

Jan. 24th, 1930.

## CHASSIS DESIGN COMMITTEE EXECUTIVE SESSION.

### CHASSIS DESIGN.

Dimension of Chassis - location of openings for filter choke and By pass condensers.

Mr. Edison recommended increase in the depth of the chassis by  $\frac{1}{4}$  inch to give more leeway for location of parts and thereby avoid interference. He also suggested relocation of the openings for chokes and By-pass condensers. This to give a little more width to the chassis stock between chokes and condensers and thus strenghten the chassis at these points and make assembly of the parts easier. When making changes in chassis dimensions the R-5-cabinet should be kept in mind as the chassis must fit into a cabinet having dimensions of the R-5.

### THICKNESS OF CHASSIS METAL PLATES

After considering different thicknesses of sheet metal for chassis construction .062 - 16 gauge sheets were thought heavy enough to meet all conditions.

A chassis made of .062 sheet metal will be ready for inspection at the next meeting. Mr. Harris will have this chassis made up.

Before making final decision on the location of openings in the chassis and thickness of the metal, Mr. Edison requested condensers, chokes and other parts it is possible to assembly to the chassis - be assembled so any interference or inaccessibility in assembly can be noted and corrected.

### STRANDED WIRE

Approval was given to the use of stranded wire 1/64" rubber wall cotton covered and paraffin coated.

Samples will be brought in at the next meeting. Mr. Jacobs will supply the wire samples.

### DIAL MECHANISM

Mr. Edison stated, Mr. Eaton had a dial mechanism in process and he thought it would be ready by the next meeting. This dial would have two windows at top one above the other. This tentative design will be simple and accessible.

### TUNING FEATURES

Mr. Edison stated further tests would be made of various tuning features in an effort to perfect a satisfactory tuning system.

## CABINET CONSTRUCTION AND ACOUSTICS

Mr. Harris stated he had made a number of tests using different speakers. He was unable to make any definite statements on acoustics until different speakers could be obtained. He suggested this be done immediately so tests could be made.

### SPEAKERS

Mr. Walsh suggested Magnavox - Utah, Jensen and Symington speakers be obtained so soon as possible and a test made of same. Mr. Walsh stated it was desirable to design the chassis for two or three speakers so one or more speakers of different makes could be used in case of necessity, should a speaker manufacturer go out of business.

Mr. Holley stated samples of various speakers are due in a few days. These speakers will be put through tests.

### BURNED OUT SOCKETS.

Mr. McGee said there was need for a better 280 socket as about 500 sockets had burned out.

Mr. Harris said the Eby sockets had been changed in the contacts which change would overcome burning out.

### ESCUTCHEON PLATE

Mr. Holley said the design of the escutcheon plate should be given more time and an effort made to arrive at a better design.

Mr. Harris stated he was working on the dial and Mr. Richards on the panel.

Mr. Holly in conjunction with Mr. Harris and Mr. Richards will obtain specifications that will enable him to obtain costs on an escutcheon plate of a suitable design.

### VENTILATION OPENINGS IN TUBE SHIELD

Mr. Hirsch called attention to lack of sufficient ventilation in tube shields and suggested a test be made to determine the ventilation needed.

Mr. Harris and Mr. Jacobs will conduct this test.

Mr. Clark suggested the use of perforated metal in shields.

Individual shield cans were favored and approved.

### COMPENSATING CONDENSERS

Mr. McGee recommended the use of pure bakelite in compensating condensers to avoid changes due to expansion caused by moisture.

Mr. Jacobs is to be consulted on this and in conjunction with Mr. McGee will report at the next meeting.

#### VARIABLE CONDENSERS

Mr. Jacobs and Mr. Hardy will report on legal features at the next meeting.

#### PLANT LAYOUT

Reconsideration of the cost of Plant Layout in building 24 was recommended by Mr. Walsh. The cost \$75,000 being quite heavy, it could probably be cut down.

Mr. Walsh presented his views on features he thought desirable in new chassis design. Among the things he mentioned were the following.

Automatic Volume control, a limited number of tubes, a chassis in which two or more speakers of different makes could be used, Investigation of the Pentode tube, the use of which may reduce the number of tubes in Edison Radios.

Mr. Walsh said the above mentioned features and other new developments that are represented in Radio receivers of other manufactures and which are coming forward from time to time are essential to a successful sales campaign.

Those present at the meeting were Messrs: Walsh, Edison, McGee, Harris, Olson, Clark, Holley, Burns, Hirsch, Manchester, McCarthy, Arrowsmith, Berggren, Cosden and Schweitzer.

E. Trautwein, Sec'y.

January 24, 1930.

COMMITTEE MEETING ON RADIO CHASSIS DESIGN

THE MINUTES OF THE PREVIOUS MEETING WERE APPROVED AS ISSUED.

SOLDER LUGS

Mr. Neilson presented two terminals with solder lugs for approval.  
The type of lugs shown were approved.

Mr. Harris will have drawings made and specifications drawn.

Lugs for sockets, coils and compensating condensers will receive the attention of the solder lug committee. A report will be rendered next meeting.

Solder lug committee:-

Messrs:	Harris	Neilson
	Manchester	Berggren
	McGee	Holle

MOLDED SPOOLS FOR R. F. COILS

Owing to increase in cost of molded spools over wooden spools, it was decided to continue the use of wooden spools. This action was taken after the committee had made its report.

Committee on Cost of Molded spools.

Messrs:	Jacobs	Harris
	Holly	Haker

DIAL PANELS

The committee investigating dial panel design could make no report at the Jan. 24th meeting. There being no approved dial mechanism, decision on design of dial panels will be held over until the next meeting at which time a dial mechanism will be shown for inspection and approval.

A dial panel that could be built into the cabinet was advocated by the dial panel committee.

Mr. Manchester stated the dial panel in last years Radio caused a loss of about \$15,000, owing to the need of repairing panels damaged in assembly operations and scrapped on account of defects. A panel built into the cabinet would save much of this waste material and money.

Committee on Dial Panel Design

Messrs:	Manchester	Richards
	McGee	Harris
	Jacobs	Clarke

CRADLE DESIGN

The cradle design Committee reported the cradle now used in supporting Radio sets in shocks, was satisfactory in design, and

recommended the use of this cradle be continued.

Cradle Design Committee  
Messrs: McGee, Richards, Clarke

COMMITTEE ON COSTS

- Mr. Manchester speaking for the costs committee stated lack of drawings of parts and assemblies delayed cost estimates. He stated however that costs were being established on certain parts upon which approval had been given.
- Mr. Harris stated drawings were being made as rapidly as possible after approval had been given on certain parts and assemblies.
- Mr. Theodore Edison stated he had appointed Mr. Cosden to establishing tentative cost figure on parts for the new design chassis using last years parts lists as a working basis. So fast as cost figures on New Chassis parts were obtained definite costs figures could be established. As many of the new parts will be similar to last years parts. Mr. Cosden can establish tentative figures on such parts.

Therefore Mr. Cosden becomes a member of the Cost Committee.  
Cost Committee:-

Messrs: Manchester	Harris
Holley	Haker
Jacobs	Cosden

CHASSIS FINISH

Mr. Harris submitted a report on Chassis finish giving costs and process used in obtaining the Copper Bronze finish which was favorably received by the Chassis Committee.

A number of samples parkerized and finished in one and two coats of Copper bronze lacquer were presented for inspection.

While approval was given for the use of Copper bronze lacquer as the finish for the new chassis, final approval was withheld to arrive at a more substantial finish that would not mar so readily. Addition of more lacquer to the copper bronze would probably overcome this objection.

Mr. Harris will again present for final approval at the next meeting the sample plate which Mr. Walsh and Mr. Edison approved for coating and color.

The sample is to have a more durable finish not so easily marred as when first presented.

Committee on Finish of Chassis:-

Messrs: Harris	McGee
Jacobs	Berggren
Manchester	Richards

January 24th, 1930.

- 3 -

CONVEYOR JACK AND BENCH

Mr. Manchester commented on the size and weight of the Jack as shown at the meeting. The size of the Jack having been increased which with the weight of Chassis added would make it heavy for girls to handle in assembly operations.

Before giving his approval he requested a Chassis and Jack be shown at the next meeting so a better opinion could be formed on the practical application of the Jack in assembly operations.

Those present at the meeting were

Messrs: A. L. Walsh	Clarke
T. Edison	Berggren
Manchester	Nielson
McGee	Haker
Burns	Kurtz
Harris	Cosden
Olson	Schweitzer
Arrowsmith	Hirsch
Rhaines	Sommer
McCarthy	
Holley	
Burns	
Holle	

Next meeting Friday Jan. 31st, 1:30 P.M..

E. Trautwein, Sec'y.

January 31, 1930.

MEETING FOR DISCUSSION OF 1930 RADIO DESIGN

Minutes of January 24th meeting with corrections in paragraphs 1 and 3 were approved as issued.

Correction: Paragraph 1. The increase in the dimensions of the depth of the chassis, stands corrected to  $\frac{3}{4}$  of one inch, instead of  $\frac{1}{4}$  of one inch.

Correction: Paragraph 3. The approval for the use of stranded wire is subject to the final approval of Mr. Jacobs, who will recommend the wire specifications in accordance with Engineering requirements.

1. SOLDER LUGS

Mr. Harris has had drawings made and specifications drawn of soldering lugs approved at the last meeting.

Mr. Jacobs stated that he thought there would be no difficulty in obtaining sockets and coils having soldering lugs approved by us, or lugs of a design that would meet our approval.

