2270	2270	2270	2270
Fil. Volts	11	11	11	11	11	11
Aud. Osc. Ip (MA)		126		126		125
% Mod. Pos. Peaks		-		-		-
Neg. Peaks		74		74		70
% MCW to CW Power		61.4		62		64
Ant. Cur. External	17.9	14.0	35.7	28.2	32.9	26.3
Watts Output	2685	1647	1655	1025	1720	1100
Watts Req. by Specs.	2580	1290	1650	825	1690	845

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Table 15

Model XTAQ-5 Transmitting Equipment
Accuracy of Reset to Previously Calibrated Frequencies

Test as per paragraph 3-7-1 of Specifications RE 13A 351J

Trial No.	Frequency Kc	Time Seconds	Deviation in Frequency Cycles	Deviation in Frequency Per Cent
Original	200.170	-	-	-
1	167	49	3	0.0015
2	163	56	7	0.0035
3	183	48	13	0.0065
4	168	56	2	0.001
5	177	37	7	0.0035
		Average:	6.4	0.0032

(Note: Transmitter pre-heated about 30 minutes before test on 200 KC was conducted.)

Original	600.324	-	-	-
1	353	46	29	0.0048
2	321	51	3	0.0005
3	325	45	1	0.00017
4	349	46	25	0.0042
5	338	50	14	0.0023
		Average:	14.5	0.0024

(Note: Transmitter pre-heated about 40 minutes before test on 600 KC was conducted.)

Specification Requirements: Average of 5 trials - 0.01%
No one trial to exceed - 0.015%

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Table 16

Model XTAQ-5 Transmitting Equipment
Test for Lost Motion, Back Lash and Torque Lash

Test as per paragraph 3-7-2 of Specifications RE 13A 351J

Trial No.	Frequency when Approached from Clockwise Direction	Frequency when Approached from Counter Clockwise Direction	Backlash Cycles	Backlash Per Cent
1	200.171	200.190	19	0.009
2	170	197	27	0.014
3	176	186	10	0.005
4	170	192	22	0.011
5	170	192	22	0.011
		Average:	20	0.01%

Initial Frequency: 200.171
Frequency of maximum departure: 200.197
Difference 26 cycles; 0.013%
Permitted by Specifications: 0.045%
Average permitted by specifications: 0.02%

1	600.245	600.283	38	0.0063
2	234	308	74	0.0123
3	253	287	34	0.0057
4	255	275	20	0.0033
5	265	320	55	0.0092
		Average:	44.2	0.0074%

Initial Frequency: 600.245
Frequency of maximum departure: 600.320
Difference: 75 cycles; 0.0125%
Permitted by specifications: 0.045%
Average permitted by specifications: 0.02%

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Table 17

Model XTAQ-5 Transmitting Equipment
Operation of Adjust-Tune-Operate Control

Test as per paragraph 3-7-3 of Specifications RE 13A 351J

Step 1 "Adjust"	Step 2 "Tune"	Step 3 "Operate"	Maximum Frequency Change Cycles	Per Cent
175.128	175.124	175.114	14	0.008
200.346	200.341	200.334	12	0.006
225.155	225.148	225.131	24	0.0107
250.276	250.269	250.251	25	0.01
300.295	300.289	300.271	24	0.008
400.252	400.250	400.248	4	0.001
500.265	500.262	500.259	6	0.0012
600.302	600.276	600.245	57	0.0095

Specification Requirements: 0.015%

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Table 18

Model XTAQ-5 Transmitting Equipment
Detuning of Circuits

Test as per paragraph 3-7-4 of Specifications RE 13A 351J

Circuit Detuned	Frequency Kc	Change in Frequency Cycles	Per Cent
Normal	200.261		
IPA "D" - cc	263	2	0.001
IPA "D" - c	260	1	0.0005
PA "F" - cc	264	3	0.0015
PA "F" - c	263	2	0.001
Ant. "H" - cc	265	4	0.002
Ant. "H" - c	265	4	0.002
Normal	600.246		
IPA "D" - cc	206*	40*	0.0067
IPA "D" - c	235	11	0.0018
PA "F" - cc	250	4	0.00067
PA "F" - c	245	1	0.00017
Ant. "H" - cc	241	5	0.00083
Ant. "H" - c	242	4	0.00067

Note: IPA "D" - cc indicates that the Intermediate Power Amplifier circuit was detuned in a counter-clockwise direction. "C" indicates detuning in clockwise direction.

(*) indicates that this measurement was re-checked and the same values obtained.

Specification Requirements: - 0.01%

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Table 18

Model XTAQ-5 Transmitting Equipment
Detuning of Circuits

Test as per paragraph 3-7-4 of Specifications RE 13A 351J

Circuit Detuned	Frequency Kc	Change in Frequency Cycles	Per Cent
Normal	200.261		
IPA "D" - cc	263	2	0.001
IPA "D" - c	260	1	0.0005
PA "F" - cc	264	3	0.0015
PA "F" - c	263	2	0.001
Ant. "H" - cc	265	4	0.002
Ant. "H" - c	265	4	0.002
Normal	600.246		
IPA "D" - cc	206*	40*	0.0067
IPA "D" - c	235	11	0.0018
PA "F" - cc	250	4	0.00067
PA "F" - c	245	1	0.00017
Ant. "H" - cc	241	5	0.00083
Ant. "H" - c	242	4	0.00067

Note: IPA "D" - cc indicates that the Intermediate Power Amplifier circuit was detuned in a counter-clockwise direction. "C" indicates detuning in clockwise direction.

(*) indicates that this measurement was re-checked and the same values obtained.

Specification Requirements: - 0.01%

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Table 19

Model XTAQ-5 Transmitting Equipment
Operation of Power Output Control

Test as per paragraph 3-7-5 of Specifications RE 13A 351J

Power Output Watts	Per Cent Power	Antenna Current	Plate Volts	Frequency Kc.	Frequency Change Cycles	Frequency Change Per Cent
2445	100	18.3	2230	200.232		
1835	75	15.85	1980	235	3	0.0015
1215	49.7	12.9	1650	236	4	0.002
605	24.7	9.1	1250	240	8	0.004
264	9.9	5.9	850	243	11	0.0055
120	4.9	4.05	748*	244	12	0.006
2670	100	19.1	2210	250.263		
2005	75	16.6	1950	267	4	0.0016
1330	49.8	13.5	1650	272	9	0.0036
674	25.2	9.6	1250	278	15	0.006
272	10.2	6.1	920	282	19	0.0076
120	4.5	4.05	749*	286	23	0.0092
2890	100	19.9	2210	400.292		
2180	75.4	17.3	1960	292	0	0
1450	50.2	14.1	1650	293	1	0.00025
730	25.3	10.0	1250	295	3	0.00075
298	10.3	6.4	920	295	3	0.00075
120	4.15	4.05	730*	295	3	0.00075
2920	100	20.0	2240	600.265		
2210	75.7	17.4	2000	272	7	0.0017
1450	49.6	14.1	1660	282	17	0.0028
744	25.5	10.1	1280	294	29	0.0048
290	9.9	6.3	875	298	33	0.0055
120	4.1	4.05	749*	311	46	0.0077

Note: (*) denotes minimum generator voltage obtainable.

Antenna Constants: Resistance - 7.3 ohms
Capacity - 919 μμfds

Specification requirements: Frequency change not to exceed 0.005% for power reduction to 10% of full power.

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Table 20

Model XTAQ-5 Transmitting Equipment
Change of Tubes
(Master Oscillator Circuit)

Test as per paragraph 3-7-6 of Specifications RE 13A 351J

Tube Mfgr. and Ser.No.	Frequency Kc.	Deviation from Mean Frequency Cycles	Per Cent
RCA 45200	200.256	28	0.014
RCA 45201	224	4	0.002
RCA 45202	240	12	0.006
RCA 45203	195	33	0.0165
RCA 45207	215	13	0.0065
RCA 45208	214	14	0.007
WL 25036	258	30	0.015
WL 25038	324	96	0.048
RCA 36135	203	25	0.0125
RCA 36156	155	73	0.0365
Mean:	200.228	32.8	0.0164

Specification Requirements: For any one lot of tubes in Master Oscillator - 0.015%

If the tubes are considered in separate lots, the following results are obtained:

RCA 45200	200.256	32	0.016
RCA 45201	224	0	0
RCA 45202	240	16	0.008
RCA 45203	195	29	0.0145
RCA 45207	215	9	0.0045
RCA 45208	214	10	0.005
Mean:	200.224	16	0.008
RCA 36135	200.203	24	0.012
RCA 36156	155	24	0.012
Mean:	200.179	24	0.012
WL 25036	200.258	33	0.0165
WL 25038	324	33	0.0165
Mean:	200.291	33	0.0165

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Table 21

Model XTAQ-5 Transmitting Equipment
Change of Tubes
(Intermediate Amplifier Circuit)

Test as per paragraph 3-7-6 of Specifications RE 13A 351J

Tube Mfgr. and Ser.No.	Frequency Kc.	Deviation from Mean Frequency Cycles	Per Cent
RCA 45201	200.225	10	0.005
RCA 45202	225	10	0.005
RCA 45203	226	9	0.0045
RCA 45207	232	3	0.0015
RCA 45208	235	0	0
RCA 36135	238	3	0.0015
RCA 36156	240	5	0.0025
WL 25036	241	6	0.003
WL 25038	243	8	0.004
WL 25043	244	9	0.0045
	Mean: 200.235	6.3	0.00315

Note: RCA Tube No. 45201 was replaced in the circuit at the end of the test and produced a frequency of 200.247. The difference between this frequency and the original frequency obtained with the same tube is due to the inherent drift in the transmitter.

(POWER AMPLIFIER CIRCUIT)

GE 15514 (R)*			
GE 15535 (L)*	200.252	0.3	0.00015
GE 15537 (R)*			
GE 15543 (L)*	200.252	0.3	0.00015
GE 14145 (R)#			
GE 14140 (L)#	200.253	0.7	0.00035
Mean:	200.2523	0.43	0.000215

* denotes Graphite Anode Tubes
\# denotes Molybdenum Anode Tubes

Specification Requirements: 0.005%

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Table 22

Model XTAQ-5 Transmitting Equipment
Change of Tubes
(Master Oscillator Circuit)

Test as per paragraph 3-7-6 of Specifications RE 13A 351J

Tube Mfgr. and Ser.No.	Frequency Kc.	Deviation from Mean Frequency Cycles	Per Cent
RCA 45202	600.229	24	0.0004
RCA 45203	163	42	0.0007
RCA 45207	195	10	0.00017
RCA 45208	192	13	0.00022
RCA 45200	289	84	0.014
RCA 45201	219	14	0.00023
WL 25036	218	13	0.00022
WL 25038	403	198	0.033
RCA 36135	140	65	0.0108
RCA 36156	000	205	0.034
	Mean: 600.205	66.8	0.0111

Specification Requirements: 0.015%

Note: RCA Tube No. 45202 was replaced in the circuit at the end of the test and produced a frequency of 600.250. The difference between this frequency and the original frequency obtained with the same tube is a measure of the inherent drift of the transmitter.

If RCA tubes of the 45000 group are considered separately, the average deviation from the mean frequency is 0.0052%. RCA tubes of the 36000 group give a result of 0.0117%.
WL tubes give a result of 0.0154%.

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Table 23

Model XTAQ-5 Transmitting Equipment
Change of Tubes

Test as per paragraph 3-7-6 of Specifications RE 13A 351J

Tube Mfgr. and Ser.No.	Frequency Kc.	Deviation from Mean Frequency Cycles	Per Cent
	(INTERMEDIATE POWER AMPLIFIER)		
RCA 45202	600.305	35	0.0058
RCA 45203	320	20	0.0033
RCA 45207	328	12	0.002
RCA 45208	337	3	0.0005
RCA 36135	342	2	0.00033
RCA 36156	348	5	0.00083
WL 25036	353	13	0.0022
WL 25038	362	22	0.0037
WL 25043	368	28	0.0047
RCA 45201	376	36	0.006
Mean:	600.440	17.6	0.0029

Note: RCA tube No. 45201 was replaced in the circuit at the end of the test and produced a frequency of 600.379. The difference between this frequency and the original frequency obtained with the same tube is a measure of the inherent drift of the transmitter.

	(POWER AMPLIFIER CIRCUIT)		
GE 15537 (R)*			
GE 15543 (L)*	600.385	2	0.0003
GE 14145 (R)#			
GE 14140 (L)#	600.389	0	0
GE 15514 (R)*			
GE 15535 (L)*	600.387	2	0.0003
Mean:	600.387	1.3	0.00022

* denotes Graphite Anode Tubes
\# denotes Molybdenum Anode Tubes

Specification Requirements: 0.005%

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Table 24

Model XTAQ-5 Transmitting Equipment
Variation of Supply Line Voltage

Test as per paragraph 3-7-7 of Specifications RE 13A 351J

Line Volts	Line Freq.	Fil. Volts	Bias Volts	M.O. Ep	P.A. Ep	Ant. Curr.	Frequency Kc.	Freq. Cycles	Change %
			Minus to plus 5% in one minute						
418	59.5	10.5	114	740	2210	18.0	200.276		
440	59.5	11.0	115	745	2220	18.1	200.280		
462	59.5	11.6	115	745	2225	18.2	200.283	7	0.0035
418	59.5	10.45	114.5	745	2250	20.4	600.196		
440	59.5	11.0	115	750	2260	20.4	600.195		
462	59.5	11.6	115	750	2260	20.4	600.194	2	0.0003
			Minus to plus 5% in five minutes						
418	59.5	10.5	114	745	2220	18.2	200.285		
440	59.5	11.0	115	745	2220	18.2	200.290		
462	59.5	11.6	115	745	2210	18.2	200.295	10	0.005
418	59.5	10.45	114	740	2245	20.3	600.195		
440	59.5	11.0	114	745	2245	20.2	600.190		
462	59.5	11.6	114	745	2250	20.3	600.189	6	0.001

Specification Requirements: 0.006%

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Table 25

Model XTAQ-5 Transmitting Equipment
Variations in Ambient Temperature

Test as per paragraph 3-7-8 of Specifications RE 13A 351J

Time	Ambient Temp. °C.	Frequency Kc.	P. A. Ip	Output Watts	Rel. Hum. %	P. A. Ep	Line Volts
0830	48.5	200.266	2.10	2460	14	2270	438
45	50.0	251	2.00	2415	19	2210	440
0900	51.0	250	1.90	2185	20	2150	438
15	50.5	255	1.75	2000	25	2100	438
30	51.0	261	1.70	1950	23	2100	435
0945	41.5	270	1.70	1930	21	2090	430
1000	40.5	280	1.70	1930	16	2080	434
1015	40.0	285	1.70	1930	13	2080	433
30	41.5	287	1.70	1930	13	2080	435
45	39.5	288	1.70	1930	13	2080	435
(An abrupt frequency change of 90 cycles occurred at 10:58 - See Note)							
1100	32.0	380	1.78	1930	15	2090	435
15	30.0	385	1.78	1930	16	2080	435
30	29.0	383	1.80	1950	17	2090	436
45	30.5	381	1.80	1950	14	2100	437
1200	30.5	379	1.85	1950	14	2100	436
1215	19.0	379	1.90	1975	46	2140	435
30	20.0	375	1.90	1975	61	2140	437
45	20.0	371	1.95	1975	64	2150	435
1300	20.0	368	1.98	2000	54	2150	432
15	20.0	368	1.98	2020	48	2150	434
1330	10.0	371	1.99	2020	35	2150	432
45	10.0	374	1.99	2045	35	2190	432
1400	10.5	374	2.00	2065	31	2190	435
15	10.0	371	2.00	2065	35	2190	430
30	10.0	372	2.00	2090	35	2200	432
1445	1.5	375	2.04	2140	-	2210	431
1500	1.5	376	2.09	2190	-	2240	430
15	1.5	376	2.10	2190	-	2240	430
30	0.5	376	2.10	2215	-	2240	430
45	0.5	375	2.10	2215	-	2250	427

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Table 25 (Cont.)

SUMMARY

Temperature Change Degrees C.	Cycles Change per 10 Degrees C.	Per Cent Change per 1 Degree C.
51.0 to 39.5	27	0.0012
39.5 to 30.5	1*	0.00005
30.5 to 20.0	11	0.00052
20.0 to 10.0	4	0.0002
10.0 to 0.5	3	0.00016

Specification requirements: Not greater than 0.0025% frequency change per 1 degree Centigrade.

(*) denotes that 90 cycles abrupt increase in frequency was eliminated in determining above change.

Note: A new Titanium Dioxide Compensating Capacitor had been installed in the Master Oscillator Circuit previous to this run. This compensating condenser had produced good results on a previous 2-hour locked key test at a constant ambient temperature (See Table No. 33). After the temperature variation test at 200 Kc the M.O. compartment was removed and the compensating condenser was inspected. No damage could be detected. The compensating condenser and other elements in the circuit were relieved and then retightened in order to eliminate any undue stresses or strains which may have developed. After this had been accomplished and the transmitter again put into operation, small frequency shifts occurred intermittently for a time but gradually disappeared.

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Table 26 (Cont.)

SUMMARY

Temperature Change Degrees C.	Cycles Change per 10 Degrees C.	Per Cent Change per 1 Degree C.
50.0 to 41.5	68	0.0013
41.5 to 29.5	32	0.00045
29.5 to 20.5	35	0.00065
20.5 to 10.0	55	0.00092
10.0 to 1.0	58	0.00097

Specification Requirements: Not greater than 0.0025% frequency change per 1 degree Centigrade.

Note: Original Titanium Dioxide Compensating Condenser in circuit during this test. See text of report for discussion.

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Table 27

Model XTAQ-5 Transmitting Equipment

Variations in Ambient Temperature
(New Compensating Capacitor in M.O.)

Test as per paragraph 3-7-8 of Specifications RE 13A 351J

Time	Ambient Temp.°C.	Frequency Kc.	P. A. Ip	Output Watts	Rel. Hum.%	P. A. Ep	Line Volts
0830	50.0	600.384	2.10	3000	24	2270	433
45	50.5	341	2.01	2980	26	2240	432
0900	51.0	309	1.99	2920	26	2190	433
15	51.5	298	1.90	2755	22	2150	433
30	51.0	305	1.90	2675	18	2100	430
0945	44.5	323	1.90	2565	20	2100	433
1000	40.5	345	1.89	2540	18	2100	434
15	41.5	361	1.90	2540	16	2100	436
30	41.0	373	1.89	2485	19	2100	437
45	40.5	378	1.89	2515	19	2100	435
1100	35.0	380	1.90	2485	21	2100	437
15	30.5	397	1.90	2435	17	2100	435
30	30.0	401	1.90	2460	16	2120	436
45	30.0	406	1.92	2460	14	2140	432
1200	30.0	410	1.91	2445	15	2140	435
1215	20.0	412	1.95	2460	37	2150	436
30	19.0	418	1.98	2485	27	2150	434
45	20.0	426	1.99	2485	26	2150	433
1300	19.5	434	1.99	2540	24	2150	433
15	19.5	439	1.98	2540	24	2160	426
1330	10.0	449	2.00	2565	29	2190	430
45	10.5	462	2.00	2590	27	2200	432
1400	10.0	473	2.00	2565	35	2200	430
15	10.0	484	2.00	2590	35	2200	430
30	10.0	492	2.01	2590	35	2210	430
1445	1.5	519	2.09	2645	-	2240	428
1500	1.0	543	2.10	2675	-	2250	432
15	0.0	565	2.10	2700	-	2250	431
30	0.5	577	2.10	2730	-	2250	431
45	1.0	583	2.10	2700	-	2250	432

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Table 27 (Cont.)

SUMMARY

Temperature Change Degrees C.	Cycles Change per 10 Degrees C.	Per Cent Change per 1 Degree C.
51.0 to 40.5	73	0.0012
40.5 to 30.0	32	0.00051
30.0 to 19.5	29	0.00046
19.5 to 10.0	43	0.00075
10.0 to 1.0	91	0.0017

Specification requirements: Not greater than 0.0025% frequency change per 1 degree Centigrade.

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Table 28

Model XTAQ-5 Transmitting Equipment
Variations in Humidity

Test as per paragraph 3-7-9 of Specifications RE 13A 351J

Time	Ambient Temp.°C.	Rel. Hum.%	Frequency Kc.	P. A. Ip	Watts Output	P. A. Ep	Line Volts
1100	40.5	21	200.345	2.10	2460	2270	430
15	40.5	20	335	2.09	2440	2250	431
30	41.0	21	334	2.01	2410	2230	430
45	40.0	20	337	2.00	2385	2210	433
1200	40.5	55	338	2.00	2360	2210	436
15	40.0	80	335	2.00	2310	2200	435
1230	41.5	90	331	2.00	2310	2210	434
45	41.5	90	325	1.99	2285	2190	430
1300	41.0	90	323	1.99	2285	2190	433
15	42.0	90	322	1.98	2260	2190	430
30	41.5	87	322	1.99	2260	2190	428
1345	40.0	34	331	1.98	2260	2190	429
1400	41.0	21	344	1.99	2285	2190	434
15	40.0	18	350	1.99	2260	2180	429
30	40.5	18	355	1.99	2260	2190	434
45	40.0	20	355	1.99	2260	2190	432
1500	40.5	17	356	1.99	2260	2180	430
(Voltages readjusted to normal at conclusion of test.)							
1505	40.5	20	200.360	2.00	2260	2180*	432

* Maximum voltage plate generator could furnish; all other potentials O.K.

Antenna Constants: Resistance 6.75 ohms; Capacity 919 μμf

Greatest frequency variation noted during second and third tests from that prevailing at end of first test (time 1145) 19 cycles or 0.0095%. Specification requirements: 0.05%.

Decrease in Power Output during test:

Calculated from data at 1100 and 1500 o'clock - 8.1%
Calculated from data at 1145 and 1500 o'clock - 5.2%
Specification Requirements: 5.0%

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Table 29

Model XTAQ-5 Transmitting Equipment
Variations in Humidity

Test as per paragraph 3-7-9 of Specifications RE 13A 351J

Time	Ambient Temp.°C.	Rel. Hum.%	Frequency Kc.	P. A. Ip	Watts Output	P. A. Ep	Line Volts
0815	39.5	27	600.750	2.10	2860	2270	435
30	41.0	28	713	2.08	2780	2210	433
45	41.0	24	697	2.00	2700	2150	432
0900	40.0	20	693	2.00	2620	2140	430
0915	40.5	75	680	1.97	2540	2120	432
0930	41.0	90	621	1.92	2460	2100	431
45	41.0	90	572	1.90	2440	2100	433
1000	41.5	90	545	1.90	2440	2100	431
15	41.0	87	540	1.91	2410	2090	435
30	41.0	90	550	1.90	2410	2090	430
1045	40.0	38	608	1.91	2410	2090	428
1100	41.0	21	658	1.90	2410	2090	433
15	40.0	19	690	1.89	2385	2080	431
30	41.0	16	708	1.90	2410	2080	433
45	41.0	18	714	1.90	2385	2080	432
1200	41.0	16	725	1.90	2385	2080	435
	(Voltages readjusted to normal at conclusion of test.)						
1202	41.0	16	725	2.03	2700	2210*	435

* Maximum voltage plate generator could furnish; all other potentials O.K.

