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McDonnell Aircraft Corp., St. Louis, Mo. (Report 2437)

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Wood, C. R., Jr. 15 Feb 52 10pp photos

USAF Contr. No. AF33(038)-9845

Helicopter rotors, Jet
Engines, Ramjet - Performance
Testing facilities - Aerodynamics
H-20

Rotating Wing Aircraft (34)
Drive System (6)

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MAC 273 (REV. 2-24-50)

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REPORT 2197

PROPELLER LABORATORY

DATE 15 February 1952

REVISED

McDONNELL Aircraft Corporation

ST. LOUIS 3, MISSOURI

PROGRESS REPORT 65

MONTH OF JANUARY 1952

RAM JET HELICOPTER DEVELOPMENT

SUBMITTED UNDER Contract AF 33(038)-9845

PREPARED BY C. R. Wood, Jr.

APPROVED BY R. R. Osborn

APPROVED BY A. C. Ballauer

APPROVED BY C. H. Burkam

Enclosure (1)
Ref: 2143-301-2374

CONTENTS

1. SUMMARY

The higher thrust, longer 8.72-inch diameter rear jets required for flight test program with the 27-inch diameter rotor are 50% completed. The jets are scheduled to be available to start the program in compliance with Item 5 and 8 of subject contract late in March. The modified design for the second 27-inch rotor in compliance with Item 6 of subject contract was submitted to Navy on 15 January 1952.

2. ROTOR DEVELOPMENT

2.1 No. 1, 27-Foot Diameter Rotor

No Change.

2.2 No. 2, 27-Foot Diameter Rotor

2.2.1 The modified design of the second 27-foot diameter rotor was submitted to NACA on 15 January 1952. The basic changes were:

2.2.1.1 The removal of the spar closure channel and substitution of an internal spanwise compression member.

2.2.1.2 The increase of the trailing edge skin gauge. Successful structural tests have been made on samples of the new design (MAC Drawing 22-1202). A set of blades MAC-financed, is currently under construction.

2.2.2 NACA's letter dated 30 January 1952, with reference to the construction of the second 27-foot diameter rotor, is being studied and a letter reply is being prepared.

9. 8.71-INCH DIAMETER RAM JETS

The structural re-design of the 8.71-inch diameter ram jets was completed in January. One set of the new ram jets is scheduled to be available for whirl tests on the 27-foot diameter rotor late in March. Flight tests in compliance with Items 5 and 8 of subject contract are scheduled upon completion of the whirl tests.

The estimated required procedure for the design and fabrication of one set of structurally improved 8.71-inch ram jets is:

Stress Analysis

Weights and C.G. Determination

Preparation of Drawings

Re-work of Test Jets

Static Testing (Free Air Jet)

Repair and Re-work of Available Jets

Whirlstand Test of Jets

Preparation of Inconel "X" Tensile Test Specimen

Ignition Development and Re-work

Fabricate New Set of Jets

Whirl Test of New Jets

Temperature Surveys and Data Analyses

3.1 Whirl Test High Speed Photographs

High speed photographs were taken of the ram jet exit during whirl test operations, Enclosures (1) through (5). They show that the exit deforms during the whirl test without a permanent modification in the exit shape. The measurements of ram jet exits during whirl tests are scaled off the enlarged prints and may reflect errors due to printing, paper stretching, or in measuring the print.

3.2 Modified Whirl Stand

The MAC-financed single blade hub meter and the modified whirl test stand reported in Progress Report No. 60 for August 1951, is approximately 90% complete.

4.0 XH-20, USAF 46-689 and 46-690

4.1 XH-20, No. 1, USAF 46-689

No change.

4.2 XH-20, No. 2, USAF 46-690

No change.

5.0 DAILY FLIGHT SHEETS - XH-20 Flight Test Data

There were no scheduled flights during January 1952.

6.0 WORK PROGRAM FOR FEBRUARY 1952

The increased thrust 8.71-inch diameter ram jets are scheduled for completion late in March 1952.