He stated, however, that he had been unable to induce the Camden Condenser Company to comply with our request that our approved soldering lug design be made part of the assembly of their variable condenser compensator. Mr. Jacobs will request them to reconsider the matter.

Mr. Eaker asked whether we were dependent upon one condenser manufacturer for our supply.

Mr. Jacobs replied that he was looking into the matter and was at that time in touch with another condenser manufacturer with a view to having more than one source of supply in case of emergency.

Mr. Holley will obtain costs on new soldering lugs and will make a report at the next meeting.

Soldering Lug Committee

Messrs: Harris, Manchester, Jacobs, McGee, Nielson, Bergren and Holle.

2. DIAL PANEL

A definite decision on the design of the panel is awaiting completion and final approval of the dial mechanism.

Dial Panel Design Committee

Messrs: Manchester, McGee, Jacobs, Richards, Harris and Clarke.

3. DIAL MECHANISM

Mr. Eaton is working on a dial mechanism, which will be shown at the next meeting.

Mr. Harris brought into the meeting a dial which contained several parts of the present Light-O-Matic Dial together with several major improvements. This was thought to be of advantage as these parts could be put into production at once.

Pending completion of the dial Mr. Eaton is working on

10/11  
All right  
a decision on and approval of a dial mechanism was held over until the next meeting.

#### 4. COMMITTEE ON COSTS

The cost committee had no report to make on costs. Final decision on design and drawings are necessary to obtain some of the costs. Mr. Cosden, speaking for the Cost Committee, reported some progress.

##### Cost Committee

Messrs: Manchester, Holley, Jacobs, Harris, Baker and Cosden..

#### 5. CHASSIS FINISH

Mr. Harris showed sample plates which had been "Parkerized" and bronze lacquered. While the finish showed improvement and much less tendency to mar or show effects of handling, owing to the absence of Mr. Walsh, final approval of the finish for the chassis was held over until the next meeting.

##### Committee On Finish

Messrs: Harris, Jacobs, Manchester, McGee, Hargren and Richards.

#### 6. JACK - CONVEYOR AND BENCH

Mr. Manchester favored the smaller Jack. He also stated that there was no need to give the Jack an offset at each end.

The design of the small Jack was approved as submitted.

#### 7. BINDING POST ASSEMBLY

Mr. Harris showed an antenna and ground binding post assembly of molded material.

This assembly was approved.

Mr. Harris also stated that a pin jack assembly for electric pickup connections could be obtained.

#### 8. LINE SWITCH

Mr. Harris stated that a decision on the type and location of the line switch will depend upon the dial panel. He has in mind a number of ways in which a line switch can be mounted when the design of a dial panel is decided upon.



## 9. SPEAKERS

Mr. Harris and Mr. McGee reported that they had made comparative tests of Jensen and Stevens speakers. Mr. McGee commented favorably on the Stevens speaker, both for tone quality and as a good business proposition. He stated that the Stevens Company was ready to do business on a basis of cost plus 10%.

It was thought advisable to consider the Stevens speaker when testing the other makes suggested by Mr. Walsh - namely Magnavox, Utah, Jensen and Symington. There may be other good speakers worthy of consideration.

Mr. Holly is obtaining samples of several makes of speakers.

Mr. Harris will make further tests.

## 10. MOUNTING SPEAKERS IN CABINETS

Procedure for mounting the speaker in cabinet was under discussion. Mr. Jacobs suggested that the speaker be raised as high as the construction of the speaker compartment would permit.

Mr. Harris said there was a possibility of eliminating the speaker base, providing the front panel of the cabinet was heavy enough to support the speaker. Lack of the base on speaker would probably equalize cost of heavier panel in cabinet.

Mr. Harris will present further data at next meeting.

## 11. DIAL ESCUTCHEON PLATE

Mr. Holly requested further advice on design of a new escutcheon plate.

Mr. Harris stated that the design of the escutcheon plate is dependent upon the approval of a dial mechanism.

Mr. Harris and Mr. Holly will be able to decide what action can be taken on escutcheon plate design, after adaptation of an approved dial mechanism.

## 12. VENTILATION OF TUBE SHIELDS

Mr. Jacobs stated that the addition of openings in tube shields would take care of this matter.

## 13. STRANDED WIRE

Mr. Jacobs will supply samples and specifications.

## 14. TO INCREASE LENGTH OF CHASSIS

Mr. Edison suggested that the length of the chassis be increased by  $\frac{1}{2}$  inch to give more space for variable condensers and allow space for adding an additional variable condenser (making a total of six) or other make condensers. This was approved.

15. TO INCREASE DEPTH OF CHANNEL SHIELD

It was decided to increase the depth of the channel shield by 1/8th inch, to afford better shielding of wire leads. This was approved.

16. POWER UNIT CONNECTING BLOCK AND CABLE

Mr. Harris suggested and described connecting blocks and plugs as methods of attaching cord.

Mr. Holley is in touch with suppliers regarding connectors and will have samples and costs at next meeting.

Mr. Harris will also have further data ready at next meeting.

17. BURNED OUT SOCKETS

Mr. Holley will secure sample sockets.

Mr. Harris will make tests to determine the type of socket that will eliminate burning out.

18. CHASSIS METAL STOCK

A chassis made from 16 gauge (.062) stock, as recommended at previous meeting, was presented by Mr. Harris. As the chassis appeared to have the required strength and no objection was offered to the use of sheet stock of this gauge, approval for this construction was given.

19. OPEN AIR TRANSFORMERS

Further investigation of the open air transformer is being made by Mr. Harris. Mr. Holley is obtaining costs.

20. "B" TYPE LAMINATIONS

Mr. Holly is obtaining costs.

21. POTTING TRANSFORMERS AND CHOKES

There was considerable discussion on this subject. Some members of the committee favored the use of transformers and chokes partly open or encased in metal casings that formed both casing and mount for the transformers and chokes. Other members, particularly those connected with the sales department favored the present way of potting, plus a better design, as an added sales feature.

As this remained an open question to which consideration must be given, and a quick decision reached, the Engineering and Sales Depts. were requested to get together at the earliest opportunity

and present their views at the next meeting.

Mr. Manchester recommended that costs be obtained on this method of shielding and mounting with a view toward the manufacture of our own parts.

## 22. RECOMMENDATIONS FOR IMPROVEMENT

Mr. McGee put in writing a number of recommendations which he stated he would like to see incorporated into the new chassis design.

- a. The adoption of a spring lock to insure permanent adjustment of the pilot light in its socket, Yaxley Manufacturing Company have incorporated a similar spring in the design of their pilot light socket.

This was approved and will be carried out.

- b. An improved method of positively locking thrust screws on variable condensers. Complaints from the field indicate that the present method of locking the thrust screws by means of a nut is not as satisfactory as it might be. The present method might be improved by the addition of a lock washer.

This matter will be taken up with the Camden Condenser Co.

- c. Compensating condenser connecting lugs should be tinned to eliminate possibility of rosin joints in production.

Mr. Jacobs said that this had been taken up with Camden Cond. Co.

- d. The compensator adjusting screw should be insulated by means of a pure bakelite washer.

Mr. Jacobs said that this was now being done.

- e. Split steel compensator adjusting screw should be employed to replace the present style of adjustment screw.

Mr. Jacobs said that Camden would install these screws no charge if we supplied them.

## 23. CABINETS

Mr. Richards will have cabinets in from Wisconsin as soon as possible showing construction, etc.

24. IMPORTANT

Reports in writing are requested whenever possible to do so. This helps greatly in coming to a quick decision and avoids lengthy discussion on subjects that can be covered in a few written lines.

It also avoids errors and the need of correcting the minutes, due to misconstruing the points that should be brought out. It is difficult to arrive at proper conclusions to problems under lengthy discussion.

NOTE: Next meeting Friday, February 7th, 1930.

Those present:

Messrs:	T. M. Edison	W. R. Kurtz
	A. A. Manchester	E. Kother
	C. T. Jacobs	R. Burns
	P. J. McGee	E. Haker
	A. R. Karch	J. F. McCarthey
	G. C. Harris	F. F. Schweitzer
	W. O. Olson	G. Eaton
	W. W. Cowan	G. O. Cosden
	F. F. Holly	Nielsen
	John Holle	Clark
	A. J. Rhaines	E. Trautwein
	W. R. Arrowsmith	
	C. J. Hirsch	
	R. Sommers	

*E. Trautwein*

*ms. 11-30*

February 7, 1930.

MEETING FOR DISCUSSION OF 1930 RADIO DESIGN

Those present at the meeting were; Messrs:

T. M. Edison	W. W. Cowan	W. B. Arrowsmith
A. A. Manchester	G. O. Cosden	R. Burns
C. T. Jacobs	Kother	E. Haker
P. J. McGee	F. F. Holley	J. F. McCarthy
G. C. Harris	J. Holle	C. F. Schweitzer
W. O. Olson	A. J. Rhaines	G. Eaton
Mr. Clarke	W. R. Kurtze	H. B. Nielsen

Minutes of the January 31st meeting were approved as issued.

1. SOLDER LUGS

Mr. Holley presented some costs on Soldering Lugs which he has on file.

Mr. Harris called attention to the fact that there would be various kinds of soldering lugs if we buy commercially, most of the component parts, such as coils, condensers, audio transformers, and power transformers.

Having adapted a solder lug of our own design, it would be beneficial to standardize so far as possible in solder lugs as portion of the equipment of the various above mentioned parts.

The soldering Lug Committee will bring in further recommendations at the next meeting. Mr. Holley will supply additional cost figures.

