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BY George R. Jordan, USCO

MARCH 23 1950

Horten Tailless Aircraft

50016

(None)

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(Same)

TR-76-45

(Same)

(e) Secr. U.S. English 26 photos, diagrs

A detailed description is given of the H-IX-V2 jet propelled tailless fighter. The aircraft is powered by two BMW turbojet engines. It is equipped with five fuel tanks in each wing. Two bombs of 2200 lb each and four 37 mm cannons are carried. The main landing gear retracts inboard. The nose wheel is self-centering but not steerable. Brakes are supplied for main wheels only. No armor, leakproof tanks, and de-icing equipment are provided for this experimental model. At 20,000 ft, with full load, the the airplane is supposed to obtain a maximum speed of 720 mph. A short description is also given of the H-VIII, a six-engine flying wing, with a maximum range of 4500 miles at a cruising speed of 200 mph at an altitude of 5000 ft. This aircraft will carry about 60 passengers. A list is appended of other Horten-developed aircraft, mostly gliders.

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Airplane Design and Description (10)
Research Types (13)

Airplanes, Tailless (08724.8)

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TECHNICAL REPORT NO. 76-45

ON

HORTEN TAILLESS AIRCRAFT

SUMMARY

A short description of a tailless jet propelled fighter built and designed by Horten Bros. Some data is also presented on a large transport flying wing now under construction and other Horten aircraft.

U. S. NAVAL TECHNICAL MISSION IN EUROPE

Foreign Equip. Branch
Tech. Data Lab., Eng. Div.

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Foreign Equip. Branch
Tech. Data Lab., Eng. Div.

1. Introduction.

The information presented in this report was collected partly from captured documents and partly from an informant who was a draftsman for the Horten firm. Because of the technical limitations of the informant, some of the data must be accepted with appropriate reserve. The informant, however, had kept in continuous close touch with the designers, the Horten Brothers, until the time of his capture. Most of the data obtained pertains to a new jet-propelled tailless fighter, the H-IX-V2, which was designed and built at Goingen under the technical supervision of Major Walter Horten and Oberleutnant Riemar Horten of the Luftwaffe. In the following sections are given a short description of the H-VIII, a large commercial flying wing which is under construction at Göttingen, and a description of other Horten designs. The last section is a complete list of captured documents which are being processed and filed by C.I.O.S.

2. The H-IX-V2 Jet-Propelled Tailless Fighter.

2.1 General

This single seater fighter-bomber was designed by the Horten Bros. and built at the Luftwaffe Sonderkommando 9 at Gottingen during the war. It is the product of fourteen years of experience in tailless aircraft design. In aspect and construction it is very similar to the H-V (see section 4.6), which was built primarily for the purpose of carrying out preliminary research and development on aircraft of the H-IX type. The outstanding new feature in the H-IX-V2 is the use of jet propulsion. The first experimental design of the H-IX was designated the H-IX-V1 (V - Versuch). An increase in size of the jet-power units forced a redesign which is designated the H-IX-V2. The H-IX-V1 and H-IX-V2 are essentially similar. They are both being tested at Oranienburg. The H-IX-V3 is a version of the H-IX-V2 designed at Gothaer-Waggon Fabrik for the study of mass production problems. The H-IX-V4 is a two seater version of the H-IX-V2 intended for night fighting. It has a larger pointed nose.

2.2 Description

No exact drawings of the airplane could be obtained. Three views of a project design closely resembling the H-IX-V2 are shown in figure I. Major differences between this drawing and the H-IX-V2 are indicated in the sketch of figure 2 drawn from a verbal description of these differences by a draftsman familiar with the aircraft.

In the H-IX-V2:

a. The rear gunner is eliminated and the canopy is faired aft.

b. In plan form the tail end of the cockpit protrudes aft of the wing and fairs to a point.

c. The engines are further apart and moved forward.

d. The main landing gear retracts inboard instead of outboard.

e. There is one nose wheel instead of two.

f. There are three movable surfaces on each wing instead of two.

General characteristics of the H-IX-V2 are as follows:

Span - 53.5 ft. (16 meters)
Wing area - 452 sq. ft. (42 sq. meters)
Gross weight - 13,000 lbs. at full load.

Two BMW jet engines (see figures 3 to 9) Probably BMW 003?
Five fuel tanks in each wing (see figures 2 and 16)
Two bombs of 2200 lbs. each.
Four 37 mm cannons.
Main landing gear retracts inboard.
Nose wheel self-centering but not steerable.
Brakes on main wheels only.
Spring operated catapult seat.
Armor, leakproof tanks and de-icing equipment are not provided on the experimental model.
Figures 3 to 9 are photographs showing the center section of the wing of the H-IX-V2 under construction and the jet engines. Wooden assembly templates may be seen.

2.3 Performance

The wing loading is 40 lbs./sq. ft. The maximum speed with full load at 20,000 ft. was quoted to be 720 mph, the landing speed 90 mph, and the endurance 4½ hours. The airplane is being flight-tested at Berlin-Oranienburg. Take-off runs of 1600 ft. were obtained on initial flights with light load. It was estimated by the Germans that a take off run of 3000 ft. would be needed with full load. No wind tunnel tests were carried out for this airplane since considerable information was available from the performance of a similar airplane, the H-V, previously flown. The maximum speed of the jet-propelled Me 262 was quoted by the informant as 560 mph and that of the jet-propelled Arado 234 as 500 mph.

2.4 Controls

The movable surfaces marked 2 and 3 in the sketch (figure 2), act essentially as a combination of ailerons and elevator (elevens). The inboard movable surface marked "1" in the sketch and a similar area across the center section of the wing are used as landing flaps. Maximum deflection of the control surfaces is shown in figure 10 for three positions of the stick. The indicated deflection angles are approximate. Positive angles correspond to downward deflection on the outboard aileron which has full Friese nose. The amount of protrusion below the wing contour, in the case of an upward deflection, increases from the tip inboard allegedly to avoid snatch. On the middle control surface (marked 2), the nose is a blunt Friese. Tabs are only fitted to the middle control surfaces. They act as geared balance and trim tabs. All control surfaces are statically balanced. The lever arm of the stick may be varied. By lifting the stick it assumes a position giving reduced stick forces at high speed. The kinematic principle of the control gear is illustrated in figure 11. The details of this figure actually correspond to the H-V, but the principle used is allegedly the same in the H-IX. An ingenious mechanism is used to transfer the motion of the control arm in the horizontal plane of the wing into a vertical control surface deflecting. This mechanism is shown in figures 12 and 13. Directional control is obtained by means of wing tip spoilers indicated at locations 4 and 5 in figure 2. There is one pair of small spoilers and one pair of larger spoilers on each wing. The foot control gear is designed in such a way that the small spoilers protrude first, affording a more gentle action at high speed. The design of these spoilers is shown in figure 14. On most previous Horten designs, including the H-V, leading edge spoilers were used. These spoilers were hinged at the leading edge as shown in figures 11 and 15. This type of design was abandomed because of the aerodynamic shadow effect on the ailerons, high control forces, and mechanical complications. The spoilers of the H-IX slide in and out of the wing in a plane perpendicular to the direction of flight.

2.5 Structure

The wing is entirely of wooden construction except for the tips, which are of light metal, and the center portion which is of welded steel tubes. A cross

section of the wing is shown in figure 16. Wood glues are Kauritleim W and WHK made by I. G. Farben. There is one main spar and one auxiliary spar. Control rods are contained inside the main box spar. The wing surface is plywood covered with special lacquer finish for smoothness. The airfoil section is not laminar. The jet engines are mounted through the main spar. Aft of the engine exhaust the wing is covered by a protective metal plate at a distance of about 10 mm along the wing surface. Extensive use has been made of wood because of a shortage of light metals and also in order to facilitate the construction. Figure 17 shows the structure of the H-V which resembles closely that of the H-IX.