Antenna Constants: Resistance 6.75 ohms; Capacity 919 μμf

Greatest frequency variation noted during second and third tests from that prevailing at end of first test (time 0900) 153 cycles or 0.0255%. Specification requirements: 0.05%

Decrease in Power Output during test:

Calculated from data at 0815 and 1200 o'clock - 16.6%
Calculated from data at 0900 and 1200 o'clock - 9.0%
Specification Requirements: 5.0%

Table 30

Model XTAQ-5 Transmitting Equipment
Locked Key Operation for Two Hours

Test as per paragraph 3-7-10 of Specifications RE 13A 35LJ

Time	Ambient Temp.°C.	Frequency Kc.	Cycles Change	Per Cent Change	Power Watts	Pr. Amplifier Ep	Ip
0830	25.5	(filaments energized)					
35	25.5	200.193			2360	2270	2.1
40	25.5	202	9	0.0045	2305	2260	2.1
45	25.4	208	15	0.0075	2305	2260	2.1
50	25.5	211	18	0.009	2305	2250	2.1
55	25.4	215	22	0.011	2305	2240	2.09
0900	25.4	218	25	0.0125	2285	2240	2.05
05	25.7	220	27	0.0135	2260	2230	2.02
10	25.8	224	31	0.0155	2235	2220	2.01
15	25.8	229	36	0.018	2210	2210	2.0
20	25.8	235	42	0.021	2185	2200	2.0
25	25.9	243	50	0.025	2185	2200	1.99
30	25.9	250	57	0.0275	2160	2190	1.98
35	26.0	260	67	0.0335	2115	2180	1.95
40	26.0	270	77	0.0385	2115	2180	1.95
45	26.0	280	87	0.0435	2115	2180	1.95
50	26.0	291	98	0.049	2090	2180	1.94
55	26.2	300	107	0.0535	2090	2170	1.92
1000	26.2	310	117	0.0585	2090	2165	1.92
05	26.1	318	125	0.0625	2065	2160	1.91
10	26.0	325	132	0.066	2065	2160	1.9
15	26.4	333	140	0.070	2040	2160	1.9
20	26.2	343	150	0.075	2020	2160	1.9
25	26.2	346	153	0.0765	2000	2160	1.9
30	26.2	352	159	0.0796	2000	2160	1.9
35	26.2	357	164	0.082	2000	2160	1.89
	(At conclusion of test voltages readjusted to normal.)						
36	26.2	360	167	0.0835	2185	2270	2.0

Relative humidity during course of test ranged between limits of 64% and 78%.

Temp. of load coil: Start - 25° C; Finish - 44° C.
Temp. of P. A. Plate Choke: Start - 25° C; Finish - 115° C.

Antenna Constants: Resistance 6.75 ohms; Capacity 919 μμf.

Frequency change during first 5 minutes: 9 cycles; 0.0045%
Specification requirements: 0.015%
Frequency change during remainder of test: 155 cycles; 0.0775%
Specification requirements: 0.03%

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Table 31

Model XTAQ-5 Transmitting Equipment
Locked Key Operation for Two Hours
(Transmitter Adjusted for MCW)

Test as per paragraph 3-7-10 of Specifications RE 13A 351J

Time	Ambient Temp.°C.	Frequency Kc	Cycles Change	Per Cent Change	Power Watts	Pr. Amplifier Ep	Pr. Amplifier Ip
0830	27.0	(Filaments energized)					
35	27.0	200.174			1305	2270	1.82
40	27.2	181	7	0.0035	1305	2270	1.8
45	27.3	185	11	0.0055	1265	2250	1.7
50	27.6	185	11	0.0055	1250	2250	1.7
55	27.9	187	13	0.0065	1230	2250	1.69
0900	28.0	187	13	0.0065	1230	2240	1.67
05	28.0	189	15	0.0075	1230	2220	1.64
10	28.0	190	16	0.008	1230	2210	1.63
15	28.5	192	18	0.009	1230	2210	1.62
20	28.9	196	22	0.011	1215	2200	1.61
25	28.9	199	25	0.0125	1215	2200	1.6
30	29.0	203	29	0.0145	1215	2200	1.6
35	29.0	209	35	0.0175	1215	2190	1.6
40	29.0	213	39	0.0195	1215	2175	1.6
45	29.2	220	46	0.023	1215	2175	1.6
50	29.5	230	56	0.028	1215	2160	1.59
55	29.6	240	66	0.033	1195	2160	1.59
1000	29.8	250	76	0.038	1195	2160	1.59
05	29.9	261	87	0.0435	1195	2150	1.58
10	29.9	274	100	0.05	1175	2150	1.58
15	29.9	285	111	0.0554	1175	2150	1.58
20	29.9	298	124	0.062	1175	2150	1.58
25	30.0	307	133	0.0665	1175	2150	1.58
30	30.0	317	143	0.0715	1175	2150	1.58
35	30.0	325	151	0.0755	1175	2150	1.58
	(At conclusion of test voltages readjusted to normal.)						
1037	30.0	330	156	0.078	1323	2260	1.7

Relative humidity during course of test ranged between limits of 57% and 80%.

Antenna Constants: Resistance 6.75 ohms; Capacity 919 μμf.

Frequency change during first 5 minutes: 7 cycles; 0.0035%
Specification Requirements: 0.015%
Frequency change during remainder of test: 144 cycles; 0.072%
Specification Requirements: 0.03%

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Table 32

Model XTAQ-5 Transmitting Equipment

Locked Key Operation for Two Hours

Test as per paragraph 3-7-10 of Specifications RE 13A 351J

Time	Ambient Temp.°C.	Frequency Kc.	Cycles Change	Per Cent Change	Power Watts	Pr. Amplifier Ep	Ip
1025	25.5	Filaments Energized					
30	25.0	200.250			2385	2270	2.1
35	25.5	275	25	0.0125	2385	2260	2.1
40	26.0	295	45	0.0225	2360	2250	2.08
45	26.5	313	63	0.0315	2335	2240	2.08
50	24.5	325	75	0.0365	2310	2220	2.04
55	26.5	337	87	0.0435	2285	2200	2.01
1100	26.2	347	97	0.0485	2285	2200	2.0
05	24.5	358	108	0.054	2285	2200	2.0
10	24.5	366	116	0.058	2285	2200	2.0
15	26.5	374	124	0.062	2240	2190	1.98
20	26.0	380	130	0.065	2215	2190	1.98
25	25.5	385	135	0.0675	2185	2180	1.97
30	25.5	390	140	0.07	2185	2170	1.98
35	24.5	393	143	0.0715	2165	2160	1.94
40	24.5	396	146	0.073	2165	2160	1.94
45	24.5	400	150	0.075	2165	2150	1.94
50	26.0	404	154	0.077	2165	2150	1.94
55	25.5	405	155	0.0775	2165	2150	1.92
1200	25.0	408	158	0.079	2165	2150	1.92
05	24.5	409	159	0.0795	2140	2150	1.92
10	24.0	411	161	0.0805	2140	2150	1.91
15	26.0	413	163	0.0815	2140	2150	1.91
20	25.0	413	163	0.0815	2140	2150	1.91
25	25.0	413	163	0.0815	2140	2150	1.9
30	25.0	414	164	0.082	2140	2150	1.9
	(At conclusion of test voltages readjusted.)						
1232	25.0	200.416	166	0.083	2285	2250	2.0

Relative humidity during course of test ranged between limits of 24% and 30%. During this test equipment was installed in temperature controlled room where temperature and humidity could be controlled within narrow limits.

Antenna Constants: Resistance 6.75 ohms; Capacity 919 μμf

Frequency change during first five minutes: 25 cycles; 0.0125%
Specification requirements: 0.015%
Frequency change during remainder of test: 139 cycles; 0.0695%
Specification requirements: 0.03%

Temperature room had been stabilized at 30% relative humidity at 25 Deg. C. 30 minutes before test started.

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Table 33

Model XTAQ-5 Transmitting Equipment
Locked Key Test for Two Hours
(New Titanium Dioxide Compensator Capacitor in Master Circuit)

Test as per paragraph 3-7-10 of Specifications RE 13A 351J

Time	Ambient Temp.°C.	Frequency Kc	Cycles Change	Per Cent Change	Power Watts	Pr. Amplifier Ep	Pr. Amplifier Ip
1425	25.5	(Filaments energized)					
30	25.0	200.198			2310	2270	2.1
35	26.0	195	3	0.0015	2310	2270	2.1
40	25.5	193	5	0.0025	2285	2260	2.09
45	26.0	192	6	0.003	2235	2250	2.05
50	25.5	191	7	0.0035	2210	2250	2.03
55	24.5	191	7	0.0035	2210	2240	2.02
1500	25.0	191	7	0.0035	2185	2240	2.00
05	24.5	190	8	0.004	2165	2240	2.00
10	24.5	190	8	0.004	2165	2230	2.00
15	24.5	190	8	0.004	2165	2210	1.99
20	25.0	191	7	0.0035	2165	2200	1.99
25	26.0	192	6	0.003	2140	2200	1.98
30	26.0	192	6	0.003	2115	2200	1.98
35	25.5	193	5	0.0025	2090	2190	1.91
40	26.0	193	5	0.0025	2090	2190	1.91
45	26.0	193	5	0.0025	2090	2190	1.91
50	26.0	194	4	0.002	2090	2190	1.91
55	25.0	194	4	0.002	2090	2190	1.91
1600	25.0	195	3	0.0015	2090	2190	1.91
05	25.0	195	3	0.0015	2090	2190	1.91
10	25.0	196	2	0.001	2065	2190	1.91
15	25.0	197	1	0.0005	2065	2190	1.91
20	25.0	196	2	0.001	2065	2190	1.91
25	25.0	197	1	0.0005	2065	2190	1.91
30	26.0	197	1	0.0005	2065	2190	1.91
	(Voltages readjusted to normal)						
1632	29.0	200.200	2	0.001	2310	2260	2.0

Relative humidity during course of test ranged between limits of 10% and 21%. During this test equipment was installed in temperature controlled room where temperature and humidity could be controlled within narrow limits.

Antenna Constants: Resistance 6.75 ohms; Capacity 919 μμf

Frequency change during first 5 minutes: 3 cycles; 0.0015%
Specification Requirements: 0.015%
Frequency change during remainder of test: 5 cycles; 0.0025%
Specification Requirements: 0.03%

A new plate choke was installed previous to this test; temperature at start of test 25° C; at end of test 126° C.

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Table 34

Model XTAQ-5 Transmitting Equipment
Locked Key Operation for Two Hours

Test as per paragraph 3-7-10 of Specifications RE 13A 351J

Time	Ambient Temp.°C.	Frequency Kc.	Cycles Change	Per Cent Change	Power Watts	Pr. Amplifier Ep	Ip
0830	25.8	(Filaments energized)					
35	25.9	400.163			2810	2270	2.1
40	25.9	175	12	0.003	2840	2270	2.1
45	25.8	185	22	0.0055	2810	2250	2.07
50	26.0	192	29	0.0073	2755	2240	2.05
55	26.0	195	32	0.008	2725	2230	2.01
0900	26.0	197	34	0.0085	2700	2225	2.01
05	26.0	198	35	0.0088	2700	2210	2.0
10	26.0	200	37	0.0093	2675	2200	1.99
15	26.2	202	39	0.0098	2645	2200	1.99
20	26.2	205	42	0.0105	2590	2180	1.97
25	26.2	210	47	0.0117	2565	2180	1.95
30	26.2	217	54	0.0135	2540	2180	1.95
35	26.2	223	60	0.0150	2540	2180	1.94
40	26.2	230	67	0.0168	2515	2170	1.94
45	26.2	238	75	0.0188	2540	2170	1.93
50	26.2	248	85	0.0212	2515	2170	1.92
55	26.2	255	92	0.023	2515	2170	1.92
1000	26.3	261	98	0.0245	2490	2160	1.91
05	26.5	268	105	0.0263	2435	2150	1.9
10	26.6	272	109	0.0273	2435	2150	1.9
15	26.6	277	114	0.0285	2435	2150	1.9
20	26.6	282	119	0.0297	2435	2150	1.9
25	26.5	286	123	0.0308	2435	2150	1.9
30	26.8	289	126	0.0315	2435	2150	1.89
35	26.8	292	129	0.0322	2435	2150	1.89
	(At conclusion of test voltages readjusted to normal.)						
1036	26.8	295	132	0.033	2785	2260	2.0

Relative humidity during course of test ranged between limits of 57% and 63%.

Temperature of load coil: Start - 26° C; Finish - 48° C.
Temperature of P.A. Plate Choke - 25° C; Finish - 94° C.

Antenna Constants: Resistance 6.75 ohms; Capacity 919 μμf

Frequency change during first 5 minutes: 12 cycles; 0.003%
Specification requirements: 0.015%
Frequency change during remainder of test: 117 cycles; 0.0293%
Specification requirements: 0.03%

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Table 35

Model XTAQ-5 Transmitting Equipment
Locked Key Operation for Two Hours

Test as per paragraph 3-7-10 of Specifications RE 13A 351J

Time	Ambient Temp.°C.	Frequency Kc.	Cycles Change	Per Cent Change	Power Watts	Pr. Amplifier Ep	Ip
0930	26.9	(Filament Energized)					
35	26.8	600.317			2860	2270	2.05
40	26.7	335	18	0.003	2840	2260	2.05
45	26.8	341	24	0.004	2840	2250	2.03
50	26.8	343	26	0.0043	2810	2240	2.01
55	26.8	344	27	0.0045	2765	2230	2.00
1000	26.7	343	26	0.0043	2700	2210	1.99
05	26.6	342	25	0.0042	2700	2210	1.99
10	26.7	343	26	0.0043	2700	2200	1.98
15	26.8	344	27	0.0045	2675	2200	1.98
20	27.0	347	30	0.005	2675	2190	1.95
25	27.0	349	32	0.0052	2645	2180	1.95
30	27.0	352	35	0.0058	2620	2170	1.93
35	27.0	358	41	0.0068	2590	2170	1.93
40	27.0	365	48	0.008	2565	2160	1.92
45	27.0	373	56	0.0092	2565	2160	1.91
50	27.0	380	63	0.0105	2565	2160	1.91
55	27.0	390	73	0.0122	2540	2150	1.90
1100	26.9	399	82	0.0137	2540	2150	1.90
05	26.9	407	90	0.0150	2540	2150	1.90
10	26.9	416	99	0.0165	2540	2150	1.90
15	26.9	425	108	0.018	2540	2150	1.90
20	27.0	436	119	0.0198	2540	2150	1.90
25	27.0	444	127	0.0212	2515	2150	1.89
30	27.0	451	134	0.0223	2515	2150	1.89
	(At conclusion of test voltages readjusted.)						
31	27.0	457	140	0.0233	2780	2250*	2.00

(*) denotes that 2250 volts was the maximum voltage obtainable from the motor generator after this period of operation.

Relative humidity during course of test ranged between limits of 68% and 73%.

Temperature of antenna variometer: Start - 27°C; Finish - 59° C.
Temperature of P. A. Plate Choke: Start - 27° C; Finish - 96° C.

Antenna Constants: Resistance 6.75 ohms; Capacity 919 μμf

Frequency change during first 5 minutes: 18 cycles; 0. 003%
Specification requirements: 0.015%
Frequency change during remainder of test: 116 cycles; 0.0193%
Specification requirements: 0.03%

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Table 36

Model XTAQ-5 Transmitting Equipment

Change from Key Locked to Intermittently Keyed Condition

Test as per paragraph 3-7-11 of Specifications RE 13A 351J

Test Condition	Frequency at end of 10 minute key locked period (kc)	Frequency at end of 10 sec. dash 20 minutes later (kc)	Change in Freq. Cycles	Per Cent
MO Fil. lighted	200.253	200.250	3	0.0015
MO Fil. not lighted	200.249	200.254	5	0.0025
MO Fil lighted	600.194	600.195	1	0.00017
MO Fil not lighted	600.192	600. 211	19	0.0033

Note: Motor Generator not in operation during idle periods.

Specification Requirements:

M.O. filament lighted - 0.01%
M.O. filament not lighted - 0.02%

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Table 37

Model XTAQ-5 Transmitting Equipment
Change from Continuously Keyed Condition to
Intermittently Keyed Condition

Test as per paragraph 3-7-12 of Specifications RE 13A 351J

Frequency at end of 30 minutes continuous keying (kc)	Frequency at end of 10 second dash after 20 minute pause (kc)	Change in Frequency Cycles	Per Cent
200.254	200.251	3	0.0015
600.204	600.169	35	0.0058

Note: Motor Generator in operation continuously during tests.

Specification Requirements: 0.01%

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Table 38

Model XTAQ-5 Transmitting Equipment
Inclination Test

Test as per paragraph 3-7-13 of Specifications RE 13A 351J

Time	Maximum Frequency	Difference (Cycles)	Minimum Frequency	Test Condition
	Inclination: Side to Side			
1440	200.221			Stationary
1445	226	4	200.222	Inclination
1450	227	4	223	"
1455	228	4	224	"
1500	231	5	226	"
1505	231	4	227	"
1510	234	5	229	"
1511	227			Stationary

Maximum frequency change during test from frequency at start of test: 13 cycles; 0.0065%.
Maximum frequency change at any two points in one inclination cycle (max. to min.) 5 cycles; 0.0025%
Specification Requirements: 0.005%

Notes: Minimum frequencies were obtained when table was level.

Maximum frequencies were obtained when transmitter was inclined to extreme right.

Equipment (transmitter) had been in operation approximately 20 minutes prior to start of test.

Inclination at rate of 5 complete cycles per minute.

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Table 39

Model XTAQ-5 Transmitting Equipment
Inclination Tests

Test as per paragraph 3-7-13 of Specifications RE 13A 351J

Time	Maximum Frequency	Difference (Cycles)	Minimum Frequency	Test Condition
	Inclination: Front to back			
1010	200.297			Stationary
1015	305	8	200.297	Inclination
1020	305	7	298	"
1025	307	8	299	"
1030	309	9	300	"
1035	310	9	301	"
1040	311	8	303	"
1041	305			Stationary

Maximum frequency change during test from frequency at start of test: 14 cycles; 0.007%

Maximum frequency change at any two points in inclination cycle (max. to min.): 9 cycles; 0.0045%

Specification requirements: 0.005%

Notes: Transmitter had been in operation practically continuously two hours prior to test.

Minimum frequency occurred when transmitter was inclined all the way backward.

Maximum frequency occurred when transmitter was inclined all the way forward; four or five rapid lilts of about 5 cycles occurred in this region.

Inclination at rate of 5 complete cycles per minute.

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Table 40

Model XTAQ-5 Transmitting Equipment
Inclination Test

Test as per paragraph 3-7-13 of Specifications RE 13A 351J

Time	Maximum Frequency	Difference (Cycles)	Minimum Frequency	Test Condition
		Inclination: Side to side		
0900	600. 231			Stationary
0905	239	13	600.226	Inclination
0910	240	11	229	"
0915	242	9	231	"
0920	247	13	234	"
0925	243	4	239	"
0930	246	3	243	"
0931	240			Stationary

Maximum frequency change during test from frequency at start of test: 16 cycles; 0.0027%
Maximum frequency change at any two points in one inclination cycle (max. to min.): 13 cycles; 0.0022%
Specification requirements: 0.005%

Notes: During this test rapid lilts were noted in the output frequency; these disappeared at 0921 and were not again noted.

Minimum frequencies occurred when transmitter was inclined toward extreme left.

Maximum frequencies occurred when transmitter was inclined toward extreme right.

Inclination at rate of 5 complete cycles per minute.

Transmitter had been in operation approximately 40 minutes prior to test.

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Table 41

Model XTAQ-5 Transmitting Equipment
Inclination Test

Test as per paragraph 3-7-13 of Specifications RE 13A 351J

Time	Maximum Frequency	Difference (Cycles)	Minimum Frequency	Test Condition
	Inclination: Front to back			
0830	600.252			Stationary
0835	275	21	600.354	Inclination
0840	278	21	257	"
0845	282	20	262	"
0850	287	20	267	"
0855	290	21	269	"
0900	293	22	271	"
0901	277			Stationary

Maximum frequency change during test from frequency at start of test: 41 cycles; 0.0068%
Maximum frequency change at any two points in inclination cycles (max. to min.): 22 cycles; 0.0037%
Specification requirements: 0.005%

Notes: Transmitter warmed up about 15 minutes prior to start of test.

Maximum frequency occurred when transmitter was inclined forward. Four or five rapid lilts occurred in this region corresponding to a frequency change of about 15 cycles.

Inclination at rate of 5 complete cycles per minute.

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Table 42

Model XTAQ-5 Transmitting Equipment
Vibration

Test as per paragraph 3-7-14 of Specifications RE 13A 351J

Time	Frequency Kc	Remarks
1335	200.195	Not vibrating
1335	195	Vibration started
1340	194	
1345	193	
1350	195	
1355	195	
1400	194	
1405	195	
1405	195	Vibration stopped

Maximum set in frequency between beginning and end of test - 0 cycles; 0%

Specification Requirements: 0.005%

1235	600.189	Not vibrating
1235	188	Vibration started
1240	186	
1245	179	
1250	177	
1255	185	
1300	183	
1305	185	
1305	183	Vibration stopped.