SOLDERING LUG COMMITTEE

Messrs: Harris, Jacobs, McGee, Manchester, Berggren, Holle, Holley, and Nielsen.

2. DIAL PANELS

Mr. Edison stated different types were being made up. These panels are dependent upon the design of the dial which is still an open question.

DIAL PANEL DESIGN COMMITTEE

Messrs. Manchester, McGee, Jacobs, Richards, Harris, and Clarke.

*Copy 6-29-30  
added to minutes*

### 3. DIAL MECHANISMS

Mr. Eaton presented a new dial design. A discussion of the production cost of this dial developed the fact that the cost of construction of this type of dial would probably be slightly under the cost of the dial used in the present set.

Mr. Harris showed a dial mechanism of new design which embodied a number of parts used in the present dial assembly. This dial contained fewer parts than the present assembly and due to its simple construction would lower production cost.

Mr. Holley presented some cost figures on dial parts which he has on file.

Mr. Harris stated, he was in a position to supply Mr. Holley with drawings, so that he could obtain cost estimates.

Mr. Manchester suggested that costs be obtained on complete dial assemblies, also on the various component parts of the dials. He further stated, that he favored the assembly of dials instead of purchasing complete assemblies. He was of the opinion that defects could be detected and corrections made during assembly of the dial, thus avoiding dismantling completely assembled dial mechanisms to correct some slight mechanical trouble.

Mr. Holley will obtain costs on dial mechanisms and parts as suggested by Mr. Manchester.

#### DIAL MECHANISM COMMITTEE

Messrs. Manchester, Jacobs, McGee, Harris, Richards and Clarke.

### 4. SPEAKERS

Mr. Harris stated, he had nothing further to report on speaker tests. He has on hand Stevens, Rola, and Magnavox speakers. The Symington speaker is expected to arrive this week. Mr. Harris will then be able to continue comparative tests. He will report further on this matter at the next meeting.

### 5. MOUNTING SPEAKERS IN CABINET

Mr. Harris stated he could make no definite report on mounting speakers as this was still a matter that required further investigation and a decision on the type of front panel in the new cabinets. Should the speaker be mounted on the front panel of the cabinet, the panel would have to be of heavy material. Owing to the absence of Mr. Richards the cabinet situation could not be taken up with him.

Mr. Harris stated further that mounting the speaker on the front panel of the cabinet and eliminating the speaker base would not result in a saving, as the extra connections made necessary by this method of mounting would offset the proposed saving. The strengthening of the front panel would probably add to the cost.

Mr. McGee favored mounting the speaker separately on a baffle board if it would result in better tone quality.

No decision being reached, it was decided to wait until Mr. Richards return before the question of mounting the speaker was definitely decided.

#### 6. CHASSIS DESIGN

Mr. Harris was unable to show a chassis of the new design embodying the increase in dimensions approved at the previous meeting. Owing to the possibility of slight changes in the dimensions of the filter condenser containers, some slight change in the openings in the chassis may be necessary. Therefore, he did not build a chassis to the accepted dimensions.

#### 7. POWER UNIT CONNECTING BLOCK AND CABLE

Mr. Harris stated, he was securing samples.

#### 8. BURNT SOCKETS

Mr. Harris stated, he has under consideration, sockets of a different type that will eliminate this difficulty. This difficulty will not occur in the new models as a different type of socket will be used.

#### 9. OPEN AIR TRANSFORMERS

A chassis was shown on which open air transformers were mounted. Mr. McGee questioned the use of open air audio transformers. He was of the opinion that moisture getting between the case and the laminations would cause a chemical action that would result in a breakdown of the transformers.

Mr. Harris agreed with Mr. McGee and cited the experience of Mr. Skimmerhorn in the use of open air audio transformers. He stated that Mr. Skimmerhorn's experience showed open circuits due to moisture which resulted in the return of a number of transformers. When potted, transformers are protected and less breakdowns occur.

The open air type of transformer will again come before the committee at the next meeting at which time the views of the Sales Department will be presented.

Cost figures on open air type and potted type transformers will be presented at the next meeting.

#### 10. "B" TYPE LAMINATIONS

This is being considered in the general discussion of the power transformers.

TRANSFORMER COMMITTEE

Messrs. McGee, Harris, Manchester, Holley, and Karch.

11. VARIABLE CONDENSERS

Mr. Jacobs had no further report to make.

12. LINE VOLTAGE TAP

Mr. Harris is investigating this matter and will report at the next meeting. Mr. McGee will consult Mr. Walsh on the matter as soon as possible.

13. BILL OF MATERIALS (NEW CHASSIS DESIGN)

Mr. Haker requested a bill of materials be submitted at an early date. Mr. Harris said that he could supply a bill of materials as soon as the new chassis was available. Mr. Jacobs stated, that the new chassis could be heard at his home to-night. Members of the committee will visit Mr. Jacob's home and endeavor to reach a decision on the chassis as it will be demonstrated to them. If satisfactory, the chassis will be made the basis for a bill of materials that will enable approximate costs to be obtained.

Mr. Jacobs stated, he could supply nearly all the materials contained in the chassis to enable costs to be obtained and specifications to be drawn up in order to have this data available at an early date. Minor changes that may be necessary in any of the component parts can be made at a later date.

There being no new business to come before the Committee, the meeting adjourned.

The next meeting will be held in Building #25 February 14th at 1:30 o'clock P.M.

Please submit in writing any reports that are to be made.

E. Trautwein, Secretary.

Copies to: Messrs:	Chas. Edison	F. F. Holley	R. Burns
	T. M. Edison	John Holle	E. Haker
	R. H. Allen	A. J. Rhaines	W. Hardy
	A. L. Walsh	W. B. Arrowsmith	J. F. McCarthy
	A. A. Manchester	G. H. Sevraine	C. S. Williams
	C. T. Jacobs	E. M. Richards	C. F. Schweitzer
	P. J. McGee	W. Hildebrand	G. Eaton
	G. C. Harris	E. Trautwein	A. J. Clarke
	W. O. Olson		W. R. Kurtze
	W. W. Cowan	C. Luhr	F. Bostock
	G. O. Cosden	H. B. Nielsen	J. Greeley
	Mr. Kother	R. Sommers	Mr. Berggren



February 7, 1930.

REPORTS TO BE MADE AT NEXT RADIO DESIGN MEETING

(In making reports, please bring in a typewritten summary which will be suitable for incorporation in the minutes of the meeting.)

Mr. Harris	Paragraph #1	Soldering Lugs
Mr. Harris	" 2	Dial Panels
Mr. Harris	" 3	Dial Mechanism
Mr. Holley	" 3	Dial Mechanism Costs
Mr. Harris	" 4	Speaker Tests
Mr. Harris	" 5	Speaker Mounting
Mr. Harris	" 6	Chassis Design
Mr. Harris	" 7	Power Unit Connecting Block and Cable
Mr. Harris	" 8	Burnt Sockets
Mr. Harris } Mr. McGee }	" 9	Open Air Transformers
Mr. Jacobs	" 11	Variable Condensers
Mr. Harris } Mr. McGee }	" 12	Line Voltage Tap
Mr. Harris } Mr. Jacobs }	" 13	Bill of Materials
	" 13	New Chassis Design

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From minutes of 1930 Chassis Design Meeting February, seventh.

New Eng Record 111

55-65

Sub Mechan Chart Card 1375/11

noted  
2-18-30  
E.C.C.

February 14, 1930.

MEETING FOR DISCUSSION OF 1930 RADIO DESIGN

Those present at the meeting were: Messrs:

- |                 |                  |                 |
|-----------------|------------------|-----------------|
| T.M. Edison     | W. W. Cowan      | R. Burns        |
| A.A. Manchester | F. F. Holley     | E. W. Baker     |
| C.T. Jacobs     | J. Holle         | J. F. McCarthy  |
| J. McGee        | A. J. Rhaines    | F. F. Schwitzer |
| R. R. Karch     | W. B. Arrowsmith | G. Eaton        |
| G. C. Harris    | C. J. Hirsch     | Nielsen         |
| W. O. Olson     | W. R. Kurtze     | A. J. Clark     |
|                 |                  | E. Trautwein    |

The minutes of the meeting of February 7th were approved as issued.

1. SOLDER LUGS

Mr. Harris showed sockets having a new design of solder lug which were favorably received by the committee. The committee will look into this matter and report at the next meeting.

SOLDER LUG COMMITTEE: Messrs: Harris, Jacobs, McGee, Manchester, Berggren, Holle, Holley and Nielsen.

2. DIAL MECHANISMS

Mr. Eaton again presented the dial developed by him and stated cost of this dial would be about three dollars and fifty cents. This cost included one hundred and sixty percent overhead. This would be the approximate cost figure if the dial was made and assembled in the works. He stated however, that this cost could be cut down considerably after a few changes he had in mind could be worked out and incorporated into the dial assembly.

Mr. Harris again presented the dial mechanism developed in his department. While he could give no official cost figures on this dial, he was of the opinion that the cost of the dial would be less than the cost of the dial used in Light-O-Matic models, which ranged in cost from two dollars and sixty seven cents to three dollars.

Dial costs are to be obtained by Mr. Harris and so soon as costs are available a special meeting will be held to decide upon the type of dial to be adapted.

DIAL MECHANISM COMMITTEE: Messrs: Manchester, Jacobs, McGee, Harris, Richards, Holley and Clarke.