3. The H-VIII Six Engine Flying Wing

This airplane is under construction at the Luftwaffe Sonderkommando 9 at Gottingen. It should be ready for flight testing around November, 1945. It has a span of 157 ft. (48 meters), and is powered by six 600 hp BMW pusher engines. Figure 18 is a general view drawn by the informant from memory. The airplane range is computed to be 4500 miles at a cruising speed of 200 mph and at an altitude of 5,000 ft. It will carry about 60 passengers. The center section is of welded steel tubes. The outer wings are of wood with one main spar and one auxiliary spar. The control system is the same as for other Horten designs. Powered controls are envisaged. The nose wheel is not steerable but self-centering by spring and cam. There is no pressure cabin. The adaptation of a venturi of 3 meters diameter under the wing for use as a flying wind tunnel has been proposed.

4. Other Horten Airplanes

4.1 Horten H-1

Glider built in Bonn, 1931-32. (See figure 19)
Span - 41 ft. Flying weight - 440 lbs.
Wing area - 226 sq. ft. Gliding angle - 1/21
Weight empty - 264 lbs. Sinking speed - 2.8 ft./sec.

Won Rhön glider contest. Destroyed purposely by fire.

4.2 Horten H-II

Both glider and powered version - (see figures 19 and 20)
Built in Bonn, 1933-34.
Span - 54 ft. Flying weight - 830 lbs.
Wing area - 344 sq. ft. Gliding angle - 1/24
Weight empty - 605 lbs. Sinking speed - 2.6 ft./sec.

Has good flying qualities and does not spin. The nose drops near the stalling speed.

4.3 Horten H-III

Glider built in Tempelhof (Berlin) 1938 - (see figure 19)
Span - 66 ft. Flying weight - 750 lbs.
Wing Area - 403 sq. ft. Gliding angle - 1/28
Weight empty - 550 lbs. Sinking speed - 2.1 ft./sec.

4.4 Horten H-IV (RLM 251)

Glider built in Konigsberg-N ? in 1941 (see figure 19)
Span - 66 ft. Flying weight - 750 lbs.
Wing area - 203 sq. ft. Gliding angle - 1/37
Weight empty - 530 lbs. Sinking speed - 1.8 ft./sec.

Outer wing panel was of metal construction because it was too thin to be made out of wood. The pilot lies in a semi-prone position.

4.5 Horten H-IVb

Glider built at Hersfeld. It was a plastic wing version of the H-IV. The leading edge was made of Tronal (plastic manufactured by Dynamit A. G. - Troisdorf).
The flight characteristics were not satisfactory due to the stalling properties of the laminar wing. One glider crashed in a spin killing the pilot.

4.6 Horten V

Built in Ostheim 1936-38. Powered by two Hirth HM 60R (2x80 HP) engines. (see figures 19 and 21) Also built at the Peschke factory in Minden 1941-42 and flight tested in Gottingen in 1943. There have been side by side and single cockpit versions. A plastic version with flush cockpit was also built. This airplane crashed on the first flight due to a piloting error. The wings of this airplane were entirely plastic including the spars. (More details will be given in the C.I.O.S. report).
Characteristics of this airplane are as follows:

Span - 53.3 ft.	Flying weight - 2750 lbs.
Wing Area - 452 sq. ft.	Power 2 x 80 HP
Weight empty - 2310 lbs.	Max.Speed - 150 mph
	Landing Speed - 47 mph.

This airplane was built for the purpose of carrying on preliminary research for the Horten I?- fighter.

4.7 Horten VI (RLM 253)

Glider version of H-IV with a larger span and less dihedral was built at Hegidienberg and flown. Design was abandoned because the wings were too flexible for practical handling on the ground.

4.8 Horten VII (RLM 226)

Basically similar to the H-V. Powered by two Argus AS10-C (240 HP) engines. One airplane has been built at the Peschke factory at Minden and is being tested at Oranienburg. A second one is about to be completed. There are twenty on order. A characteristic feature is the use of a ? bar gliding spanwise and pretruding from the wing tip as a directional control. (figure 22). This device has been very satisfactory in flight.

4.9 Horten H-X

A version of the H-III with movable wing tips for lateral control. Not very successful.

4.10 Horten H-XI

Acrobatic single seat glider of about 26 ft. span being built at Hersfeld.

4.11 Horten H-XII

Two seater side by side with DKW 50 HP engine. Designed at Gottingen under construction at Kirtorf. Basically similar to H-III. Designed for private flying.

4.12 Horten Parabola (figure 19)

Glider with parabolic plan form. Built at Hegidienberg. Never flown. Destroyed by fire.

5. List of Captured Documents Related to Horten Airplanes.

No. 1. Flugzeug - Typenbuch 1940
2. " - " 1944
3. Report on Flight tests of Horten II
4. Folder on the use of plastics
5. Design requirements for Sailplanes - 1936 Vol. I
6. " " " " - 1939 Vol. III(two copies)
7. Data on kinomatics of control systems
8. Photograph of H-2, H-3 and H-4
9. " " H-2 - (four copies)
10. " " H-2
11. " " H-2
12. " " H-3
13. " " H-4 - brake flaps (spoilers)
14. " " H-4 - Aileron
15. " " H-4 - in flight, flaps out
16. Large photographs of H-2 in flight - (two photos)
17. " " " H-4 in flight - (four photos)
18. Photograph of H-4 on ground
19. " " H-4 in flight
20. " " H-5 on ground
21. " " H-7 in flight
22. " " H-7 wing under construction
23. Photographs of H-9 - installation of jet engine (seven photos)
24. Tracing of H-1, 2, 3, 4 and 7 - plan forms
25. Drawing of H-1, 2, 3, 4, 5 and parabola - plan forms
26. Tracing of H-2 general arrangement
27. Drawing of H-2[illegible] - date 3.9 36
28. Drawing of ? - General Arrangements
29. Drawing of H3B - G. A. No. 108-250 S.1 - date 7/7/39
30. Drawing of H-3D - G. A. No. 108-250 S.1 - date 11/18/40
31. Drawing of H-3D - G. A. - date 5/21/44
32. Drawing of H-3D - control systems No. 108-250-410-date 12/9/40
33. Drawing of H-3B - " " No. 108-250 - 41 S.4. - date 6/22/39
34. Tracing of H ? G.A.
35. Drawing of H-? Elevon nose shapes No. 108-251-60 - date 12/17/43
36. Drawing of H-4B ? operating ? 108-251-60 -date 12/8/43
37. Drawing of H-5C Model -date 10/18/41
38. Drawing of H-5C Model -date 10/4/41
39. Drawing of H-5C Model -date 10/3/41
40 Drawing of H-5 G.A. -date 5/30/41
41. Drawing of H-5d G. A. No. 8-252-0-S.1. (two seat) - date 3/19/42
42. Drawing of H-5d G. A. No. 8-252-0-S.1. (side seat) - date 3/23/42
43. Tracing of H-6A G. A. No. 108-253-00 - date 5/16/44
44. Tracing of H-6 Wing G. A. No. 108-253-51-S.1. - date 1/16/43
45. Tracing of H-6A outer wing No. 108-253-60 - date 9/22/43
46. Drawing of H-6V Steel spar No. 108-253-S.1-S.2. - date 9/25/42
47. Drawing of H-6 Wooden spar II No. 108-253-51-S.1. - date 9/29/42
48. Tracing of H-6 Wooden spar I No. 108-253-35 - date 9/18/42

