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INTERIM DEVELOPMENT REPORT
FOR
ANTENNA LOBE SWITCHING
TR ASSEMBLY

THIS REPORT COVERS THE PERIOD 1 JULY 1954 to 1 AUGUST 1954

BOMAC LABORATORIES, INC.
SALEM ROAD
BEVERLY, MASSACHUSETTS

NAVY DEPARTMENT BUREAU OF SHIPS ELECTRONICS DIVISION

Nobsr-64217 NE-111613, Subtask 24 August 9, 1954

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ABSTRACT

Parts for the BL-601 attenuator tube have been received and five preliminary models are being made up.

All parts for the waveguide section have been received and two sections are in process.

The mechanical design of the shutter mechanism was completed.

During the last two weeks in July, Bomac Laboratories was closed for its annual vacation period.

PART I

1. PURPOSE

1.1 The primary goal of this contract is the development of a lobe switching TR assembly for 3430 Mc.

1.2 The following parts are to be developed: (1) a mechanical shutter (BL-318), (2) an attenuator TR tube (BL-601), (3) the complete assembly(BL-512).

2. GENERAL FACTUAL DATA

2.1 Identification of Technicians

Name	Hours
W. Caithness - Electronic Engineer	10
R. Braden - Electronic Engineer	1
J. E. Burr - Drafting	26
A. F. Aylward - Technician	6
Others	4
Total	47 hours

2.2 Summary of Expenditures During Period

Funds Allocated	$21,000.00
Funds Expended to date	612.44
Unexpended Funds	$20,387.56

3. DETAILED FACTUAL DATA

3.1 Project Performance and Schedule Chart: See Fig. 1

3.2 Two problems were considered on the preliminary design of the attenuator tube (BL-601)and the waveguide seat.

3.3 The first problem is that of obtaining a high VSWR across the gap of the attenuator tube when the ignitor electrode is pulsed. If the gap spacing between the two cones is made very small (in the order of 0.003" to 0.005"), the ignitor electrode tip will be closer to the opposing cone than it will be to the cone surrounding the ignitor (see Drawing RCC-2). The field intensity across the gap will be evenly distributed due to the large surface area of the cones. It is hoped that the negative glow region can be made to short this field. To obtain this close gap spacing, it will be necessary to put an inductive iris into the narrow wall of the waveguide in the same plane as the cones.

3.4 Another method of obtaining a dense discharge across the gap is to sharpen one of the cones and arrange the gap as shown in Fig. 2. This geometry has a tendency to spread the negative glow over a larger volume and, therefore, may have more effect on the VSWR.

3.5 Another method for increasing the VSWR of the system when fired, is to place an inductive iris in the narrow wall of the waveguide $\lambda g/4$ in front of the cones. This will, in effect, form a waveguide cavity of adjustable Q_L. The field intensity at the gap of the attenuator tube would then be at a maximum. It is believed that an effective discharge would be initiated with high current density.

3.6 The consistency of clamping is the second problem which may be of a serious nature. The tube will be a fixed-tuned device. To obtain consistency from one unit to another, it was decided that a rugged structure would be used. The clamping arrangement, shown in Drawing RCC-2, positions the tube from the top disc, pushing the tube down onto spring finger contacts in the bottom of the waveguide. By using this method it was felt that the gap on the attenuator tube could be positioned accurately in the waveguide. The clamping nut will bear on a teflon ring which will be in contact with the tube disc. The disc will than be pushed down onto a corrugated copper disc, thereby making contact.

3.7 Mechanical Shutter

There are a number of problems in the development of the mechanical shutter. The first is the obtaining of an effective electrical short from the shorting rod to the waveguide. A choke joint was considered, but a simple spring contact was given preference for the initial tests because of mechanical simplicity.

3.8 Another problem is the design of an efficient AC solenoid for operation of the shorting rod. A complete assembly sketch was made of the solenoid construction (see Fig. 3) This design has a slotted plunger (Fig. 3 (1)) fully guided by oilless bearings (3), (11) and having a

3.8 beryllium-copper contact spring (4) for an electrical short. The balance of the magnetic circuit consists of a slotted soft iron seat (2) into which is pressed a group of slotted high silicon steel washers (5), and a slotted shell of SAE1112; the slotted high silicon steel washers which also act as a stop are pressed into a slotted soft iron top cap (14); a solenoid coil (6), and a phenolic spool which fits snugly in the shell (8).