3. DIALS IN EXPERIMENTAL SETS

Six dials developed by Mr. Eaton will be installed in chassis' and six dials developed by Mr. Harris will be installed in chassis'. the object of this installation is to subject the two types of dials to conditions comparable to actual operating conditions. These tests and cost of the two dials will determine the type of dial which will be adapted and put into production.

COMMITTEE: Messrs: Harris, Eaton, and Olson.

#### 4. FIFTY EXPERIMENTAL SETS

Approval was given to the installation of fifty experimental sets in R-5 cabinets. These sets are to be equipped with the type of dial developed by Mr. Harris' department.

Mr. Cowan was delegated by Mr. Manchester to act as Keyman in direct charge of the assembly of the fifty sets mentioned above.

COMMITTEE: Messrs: Manchester, Cowan, and Haker.

#### 5. SAMPLE CABINETS

Mr. Richards stated, there were six sample cabinets being made up at Wisconsin. These cabinets would be shipped to the factory as soon as possible so that the approval of the sales division could be obtained on the types of cabinets that would be adapted as the 1930 models. The early arrival of these cabinets is essential to cabinet production as a decision must be made as soon as possible to permit the cabinet factory to go into production on the accepted types. An early decision on types of cabinets for 1930 will permit action to be taken on matters now depending upon cabinet design.

COMMITTEE: Messrs: Manchester, McGee, Richards, Harris and Clarke.

#### 6. ESCUTCHEON PLATE

Mr. Richards has made up some sketches of dial escutcheon plates. No decision on the type of plate was reached as the type of dial has not been decided upon nor has the dial panel.

Mr. Karch thought no radical change should be made in the design of the escutcheon plate for reason of the large quantity of advertising matter we now have showing the dial escutcheon of the present type.

It was decided to use the present type dial on the panels of the fifty sample sets which are to be installed in R-5 cabinets.

The escutcheon plate remains an open question until dial costs are determined. This will again come up at the next meeting.

COMMITTEE: Messrs: Richards, Holley, and Harris.

#### 7. DIAL SCALE

Mr. Haker called attention to the paint on dial scales, rubbing off, also, the figures on the scale. He suggested that we secure laminated scales with the markings between the layers of the scale. This would provide a much better looking and more substantial scale.

COMMITTEE: Messrs: Harris and Holley.

#### 8. PRODUCTION ON NEW SETS

Mr. Haker called attention to the need of making a early decision on the various matters which are delaying the making of tools for producing parts and placing of orders for necessary parts to commence production.

Mr. Harris stated, that most of the drawings were made and specifications drawn up. He needed only final approval on such things as dials, transformers, etc. As soon as a final decision is made on these parts the balance of the drawings and specifications can be made up and the manufacture of tools and purchase of parts can proceed.

Mr. Haker also pointed out the length of time necessary to make up the tools and to obtain parts from suppliers. As all members of the committee fully appreciate that production must start at the earliest possible date, it is important that development problems be concentrated upon and final decisions reached.

COMMITTEE: Messrs: Manchester, Cowan, Holle and Haker.

#### 9. COMPLETE BILL OF MATERIALS

Mr. Haker suggested, a tentative bill of materials be made and orders placed for quantities of approved parts.

Pending approval of the fifty sets we are building as a basis for future production, final approval could be given suppliers to furnish the entire quota of parts.

Orders could be placed with the understanding that changes in specifications could be made at a later date.

This would give us the benefit of lower costs thru the purchase of parts in large quantities.

Mr. Haker requested that a date be set at which time a complete Bill of Materials would be supplied.

Mr. Harris stated, that until such time as final approval was given to certain parts that are now under development and waiting for costs, a complete bill of materials could not be made.

COMMITTEE: Messrs: Harris and Haker.

#### 10. POWER PACK CHASSIS FRAME

After some discussion of the thickness of the chassis metal, it was decided to retain the present thickness of the metal which is fifty thousandths.

Mr. McGee called attention to the chassis metal bending and permitting the chassis to shift in the cabinet with the result that the speaker moves back from the baffle board.

To prevent the chassis from shifting, Mr. Richards will have small blocks placed at the back corners of the frame.

COMMITTEE: Messrs: Jacobs, Harris, Manchester and McGee.

#### 11. CHASSIS (LOCATION OF HOLES)

Mr. Harris and Mr. Jacobs will determine the exact location of the holes in the chassis where transformers, chokes, and condensers will be located. Owing to slight changes in chassis dimensions, relocation of the holes becomes necessary.

11. CONNECTOR BLOCK, CABLE, AND SOCKETS  
COMMITTEE: Messrs: Harris and Jacobs.

12. RELEASE OF CHASSIS FOR PRODUCTION

Mr. Edison made inquiry regarding details which are lacking to complete the chassis. His inquiry brought forth the statement that transformers, dials, R. F. Coils, and chassis layout were the principle items that must be approved before the chassis can be considered complete, a bill of materials drawn up and costs obtained. When this is done, all costs can be obtained and production proceed after the fifty chassis we are now building have been tested and approved.

13. CONNECTOR BLOCK, CABLE, AND SOCKETS

Mr. Harris is obtaining samples of connector blocks. Fifty sample sockets are being obtained from Eby company. This subject will come up at the next meeting.

COMMITTEE: Messrs: Harris and Holley.

14. VOLTAGE REGULATING TUBE

Mr. Harris, said he had made some tests of Voltage Regulating tubes. He will make some further tests. The Sales department will give views on the use of voltage regulating tubes from the sales angle.

COMMITTEE: Messrs: Harris and McGee.

15. VARIABLE CONDENSERS

Mr. Jacobs stated, he had not taken up again with the Camden Condenser Co., the matter of supplying with their condensers, solder lugs of the new type.

Lock Washers can be obtained and will supplied on condensers at per request.

Compensating Screws will be used by the Camden Condenser Company either as supplied by us or they will supply screws approved by us.

It was decided that we shall supply Camden with split steel screws, oversize thread - parkerized or blued.

16. PRONG WASHERS

Prong washers we are now using are not very satisfactory. These washers were used in order to work up the stock on hand. Mr. Holley stated, Splitdorf is tooled up to make prong washers of a better type and a supply of these washers may be obtained thru them.

17. HOOK BOLT WING NUTS

Mr. McGee suggested, wing nuts be eliminated in favor of some other type. Mr. Harris stated, either a square or hex nut would be considered. The type of bolt and nut to be used will be

determined when sample cabinets arrive, as the type of cradle used on these cabinets may determine the type of chassis holding bolt and nut.

COMMITTEE: Messrs: Harris, Richards and McGee.

#### 18. OPEN AIR TRANSFORMERS

Mr. Harris stated, costs on open air transformers were still in process. Mr. Holley reported that no cost figures on laminations had been received.

Mr. Harris said that while costs were lacking on "B" type laminations he felt confident "EI" type would be less expensive than "B" type.

Mr. Harris thought there was no need of potting power transformers. He said that transformers, if preheated and impregnated with varnish would not be subject to corrosion.

Mr. Olson suggested that transformers be framed and a separate can could then be put over the transformer. He stated, that this would permit a standard size can or a can of a certain type to be used over transformers, chokes, and condensers. This would improve the appearance of the chassis. This method of enclosing transformers, chokes and condensers was approved by the committee. Sample cans will be made and presented for approval at the next meeting.

COMMITTEE: Messrs: Harris, McGee, Manchester, Olson, Holley, Jacobs, and Rhaines.

#### 19. AUDIO TRANSFORMERS

Mr. McGee expressed the opinion that we should give more consideration to Open Air type of audio transformers before adapting this method of construction. He pointed out that Open Air Audio transformers might be affected by stray magnetic fields which would result in interference.

Further investigation will be made of this matter. A report will be made by Mr. Harris at the next meeting.

COMMITTEE: Messrs: Harris and McGee.

#### 20. SPEAKER COMPARISON TESTS

Owing to failure to receive speakers from all manufacturers requested to submit speakers for test, Mr. Harris stated, he was unable to make any further tests.

#### 21. COSTS ON 1930 MODELS

Mr. Cosden submitted a report in which he stated that the cost of material for the 1930 model radio has been reduced to approximately three dollars and twentyfive cents in excess of material cost for the present model.

February 14, 1930.

REPORTS TO BE MADE AT NEXT RADIO DESIGN MEETING

(in making reports, please bring in a typewritten summary which will be suitable for incorporation in the minutes of the meeting.)

TO:	PARAGRAPH #.	SUBJECT.
Mr. Harris)	1	Soldering Lugs
Mr. Harris) Mr. Holley)	2	Dial Mechanism
Mr. Cowan)	4	Experimental Sets
Mr. Richards	5	Sample Cabinets
Mr. Richards) Mr. Holley } Mr. Harris }	6	Escutcheon Plate
Mr. Harris) Mr. Holley)	7	Dial Scale
Mr. Harris)	9	Bill of Materials
Mr. Richards	10	Power Pack Chassis Frame (Packing Blocks)
Mr. Harris) Mr. Jacobs)	11	Location of Holes in Chassis
Mr. Harris) Mr. Holley)	13	Connector Block, Cable, and Sockets
Mr. Harris) Mr. McGee )	14	Voltage regulat- ing Tube
Mr. Harris) Mr. Holley)	18	Open Air Transformers
Mr. Harris) Mr. McGee )	19	Audio Transfor- mers
Mr. Harris)	20	Speaker Comparison Tests.

Taken from minutes of February 14th Chassis Design Meeting.

There being no further business to come before the Committee, the meeting adjourned.

The next meeting will be held in Building #25 February 21st at 1:30 o'clock P. M.