49. Drawing of H-6A Outboard Elevon No. 108-253-35 - date 9/20/43
50. Tracing of H-6 Ribs 14.5, 15 and 15.5 No. 108-253-50 S17 - date 12/8/42
51. Tracing of H-6 Ribs 2.25 and 2.5 No. 108-253-50-S.2. - date 10/12/42
52. Drawing of H-7 Spoilers Top inner No. 8-226-37-02 - date 1/9/44
53. Drawing of H-7 Spoilers-left No. 8-226-37-S.1 - date 1/6/44
54. Drawing of H-7 Spoilers-lower No. 8-226-37-01 - date 1/7/43
55. Drawing of H-7 Spoilers-Top Outer No. 8-226-37-03 - date 1/10/44
56. Drawing of H-7 Spoilers Surface No. 8-226-037-01-01 - date 1/8/44
57. Drawing of H-7 " " No. 8-226-37-03-01 - date 1/11/44
58. Drawing of H-7 Spoiler Details
59. Drawing of H-7 " "
60. Drawing of H-7 Spoilers Operating rods No. 8-226-37-00 - date 1/14/44
61. Drawing of H-7 Spoilers Operating rods details No. 8-226-37 - date 1/14/44
62. Drawing of H-9 Project G. A. - date 3/26/42
63. Sketch of H-8 (six engine flying wing)
64. Tracing of Horten Tug G. A. - date 12/ /40
65. Drawing of Horten Tug G. A.
66. Proposals for development of the Horten Tug - date 12/15/40
67. Drawing of retractable cable system for Glider towing
68. Tracing of proposals for highly loaded motor Sailplane - date 1/28/39
69. Drawing of H-3D control system No. 108-250-40-S.1. - dated /22/42
70. Drawing of H-5 " " (two copies)
71. Drawing of Performance Data H-5 (six copies)
72. Photograph of Horten Parabola
73. Photograph of H-2, 3, 4, and 5
74. Twelve different photographs of H-5
75. Photographs of H-4 - (six different photos, some duplicated)
76. Three photographs of H-3 spoiler
77. Photographs of H-6 wing under construction
78. Photograph of H-3 wing.
79. Photograph of H-2
80. Two photographs of highly swept back model
81. Pilots control
82. Photograph of accident - H-3
83. " " H-3 aileron
84. " " H-3 spoiler
85. " " H-5
86. Drawing of H-3 controls No. 108-250-410
87. Drawing of H-3 spoiler No. 108-250-s1-U-03

These documents have been forwarded to C.I.O.S. Secreteriat in London.

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M. A. BIOT
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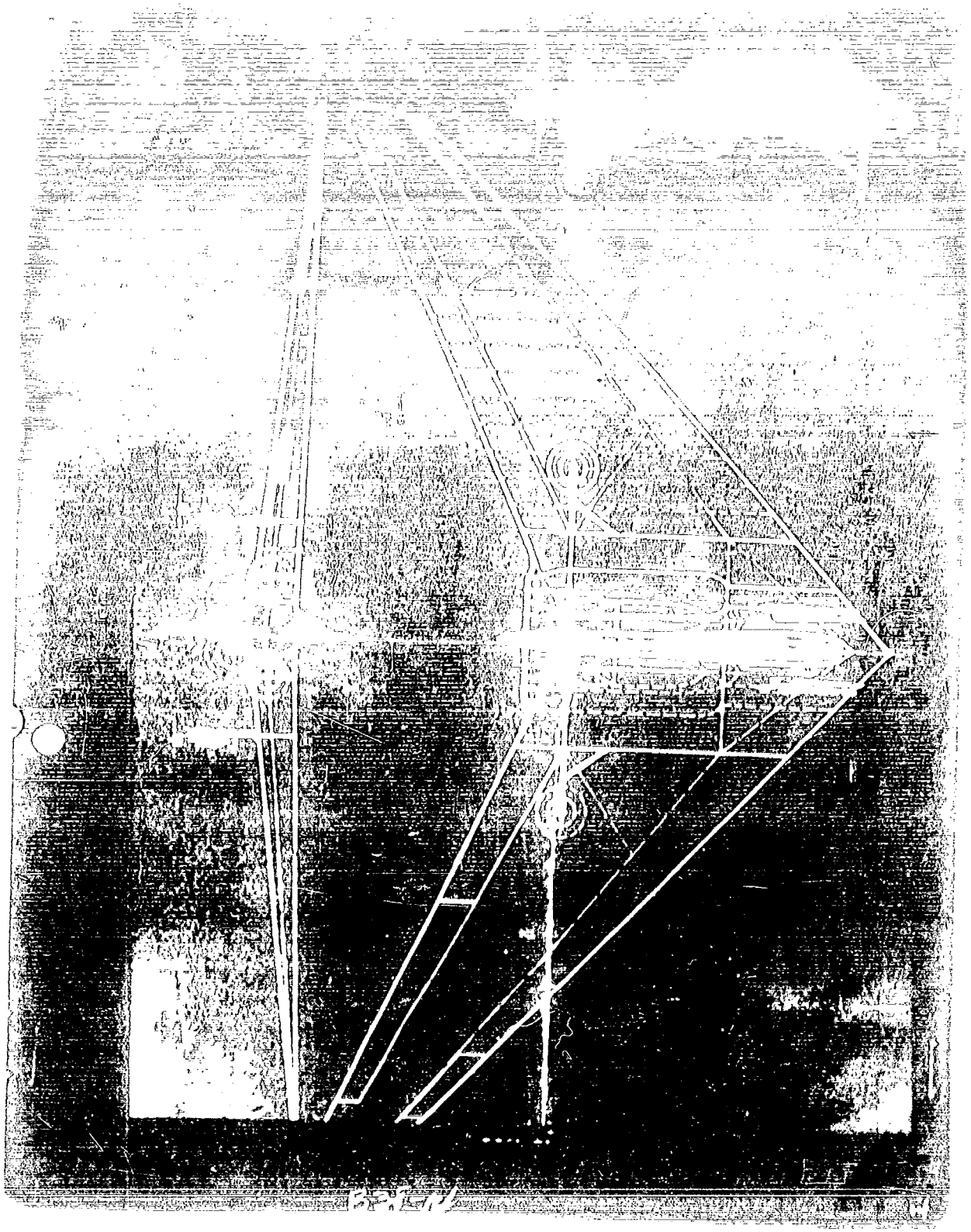
? JAYNE
Lieut., USNR