3.9 The design of a return spring (12) to hold the plunger (1) in the cased position against 15G's and to allow 3/8" retraction is another problem with which we are faced.

3.10 The last problem is the electrical design of the solenoid for a minimum force rating with a reasonable safety margin over the spring load plus 15G's times the weight of the plunger (1) and a low power factor in the open or energized position.

4. PROGRAM FOR COMING INTERVAL

4.1 All the parts are in for the attenuator tube and waveguide section. Five tubes will be made up and tuned. The waveguide sections and clamping system will be made up.

4.2 It is expected that the effectiveness of the discharge will be determined for the various systems previously described. Data on attenuator vs ignitor electrode, current and voltage, VSWR vs electrode current and voltage, insertion loss, and Q_L measurements will be

4.2 completed in the coming interval.

4.3 It is expected that tests will be made to determine the effectiveness of the spring contact (4). Data on the shutter insertion loss in the open and closed positions and the VSWR in both positions will be obtained. Computations for the solenoid circuit will be completed.

BOMAC LABORATORIES, INC.

By:

William Caithness
William Caithness
Electronic Engineer

Approved By:

George E. Carter Jr
George E. Carter, Jr.
Chief Engineer

BOMAC LABORATORIES, INC.

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Project Performance and Schedule
INDEX No. NE-111613, Subtask 24