Maximum set in frequency between beginning and end of test - 3 cycles; 0.0005%

Specification Requirements: 0.005%

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Table 43

Model XTAQ-5 Transmitting Equipment

Shock Test

Test as per paragraph 3-7-15 of Specifications RE 13A 351J

Shock Applied To:	Frequency 1 Minute Before Shock	Frequency 2 Minutes After Shock	Set in Frequency Cycles	Per Cent
Front	200.242	200.240	2	0.001
Left	200.237	200.237	0	0
Right	200.316	200.319	3	0.0015
Back	200.322	200.321	1	0.0005
Front	600.268	600.275	7	0.0012
Left	600.245	600.244	1	0.00017
Right	600.283	600.280	3	0.0005
Back	600.284	600.290	6	0.001

Specification Requirements: 0.005%

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Table 44

Model XTAQ-5 Transmitting Equipment
Summary of Frequency Stability Tests

Test as per paragraph 3-7 of Specifications RE 13A 351J

Test No.	200 Kc	600 Kc	Specification Limits
3-7-1 (a)	0.0032	0.0024	0.01
(b)	0.0065	0.0048	0.015
3-7-2 (a)	0.01	0.0074	0.02
(b)	0.0130	0.0125	0.045
3-7-3	0.006	0.0095	0.015
3-7-4	0.002	0.0067	0.01
3-7-5	0.006	0.0077	0.005
3-7-6 (a)	0.0164	0.0111	0.015
(b)	0.0031	0.0029	0.005
3-7-7	0.005	0.001	0.006
3-7-8	0.0012	0.0017	0.0025
3-7-9	0.0095	0.0255	0.05
3-7-10(a)	0.0015	0.003	0.015
(b)	0.0025	0.0193	0.03
3-7-11(a)	0.0015	0.00017	0.01
(b)	0.0025	0.0033	0.02
3-7-12	0.0015	0.0058	0.01
3-7-13	0.007	0.0068	0.005
3-7-14	0.0	0.0005	0.005
3-7-15	0.0015	0.0012	0.005
Totals:	0.0999%	0.13327%	0.2985%

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Table 45

Model XTAQ-5 Transmitting Equipment
Determination of Overlap
Master Oscillator Circuit

Test as per paragraph 3-11-1 of Specifications RE 13A 351J

Control "A"	1	1	2	2	3	3	4	4	5	5	6	6	7	7
"B"	0	900	0	900	0	900	0	900	0	900	0	900	0	900
"C"	1	1	2	2	3	3	4	4	5	5	6	6	7	7
"D"	18	86	8	78	5	78	5	78	11	80	6	78	4	76
"E"	1	3	3	4	5	5	5	6	6	6	6	7	7	7
"F"	47	74	56	88	27	78	67	54	48	76	71	52	45	82
"G"	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Frequency Kc:	168.77	211.83	201.42	252.78	239.60	300.56	289.73	363.2	349.79	438.1	422.53	528.03	507.08	631.98
Overlap Kc:	6.23		10.41		13.18		10.96		13.41		15.57		20.95	31.98
Mean Freq.:	171.89		206.63		246.19		295.08		356.5		430.32		517.56	615.99
% Overlap:	3.63		5.04		5.35		3.72		3.76		3.62		4.05	5.19

Specification Requirements: 3%
Antenna Circuit not resonated in above data.
Tuning step No. 2 used during tests.

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Table 46

Model XTAQ-5 Transmitting Equipment
Determination of Overlap
I.P.A. Circuit

Test as per paragraph 3-11-1 of Specifications RE 13A 351J

Control	"A"	1	2	1	3	2	4	3	5	4	6	5	7	6	4
	"B"	0	356	667	484	681	435	730	442	683	366	717	425	724	621
	"C"	1	1	2	2	3	3	4	4	5	5	6	6	7	7*
	"D"	19	100	0	100	0	100	0	100	0	100	0	100	0	100*
	"E"	1	3	3	5	5	6	5	6	6	6	6	7	7	7*
	"F"	45	89	49	53	21	35	67	61	46	83	70	61	44	95*
	"G"	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Frequency Kc:		168.8	217.8	198.4	267.5	237.1	319.1	286.9	386.0	341.5	457.3	416.7	556.1	503.4	671.6
Overlap Kc:		6.2		19.4		30.4		32.2		44.5		40.6		52.7	71.6
Mean Freq.		171.9		208.1		252.3		303.0		363.8		437		529.8	635.8
% Overlap:		3.6		9.3		12.1		10.6		12.2		9.29		9.94	11.3

Specification Requirements: 3%
Antenna circuit not resonated in above data.
Tuning step No. 2 used in obtaining data.

* denotes IPA and PA circuits operating as frequency doublers in order to cover entire range.

[redacted]

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Table 47

Model XTAQ-5 Transmitting Equipment
Determination of Overlap
Power Amplifier Circuit

Test as per paragraph 3-11-1 of Specifications RE 13A 351J

Control	"A"	1	1	1	1	1	2	1	3	2	4	3	6	6	4
	"B"	0	351	0	650	375	390	740	306	569	423	765	668	125	606
	"C"	1	1	1	1	1	2	1	3	2	4	3	6	6	4
	"D"	19	44	18	68	47	38	75	29	53	39	68	61	15	55
	"E"	1	1	2	2	3	3	4	4	5	5	6	6	7	7*
	"F"	45	100	0	100	0	100	0	100	0	100	0	100	0	100*
	"G"	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Frequency Kc:		168.8	182.3	168.8	197.4	183.4	219.5	202.8	255.9	229.9	318.1	289.1	494.8	432.3	668.2
Overlap Kc:		6.2		13.5		14.0		16.7		26.0		29		62.5	68.2
Mean Freq.		171.9		175.6		190.4		211.2		242.9		303.6		463.6	634.1
% Overlap:		3.6		7.7		7.4		7.9		10.7		9.6		13.5	10.8

Specification Requirements: 3%
Antenna circuit not resonated in above data.
Tuning step No. 2 used in obtaining data.

* denotes that P.A. circuit was tuned to double frequency of M.O. and I.P.A. circuits.

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Table 48

Model XTAQ-5 Transmitting Equipment
Variation of Resonant Frequency of Master Oscillator
per Division of Dial Marking

Test as per paragraph 3-15 of Specifications RE 13A 351J

Control "A"	Control "B"	Frequency Kc	Divisions Change	Kc per Division	Per Cent per Division
1	0	168.77			
1	52	170.00	52.0	0.0237	0.0139
1	302	180.00	250.0	0.04	0.0213
1	518.5	190	216.5	0.0462	0.0243
1	696	200	177.5	0.0564	0.0282
1	853	210	157.0	0.0637	0.0303
1	900	211.83	47.0	0.039	0.0184
2	0	201.42			
2	206	210	206	0.0416	0.0198
2	399	220	193	0.0518	0.0235
2	570	230	171	0.0585	0.0254
2	714	240	144	0.0694	0.0289
2	845	250	131	0.0764	0.0305
2	900	252.78	55	0.0505	0.020
3	0	239.6			
3	22	240	22	0.0182	0.0076
3	210	250	188	0.0532	0.0233
3	372	260	162	0.0618	0.0237
3	522	270	150	0.0667	0.0247
3	651	280	129	0.0775	0.0287
3	766	290	115	0.087	0.030
3	880	300	114	0.0877	0.0292
3	900	300.56	20	0.028	0.009
4	0	289.73			
4	18	290	18	0.015	0.0052
4	179	300	161	0.0621	0.0207
4	318	310	139	0.072	0.0232
4	447	320	129	0.0776	0.0242
4	563	330	116	0.0863	0.0262
4	667	340	104	0.0962	0.0283
4	762	350	95	0.105	0.030
4	853	360	91	0.11	0.305
4	900	363.2	47	0.0681	0.0187

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Table 48 (Cont.)

Control "A"	Control "B"	Frequency Kc	Divisions Change	Kc per Division	Per Cent per Division
5	0	349.79			
5	12	350	12	0.0175	0.005
5	151	360	139	0.072	0.020
5	269	370	118	0.0847	0.0229
5	379	380	110	0.091	0.0244
5	578	400	94	0.1064	0.0266
5	663	410	85	0.01177	0.0287
5	744	420	81	0.1235	0.0294
5	819	430	75	0.1335	0.0311
5	900	438.10	81	0.10	0.0229
6	0	422.53			
6	101	430	101	0.0739	0.0172
6	205	440	104	0.0961	0.0219
6	300	450	95	0.1053	0.0234
6	391	460	91	0.110	0.0239
6	479	470	88	0.1137	0.0242
6	560	480	81	0.1234	0.0257
6	633	490	73	0.137	0.0280
6	702	500	69	0.145	0.0290
6	767	510	65	0.154	0.0302
6	830	520	63	0.158	0.0304
6	900	528.03	70	0.115	0.0218
7	0	507.08			
7	45	510	45	0.065	0.0125
7	137	520	92	0.1087	0.0213
7	222	530	85	0.1177	0.0222
7	303	540	81	0.1235	0.0229
7	379	550	76	0.1316	0.0240
7	454	560	75	0.1334	0.0238
7	525	570	71	0.141	0.0247
7	589	580	64	0.156	0.0269
7	650	590	61	0.164	0.0278
7	708	600	58	0.173	0.0289
7	763	610	55	0.182	0.0299
7	816	620	53	0.189	0.0305
7	873	630	57	0.176	0.028
7	900	631.98	27	0.0734	0.0116

Specification Requirements: Frequency per division to fall between 0.015% and 0.03% at any frequency.

Width of each M.O. dial division: 0.044"
Specification Requirements: to be not less than 0.05"

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Table 49

Model XTAQ-5 Transmitting Equipment
Change in Frequency Due to Operation of Dial Locking Devices
Test as per paragraph 3-16 of Specifications RE 13A 351J

Control	Frequency Not Locked	Frequency Locked	Change in Frequency Cycles	Change in Frequency Per Cent
MO "B" cc	200.297	200.308	11	0.0055
MO "B" c	200.273	200.289	16	0.008
IPA "D" cc	200.310	200.310	0	0
IPA "D" c	200.310	200.310	0	0
PA "F" cc	200.310	200.310	0	0
PA "F" c	200.310	200.310	0	0
Ant. "H" cc	200.311	200.311	0	0
Ant. "H" c	200.312	200.312	0	0
MO "B" cc	600.279	600.309	30	0.005
MO "B" c	600.257	600.300	33	0.0055
IPA "D" cc	600.308	600.308	0	0
IPA "D" c	600.304	600.304	0	0
PA "F" cc	600.303	600.303	0	0
PA "F" c	600.303	600.303	0	0
Ant. "H" cc	600.303	600.303	0	0
Ant. "H" c	600.303	600.303	0	0

Specifications require that dial lock shall not adversely affect frequency calibration of circuits.

Note: cc denotes that dial setting had been approached in counter-clockwise direction before applying dial lock.

c denotes that dial setting had been approached in clockwise direction before applying dial lock.

Transmitter "warmed up" approximately 1/2 hour prior to above tests.

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Table 50

Model XTAQ-5 Transmitting Equipment
Action of Automatic Positioning Devices

Test as per paragraph 3-17-1 of Specifications RE 13A 351J

	I.P.A. Ip (M.A.)	P.A. Ip (Amps)	Set Ant. Amps.	Freq. Kc	Freq. Cycles	Change %
Original set.	66	2.1	22.5	200.253		
1st Re-set c	66	2.05	22.0	252	1	0.0005
2nd Re-set cc	66	2.06	22.1	252	1	0.0005
3rd Re-set c	66	2.1	22.1	253	0	0
4th Re-set cc	67	2.08	21.9	253	0	0
5th Re-set c	67	2.09	22.0	253	0	0
6th Re-set cc	67	2.09	22.0	252	1	0.0005
Original set.	118	2.1	23.0	600.255		
1st Re-set c	118	2.1	23.0	255	0	0
2nd Re-set cc	118	2.1	22.5	256	1	0.00017
3rd Re-set c	117	2.12	23.5	249	6	0.001
4th Re-set cc	118	2.1	23.0	250	5	0.00083
5th Re-set c	117	2.11	23.5	249	6	0.001
6th Re-set cc	118	2.1	23.5	250	5	0.00083

No specification limits are imposed.

Notes; Tuning of master oscillator not changed during above tests at any one frequency.

All other continuously variable controls, D, F and H detuned and reset according to positioning devices.

"c" denotes position device approached clockwise.
"cc" denotes position device approached counter-clockwise.

Transmitter had been in operation approximately two hours before this test was conducted.

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Table 51

Model XTAQ-5 Transmitting Equipment
Radio Frequency Voltages Available for Calibration

Test as per paragraph 3-17-4 of Specifications RE 13A 351J

Frequency Kc	R.F. Potential Millivolts
175	25
200	32
300	48
350	68
563	52
600	51

Notes: Transmitting was on Tuning step No. 1 during the above measurements. At other settings of the Tune-Operate switch the R.F. voltage increases.

Potentials measured at the far end of a fifty foot 40 ohm rubber insulated concentric line.

Measurements made with Ferris Model "OF" Interference Locator, Serial No. 40, which was standardized against a Model LN Signal Generator, Serial 64 (substitution method).

Specification Requirements: 1 millivolt into 75 ohm line over entire frequency range.

[redacted]

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Table 52

Model XTAQ-5 Transmitting Equipment
List of Dimensions and Weights

Transmitter Unit	Height	Depth	Width
Transmitter unit assembled:	72"	34-3/16"	49-1/4"
Specification Requirements:	72"	35"	49-3/8"
Right hand unit:	72"	34-3/16"	24-9/16"*
Left hand unit:	72"	34-3/16"	24-11/16"

(*) See paragraph 70 of text.

Motor Generator Equipment			
M.G. Set:	28"#	22"	71-5/8"
Specification Requirements:	27-1/2"	24"	83"

(#) See paragraph 176 of text.

Starter	25"	11-3/8"	19-3/4"
Specification Requirements:	25"	12"	20"

(Cubical contents: 5640 cu.in.)
(Spec. Requirements: 6000 cu.in.)

Weights	NRL Data	G. E. Name Plate	Data Instr. Book
Transmitter unit complete, including tubes:	1058	1070	1077
Motor Generator Equipment:	1177	1164	1175
Controller	78	76.5	76
Total:	2313	2310	2328**

(**) True sum of weights; instruction book adds them up to 2228 lbs.
Maximum permitted by specifications: 3500 pounds

Weight of right hand unit of transmitter: 680 pounds
Weight of left hand unit of transmitter: 378 pounds
Weight of master oscillator unit: 40 pounds
Weight of intermediate amplifier unit: 73 pounds



Table 53

Model XTAQ-5 Transmitting Equipment

Voltage Regulation of Filaments

Test as per paragraph 3-34 of Specifications RE 13A 351J

Position of key	Line Volts	Regulation of Line	Filament Volts	Regulation of Filaments
Open	440		11.0	
Closed	419	5.0%	10.5	4.8%
Open	462		11.0	
Closed	440	5.0%	10.45	5.3%

Specification Requirements: No undue variation in filament voltage.

Note: Filament voltage adjusted to normal value, 11 volts, while the key was open. Power for the above tests was obtained from a variable voltage alternator. The regulation of this alternator was better than 5% so the 5% regulation was artifically produced by adjusting the field rheostat of the Laboratory alternator.

Transmitter Frequency: 200 Kc
Transmitter Output: 2200 Watts

With a power source of good regulation (commercial lines) of 1/4 of 1% the following results were obtained:

Position of key	Filament Volts	Filament Regulation
Open	11.0	
Closed	10.97	0.27%

The adequacy of the filament rheostat was checked with the following results:

Line Volts	Pos. of Key	Pos. of Fil. Rheo.	Fil. Volts
396	Closed	All out	11.0
484	Open	All in	11.2*

(*) It was not possible to reduce the filament voltage to the rated value of 11.0 volts with the filament rheostat.

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Table 55

Model XTAQ-5 Transmitting Equipment
Power Required from Supply Lines

Test as per paragraph 6-5 of Specifications RE 13A 351J

	Starting	Running Key Open
Power Input		1.9
Line Current "A" Amps	87	5.5
Line Current "B" Amps	88	5.3
Line Current "C" Amps	88	6.3
Line Voltage	425	442

200 Kc - CW

	Keyed - 20w/min	Key locked
Power Input (KW)	3.5	7.3
Line Current "A" Amps	6.75	11.1
Line Current "B" Amps	7.0	10.75
Line Current "C" Amps	7.5	10.65
Line Voltage	442	442
RF Power Output (Watts)		2450

200 Kc - MCW

Power Input (KW)	3.25	6.54
Line Current "A" Amps	6.75	10.1
Line Current "B" Amps	6.75	9.65
Line Current "C" Amps	7.5	10.6
Line Voltage	442	442
RF Power Output (Watts)		1500

600 Kc - CW

Power Input (KW)	3.5	7.3
Line Current "A" Amps	7.0	11.25
Line Current "B" Amps	7.0	10.6
Line Current "C" Amps	7.75	11.75
Line Voltage	442	442
RF Power Output (Watts)		2500

Data at plus and minus 10% of line voltage
600 Kc - CW - Key Locked

Line Volts	Power KW
396	7.4*
442	7.3
484	7.72

* Power input rises at -10% of line voltage, presumably due to decrease of motor efficiency at low line voltage.

Antenna constants: Resistance 7 ohms; Capacity 919 μμf

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Table 56

Model XTAQ-5 Transmitting Equipment
Regulation of Generators

Test as per paragraph 6-31 of Specifications RE 13A 351J

Generator	Voltage Key Open	Voltage Key Closed	Per Cent Regulation
Main Plate	2360	2270	4.0
MO Plate	775	753	2.9
Bias*	116	116	0.0
Bias#	116**	118**	

* - As normally used

\# - Excitation load to main plate generator removed

** - Voltage rises as key is closed; generator load less than normal.

Specification Requirements: 5%

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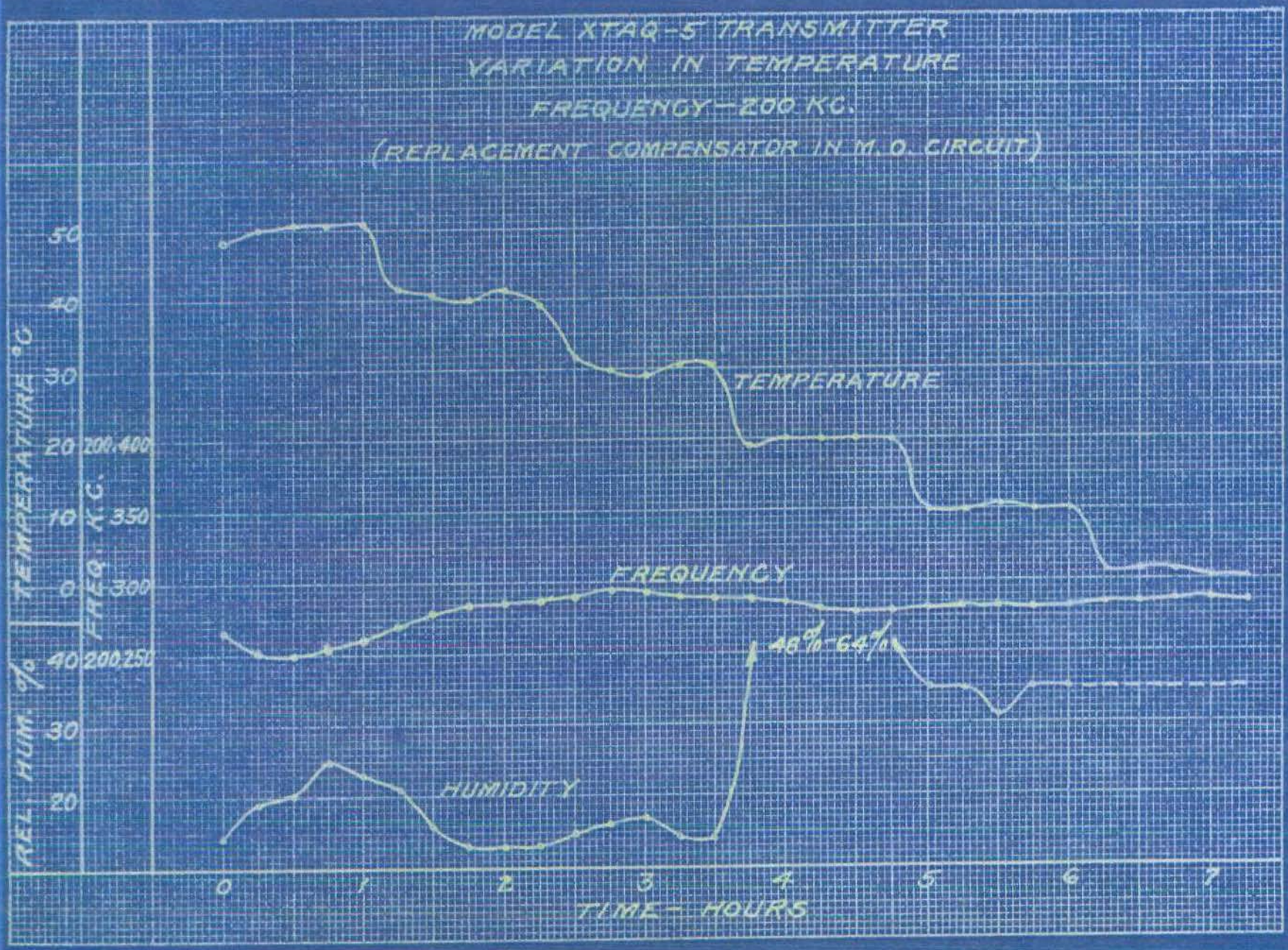

MODEL XTAQ-5 TRANSMITTER
VARIATION IN TEMPERATURE
FREQUENCY—200 KC.
(REPLACEMENT COMPENSATOR IN M.O. CIRCUIT)
TEMPERATURE °C
50
40
30
20
10
0
FREQ. K.C.
200.400
350
300
250
200
REL. HUM. %
40
30
20
TEMPERATURE
FREQUENCY
HUMIDITY
46%-64%
0
1
2
3
4
5
6
7
TIME - HOURS