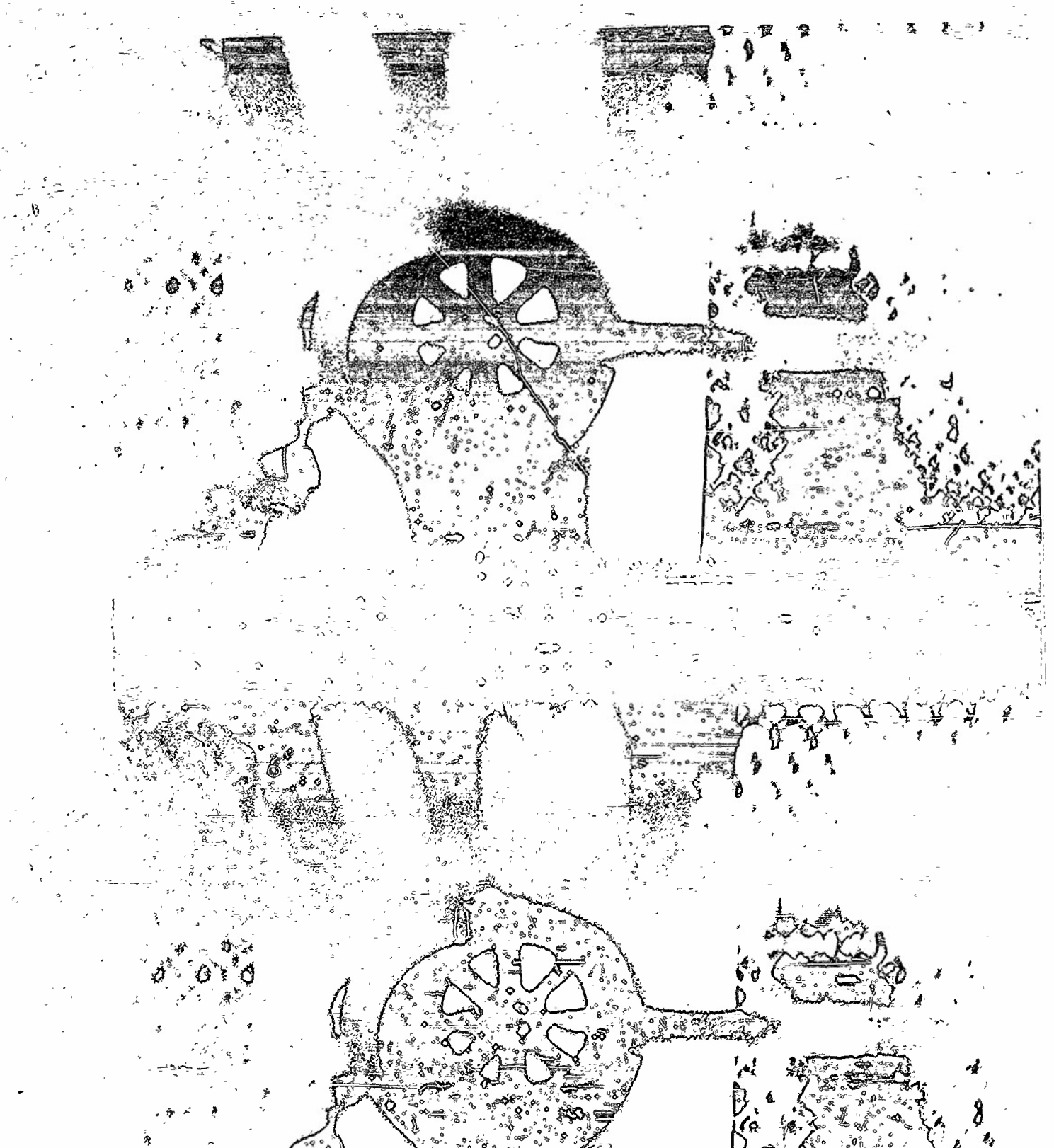

FIGURE (1) TEST 8.71-INCH DIAMETER RAM JET STATIC ON WHIRLSTAND

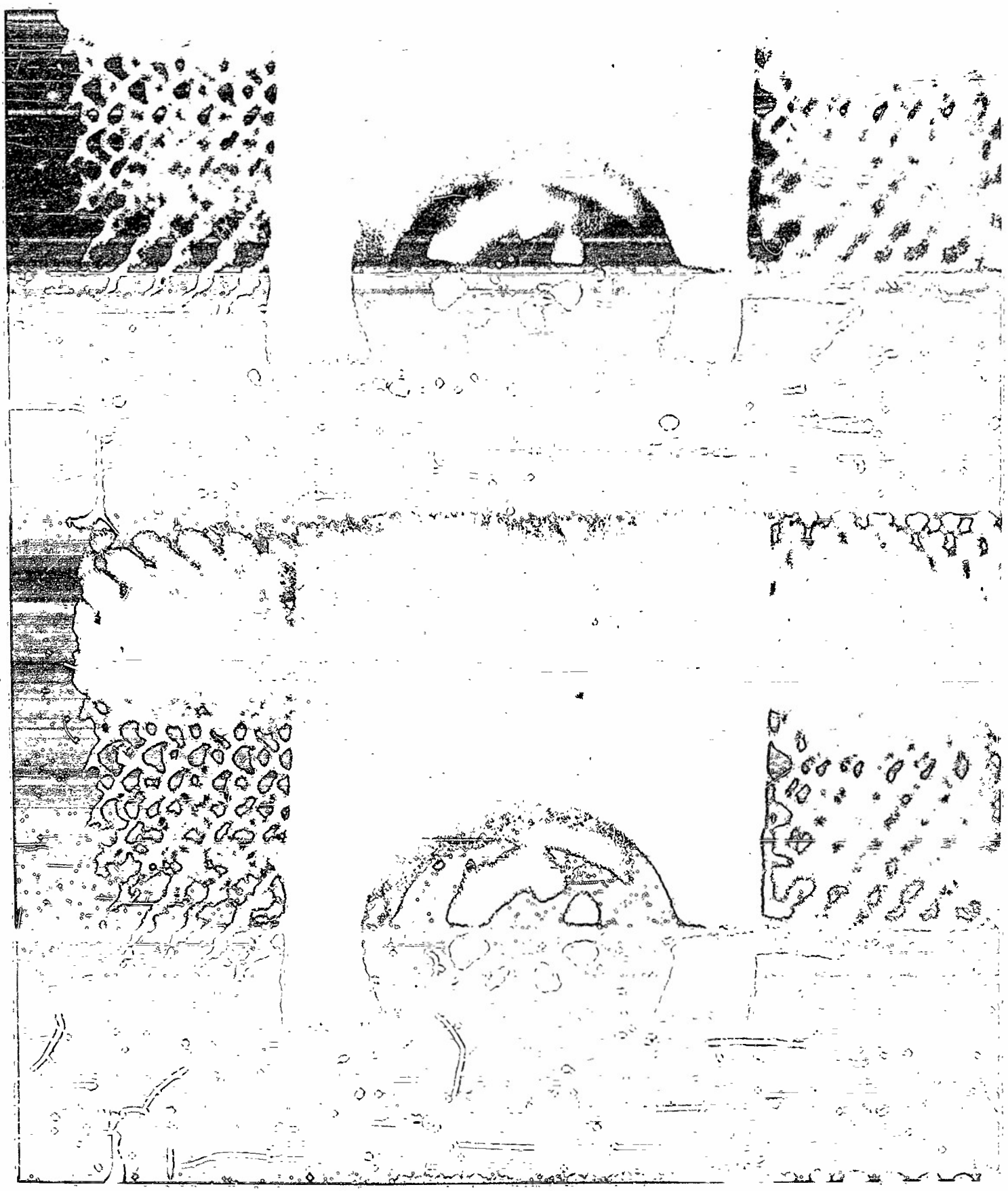