Please submit in writing any reports that are to be made.

E. Trautwein, Secretary.

Copies to Messrs:	Chas. Edison	E. F. Holley	R. Burns
	T. M. Edison	J. Holle	E. W. Haker
	R. H. Allen	A. J. Rhaines	W. Hardy
	A. L. Walsh	W. B. Arrowsmith	J. F. McCarthy
	A. A. Manchester	C. S. Williams	C. G. Clarke
	C. T. Jacobs	E. M. Richards	C. F. Schwietzer
	P. J. McGee	W. Hildebrand	G. Eaton
	G. C. Harris	E. Trautwein	A. J. Clark
	W. C. Olson	W. W. Cowan	W. R. Kurtze
	G. O. Gosden	C. H. Luhr	H. B. Nielsen
	R. Kother	C. Hirsch	R. Sommers
	Mr. Berggren	J. Greeley	F. Bostock



February 21, 1930.

MEETING FOR DISCUSSION OF 1930 RADIO DESIGN

Those present at the meeting were: Messrs:

T.M. Edison	G. C. Harris	F. F. Holley
A. L. Walsh	W. B. Arrowsmith	J. Holle
R. H. Allen	E. M. Richards	J. F. McCarthey
A. A. Manchester	W. O. Olson	A. J. Rhaines
P. J. McGee	W. W. Cowan	R. Sommers
C. Hirsch	W. R. Kurtze	E. Trautwein

The minutes of the meeting of February 14th were approved as issued.

1. SOLDER LUGS

Mr. Harris submitted a report on solder lugs as follows:

In an effort to reduce the cost of solder lugs part #200,142 Mr. Olson has submitted a new design which has been approved by the Sub-Committee on solder lugs. Specifications for this lug have been given to the Purchasing Dept. for a price estimate.

Mr. Harris stated, that the cost of this solder lug would be about one half the cost of the previous design.

Mr. Holley will obtain costs at once of this lug. Twenty five sample lugs will be made.

Mr. Manchester gave his approval to this lug. We will procure this type of lug.

2. DIAL MECHANISMS

Complete costs on the dial mechanisms as submitted by Mr. Harris were not presented.

As soon as complete costs are available Mr. Holley will present them.

Production Department will be responsible for assembly costs on dial mechanisms.

The committee decided to purchase parts for the dial mechanism and to have them assembled either by the Splitdorf Radio Corporation or the General Manufacturing Division.

In order to carry out this plan, it is important that prices be procured at the earliest possible moment.

Referred to Mr. Holley,

### 3. 1930 RADIO PRODUCTION

It is estimated that we lost the sale of fifteen thousand radio sets last year owing to our failure to make delivery. This year we should be ready to fill orders that come to us at the time of the June show.

In order to be able to deliver sets by June first, it will be necessary to start production, NOT LATER THAN MAY FIFTEENTH 1930.

There was considerable discussion as to whether it was possible to go into production by the above mentioned date.

The high points of this discussion are outlined below.

Mr. Manchester offered an alternative plan to going into production on the new set by May fifteenth. He suggested that we revise the present model with the following improvements, new finish, new dial, new cabinet, and new speaker.

With this plan we would have sets ready for delivery by June first 1930.

Mr. Edison questioned why we could not proceed with the new set so to have a quantity ready by June first?

Mr. Manchester stated, that after the set was complete and accepted by the Sales Department, that it would take some time to get ready for production. Owing to difficulties in training help and bringing thru production, it would probably be one month after starting production before quantity production would be reached. If production started on May fifteenth, Mr. Manchester stated, we could have five hundred sets ready for delivery by June first.

Mr. Walsh said he had heard conflicting rumors on the performance of the new model. With the exception of the few members on the committee, the Sales Department had not heard the new set perform.

He stated an automatic volume control was essential to the sale of the new radio set.

It was shown that the automatic volume control could not be used in the 1929 model without considerable changes in the chassis base.

Discussion also brought forth the statement that it would take longer to redesign the 1929 model than it would to complete the 1930 model.

It was definitely decided to have an automatic volume control on the 1930 model.

Mr. Walsh asked whether the new set, complete in all engineering details, could be heard.

Mr. Edison stated, that the new set had been released electrically as well as mechanically and could now be heard.

It was shown that many refinements had been added since the last demonstration at Mr. Jacob's home.

Mr. Cowan said we should proceed with caution until we are sure we are right. He thought we should wait until the fifty sample sets were tried out and any defects noted and corrected before all tools and materials were ordered for the new set.

Our past experience indicates that his point of view on this matter is worthy of serious consideration.

He stated that chassis tools were not ready for release, owing to probable changes in the location of the holes in the frame, for condensers, chokes, etc. These changes introduce an element of uncertainty which must be taken into consideration.

Mr. Edison remarked, after orders are placed for the tools, it will be about three weeks before the tools are tempered. This will give sufficient time to make changes that occur in the mean time.

The fifty sets would form the basis for any changes in the die for the chassis frame and the cost of the die would be justified in the time saved.

In order to commence production on the specified date, May fifteenth, tools for all metal parts must be released as soon as possible.

Mr. Allen suggested the following procedure.

1. Research Department make preliminary design.
2. Engineering Department make working model.
3. Sales Department approve working model.
4. Submit to Manufacturing Department for production costs.
5. Construction of sets for Sales Department.

The 1930 radio set is now ready to be turned over to the Sales Department for approval of the working model.

#### 4. PRODUCTION MATERIAL

A Bill of Materials with a schedule of dates when orders must be placed for parts to insure production of sets on May fifteenth 1930 was submitted by Mr. Burns. This bill of materials was completely revised with regard to dates on those items which need immediate decisions.

For dates on all items discussed, see the following tabulation.

Item	Date to be released.
Dial assembly complete	March 15th.
2 Gang Variable Condenser } 3 " " " }	March 15th.
Large Dog House } Small Dog House }	February 24th.
.05 - 2 Paper Condensers } .1 - 2 " " }	February 21st.
Cans for above ( 2 in each )	
Tube Base Shields } Slotted Tube Shields } Unslotted Tube Shields }	Released.
Arm & Mtg. for Switch	Open.
Main Chassis Frame } Var. Cond. Mount L } Channel L Piece }	February 26th.
Coil Shield Bases Copper } Coil Shield }	Released.
Inter-stage Coil Assemblies)	Except size of wire and No. Turns.
Filter Coil Assemblies	Released.
Antenna Coil Assembly	Released.
Filter Condenser Containing Can	Released - base dimensions.
Auto-transformer Copper Can	Released.
Bakelite Terminal Board Can	Released.
Copper Can for R. F. Choke	Released.
Can for 18 lug Term. Board	Released.
Power Pack Base	February 26th.
Mtd. chic T.E. 4 Audio Transformer	Can Released.
15 Mil 50 Henry Choke	Can Released.
25 Henry 100 Mil tapped Choke	Can Released.
Power Transformer	Can Released.
Cabinets	Ready in time.
Jensen Speaker	Open.
Motor Board Assembly	Same as Present.

5. STATIC ELIMINATOR

Mr. Walsh asked if a means for reducing static would be used in the 1930 model? Mr. Edison said, it made little difference and would increase the expense. For these reasons, it was thought advisable not to use a device of this kind.

6. PROBABLE CHANGES

Mr. Sommers stated, that some changes would probably be made in the R.F. coils - namely in the size of the wire and number of turns.

He also added, there would be some changes in gang condensers. However, the manufacturer could make these changes without difficulty.

Mr. Baker pointed out, it would be necessary to buy in large quantities to obtain the benefit of lower quotations.

Mr. Edison advised that orders for parts be placed with cancellation clauses, if necessary, to take care of changes in design.

7. DIAL MECHANISMS

After considerable discussion on parts for the dial mechanism, it was felt that any part in the dial mechanism could be obtained in six weeks.

8. FIRST FIVE THOUSAND SETS

Mr. Walsh said, after acceptance by the Sales Department, he would place an order for the first five thousand sets.

9. GANG CONDENSERS

Mr. Holley will obtain costs and samples. He will report at the next meeting. It is important that we have more than one source of supply of gang condensers.

10. TOOLS

Mr. Olson questioned whether successful bidders will be able to make delivery of tools in the time specified.  
Referred to Purchasing Department.

11. TUBE BASE SHIELD

Mr. Olsen said five hundred tube base shields could be made in the Works.

12. RADIO-PHONO TRANSFER SWITCH

Considerable discussion took place with regard to the location of the arm and mount for the radio-phono transfer switch. The locations suggested for the switch were (1) on the panel, (2) on the motor board, (3) on the dial.

As no decision was reached, this question was referred to the Dial Panel Committee for immediate action.

Committee: Messrs: Harris, McGee, Manchester, Richards, and Jacobs.

13. MAIN CHASSIS FRAME

Decision on location of radio-phonograph switch is holding up completion of drawings of the chassis frame.

14. MOTOR BOARD ASSEMBLY

Mr. Edison said, there should be no hold up as the motor board assembly is the same as the 1929 model.

16. CABINETS

Mr. Walsh felt confident we would have cabinets ready for May 15th production.  
Referred to Mr. Richards.

16. SPEAKERS

Mr. Harris stated, the Jensen Speaker Company is shipping us a new model speaker for test.

Mr. Walsh stated, other things being equal, we would probably use the Jensen speaker in the 1930 model. He pointed out that it would be undesirable to use a speaker manufactured by some company that is making radio sets. He further stated, the Utah Speaker Company was not connected with any concern now making radio sets. He thought the Utah speaker should be considered also, when making tests.