CONTRACT NO. Nobsr-64217

(Report) Date: 8-9-54
Period Covered: 7-1-54 TO 8-1-54

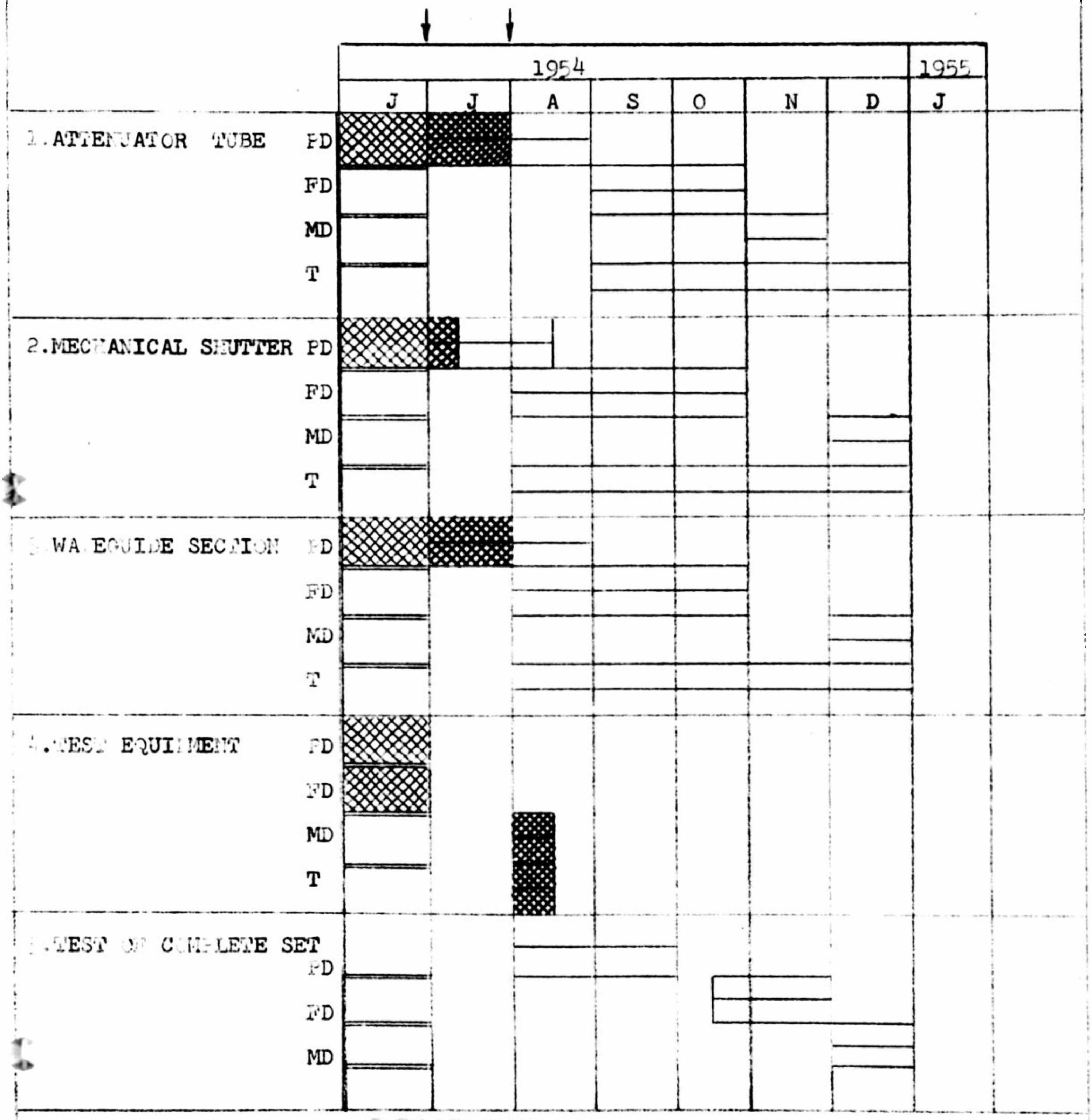

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Fig. 1 Project Performance and Schedule Chart

BOMAC LABORATORIES, INC.

Project Performance and Schedule

INDEX No. NE-111613, Subtask 24

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CONTRACT NO. Nobsr-64217

(Report) Date: 8-9-54
Period Covered: 7-1-54 TO 8-1-54

LEGEND:

▓	-Work Performed
☐	-Schedule of Projected Operation
PD	-Preliminary Design
FD	-Final Design
MD	-Model to be Delivered
T	-Test

ITEM: Estimated completion in percent of total effort expected to be expended (not chronological)

1. ATTENUATOR TUBE 20%
2. MECHANICAL SHUTTER 20%
3. WAVEGUIDE SECTION 35%
4. TEST EQUIPMENT 80%
5. TEST OF COMPLETE SET

NOTES AND REMARKS:

Fig. 1 (continued)