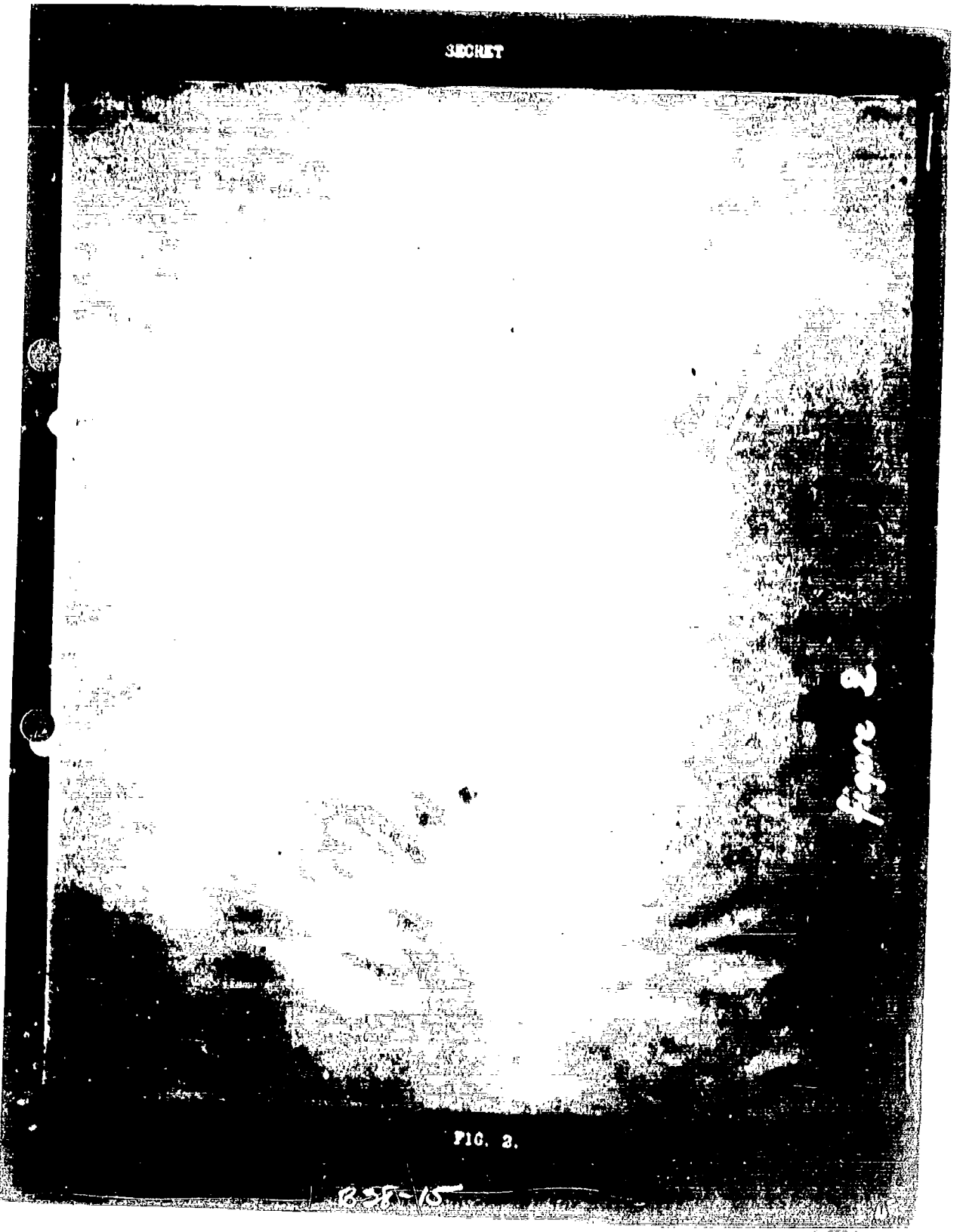


FIG. 2.