FIGURE (2) TEST 8.71-INCH DIAMETER RAM JET AT 418 RPM ON WHIRLSTAND

FIGURE (3) TEST 8.71-INCH DIAMETER RAM JET AT 425 RPM ON WHIRLSTAND

FIGURE (4) TEST 8.71-INCH DIAMETER RAM JET AT 462 RPM ON WHIRLSTAND

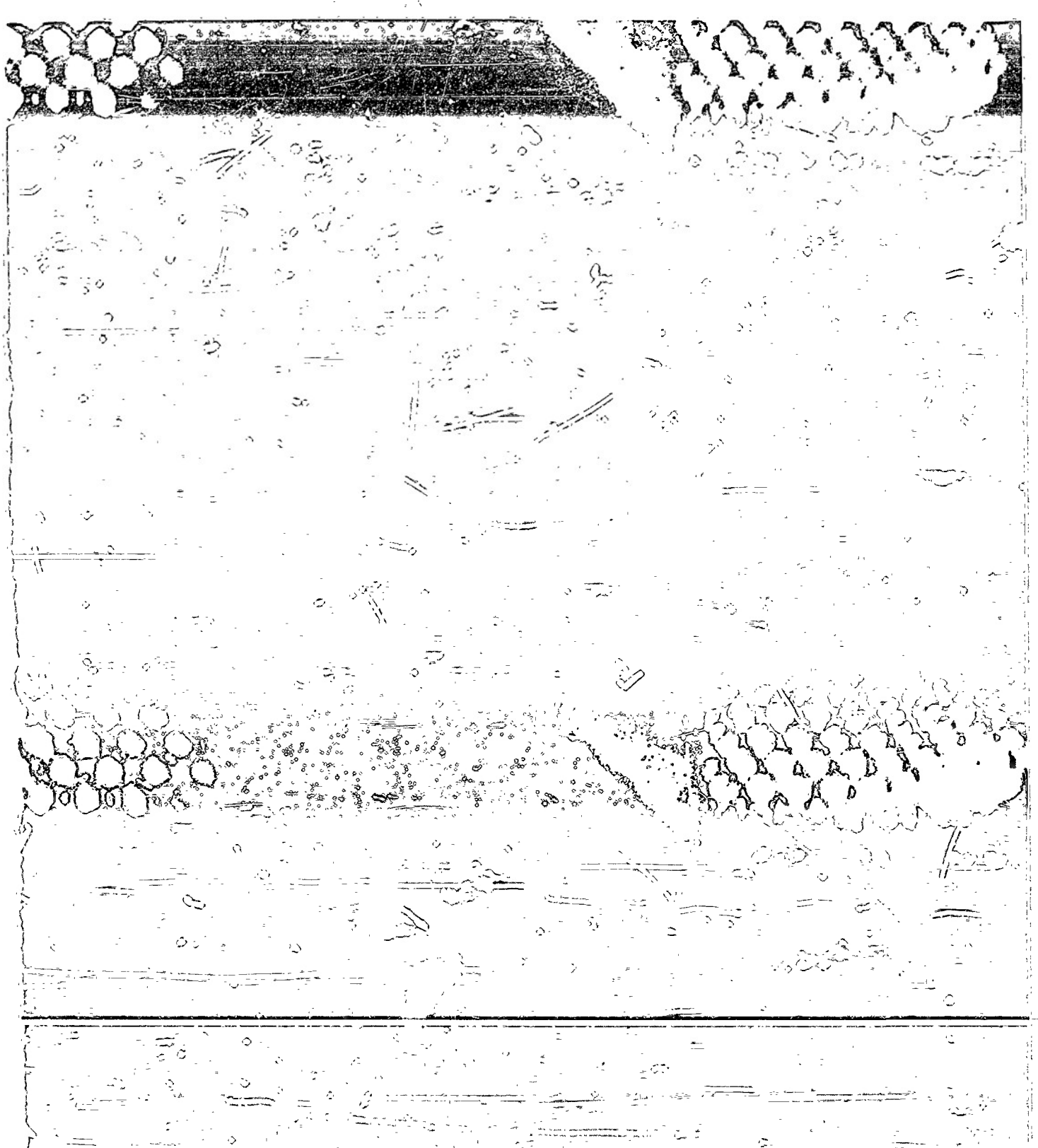

FIGURE (5) TEST 8.71-INCH DIAMETER RAM JET AT 480 RPM ON WHIRLSTAND

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