PLATE 1

U. S. NAVAL RESEARCH LABORATORY
BELLEVUE, D. C.

DATE

PLATE 2

U. S. NAVAL RESEARCH LABORATORY
BELLEVUE, D. C.

DATE

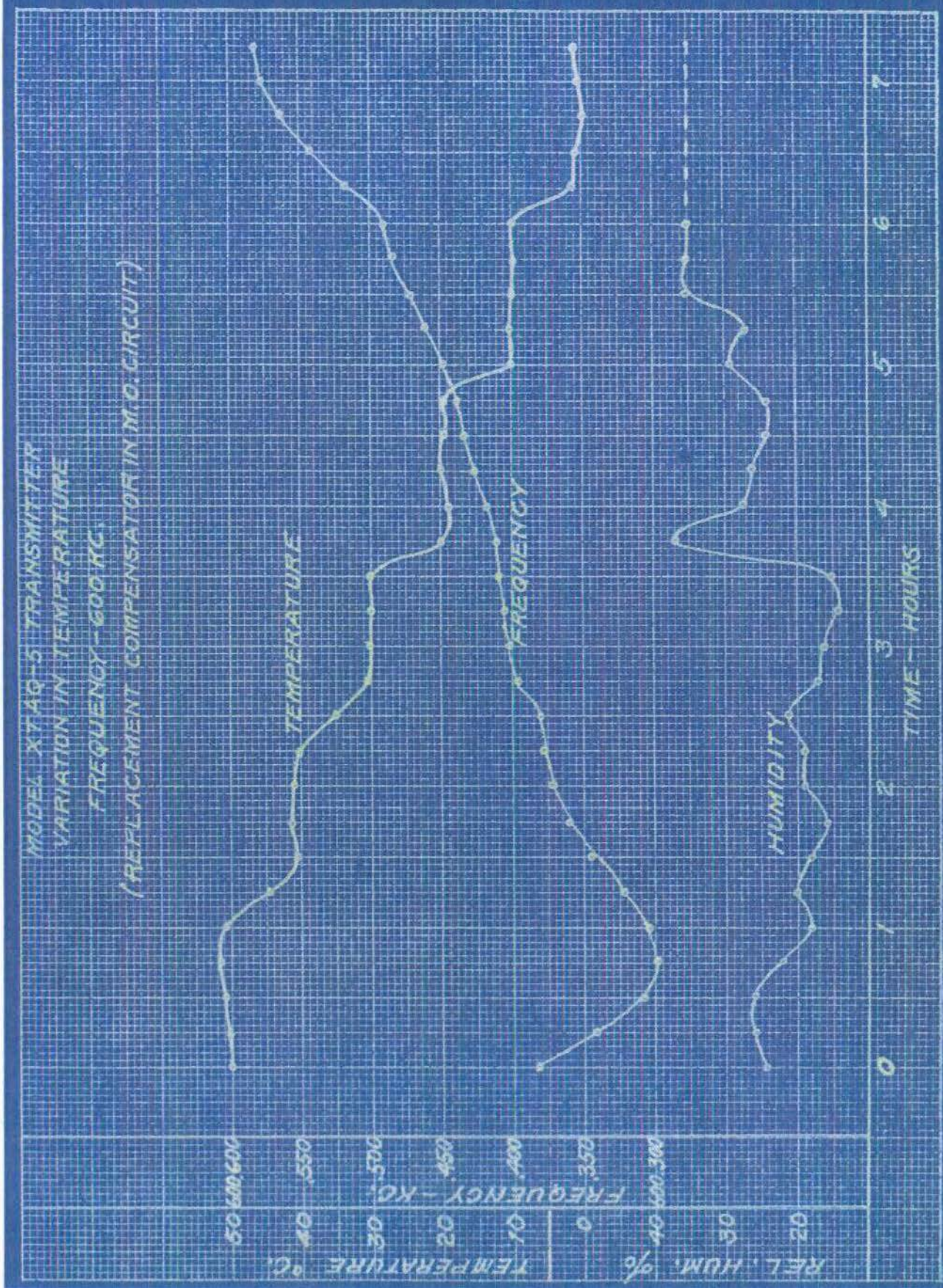


PLATE 3

U. S. NAVAL RESEARCH LABORATORY
BELLEVUE, D. C.

DATE

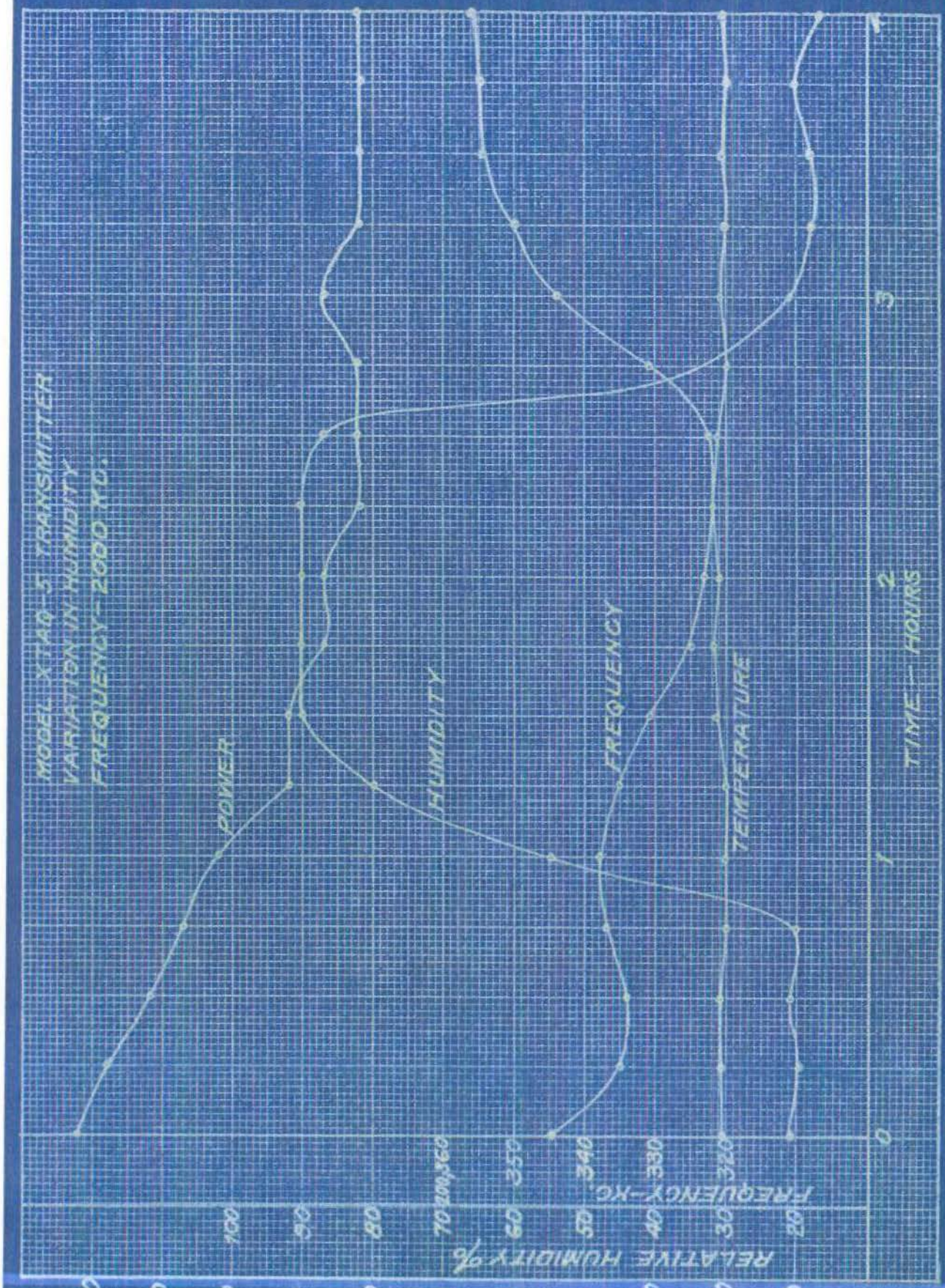


PLATE 4

U. S. NAVAL RESEARCH LABORATORY
BELLEVUE, D. C.

DATE

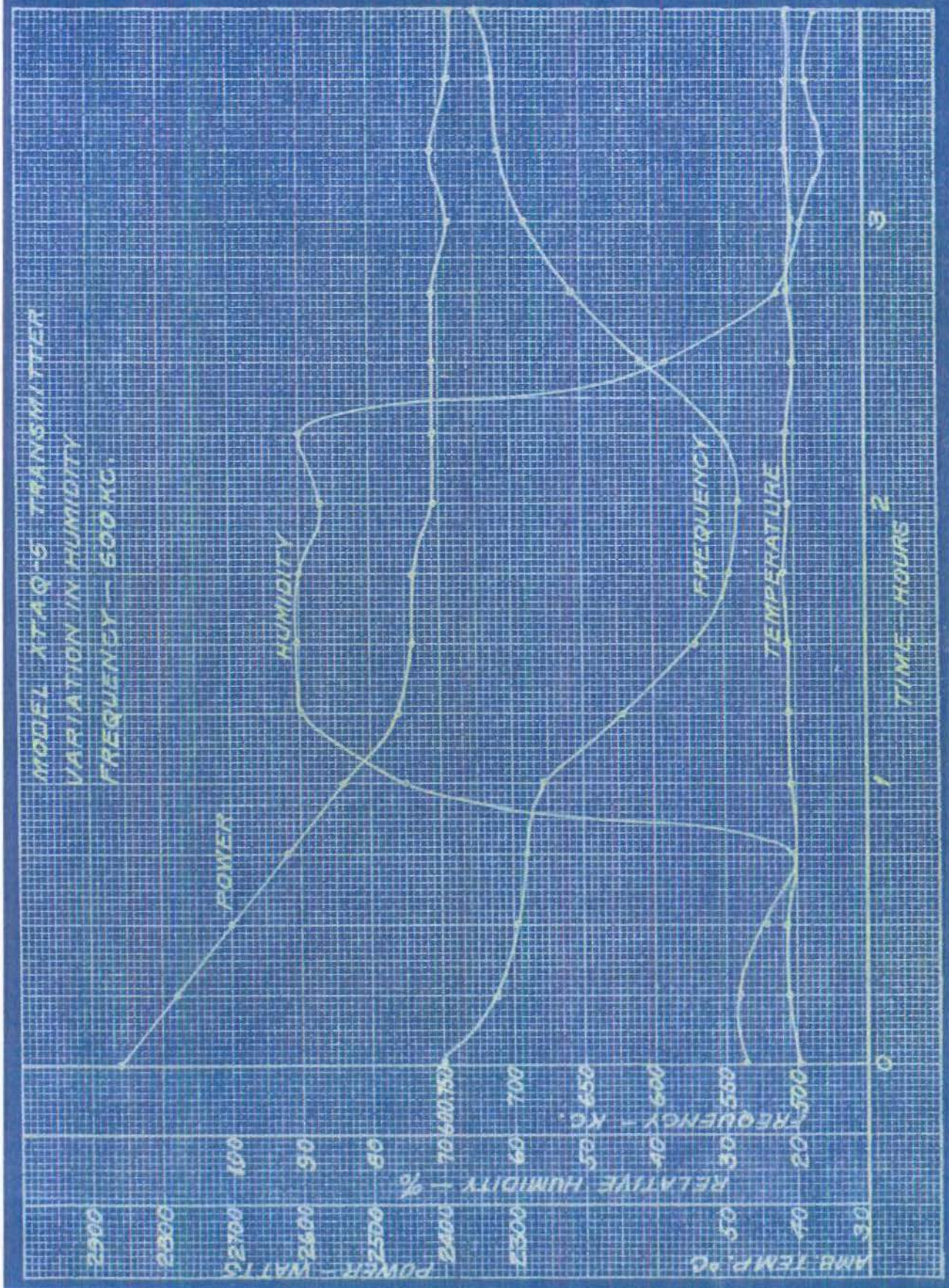


PLATE 5

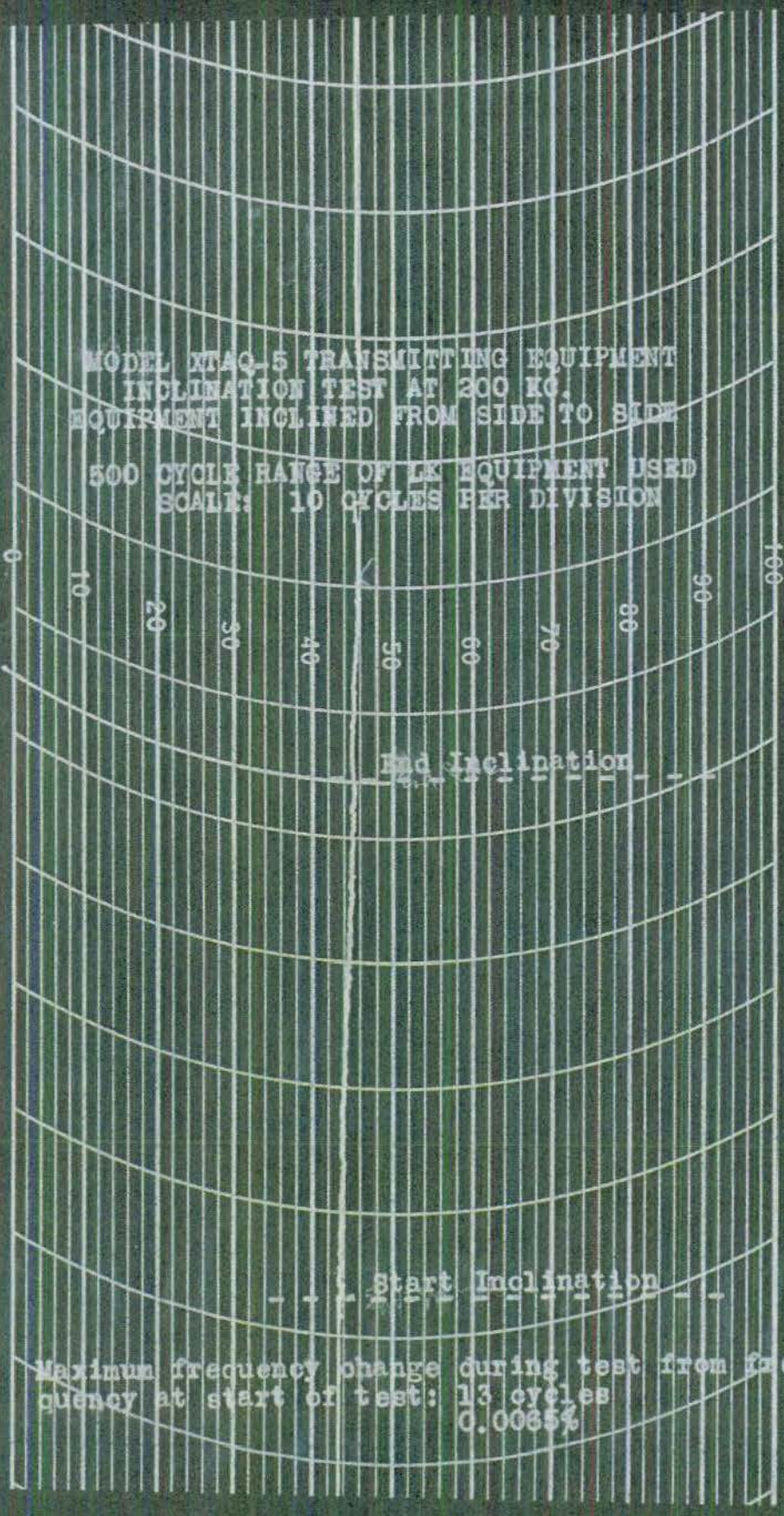

MODEL XTAQ-5 TRANSMITTING EQUIPMENT
INCLINATION TEST AT 200 KC.
EQUIPMENT INCLINED FROM SIDE TO SIDE
500 CYCLE RANGE OF LK EQUIPMENT USED
SCALE: 10 CYCLES PER DIVISION
0
10
20
30
40
50
60
70
80
90
100
End Inclination
Start Inclination
Maximum frequency change during test from frequency at start of test: 13 cycles
0.0065%
ANAPOLIS, IND., U.S.A.
ES
6

Plate 6

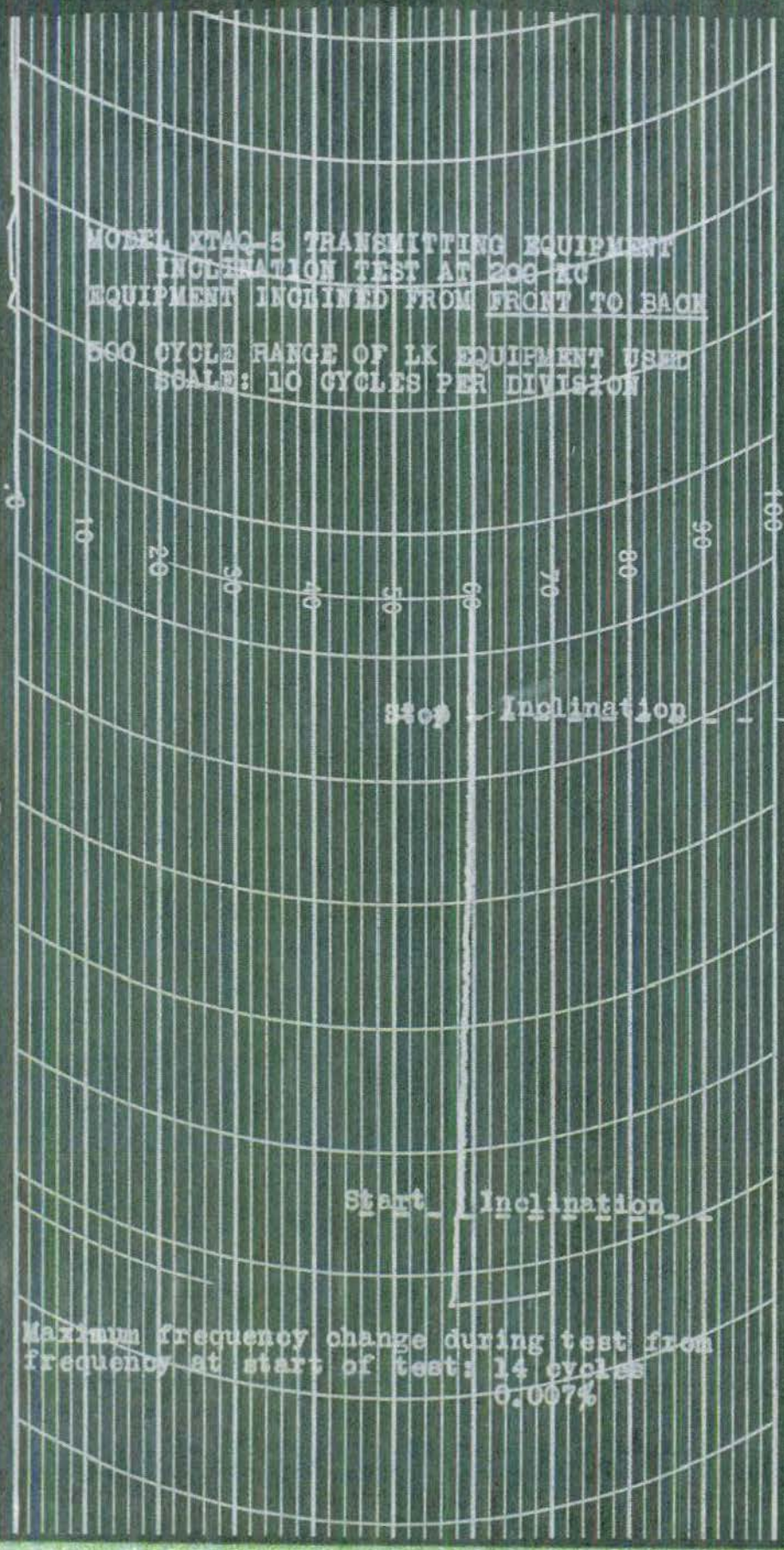

MODEL XTAC-5 TRANSMITTING EQUIPMENT
INCLINATION TEST AT 200 KC
EQUIPMENT INCLINED FROM FRONT TO BACK
500 CYCLE RANGE OF LK EQUIPMENT USED
SCALE: 10 CYCLES PER DIVISION
0
10
20
30
40
50
60
70
80
90
100
Stop Inclination
Start Inclination
Maximum frequency change during test from frequency at start of test: 14 cycles
0.007%
JUL 10 1939
6
OLIS, IND., U.S.A.
ES

Plate 7

MODEL MTAC-5 TRANSMITTING EQUIPMENT
INCLINATION TEST AT 600 KC
EQUIPMENT INCLINED FROM SIDE TO SIDE

500 CYCLE RANGE OF LK EQUIPMENT USED
SCALE: 10 CYCLES PER DIVISION

11

0 10 20 30 40 50 60 70 80 90 100

Stop Inclination

Start Inclination

Maximum frequency change during test
from frequency at start of test:
16 cycles; 0.0027%

10

1939

THE ESTERLINE-ANGUS CO., INDIANAPO

Plate 8

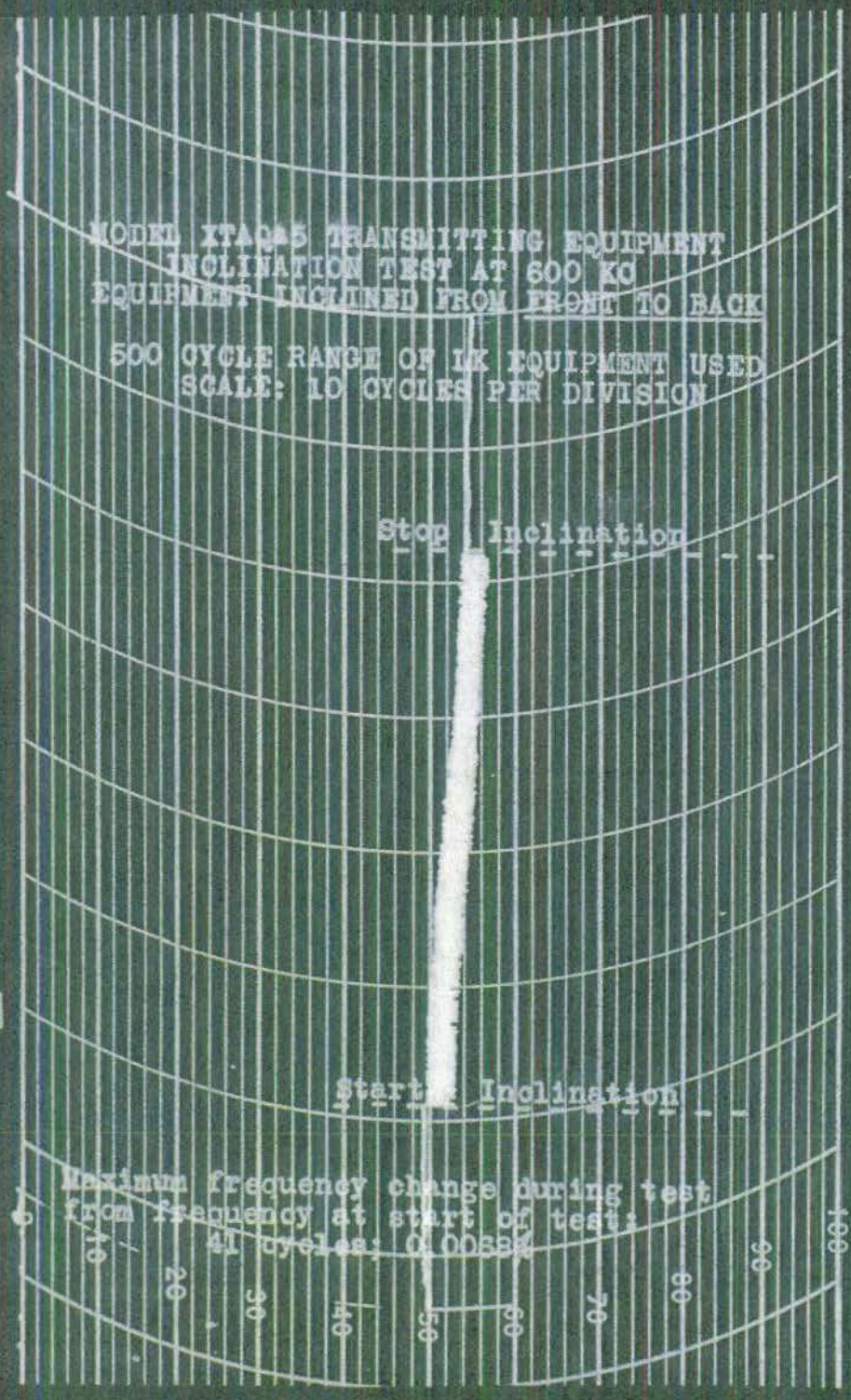

MODEL XTAC-5 TRANSMITTING EQUIPMENT
INCLINATION TEST AT 600 KC
EQUIPMENT INCLINED FROM FRONT TO BACK
500 CYCLE RANGE OF LK EQUIPMENT USED
SCALE: 10 CYCLES PER DIVISION
Stop Inclination
Start Inclination
Maximum frequency change during test
from frequency at start of test:
41 cycles: 0.0088%