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figure 2

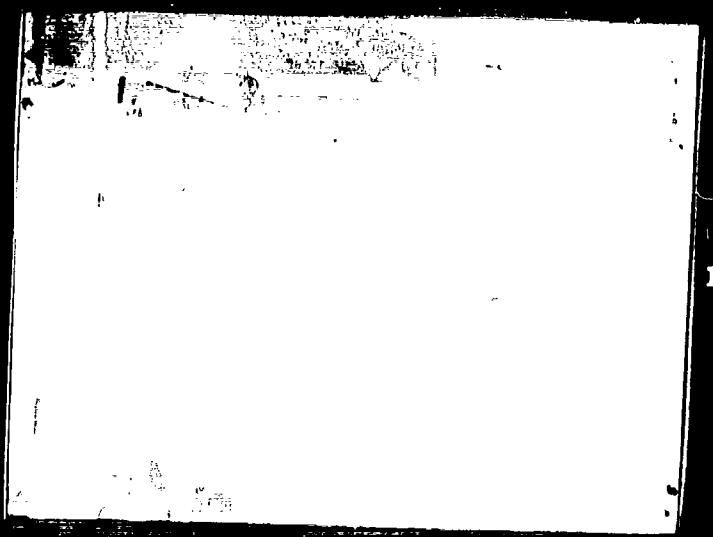


Fig. 3

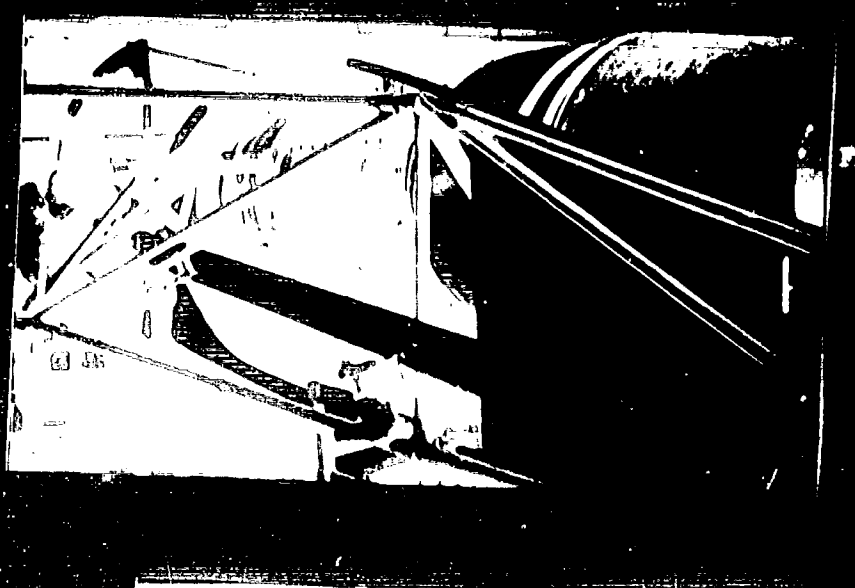


Fig. 4

Fig. 5

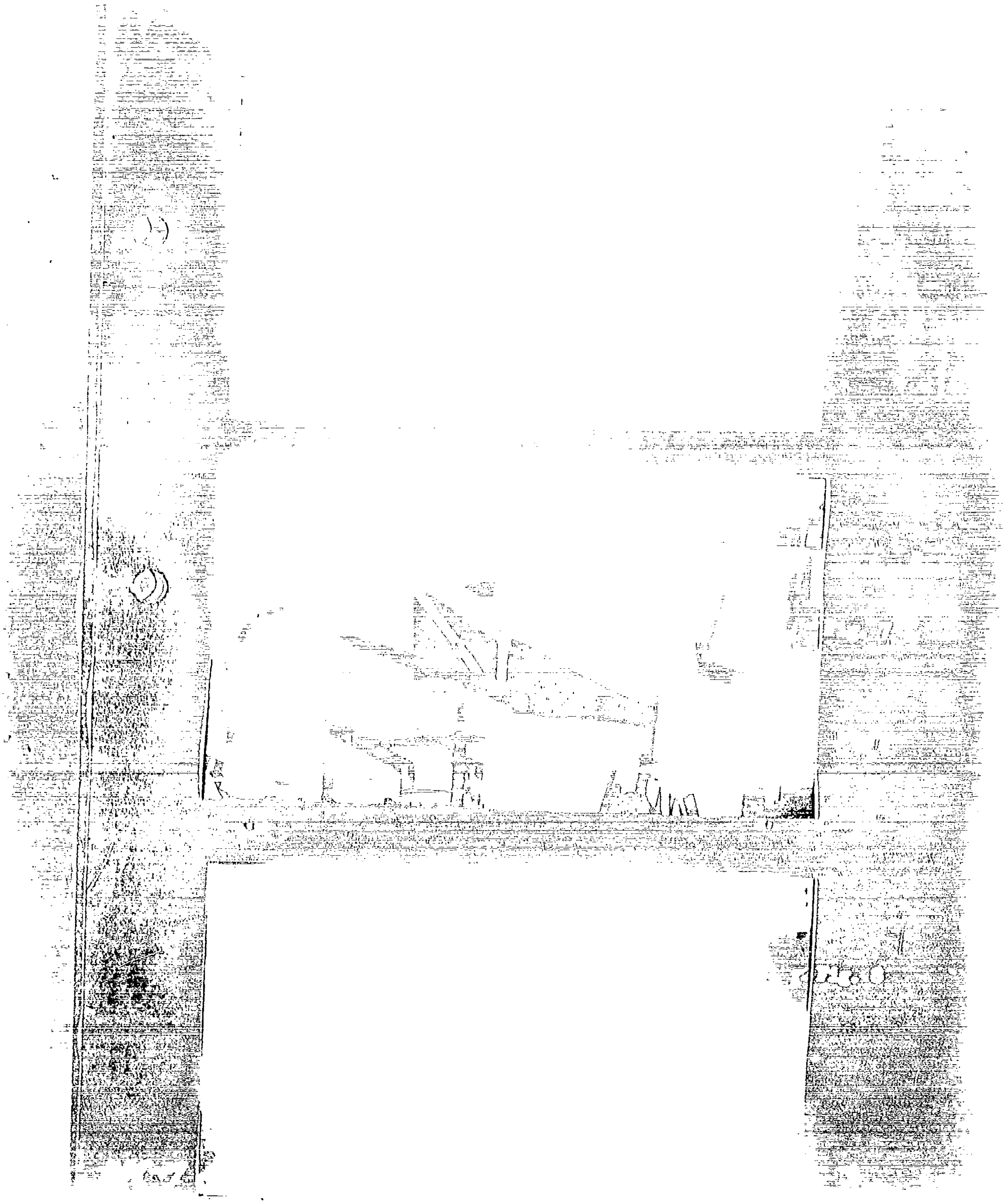


Fig. 9

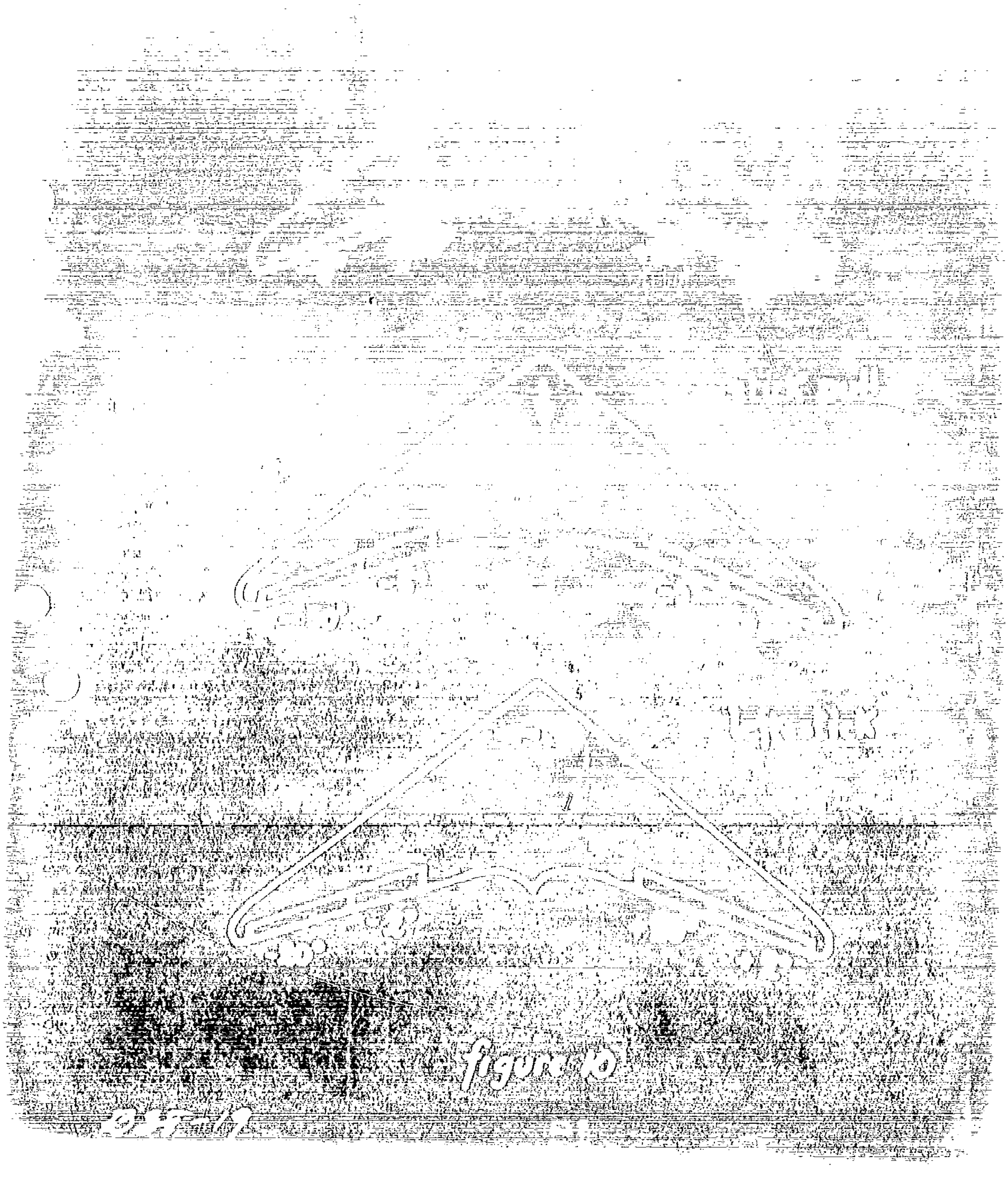
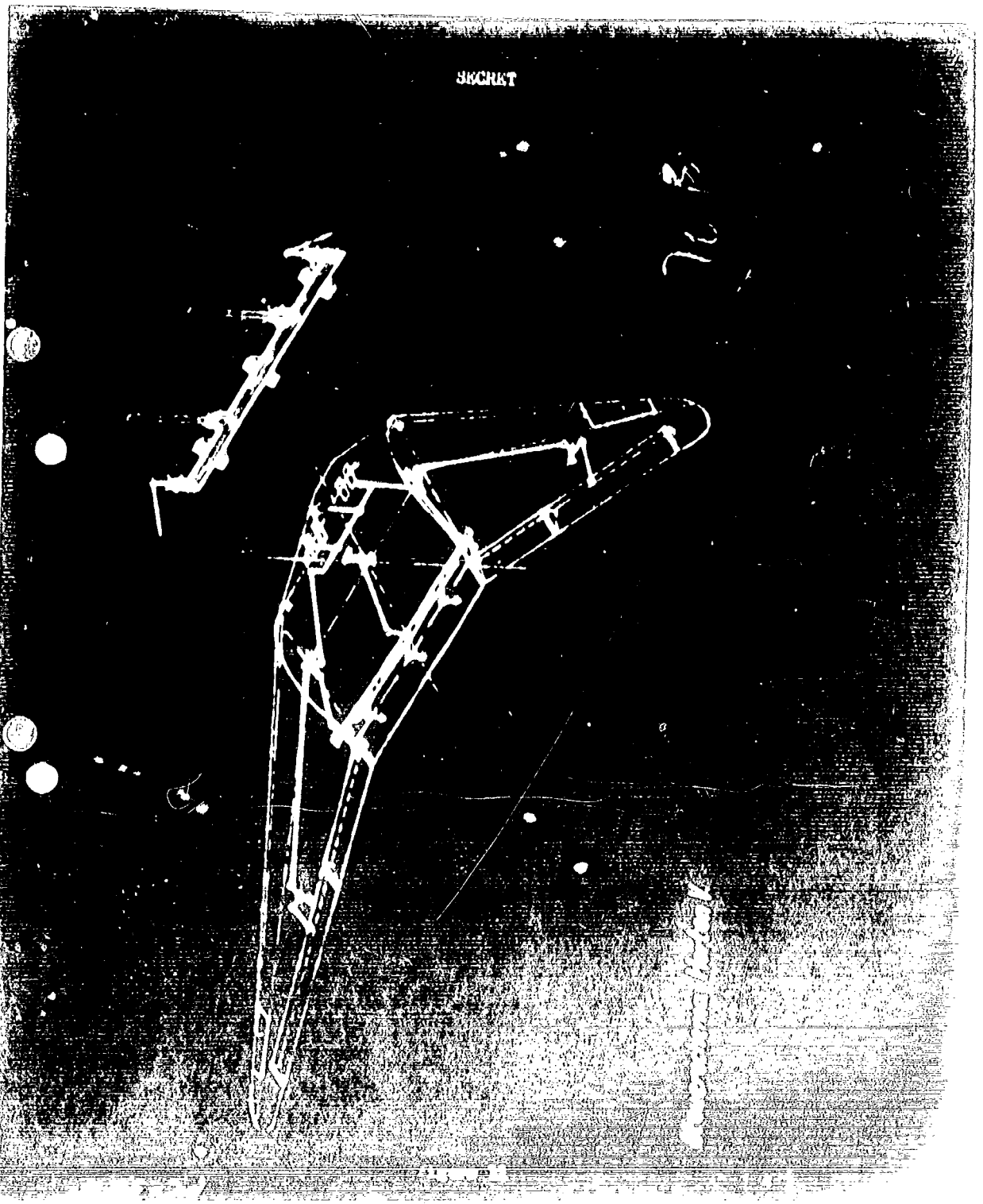