Mr. Baker stated that we had 1,000 Jensen speakers on hand which would be taken back by the Jensen Manufacturing Company, to be remodeled, provided we placed our order with them for speakers for the 1930 model.

17. -POWER PACK AND MOUNTING OF PARTS

It was decided to adapt the open air transformer (housed in a metal can) for 1930 production. The power transformer will not be potted.

Chokes, condensers, etc. will be potted.

Mr. Harris stated, that the power transformer will be preheated to remove moisture and will be impregnated with a varnish to guard against corrosion.

18. FUSE TO CONTROL LINE VOLTAGE.

It was decided to use a fuse to control line voltage. The taps to remain 105, 115, 125 volts.

It was thought that a guarantee notice should accompany the set, stating, "GUARANTEE WILL HOLD ONLY IF THE RIGHT CAPACITY FUSE IS USED".

19. SUB-PANEL COMMITTEE REPORT

A Sub-committee consisting of the following members met on February 20th and arrived at the decision detailed herein. Those present were A. A. Manchester, P. J. McGee, G. C. Harris, W. O. Olson, E. M. Richards and W. W. Cowan.

1. It was found possible and is considered economical to mount the panel as a part of the cabinet. The panel instead of being glued in place, will be secured by screws or other means which will make it detachable in the event of damage or any other reason which might require removal.

2. The holes in the panel will be accurately located with respect to the receiver unit shelf by means of a jig.

3. Calibration of the receiver unit will be accomplished by means of a jig and will be located from the punching pin and the dial tuning shaft. These points also will be used to locate the escutcheon plate after the chassis has been mounted in the cabinet. The escutcheon plate will be secured by screws to the panel.

4. After the chassis has been secured by the hook bolts, additional blocks will be screwed in place at the rear corners to prevent shifting.

5. Knobs will be of the push-on type. All shafts will be one quarter inch in diameter and will have a flat to accommodate the push-on type knob.

6. This arrangement of mounting necessitates mounting the line switch on the panel prior to mounting the chassis in the cabinet. It will be noted also that a thin nut will be on the surface of the panel. However the nut will be hidden by the switch knob.

20. CONNECTING CABLE PLUG

Mr. McGee submitted a memorandum on the connecting cable plug which reads as follows. "I believe that a connecting plug similar to the one employed on the current Victor chassis should be adapted for use on our 1930 chassis to insure permanent and positive connection, and to avoid field troubles.

21. MERSHON CONDENSER

Mr. McGee submitted a memorandum recommending consideration of the Mershon condenser. It was felt that this matter should be held in obedience as the use of this type of condenser would necessitate changes in the power pack.

22. PURCHASING POLICY

Messrs. Allen, Walsh and Clark are considering this matter.

23. DESIGNATION OF RECEIVER AND POWER UNITS BY TYPE LETTERS AND SERIAL NUMBERS.

The following committee was appointed to make a decision as soon as possible, and report on the above.

COMMITTEE: Messrs: McGee, Harris, Arrowsmith, and Rhaines.

24. CORRECTION

The following is a correction of a statement attributed to Mr. Walsh in the minutes of the January 24th Chassis Design Committee meeting. This correction is self explanatory.

In the Minutes of the "Chassis Design Committee" for January 24, I am misquoted as follows: "Mr. Walsh recommended investigation of the Pentode tube, the use of which may reduce the number of tubes in Edison Radios."

I certainly don't want anything lying around in files which gives the impression that I even considered the adoption of the Pentode tube. At the meeting of January 24 I merely stated that the radio pages of newspapers and magazines were spreading publicity to the effect that radio sets of the future will have fewer tubes. Because of such publicity, I was reluctant to produce a set for this year which would contain 11 tubes -- such a receiver having been discussed around that time.

Instead of urging that we consider the adoption of the Pentode tube I should be a bitter opponent if anybody in the organization made such a suggestion at this time.

Art Walsh.

25. SUMMARY

Mr. Walsh called attention to the fact that a great number of questions that come up at the meetings are held over until the following meetings. He said that we have now reached the point where we must make decisions at once in order to meet production schedules.

Our success this year will depend upon our ability to ship sets promptly. To do this, it will be necessary for everyone to get behind his job and push.

NOTE Should anyone meet with difficulty in putting over his end of the job, he is requested to make this fact known. If necessary, help will be given those who need it. It is absolutely necessary that we go into production on the 1930 set - not later than May 15th. 1930.



REMINDER May we again state, that much depends upon the early completion of the sixty two sample sets, now under construction.

The next meeting will be held in Building # 25 February 28th at 1:30 P.M. Please be on time.

There being no further business to come before the committee, the meeting adjourned.

E. Trautwein, Secretary.

Copies to: Messrs:

Chas. Edison  
T. M. Edison  
R. H. Allen  
A. L. Walsh  
A. A. Manchester  
C. T. Jacobs  
P. J. McGee  
G. C. Harris  
W. O. Olson  
G. O. Cosden  
R. Kother  
Mr. Berggren

F. F. Holly  
J. Holle  
A. J. Rhaines  
W. B. Arrowsmith  
C. S. Williams  
E. M. Richards  
W. Hildebrand  
W. W. Cowan  
C. H. Luhr  
G. Hirsch  
J. Greeley  
R. Burns

E. W. Haker  
W. Hardy  
J. F. McCarthy  
C. G. Clarke  
C. F. Schwietzer  
G. Eaton  
A. J. Clark  
W. R. Kurtze  
H. B. Nielsen  
R. Sommers  
F. Bostock  
E. Trautwein.

February 21, 1930.

REPORT TO BE MADE AT THE NEXT RADIO DESIGN MEETING

To:	PARAGRAPH #	SUBJECT
Mr. Holly (Cost)	1	SOLDER LUGS
Mr. Holly (Cost)	2	DIAL MECHANISMS
Mr. Holly (Cost)	9	GANG CONDENSERS
Mr. Holly (Cost)	10	TOOLS
Mr. Harris) Mr. McGee) Mr. Manchester) Mr. Jacobs) Mr. Richards)	12	RADIO-PHONO TRANSFER SWITCH
Mr. Richards	15	CABINETS
Mr. Harris	16	SPEAKERS
Mr. McGee) Mr. Harris ) Mr. Arrowsmith ) Mr. Rhaines)	23	DESIGNATION OR RECEIVER AND POWER UNITS BY TYPE LETTERS AND SERIAL NUMBERS.

Taken from the minutes of the meeting held February 21st.

February 28, 1930.

MEETING FOR DISCUSSION OF 1930 RADIO DESIGN

Those present at the meeting were:

Messrs. T. M. Edison            E. M. Richards            G. C. Cosden  
          R. Burns                A. J. Clark                C. J. Hirsch  
          A. A. Manchester        F. F. Holly                H. B. Nielsen  
          C. T. Jacobs               J. Holle                    C. G. Clarke  
          P. J. McGee                E. Haker                    W. R. Kurtze  
          G. C. Harris               A. J. Rhaines              R. Kother  
          W. O. Olson               J. F. McCarthy             E. Trautwein  
          W. W. Cawan               W. B. Arrowsmith

The minutes of the meeting of February 21 were approved as issued.

Much of the information in the minutes is confidential, and members of the committee were asked not to leave copies of the minutes lying around where they can be examined by different people.

1. SOLDER LUGS

Mr. Holly submitted a report on cost, which is on file.

2. DIAL MECHANISM

Mr. Harris submitted a report on the dial scale, together with a sample. Referred to Mr. Walsh for approval.

3. 1930 RADIO PRODUCTION

A partially complete set will be turned over to Mr. Walsh tonight for demonstration. Mr. Jacobs will turn over a complete set to the Sales Department for final approval by March 3.

Mr. Jacobs stated he would supply the Splitdorf Radio Corporation with two complete sets for use in the Production Department.

4. PRODUCTION MATERIAL

Mr. Harris presented a memorandum on the procedure with regard to drawings and specifications for production release. This report is on file and was approved by the committee.

Tools have not yet been ordered for the different parts for the new set. Mr. Manchester will see Mr. Walsh and arrange to place order with the Purchasing Department so that they can go ahead with ordering parts for the 1930 radio set.

Mr. Edison suggested that a notation be made on drawings stating that they would be subject to revision owing to changes in design. It was understood that tool manufacturers would keep in

February 28, 1930.

close touch with the Engineering Department for these changes in design.

New Items Released: Detector Unit Auto Transformer  
Audio Unit R. F. Choke

5. RADIO PHONO TRANSFER SWITCH

The location of the radio phono transfer switch was approved as submitted, with certain modifications to meet the suggestions of the committee.

6. PROBABLE CHANGES

Mr. Jacobs stated there would probably be some changes in the design of the new set before it is finally approved. He referred in particular to resistors and condensers.

6. TYPE LETTERS AND SERIAL NUMBERS FOR NEW SET

Mr. Harris submitted a report which was approved as far as the numbering system was concerned. This year's receiver and power unit will be known as Model A.

It was decided that Mr. Manchester would consult with Mr. Luttrupp with regard to the method of printing numbers on the chassis.

7. REPORT FROM COST COMMITTEE

It is estimated that the cost of the new dial parts will be approximately 88¢.

Mr. Holly suggested the possible elimination of the female plug on the main line cord, in order to effect a saving. He will obtain a report on this, and the matter will be referred to Mr. Walsh for decision.

8. REPORT OF PROGRESS ON FIFTY SETS

Mr. Cowan stated that complete specifications were not available on some parts, especially the R. F. coils.