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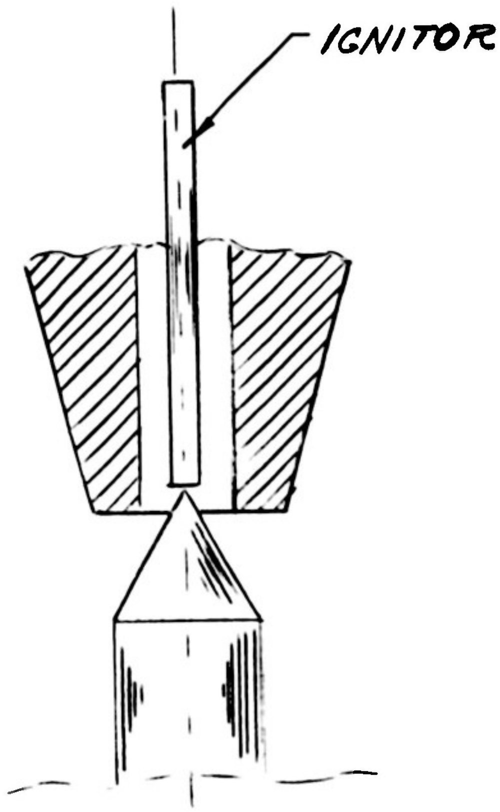
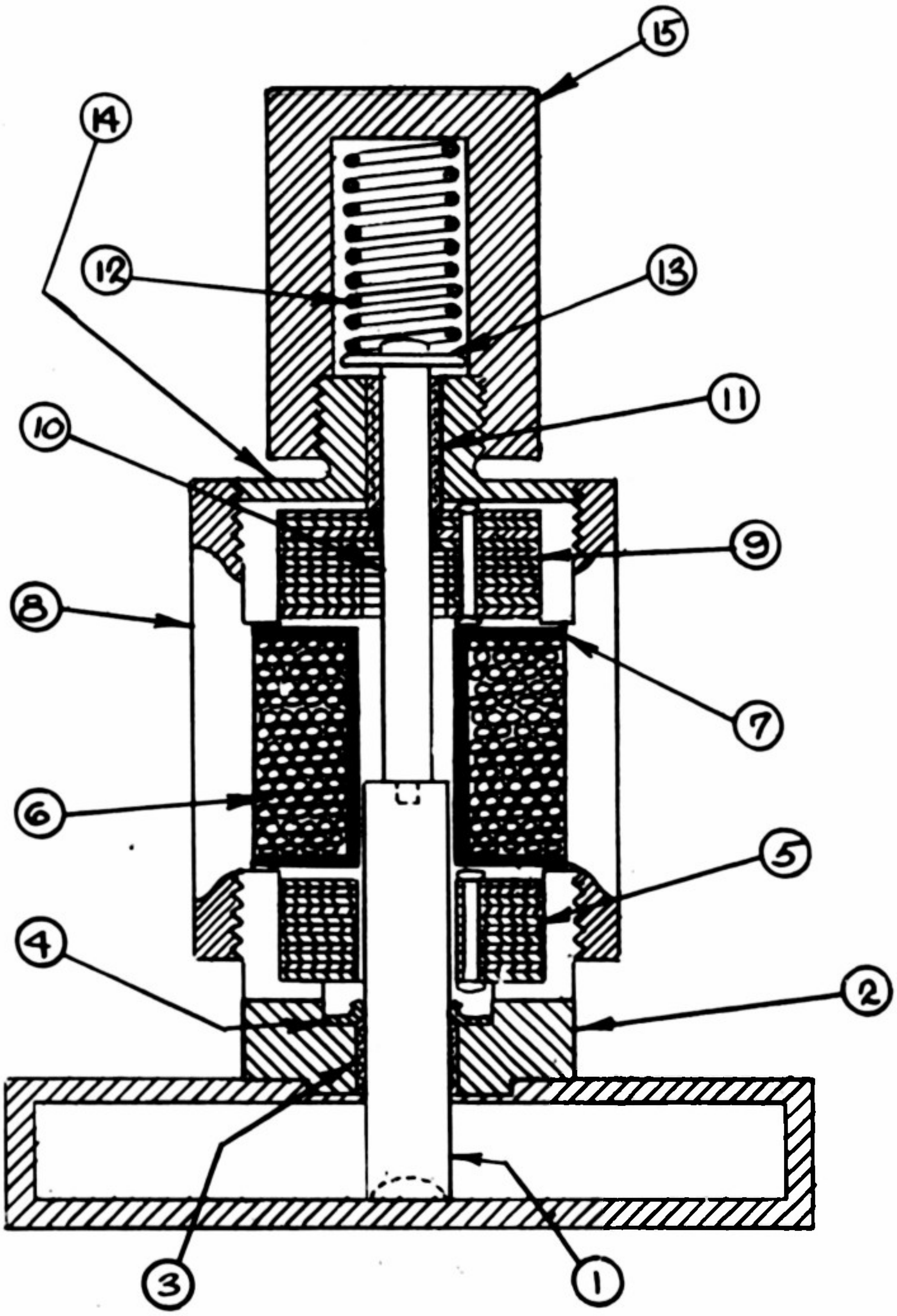