figure 10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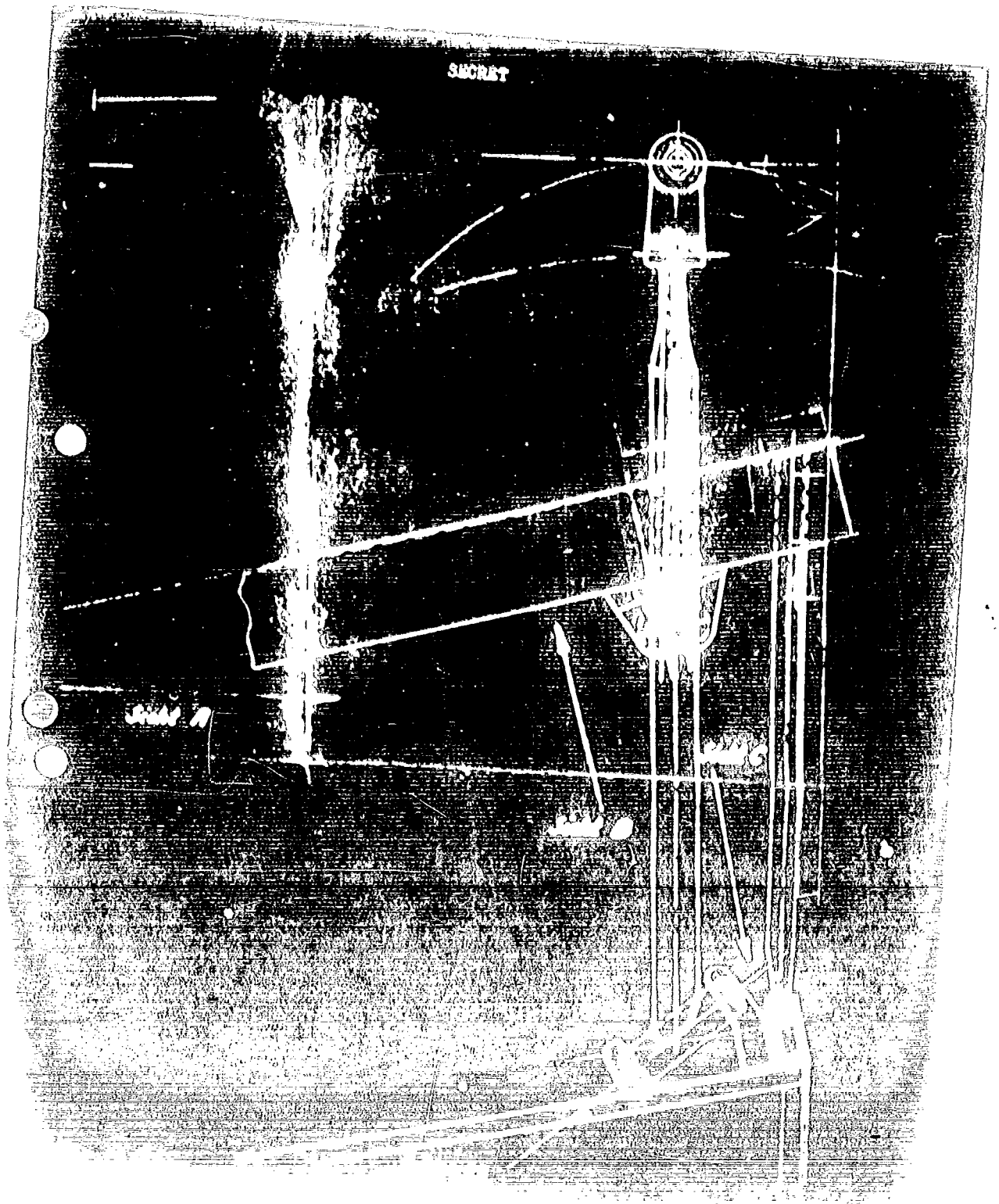
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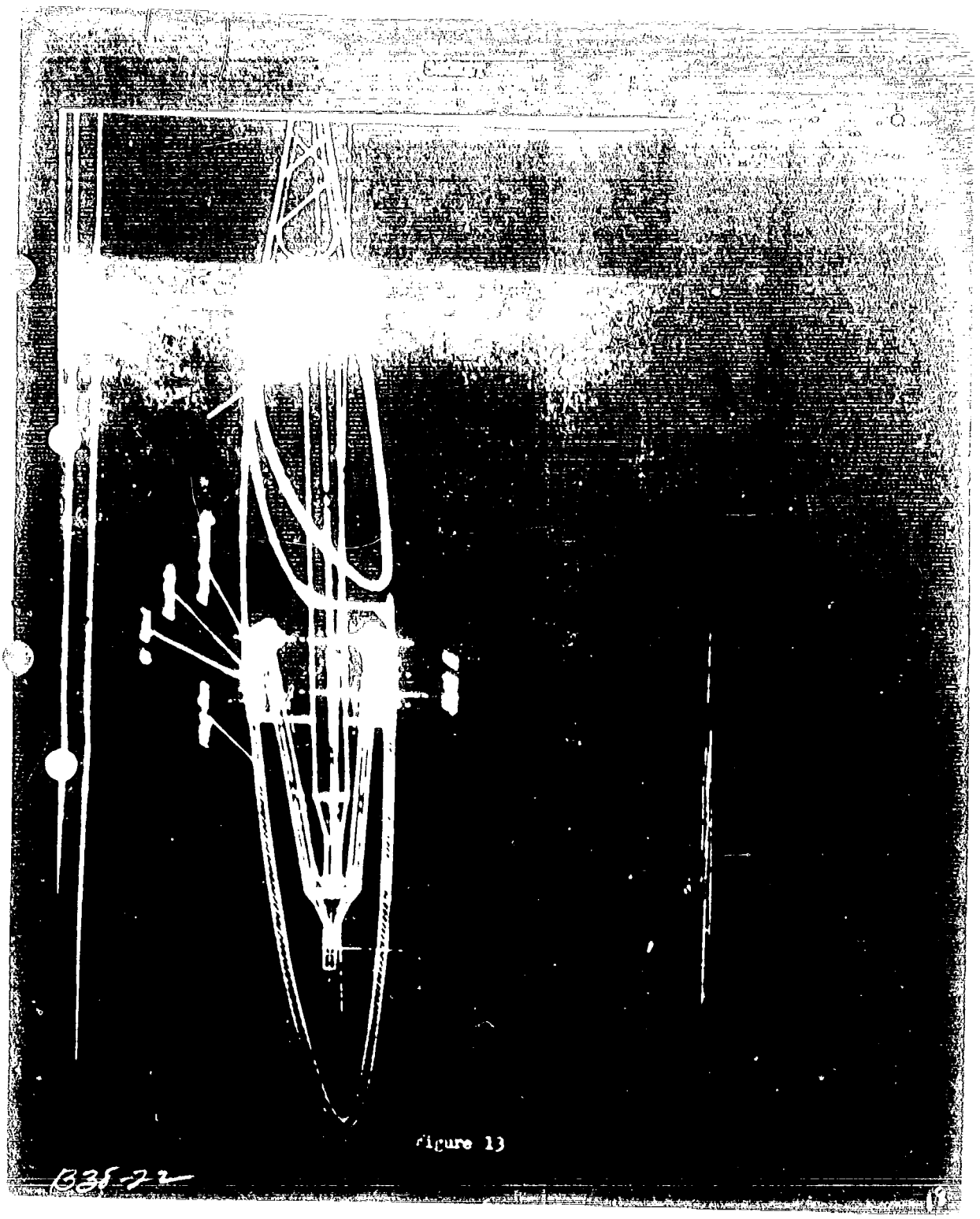