Plate 9

10
9
MODEL ATAQ-5 TRANSMITTING EQUIPMENT
VIBRATION TEST AT 300 KILOCYCLES
500 CYCLE RANGE OF LK EQUIPMENT USED
SCALE: 10 CYCLES PER DIVISION
0
10
20
30
40
50
60
70
80
90
100
Stop Vibration
Start Vibration
Maximum set in frequency between
beginning and end of test - 0 cycles
JUL 7 1939
OLIS, IND., U.S.A. CHART NO. 4313-D

Plate 10

MODEL XTAC-5 TRANSMITTING EQUIPMENT
VIBRATION TEST AT 600 KILOCYCLES

500 CYCLE RANGE OF LK EQUIPMENT USED
SCALE: 10 CYCLES PER DIVISION

Stop Vibration

Start Vibration

0 10 20 30 40 50 60 70 80 90 100

Maximum set in frequency between beginning and end of test:
3 Cycles
0.0005%

7

6

JUL 7 1939

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Plate 11

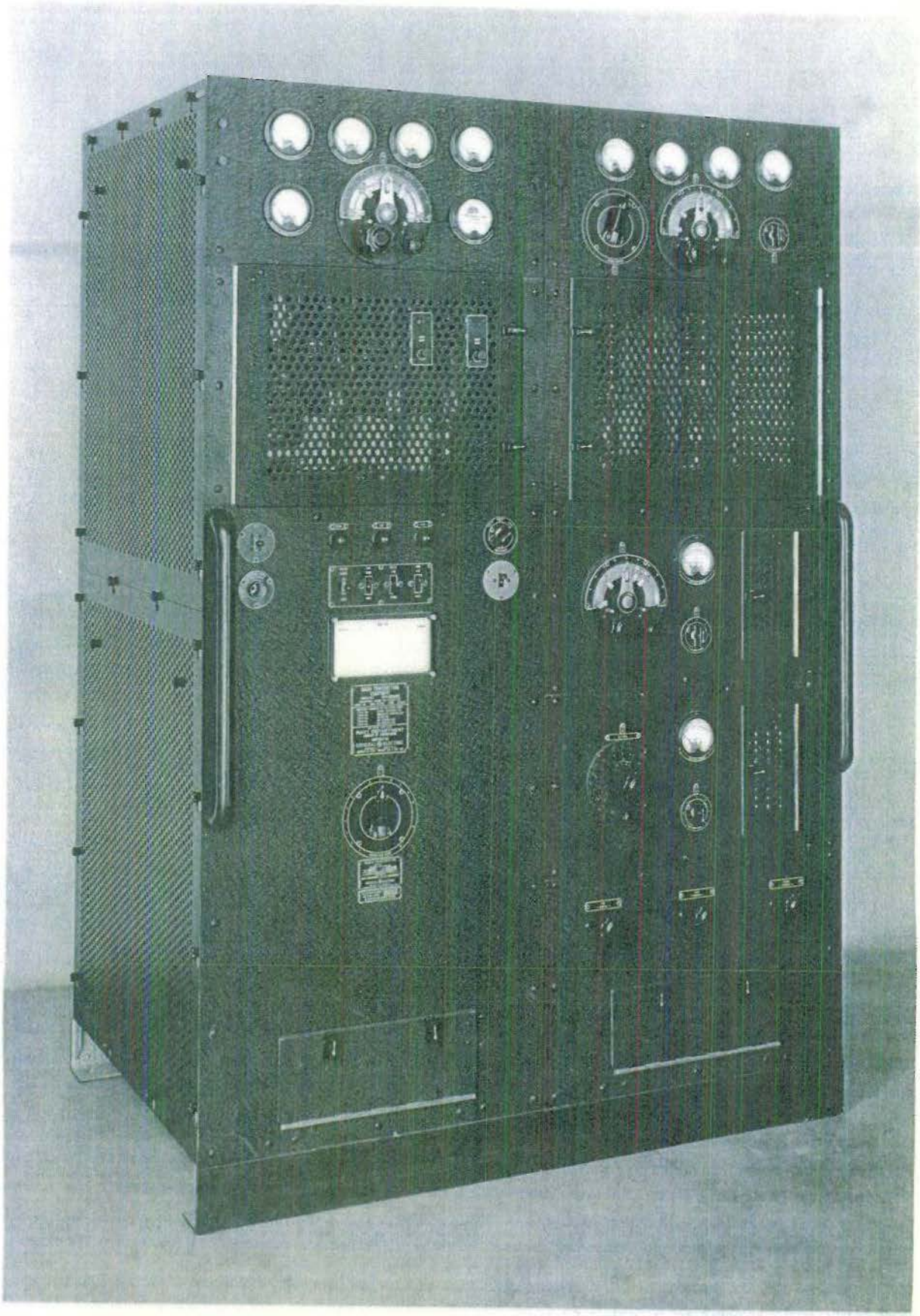


Plate 12

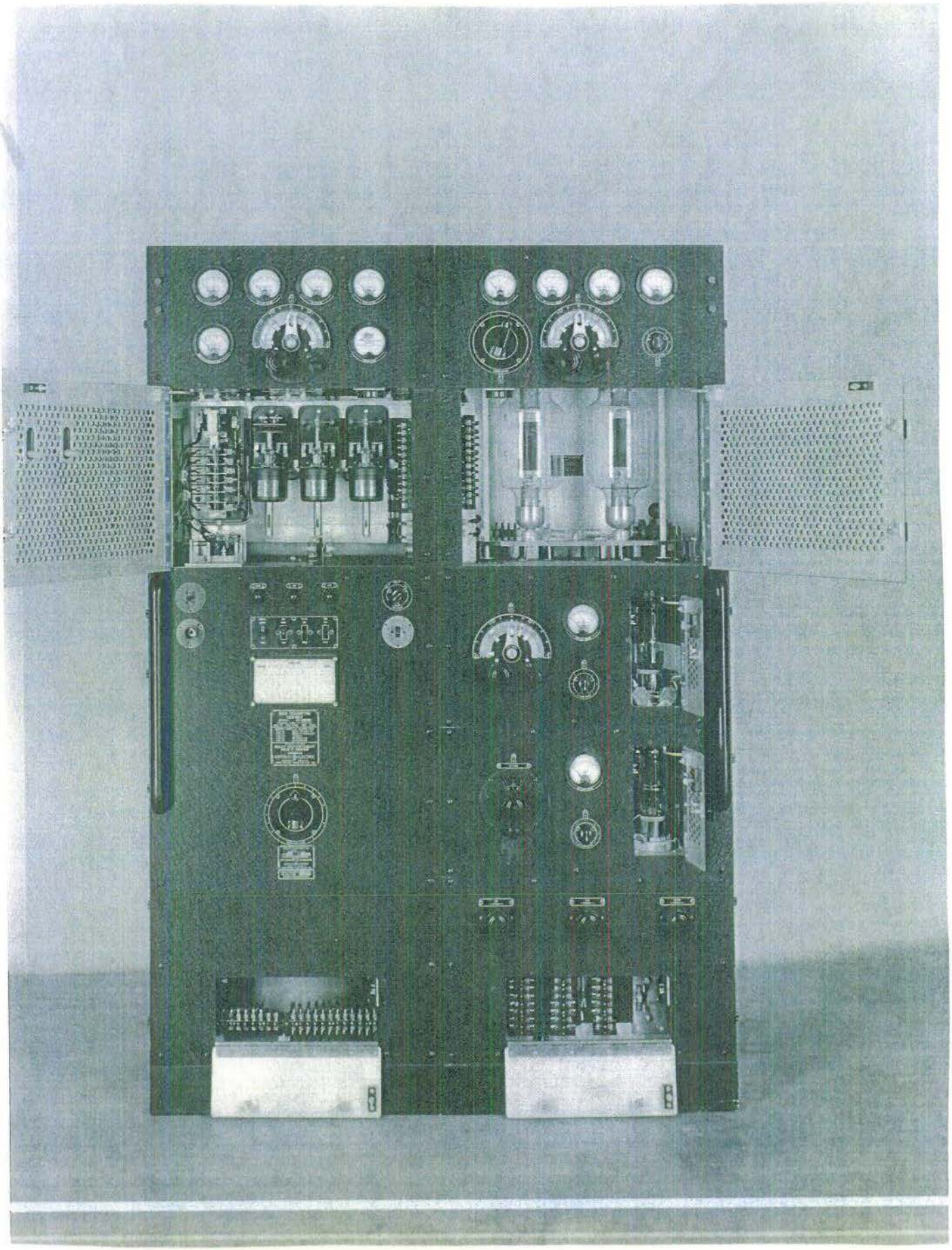


Plate 13

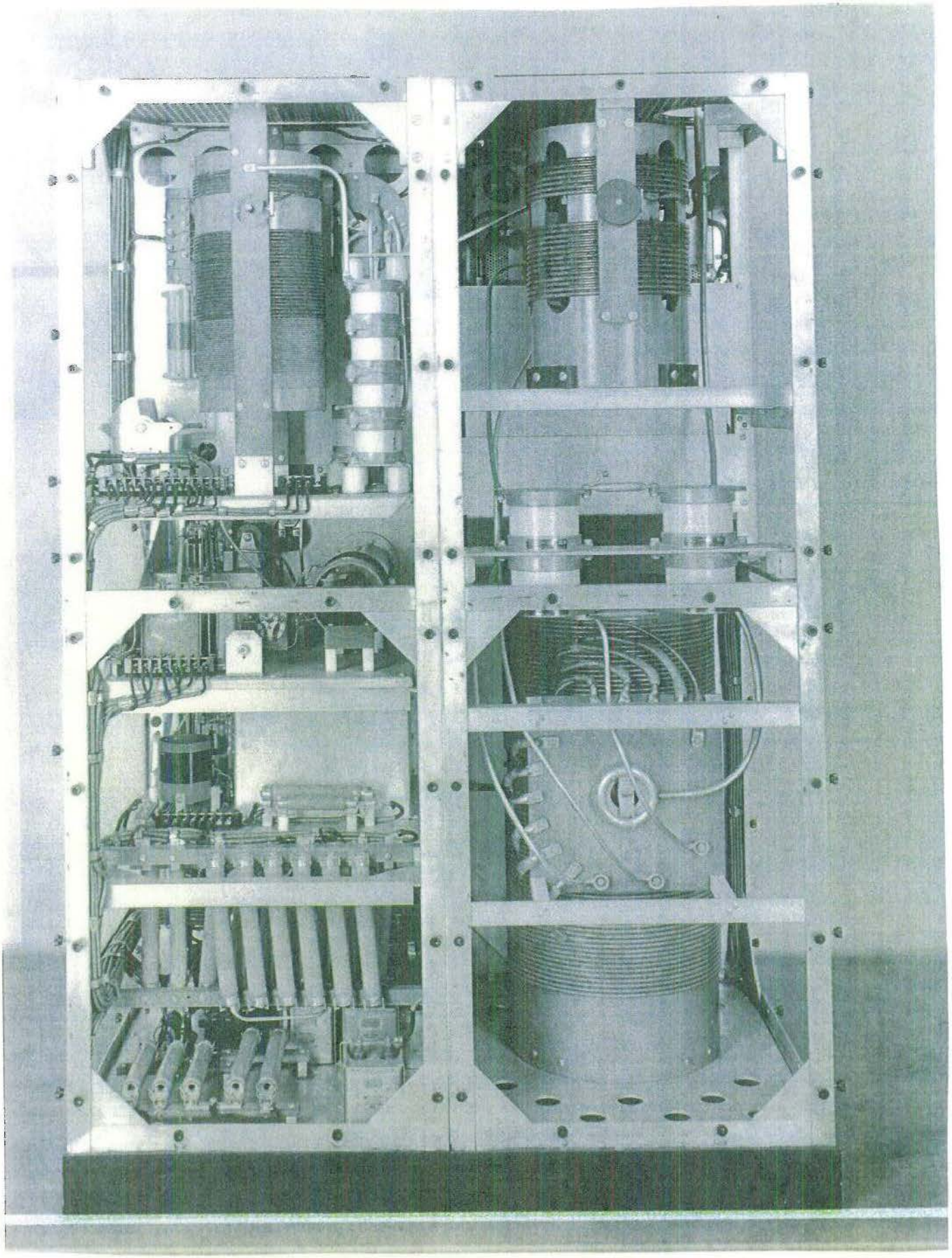


Plate 14

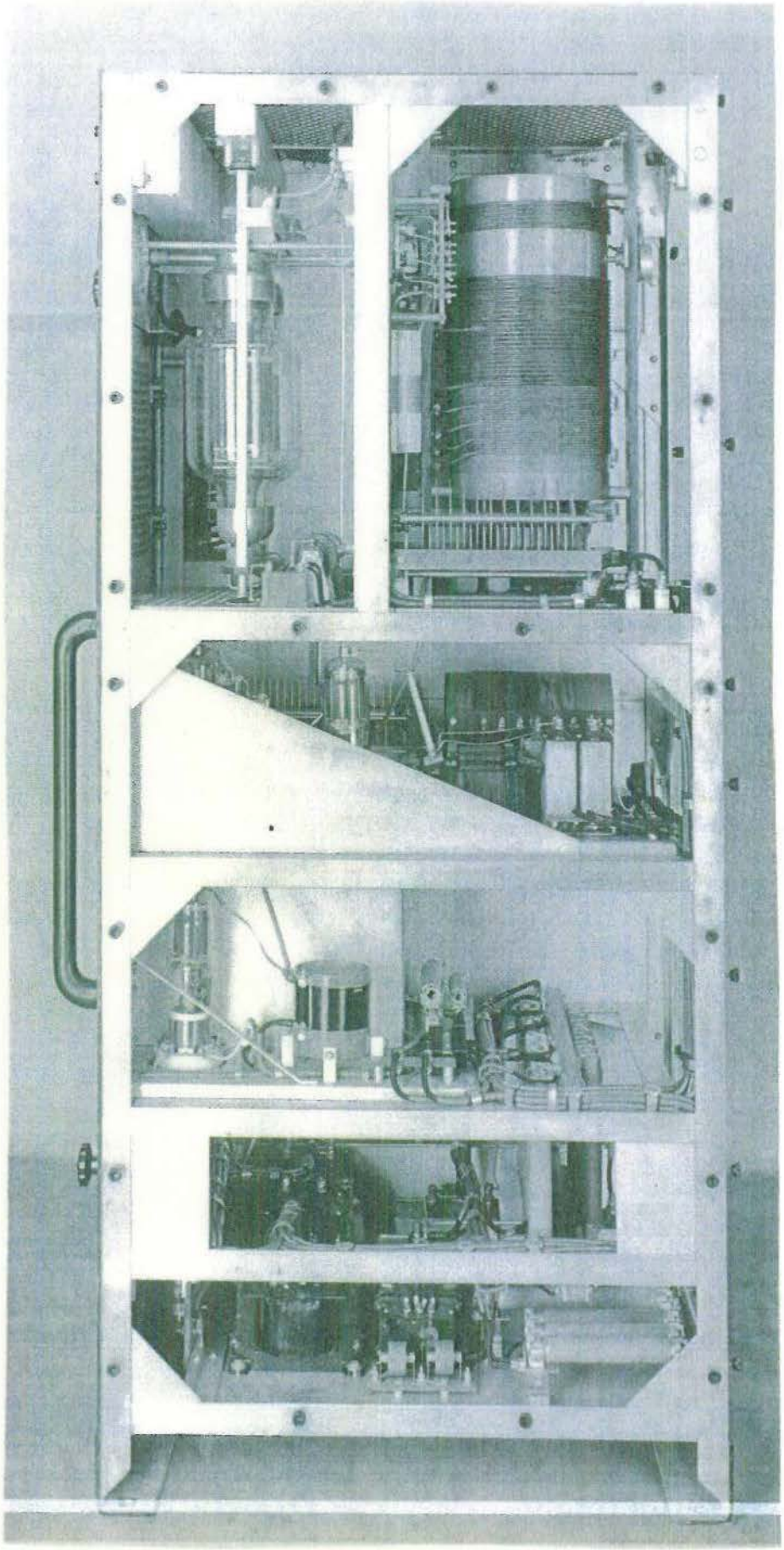


Plate 15

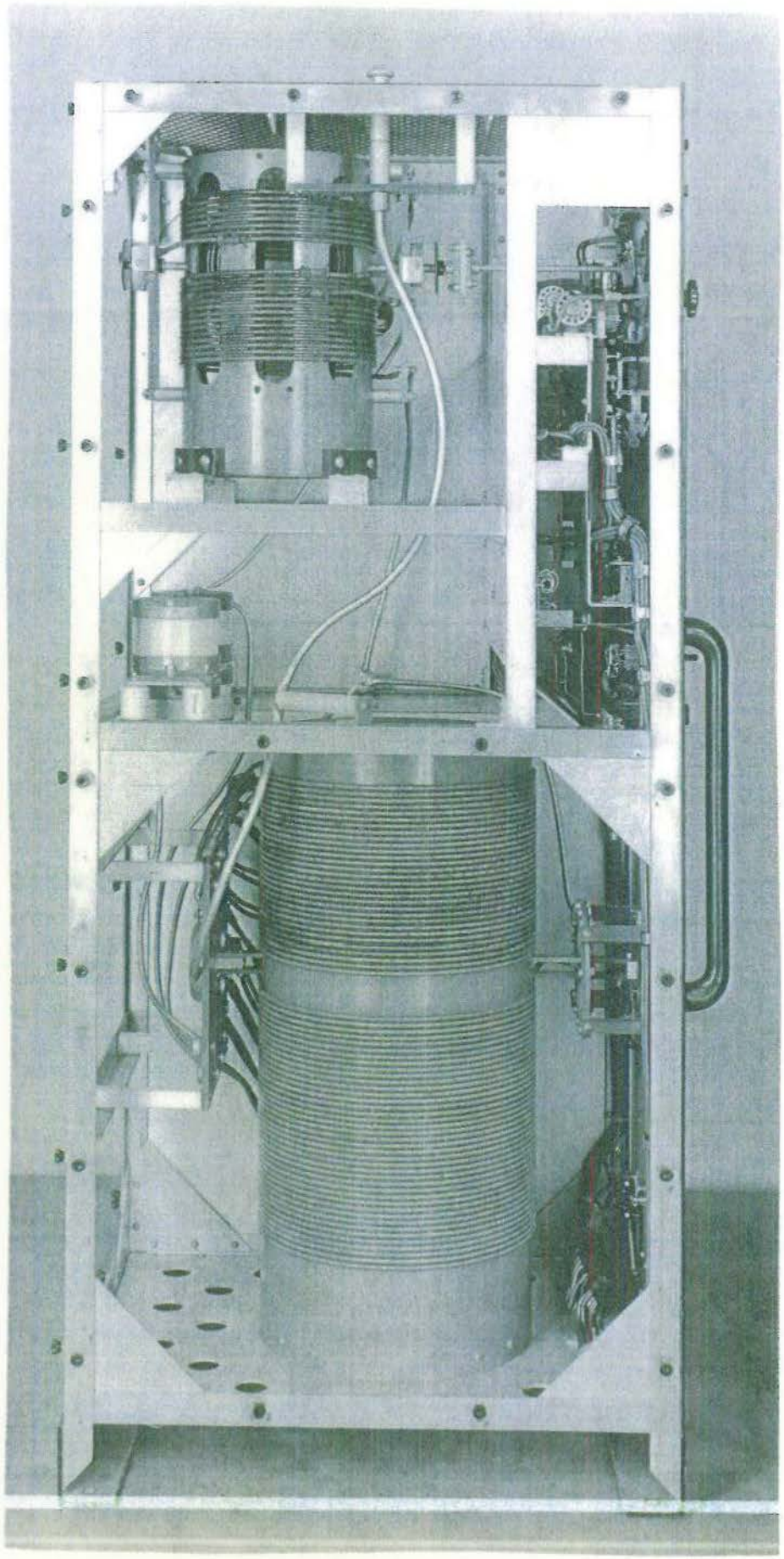


Plate 16