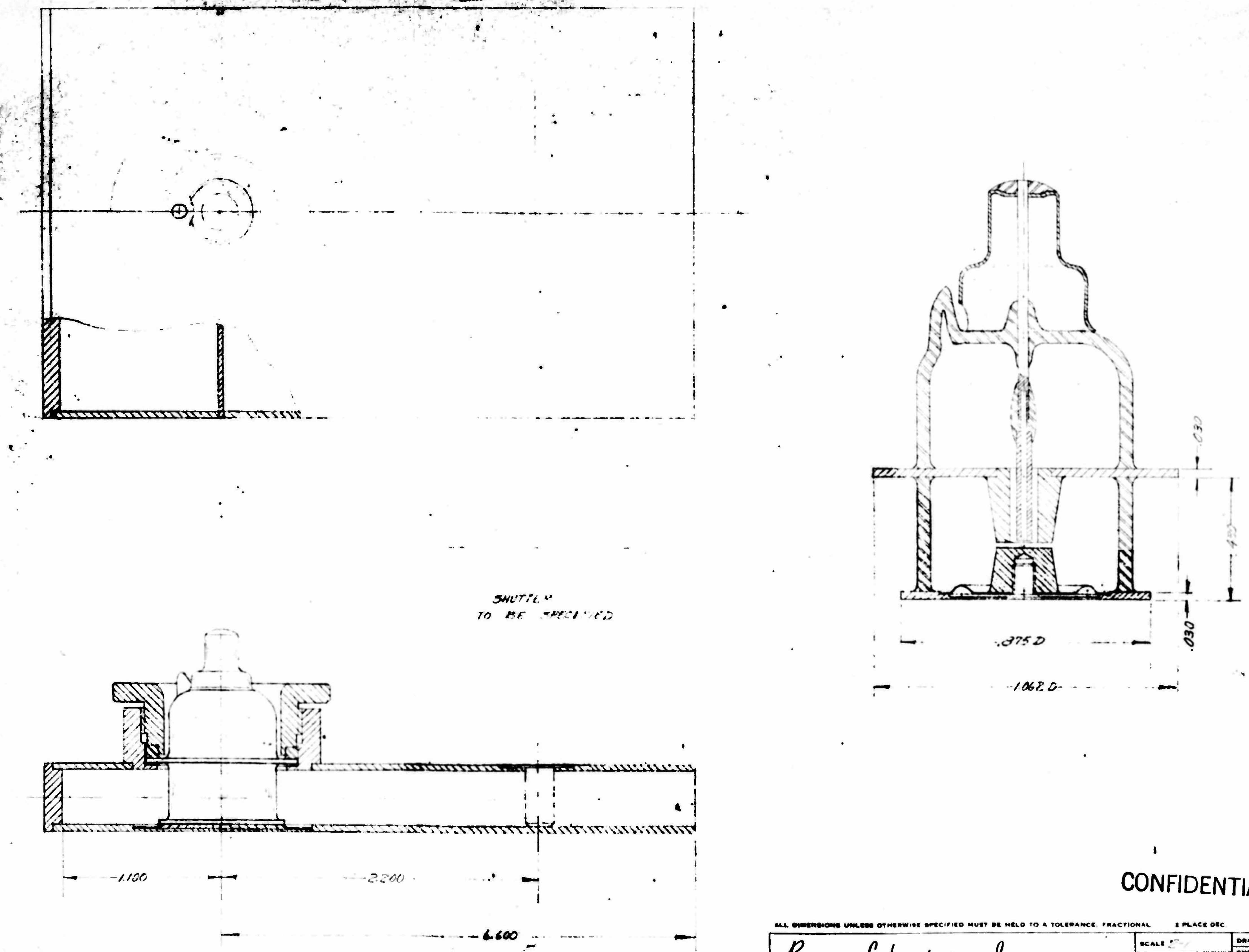
FIG. 2



1.- SAE 1112 STEEL SLOTTED PLUNGER
2.- SLOTTED SOFT IRON SEAT
3.- OILITE BEARING
4.- BC SPRING CONTACT
5.- SLOTTED HIGH SILICON STEEL WASHERS
6.- COIL
7.- PHENOLIC SPOOL
8.- SAE 1112 STEEL SLOTTED SHELL
9.- SLOTTED HIGH SILICON STEEL WASHERS
10.- BRASS NON-MAGNETIC GUIDE ROD
11.- OILITE BEARING
12.- BC RETURN SPRING
13.- TRUE ARC RETAINING RING
14.- SOFT IRON CAP SLOTTED
15.- SPRING CAP C1

FIG. 3

RCC 2



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