Figure 13

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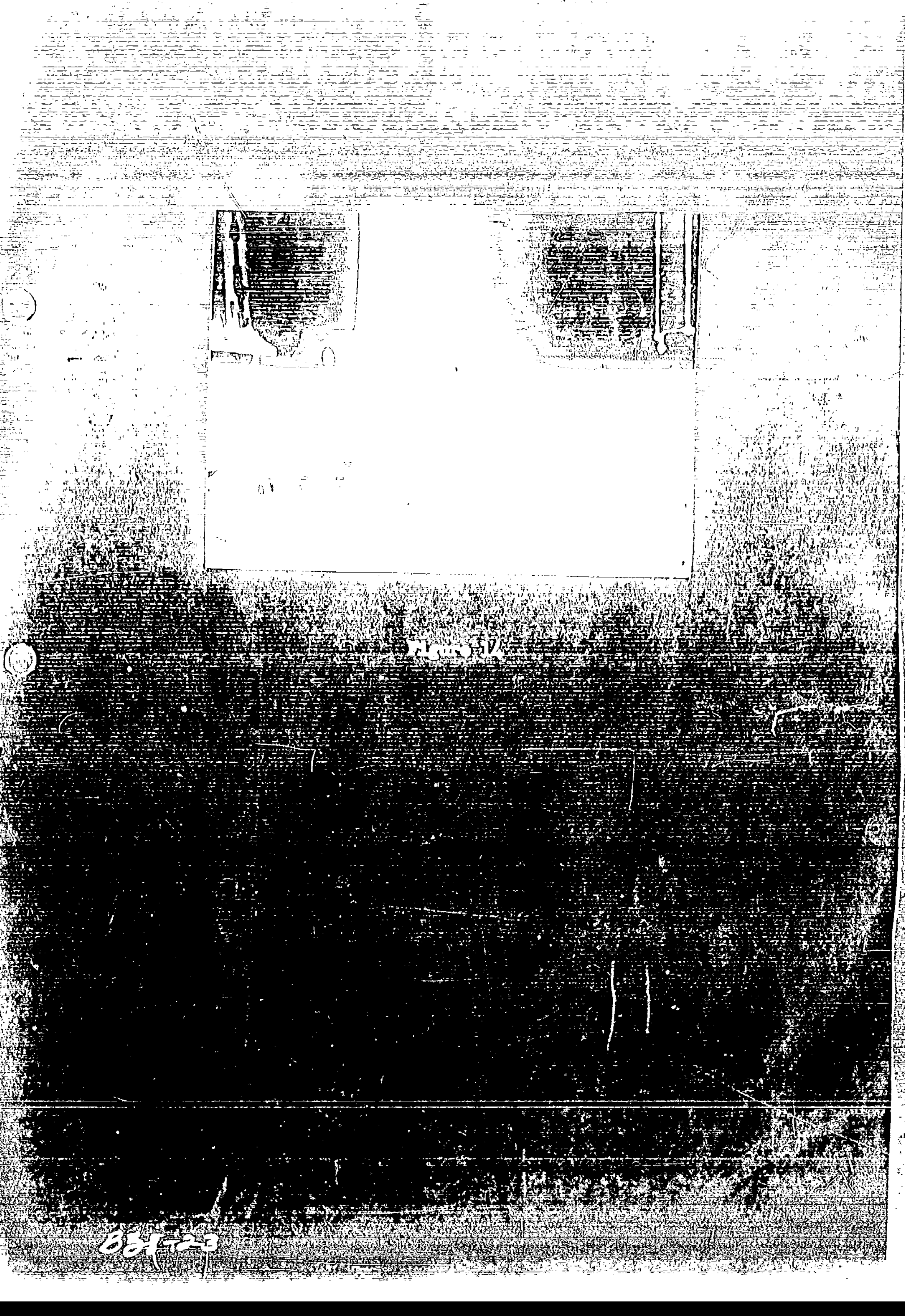