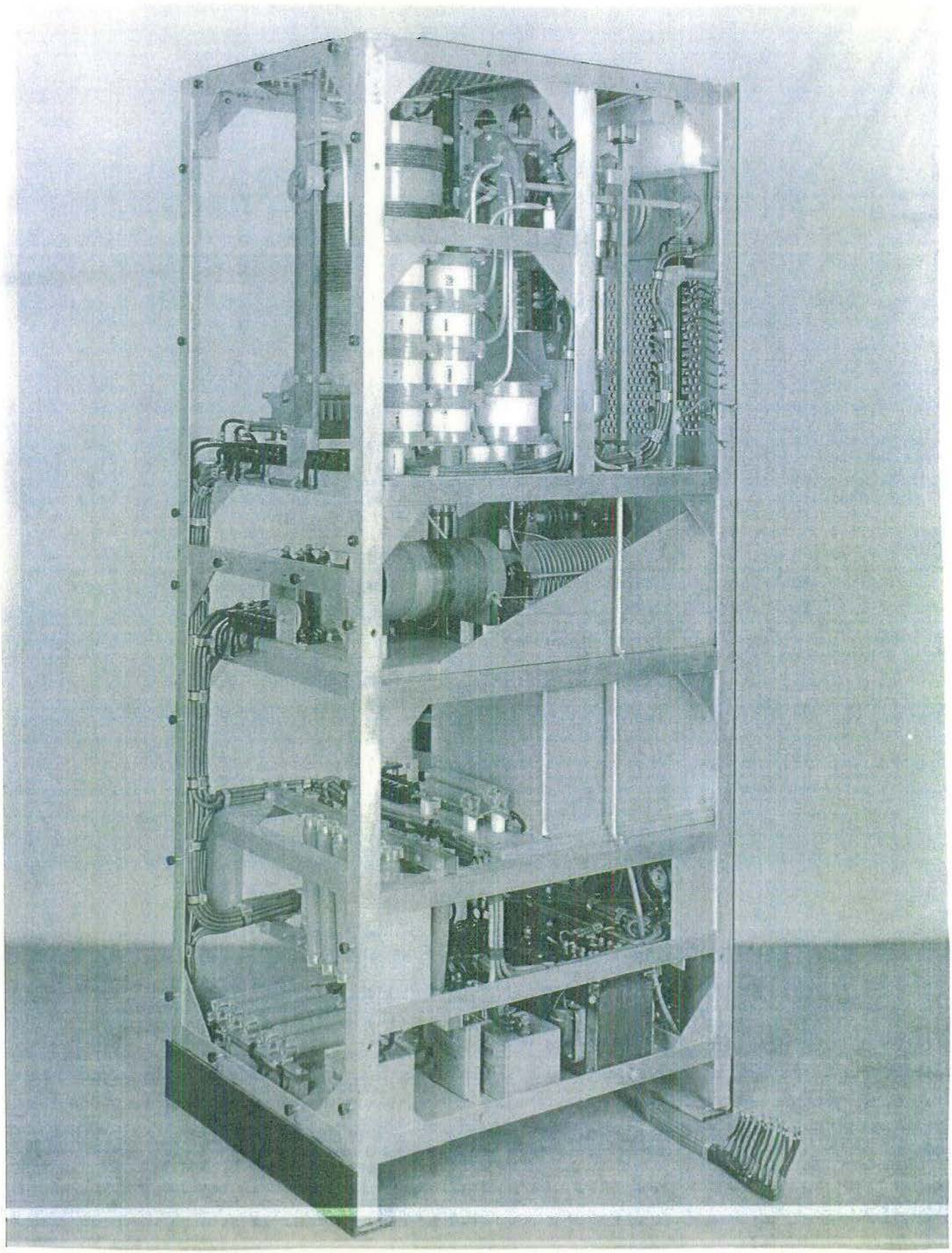


Plate 17

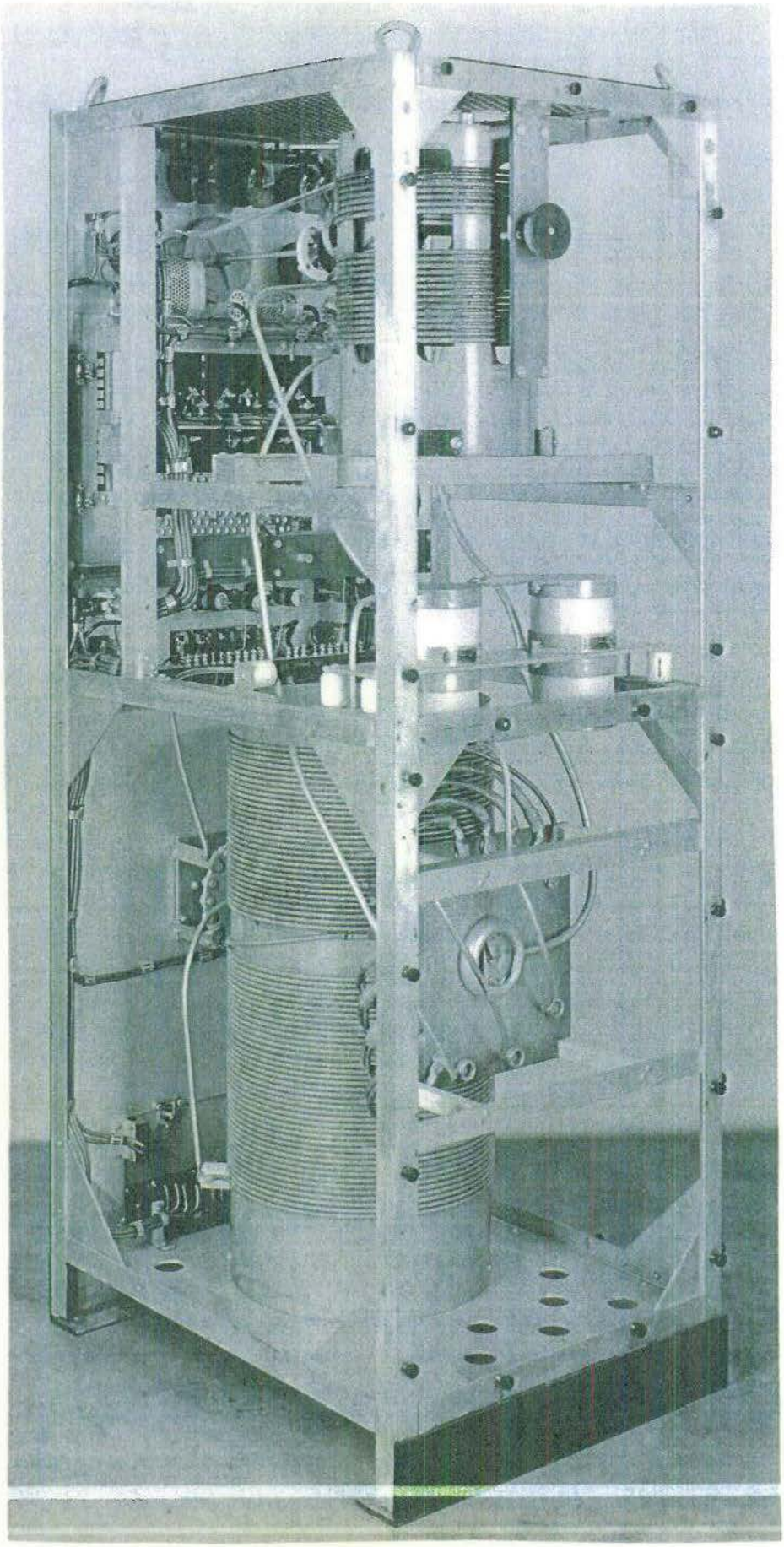


Plate 18

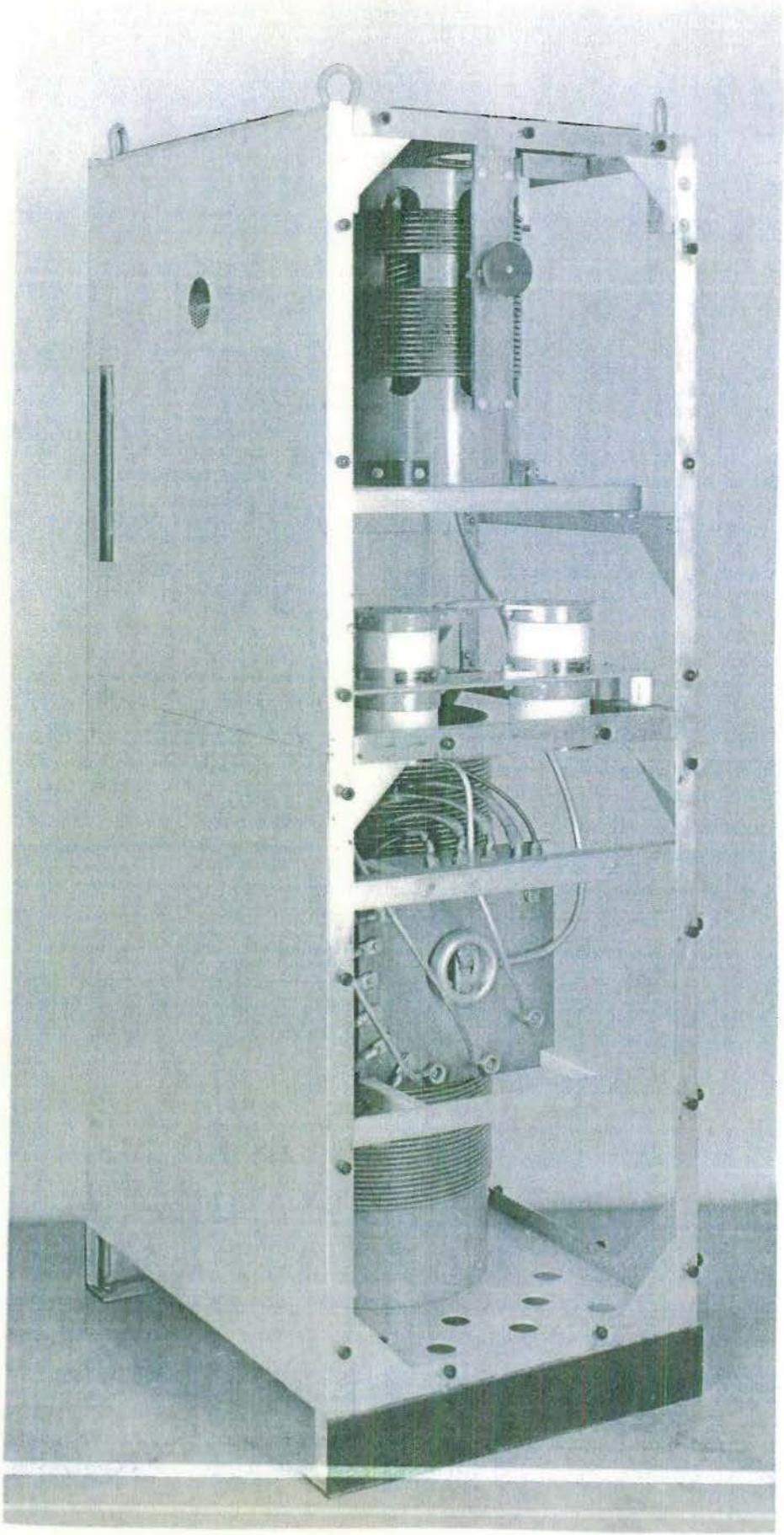


Plate 19

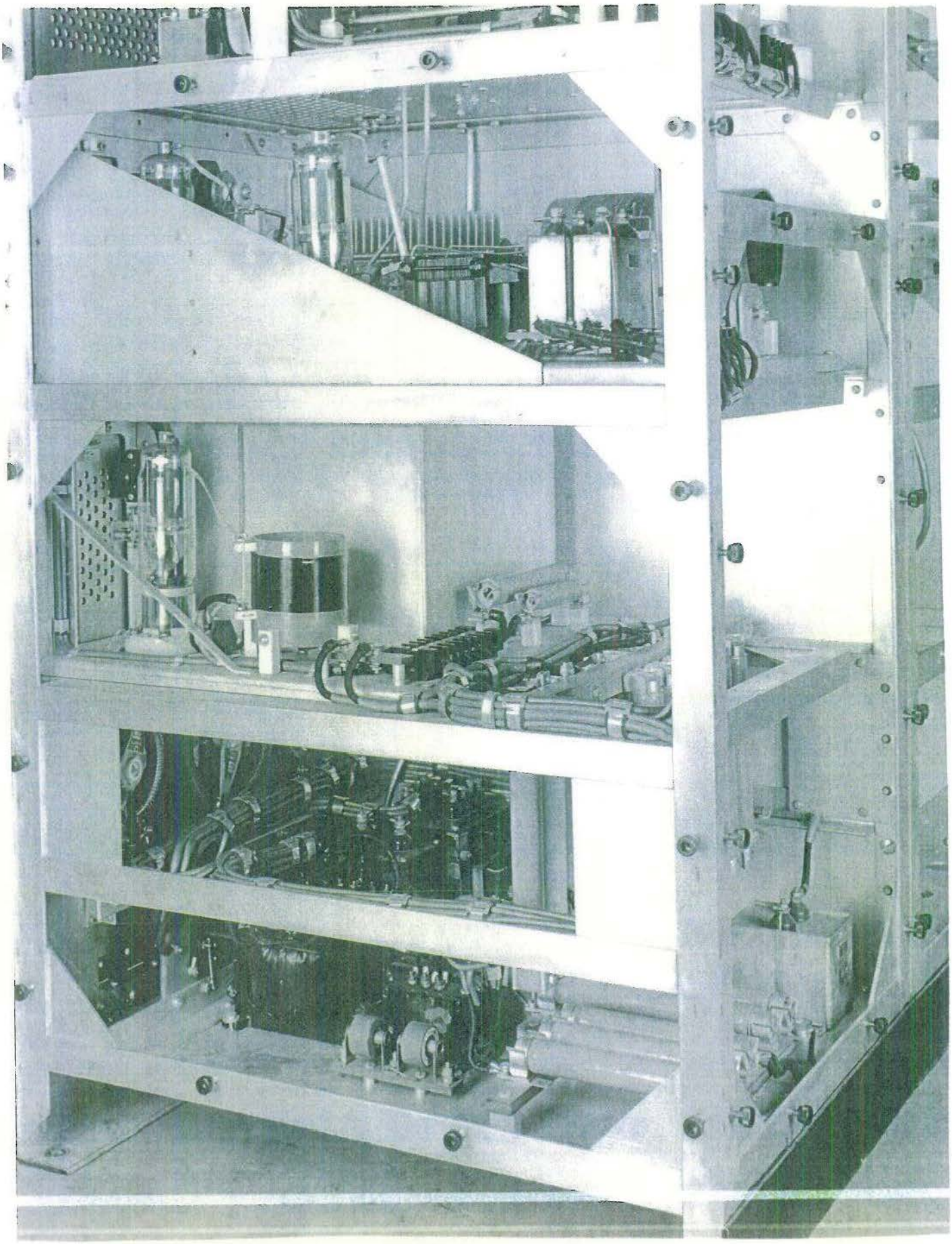


Plate 20

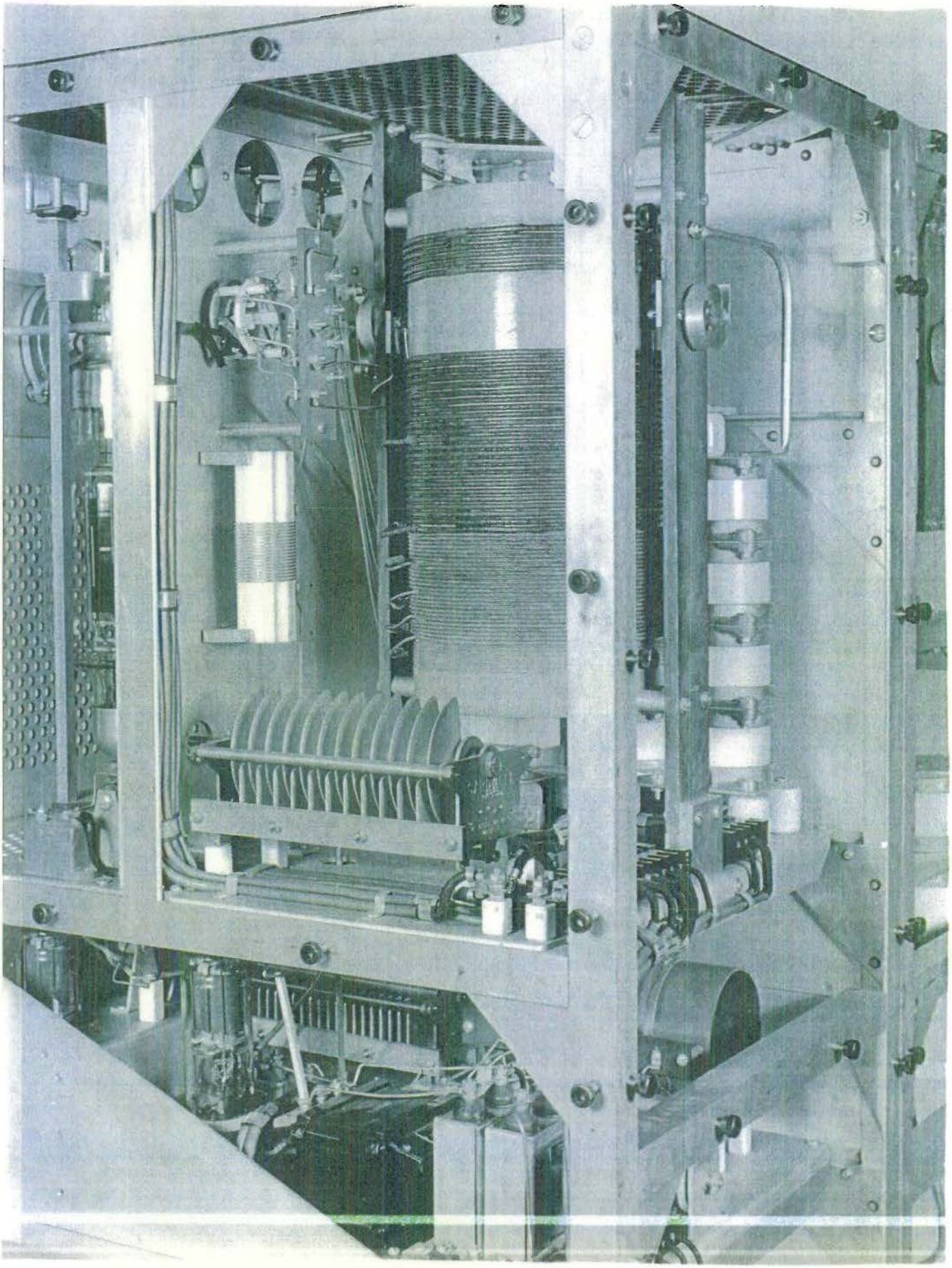


Plate 21

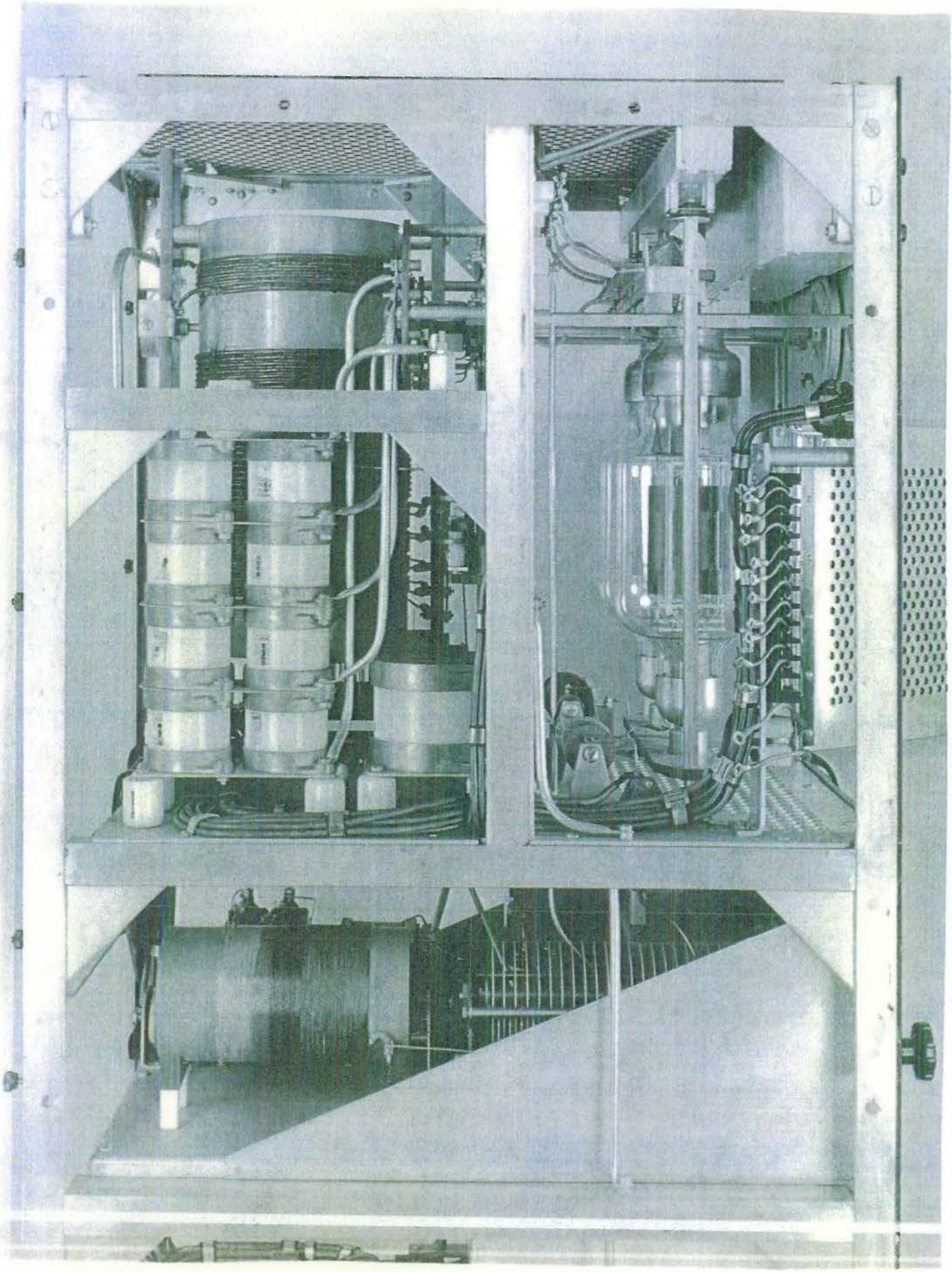


Plate 22



Plate 23

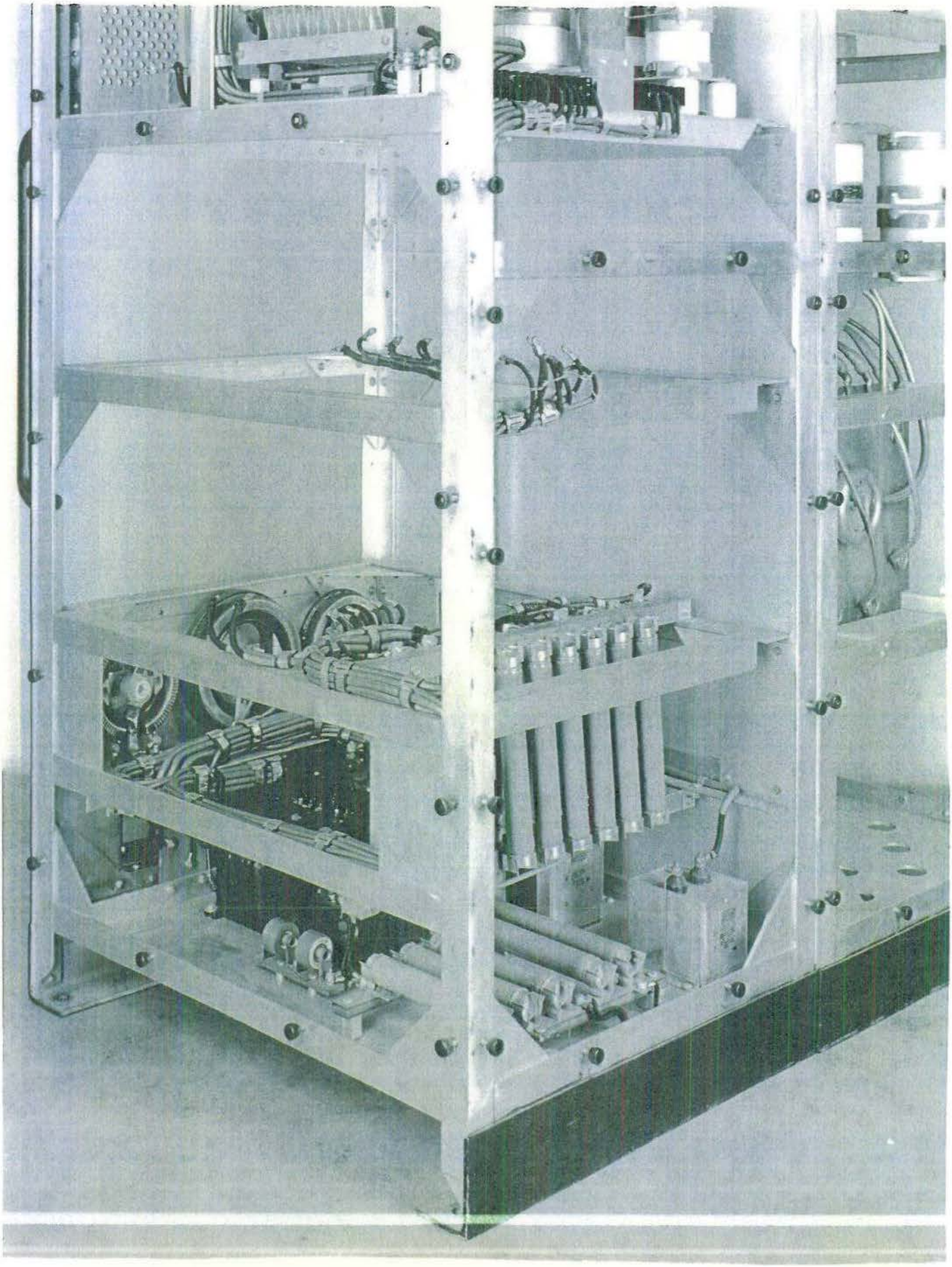


Plate 24

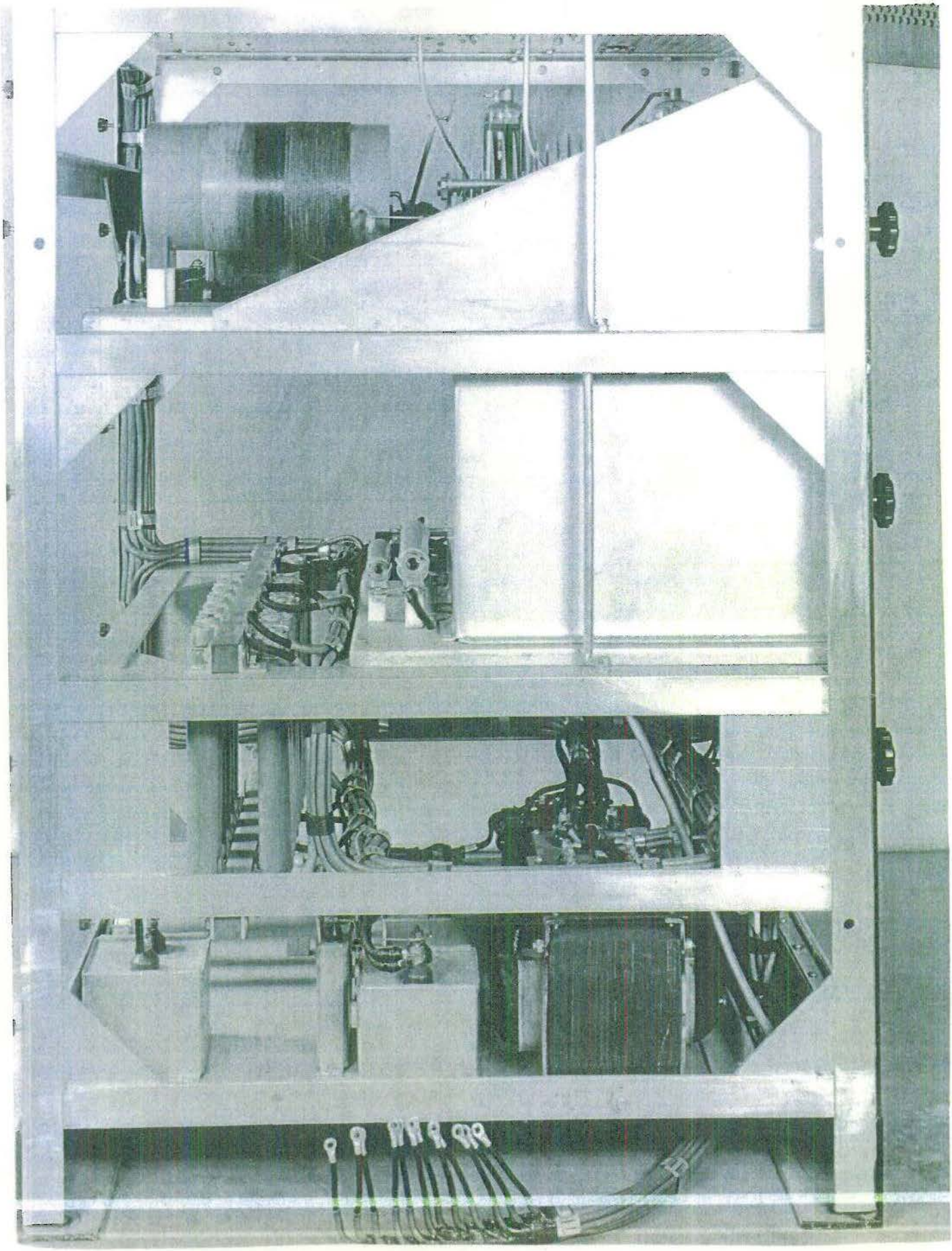


Plate 25

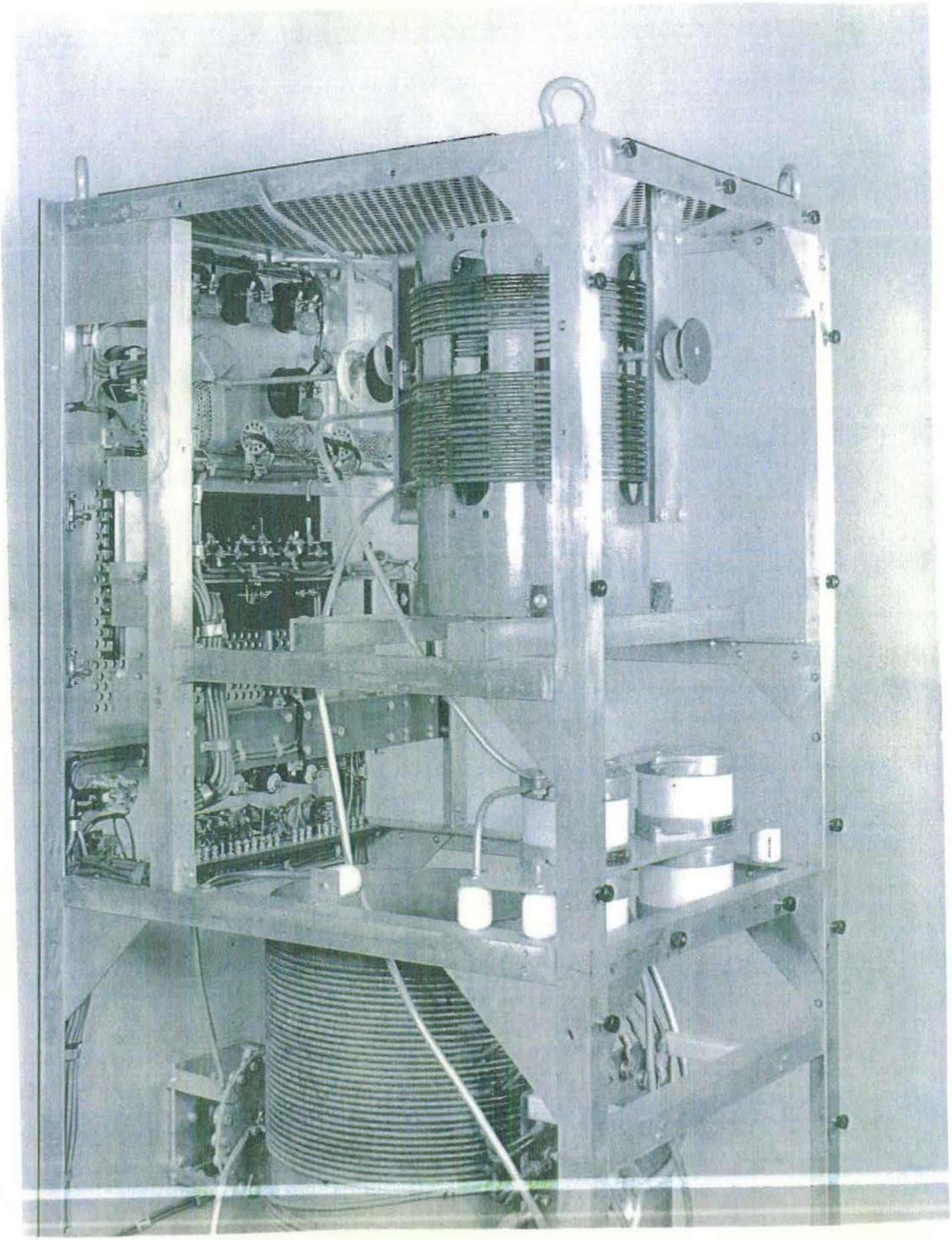


Plate 26