Mr. Olson stated that 12 chassis frames will be turned over to Splitdorf Radio Corporation on Monday for assembly.

Mr. Edison suggested that a chart be made up showing the progress being made to complete the 50 sets, and he also mentioned this same chart could be used to outline a program for future production. Referred to Mr. Cowan.

9. QUESTIONNAIRE

Mr. Arrowsmith will make up a list of questions which will be used as a basis of making up a questionnaire on the 50 sets now under construction.

February 28, 1930.

10. CONNECTING CABLE PLUG

The question of soldering connections on the connecting cable plug was referred to the Solder Lug Committee, who will make a report at the next meeting.

There being no further business to come before the committee, the meeting adjourned.

The next meeting will be held in Building #25, March 7, at 1:30 P.M. Please be on time.

E. Trautwein, Secretary.

Copies to: Messrs.	Chas. Edison	F. F. Holly	E. W. Haker
	T. M. Edison	J. Holle	J. Hardy
	R. H. Allen	A. J. Rhaines	J. F. McCarthy
	A. L. Walsh	W. B. Arrowsmith	C. G. Schweitzer
	A. A. Manchester	C. S. Williams	G. Eaton
	C. T. Jacobs	E. M. Richards	A. J. Clarke
	P. J. McGee	W. Hildebrand	W. R. Kurtze
	G. C. Harris	W. W. Cowan	H. B. Nielsen
	W. O. Olson	C. H. Luhr	R. M. Somers
	G. C. Cosden ✓	C. J. Hirsch	F. Bostock
	R. Kother	J. Greeley	E. Trautwein
	K. Berggren	R. Burns	C. G. Clarke

February 28, 1930.

REPORTS TO BE MADE AT THE NEXT RADIO DESIGN COMMITTEE

	<u>Paragraph</u>	
Mr. Harris	2	Dial Mechanism
Mr. Manchester	6	Type letters and serial numbers on new set
Mr. Holly	7	Elimination of Female Plug on Main Line Cord
Mr. Cowan	8	Chart on progress on 50 sets
Mr. Arrowsmith	9	Questionnaire
Messrs Harris Jacobs McGee Manchester Berggren Holle Holly Nielsen	10	Connecting Cable Plug

Taken from minutes of meeting held February 28.

March 7, 1930.

MEETING FOR DISCUSSION OF 1930 RADIO DESIGN

Those present at the meeting were:

Messrs. T. M. Edison	J. Holle	W. R. Kurtze
R. Burns	E. Haker	R. Kother
G. C. Harris	W. B. Arrowsmith	
W. O. Olson	G. C. Cosden	
W. W. Cowan	H. B. Nielsen	
F. F. Holly	C. G. Clarke	

The minutes of the meeting of February 28 were approved with the following correction:

Paragraph 4 - New Items Released: Detector Unit Auto Transformer  
Audio Unit R. F. Choke

These items were not released on February 28th, but since that time the Detector Unit Auto Transformer has been released.

There is a correction to the minutes of the meeting of February 14, as follows: Under Item 18 - Omit last paragraph.

1. DIAL MECHANISM

Dial mechanism completely approved except for color of scale and addition of "silent key". Referred to Mr. Walsh.

2. 1930 RADIO PRODUCTION

The set has not had final approval by the Sales Department yet.

Mr. Walsh has authorized tools to be ordered for the 1930 sets. No parts have yet been ordered.

The Production Department has been supplied with only one chassis to date. Another chassis is needed at once. Referred to Mr. Jacobs.

The power pack has not yet had final approval. Test to be made by Mr. Harris on effect of location of cable on noise.

3. PRODUCTION MATERIAL

No tools have yet been ordered. All orders for tools for the metal parts for the chassis will be placed tomorrow.

Mr. Holly is preparing a list of items which must be ordered at once in order to be ready for production on May 15th. He will submit this at the next meeting.

4. PLANT LAY OUT

Appropriation has been made to carry on the work for the plant lay out. This work is now going ahead rapidly. In order to complete the lay out for the third floor of Building 24, a complete breakdown of sub-assemblies must be made. Referred to Mr. Holle and Mr. Kother. The lay out for the cabinet assembly line is now ready for approval. Referred to Mr. Manchester and Mr. C. G. Clarke.

5. POWER TRANSFORMERS

Mr. Harris submitted two samples of power transformers. A committee consisting of Messrs. Harris, Cowan, Haker, Holly, and Kother was appointed to report on power transformers, filter chokes, and audio transformers. This committee will get together at once and decide what parts shall be bought separately and assembled in our plant.

6. NEW DESIGN PROBLEMS

Mr. Harris brought up a number of questions on design as follows:

- Item 1 - Fastening of R. F. Coils to base - Referred to the Engineering Dept.
- " 2 - Method of fastening compensating condenser - Approved
- " 3 - Connecting cable - O.K. for first 50 sets
- " 4 - Loud Speaker - Jensen approved. Referred to Mr. Walsh.

The committee decided in favor of the Jensen speaker for the first 5000 sets. Referred to Mr. Walsh for his approval.

7. TYPE LETTERS AND SERIAL NUMBERS FOR NEW SET

Mr. Manchester will see Mr. Luttropp about printing numbers on chassis, and also on cover for fuse box on power pack.

8. REPORT FROM COST COMMITTEE

Complete costs on dial are not yet available. Mr. Olson pointed out that tools for the die casting for the dial should be made up at once. Referred to Mr. Cowan.

It was decided that the female plug on the line cord would not be eliminated.

9. CONDENSERS

Mr. Holly read a letter from the Radio Condenser Company of Camden stating that they wished us to place orders with them for condensers for 1930 production on or before March 15.

Mr. Burns will see Mr. Lanahan and Mr. Jacobs regarding the conference with representatives of Scovill Manufacturing Company.

At present condensers are being held up awaiting specifications. Referred to Mr. Jacobs.



March 7, 1930.

10. REPORT ON PROGRESS OF FIFTY SETS

Mr. Cowan stated that specifications are continually being changed. It is expected that the Production Department will probably start assembly on the first fifty sets early next week provided fewer changes come through.

11. QUESTIONNAIRE

Mr. Arrowsmith is awaiting Mr. McGee's return before he submits the portion of the questionnaire which he has already made up.

12. SOCKET LUGS

The Solder Lug Committee were in favor of having the lugs on all sockets uniform and tin dipped, with the exception that heavier material is to be used for the connecting plug socket.

Mr. Harris will submit a report on methods of soldering the connecting cable plug.

13. ESCUTCHEON PLATE

The committee felt that immediate decision should be made on the escutcheon plate for the 1930 radio production on account of the time which it takes to get these. Referred to Mr. Walsh and Mr. Richards for their decision.

14. FINISH

Mr. Harris stated that the finish for the 1930 radio set will be bronze - the same as for the ER-5. He is making up specifications now.

15. FEMALE CONNECTORS

Mr. Holly pointed out that General Electric Company will require six weeks from receipt of order to deliver female connectors.

There being no further business to come before the committee, the meeting adjourned.

The next meeting will be held in Building #25, March 14, at 1:30 P.M. Please be on time.

E. Trautwein, Secretary.

G.

Copies to: Messrs.	Chas. Edison	F. F. Holly	E. W. Baker
	T. M. Edison	J. Holle	W. Hardy
	R. H. Allen	A. J. Rhaines	J. F. McCarthy
	A. L. Walsh	W. B. Arrowsmith	C. G. Schweitzer
	A. A. Manchester	C. S. Williams	G. Eaton
	C. T. Jacobs	E. M. Richards	A. J. Clark
	P. J. McGee	W. Hildebrand	W. R. Kurtze
	G. C. Harris	W. W. Cowan	H. B. Nielsen
	W. O. Olson	C. H. Luhr	R. M. Somers
	G. C. Gosden	C. J. Hirsch	F. Bostock
	R. Kother	J. Greeley	E. Trautwein
	K. Berggren	R. Burns	C. G. Clarke

March 7, 1930

REPORTS TO BE MADE AT THE NEXT RADIO DESIGN MEETING

	<u>Paragraph</u>	
Mr. Harris	1	Dial Mechanism
Mr. Holly	3	Production Material
Mr. Harris } Mr. Cowan } Mr. Haker } Mr. Holly } Mr. Kother }	5	Power Transformers Filter Chokes Audio Transformers
Mr. Manchester	7	Type Letters and Serial Numbers
Mr. Burns	9	Condensers
Mr. Cowan	10	Report on Progress of 50 Sets
Mr. Arrowsmith	11	Questionnaire
Mr. Richards	13	Escutcheon Plate

Taken from minutes of meeting held March 7.

March 14, 1930.

MEETING FOR DISCUSSION OF 1930 RADIO DESIGN

Those present at the meeting were:

Messrs. T. M. Edison	A. A. Manchester	A. J. Clark
R. Burns	W. W. Cowan	G. C. Cosden
A. L. Walsh	J. Holle	W. R. Kurtze
G. C. Harris	F. F. Holly	C. G. Clarke
W. O. Olson	E. W. Haker	G. Eaton
P. J. McGee	A. J. Rhaines	G. F. Schweitzer
W. B. Arrowsmith	J. F. McCarthey	R. Kother

The minutes of the meeting of March 7 were approved as issued.

1. DIAL MECHANISM

Dial mechanism completely approved except for color of scale and addition of "silent key". Referred to Mr. Walsh for further consideration.

Escutcheon plate - No decision as yet. Referred to Mr. Walsh.