Figure 12

Figure 16

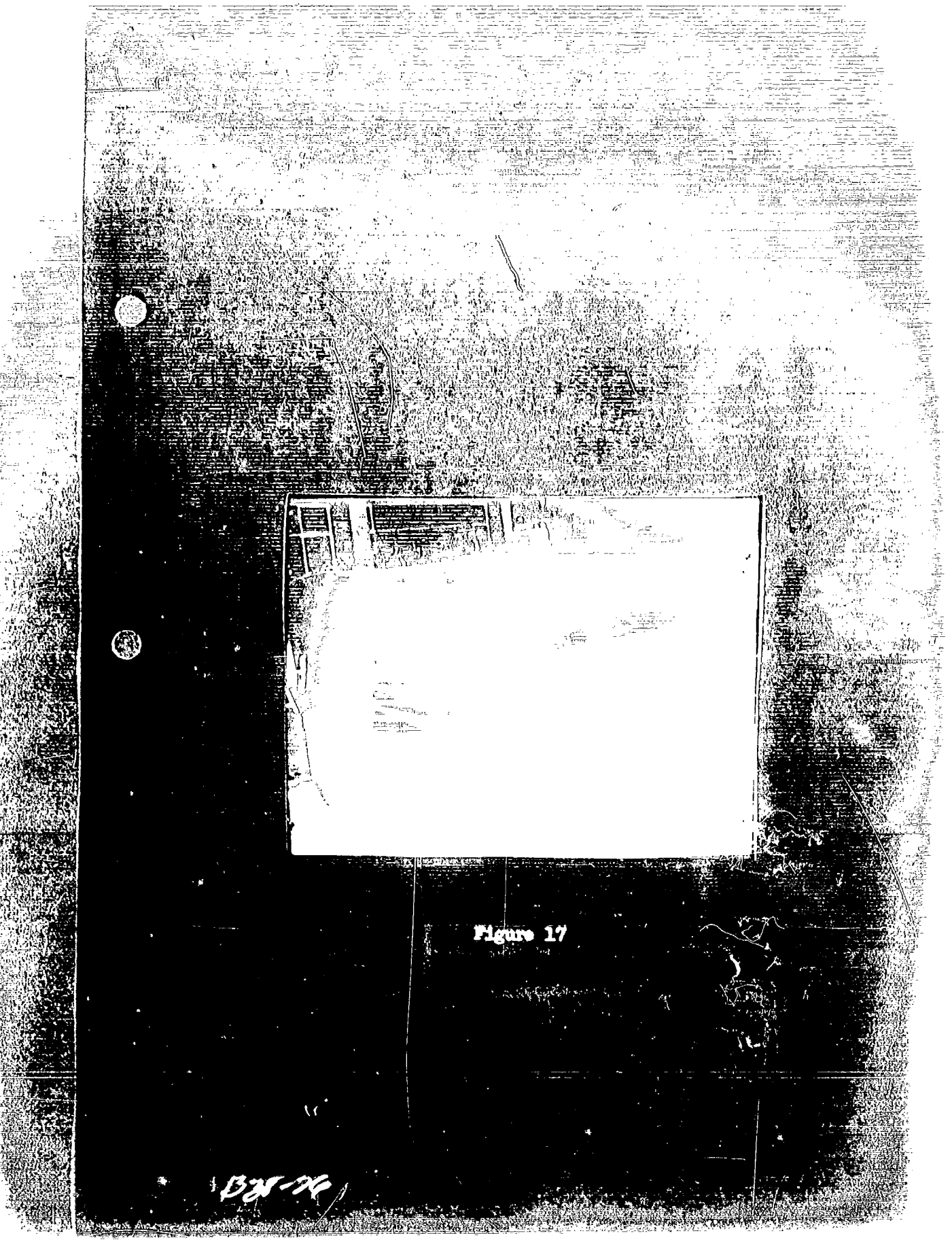

Figure 17

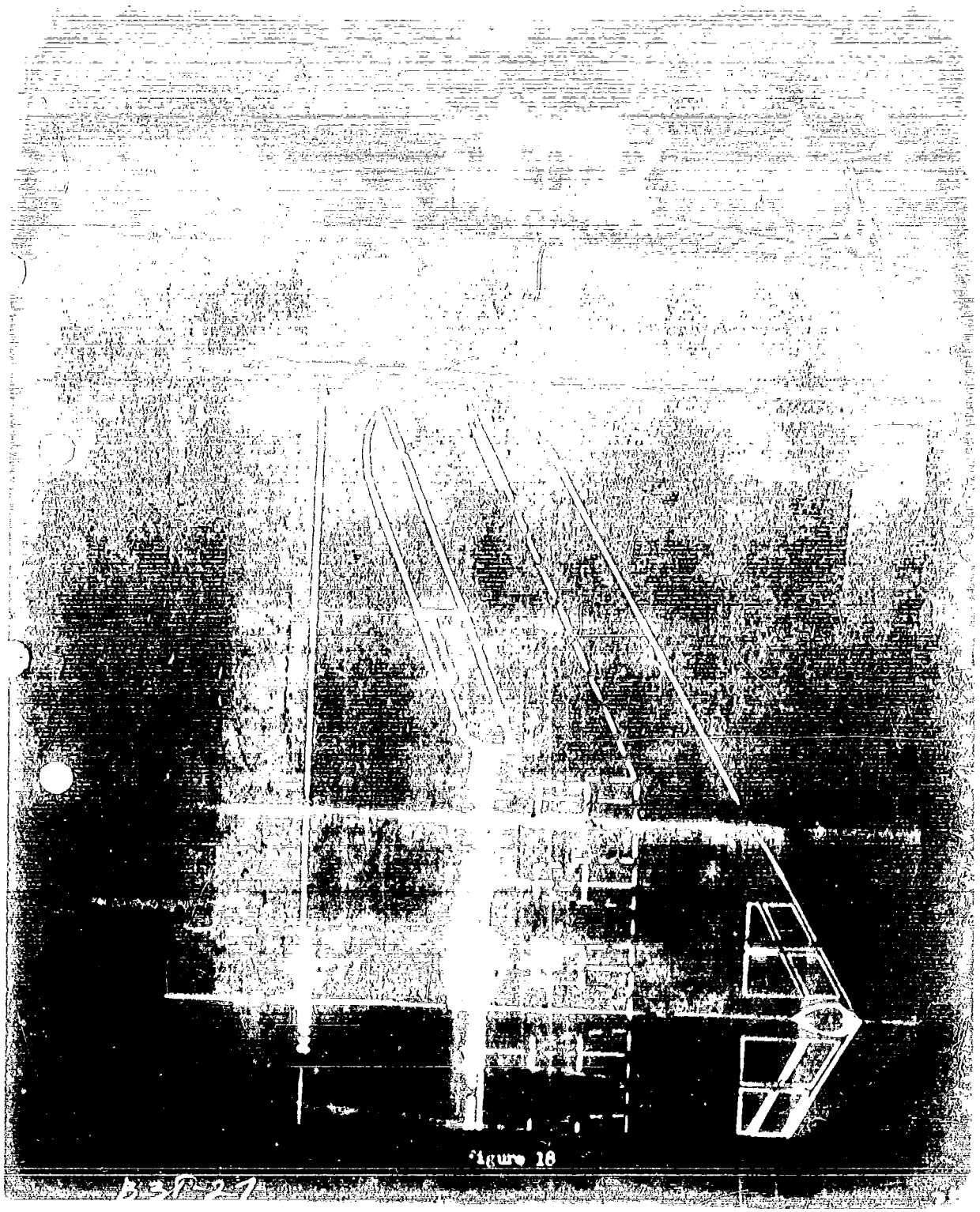

Figure 18

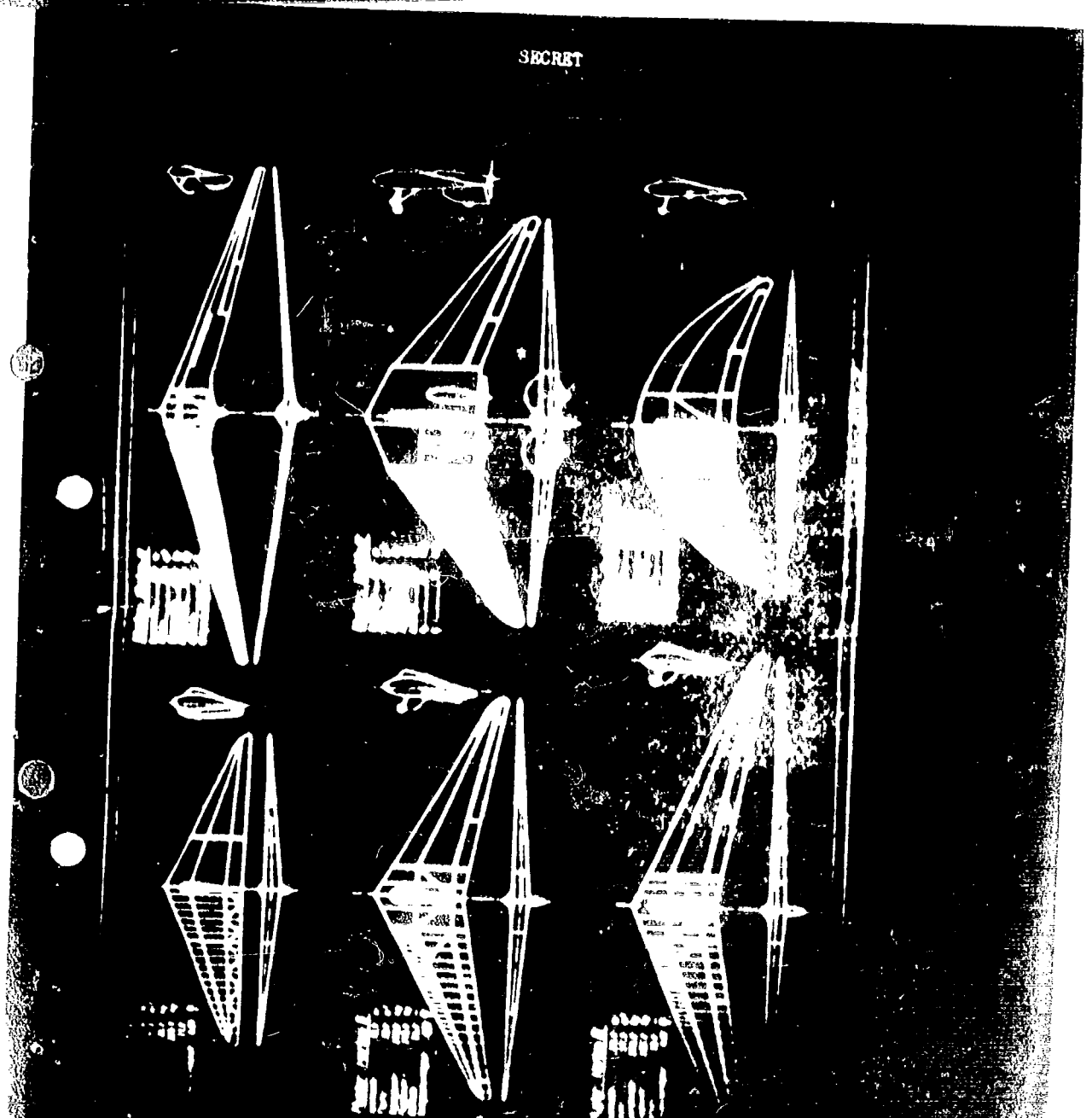

Figure 19

Fig. 20.

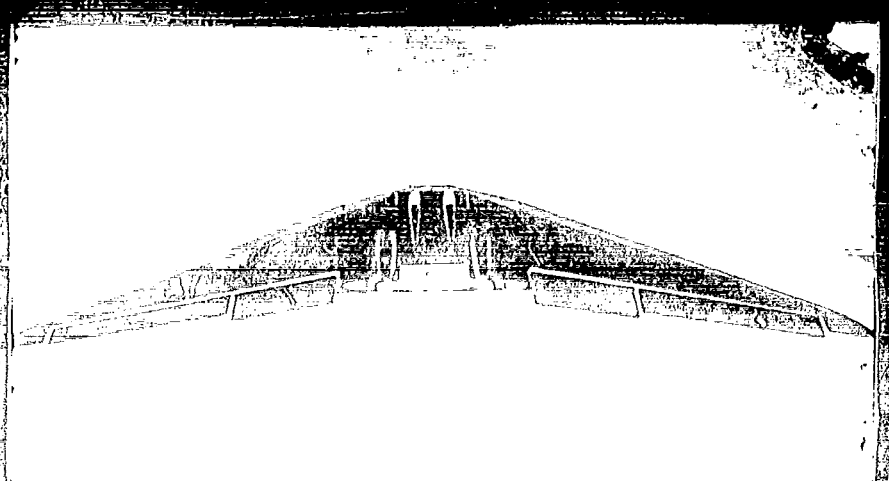

Fig. 21.

Figure 82

B 39-30

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58618

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