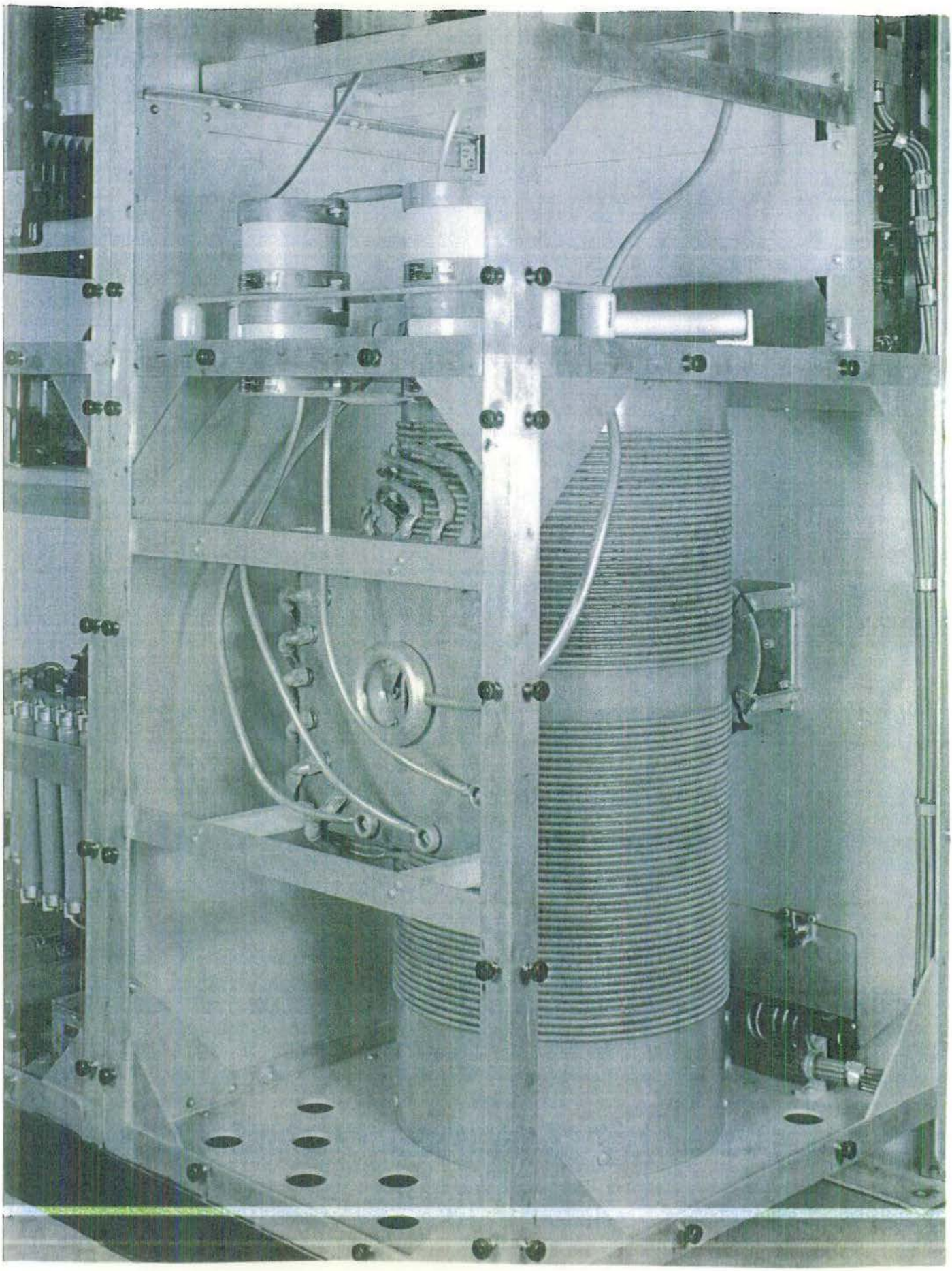


Plate 27

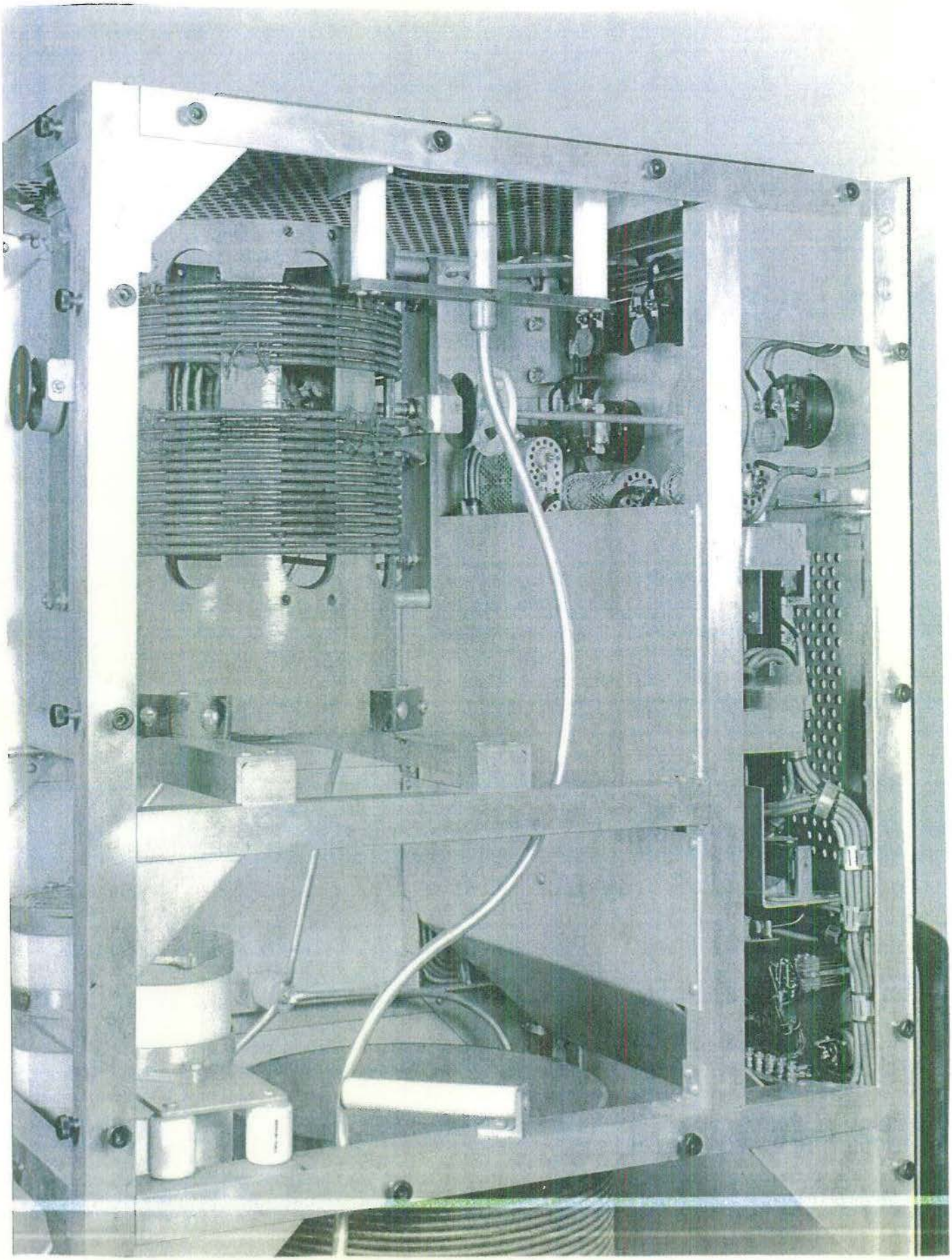


Plate 28

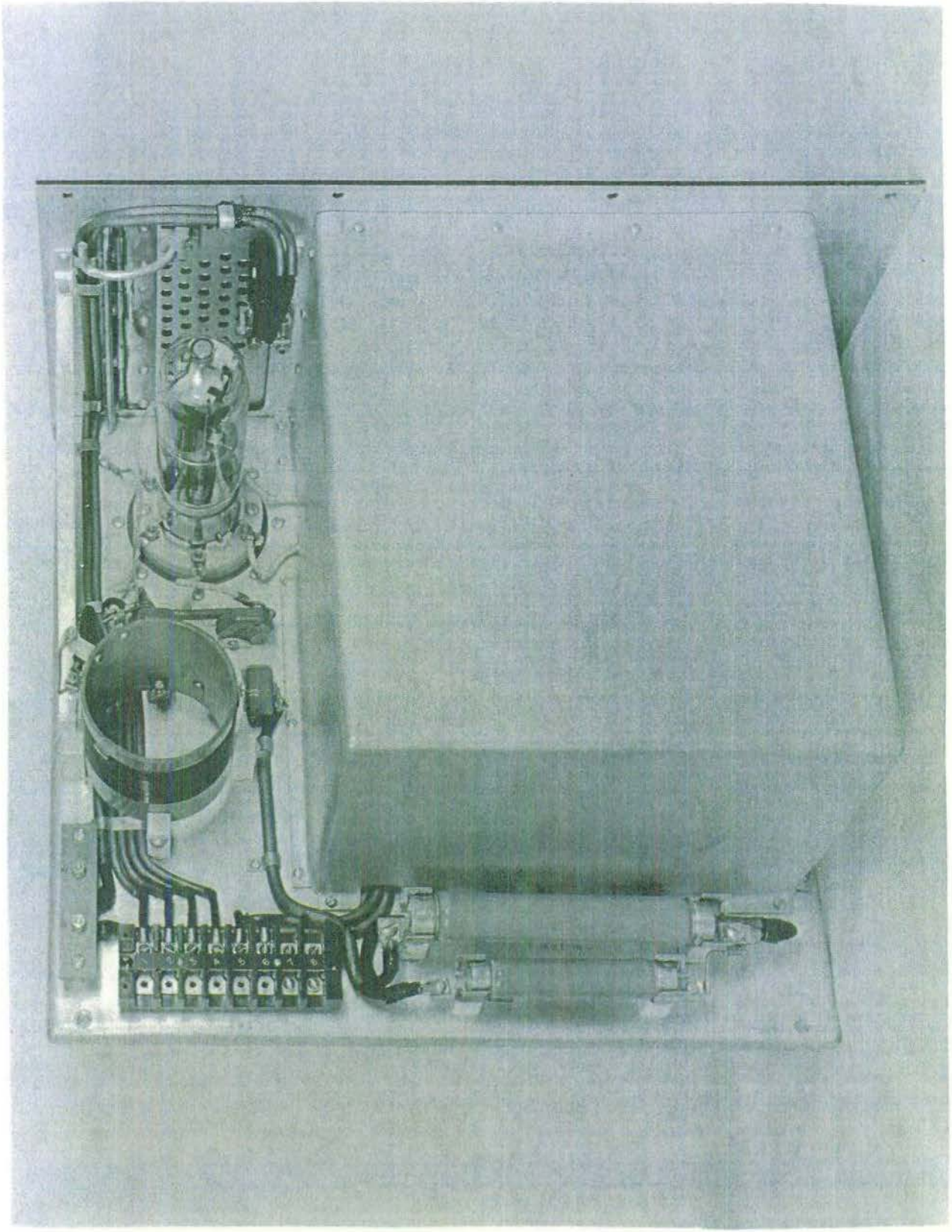


Plate 29

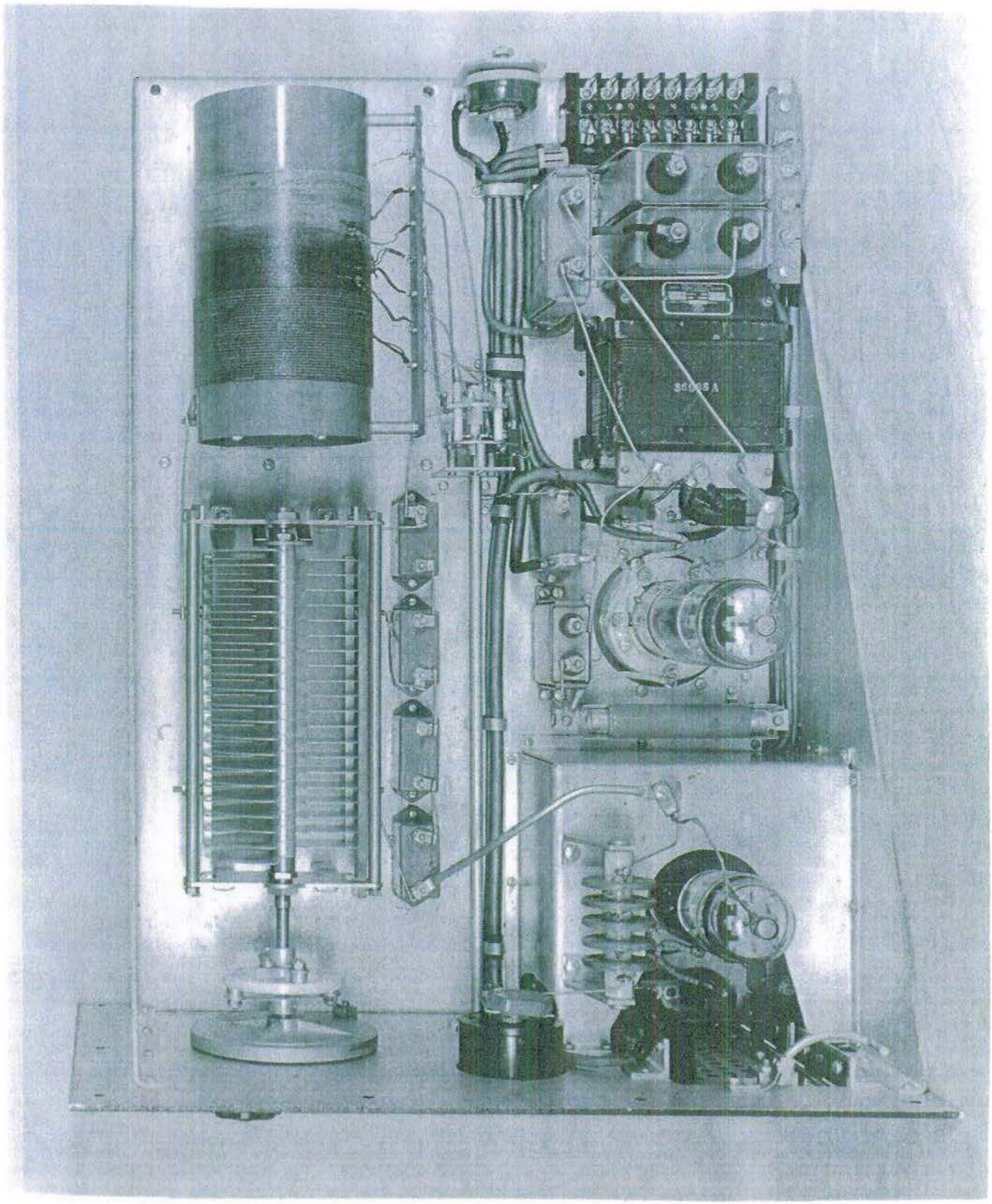


Plate 31

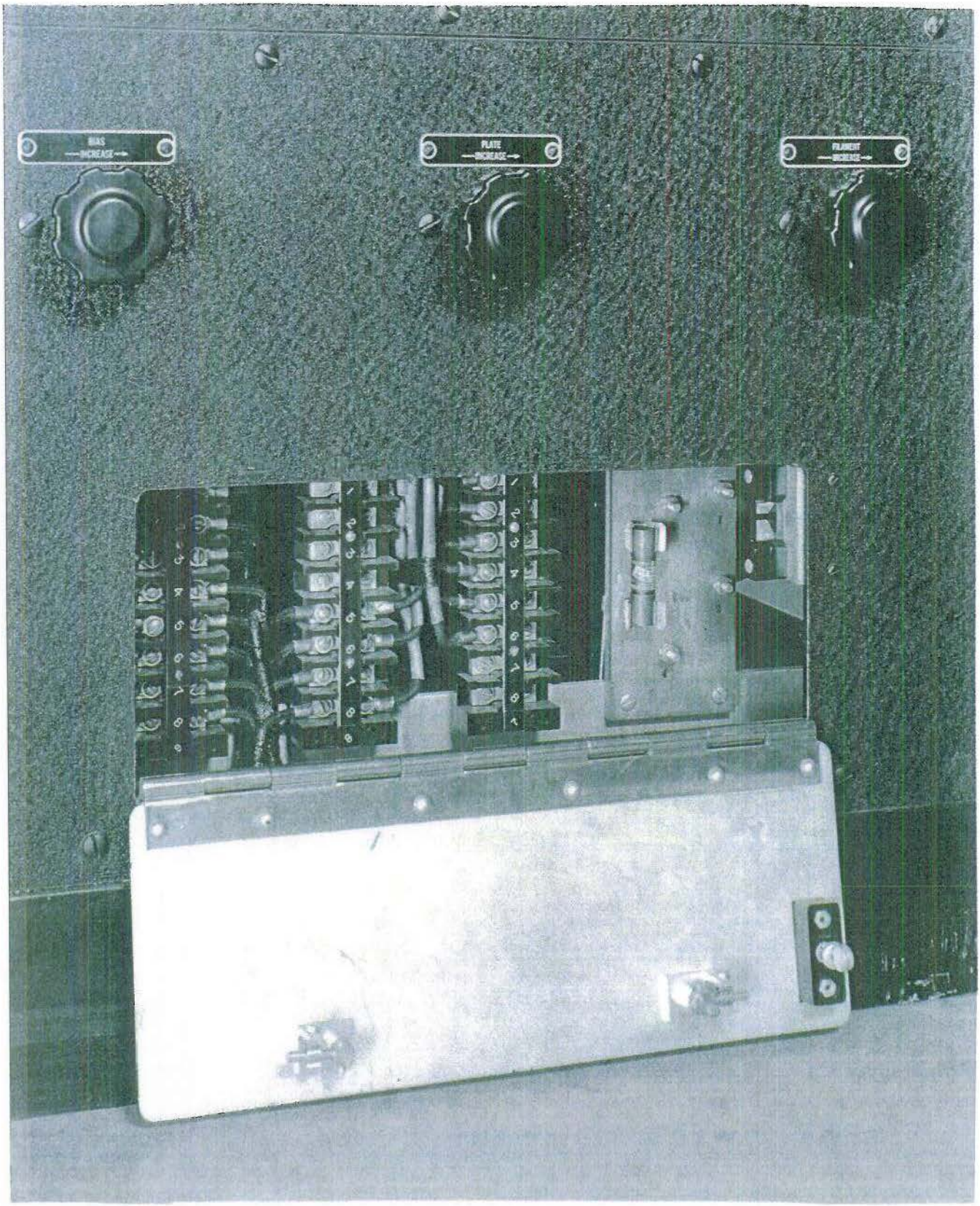


Plate 32

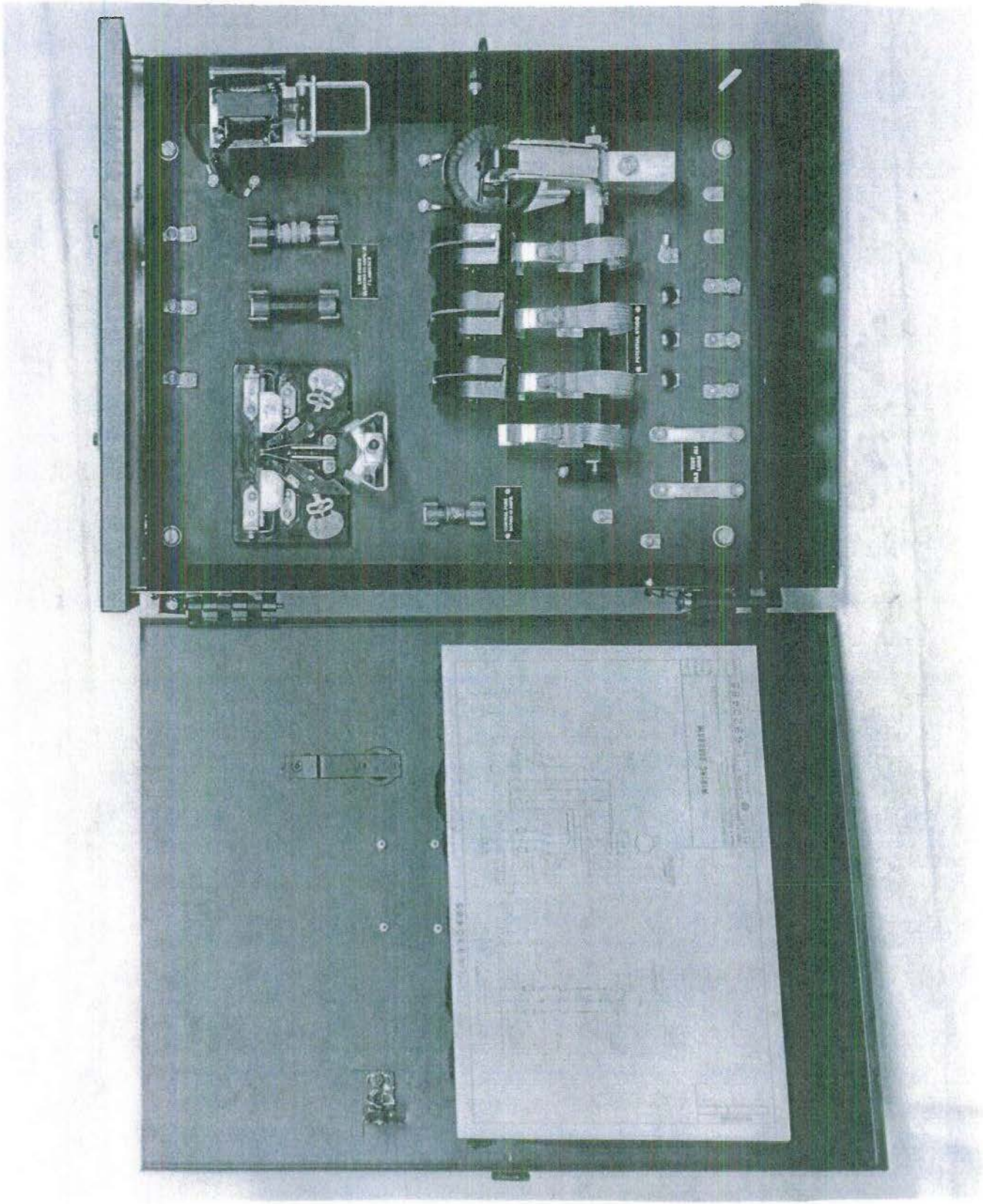


Plate 34

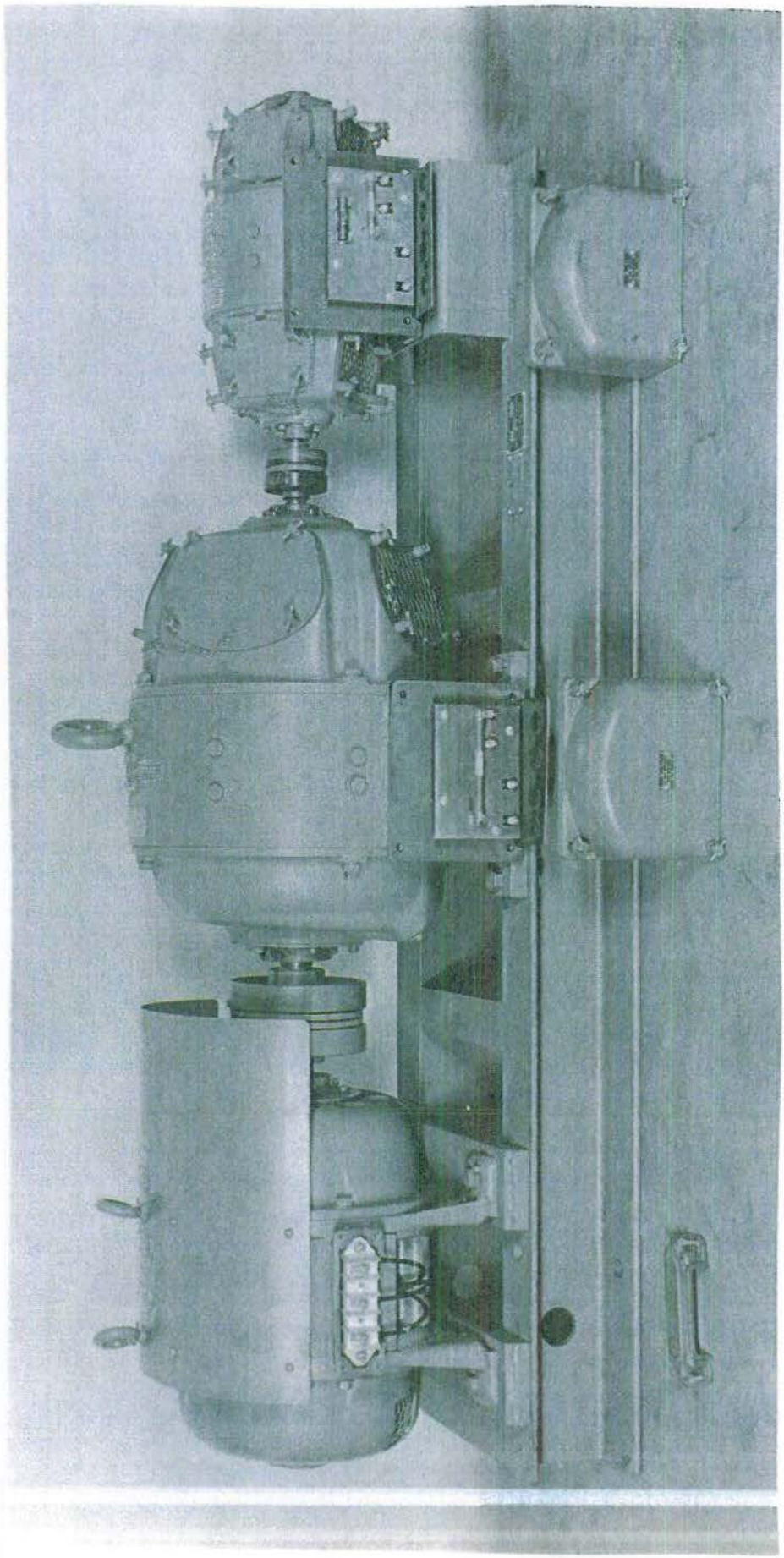


Plate 35

LIBRARY
NAVAL RESEARCH LABORATORY

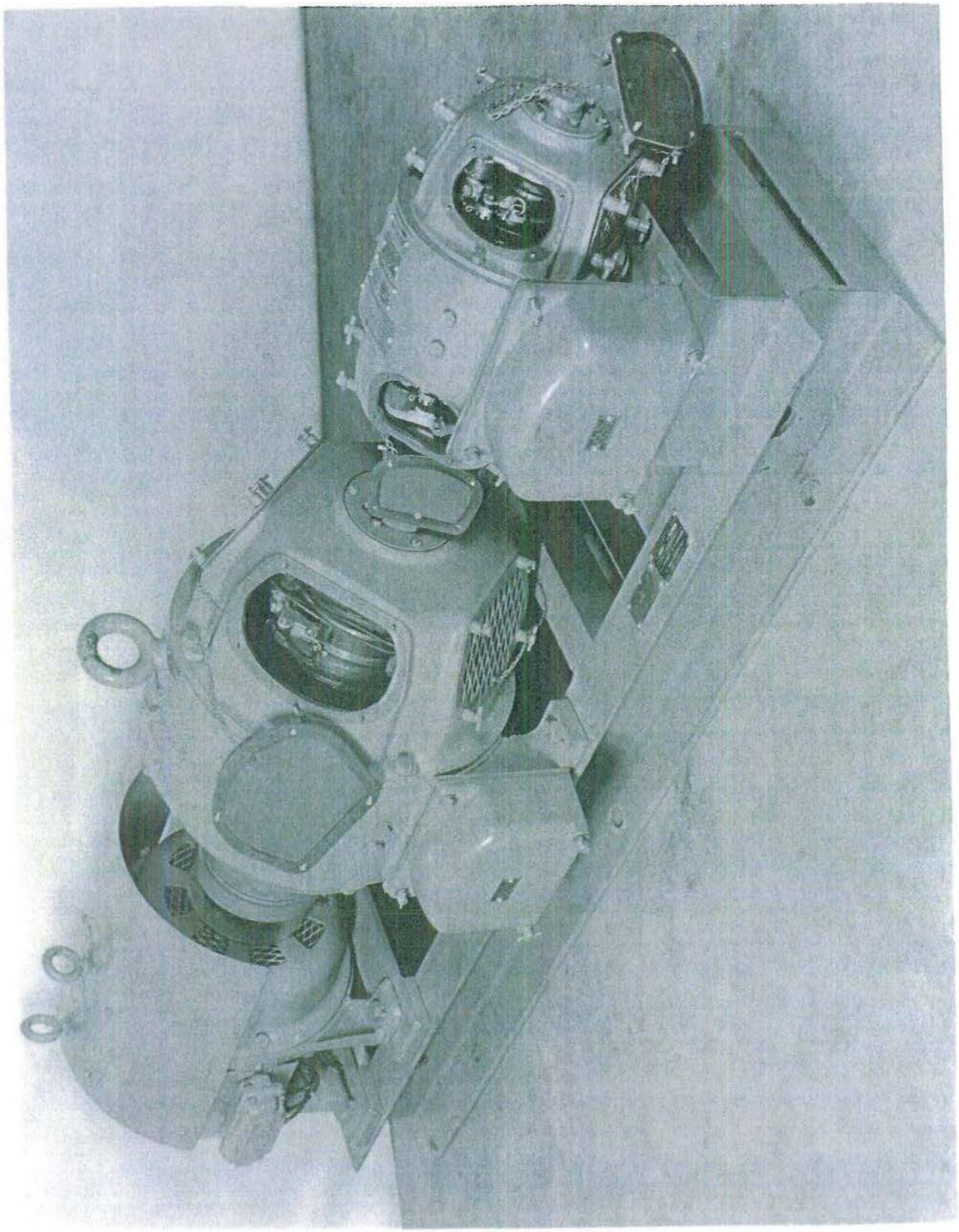


Plate 36

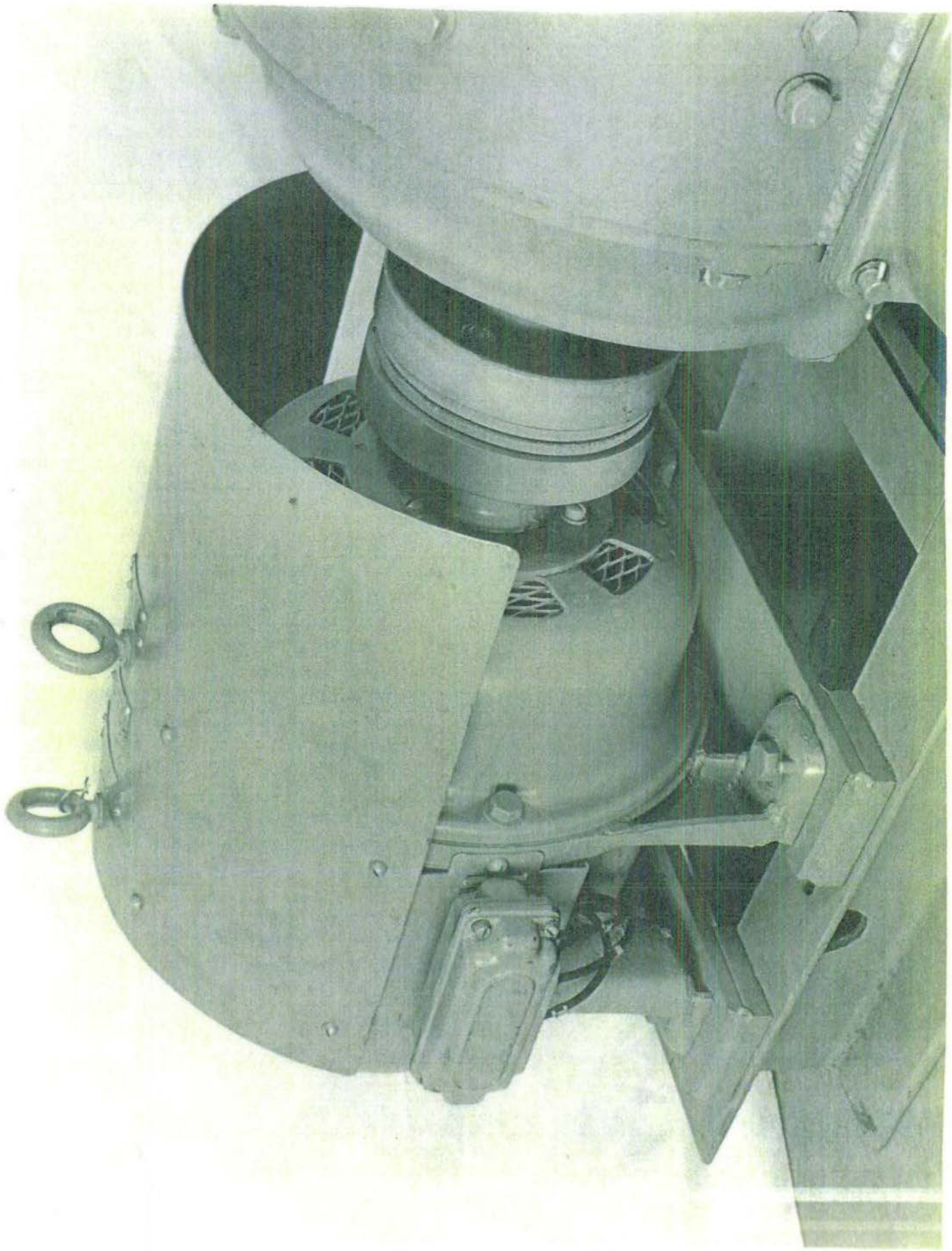


Plate 37