2. 1930 RADIO PRODUCTION

The set has not had final approval by the Sales Department as a satisfactory model has not yet been presented. Mr. Edison stated that in all probability a complete job would be available by Tuesday, March 18.

Tools for metal parts for which complete drawings are available have been ordered.

A second chassis has not yet been supplied to the Production Department. Referred to Mr. Jacobs.

The power transformer for the 1930 set will not be potted but will be covered with a metal can. The A and B chokes and audio transformers are to be potted.

3. POWER PACK

The power pack as submitted by Mr. Harris was approved, mechanically only, with the following changes:

1. The length of the power pack frame is to be the same as the length of the chassis for 1930 production.
2. The design for the plug socket is to be changed so that another type of connecting plug can be used at a later date if the design as submitted does not prove satisfactory.

March 14, 1930.

4. PRODUCTION MATERIAL

The authority given Mr. Manchester and Mr. Holly by Mr. Walsh recently to purchase certain screw machine parts in quantities up to 25,000, with the usual cancellation clauses, was further extended to include such other items as may be purchased economically in larger quantities. This extension is to include items that will not be made obsolete by any electrical changes, and orders for these items in larger quantities are to be approved by Mr. Theodore Edison and Mr. Harris.

Mr. Walsh stated that decision on the speaker would be held up until Mr. Harris has made a more thorough investigation on the Utah speaker.

5. PLANT LAY OUT

An approved lay out for sub-assemblies on the third floor of Building 24 is not yet available. Referred to Mr. Holle and Mr. Kother.

Lay out for cabinet assembly is ready for approval. Referred to Mr. Manchester and Mr. C. G. Clarke.

6. POWER TRANSFORMERS, FILTER CHOKES, AND AUDIO TRANSFORMERS

Nothing further to report at this time. Referred to Messrs. Harris, Cowan, Holly, Haker, and Kother.

7. R. F. COILS

It was decided that part of our supply of R.F. coils would be made in the plant and part would be purchased on the outside.

8. TYPE LETTERS AND SERIAL NUMBERS FOR NEW SET AND PRINTING ON FUSE BOX FOR POWER PACK

Mr. Cowan is looking into this matter and will report on it before next Tuesday, March. 18.

9. PROGRESS ON FIFTY SETS

Mr. Cowan stated that sub-assemblies will start as soon as lugs are received.

10. QUESTIONNAIRE

Mr. Arrowsmith is still working on this.

11. SOCKET LUGS

Mr. Harris reported he was waiting for samples from Eby. This item held up until sockets are received.

March 14, 1930.

There being no further business to come before the committee, the meeting adjourned.

The next meeting will be held in Building #25, March 21, at 1:30 P.M. Please be on time.

R. Burns.

G

Copies to: Messrs. Chas Edison F. F. Holly E. W. Haker  
T. M. Edison J. Holle W. Hardy  
R. H. Allen A. J. Rhaines J. F. McCarthey  
A. L. Walsh W. B. Arrowsmith C. F. Schweitzer  
A. A. Manchester C. S. Williams G. Eaton  
C. T. Jacobs E. M. Richards A. J. Clark  
P. J. McGee W. Hildebrand W. R. Kurtze  
G. C. Harris W. W. Cowan H. B. Nielsen  
W. O. Olson C. H. Luhr R. M. Somers  
G. G. Gosden ✓ C. J. Hirsch F. Bostock  
R. Kother J. Greeley C. G. Clarke  
K. Berggren R. Burns E. Trautwein

March 14, 1930.

REPORTS TO BE MADE AT THE NEXT RADIO DESIGN MEETING

Mr. Harris	Paragraph 4	Production Material - Speaker
Mr. Harris } Mr. Cowan } Mr. Holly } Mr. Haker } Mr. Kother }	" 6	Power Transformers Filter Chokes Audio Transformers
Mr. Cowan	" 8	Type letters and serial numbers, etc.
Mr. Cowan	" 9	Progress on 50 sets
Mr. Arrowsmith	" 10	Questionnaire

Taken from minutes of meeting held March 14.

March 21, 1930.

MEETING FOR DISCUSSION OF 1930 RADIO DESIGN

Those present at the meeting were:

Messrs. T. M. Edison	J. Holle	C. T. Jacobs
R. Burns	F. F. Holly	R. M. Somers
A. A. Manchester	E. W. Haker	C. G. Clarke
G. C. Harris	J. F. McCarthy	W. R. Kurtze
W. O. Olson	A. J. Clark	R. Kother
W. B. Arrowsmith	E. M. Richards	O. Besser
W. W. Cowan	G. C. Cosden	

The minutes of the meeting of March 14 were approved as issued.

1. DIAL MECHANISM

Mr. Harris stated that the color of the scale for the dial mechanism has been tentatively approved by Mr. Walsh.

The calibration for the scale will not be decided until the fifty sets are made up.

2. ESCUTCHEON PLATE

No decision has yet been made on the escutcheon plate. This item is held up awaiting final decision on cabinets. Referred to Mr. Walsh and Mr. Richards.

3. 1930 RADIO PRODUCTION

The set was approved by the Sales Department on March 19, with certain changes recommended by Mr. Walsh to give the proper tone. Referred to Mr. Jacobs.

No cabinets have yet been ordered. Mr. Richards stated that one model of cabinet will probably be released early next week. Referred to Mr. Walsh.

Orders for tools for the chassis were placed today with the General Manufacturing Division.

Mr. Holly submitted a list of tool orders and production part orders which have already been placed. This report is on file.

A second chassis has not yet been turned over to the Production Department. Referred to Mr. Jacobs.

Mr. Edison mentioned that some of the fifty sets should be given bump tests. Observations should be made to see if the filler in the mystery boxes becomes loose.

March 21, 1930

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#### 4. POWER PACK

Tools for the power pack frame have not yet been ordered. Drawings and specifications are now being completed.

The length of the power pack frame has been increased to make it the same length as the chassis frame.

Design of plug socket - Of the 50 sets now under construction at least ten of them will have a plug socket for an alternative design. Referred to Mr. Harris.

#### 5. PRODUCTION MATERIAL

Mr. Haker submitted a list of orders placed with the Purchasing Department for the first schedule on the 1930 set.

Specifications and drawings should be completed at once on the following items so that orders may be placed without delay: Transformer coils, choke coils, power pack base, paper condensers, variable condensers, volume control, tone control, R. F. coils, carbon resistors, switches, shielded wire, and scale. Referred to Mr. Harris.

Mr. Cowan, Mr. Somers and Mr. Harris will get together at once and complete all specifications.

1300 Jensen speakers now in the plant can be used for the first production on the 1930 model. The finish on these speakers must be changed if they are used.

Mr. A.J. Clark stated that a decision will be made on Saturday morning, March 22, as to our future supplier on gang condensers.

#### 6. PLANT LAY OUT

Sub-assembly lay out not yet available. Referred to Mr. Holle and Mr. Kother.

#### 7. POWER TRANSFORMERS, FILTER CHOKES, AND AUDIO TRANSFORMERS

It was decided that this year we will buy all coils and laminations and assemble them in Splittdorf Radio plant.

Mr. Harris submitted a memorandum with sample of power transformer lug. It was decided that this type of lug would be held over until samples of other lugs are received.



March 21, 1930

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8. TYPE LETTERS AND SERIAL NUMBERS FOR NEW SET AND PRINTING ON FUSE BOX OF POWER PACK

No report available on this. Referred to Mr. Cowan.

9. PROGRESS ON FIFTY SETS

Mr. Cowan stated that sub-assemblies were still being held up waiting for solder lugs. It is expected that lugs will be here on Monday, March 24. The fifty chassis bases will all be turned over to the Production Department next week.

10. QUESTIONNAIRE

No report yet available. Referred to Mr. Arrowsmith.

11. FIRST 5000 SETS

An order for the first 5000 sets with breakdown into different types has not yet been turned over to the Splitdorf Radio Corporation. Referred to Mr. Walsh.

12. MOTOR BOARD ASSEMBLY

There will be no combination models among the first release of 5000 sets.

13. FINISH

Mr. Olson stated that parkerizing acted as an insulator on the different metal parts and prevented making satisfactory ground connections. He suggested that a copper flash be used instead of parkerizing. Mr. Holly will obtain comparative costs of finishes using copper flash and parkerizing.

The finish of all the different metal parts is referred to the Committee on Finish for immediate action. Committee on Finish: Messrs. Harris, Jacobs, Manchester, McGee, Berggren, and Richards.

14. DECISIONS

Mr. Jacobs stated that the slots for the dog houses will probably not be changed from their present location.

It was decided that all cans are to be equipped with removable tops and are to be slotted on the side.

There being no further business to come before the committee, the meeting adjourned.

The next meeting will be held in Building #25, March 28, at 1:30 P.M. Please be on time.

R. Burns

G

March 21, 1930

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Copies to: Messrs:

Chas. Edison	F. F. Holly	E. W. Haker
T. M. Edison	J. Holle	W. A. Hardy
R. H. Allen	A. J. Rhaines	J. F. McCarthy
A. L. Walsh	W. B. Arrowsmith	C. F. Schweitzer
A. A. Manchester	C. S. Williams	G. Eaton
C. T. Jacobs	E. M. Richards	A. J. Clark
P. J. McGee	W. Hildebrand	W. R. Kurtze
G. C. Harris	W. W. Cowan	H. B. Nielsen
W. O. Olson	C. W. Luhr	R. M. Somers
G. C. Cosden ✓	C. J. Hirsch	F. Bostock
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K. Berggren	R. Burns	E. Trautwein