HW 4.158

HW 25955

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DATE October 17, 1952

SUBJECT [redacted] Valve Stem Seals For Motor-Operated Throttling Valves To Give Close Remote Control of Shaft If Possible [redacted]

TO File

FROM K. H. Herman by G. E. Benedict

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October 17, 1952

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FROM: K. M. Harmon by G. E. Benedict
234-5 Development, Process Assistance
Separations Technology Unit
Technical Section

VALVE STEM CONES FOR MOTOR-OPERATED THROTTLING VALVES TO GIVE CLOSE REMOTE CONTROL OF TASK II FURNACE GASES

Introduction

The furnace gas flows for Task II, RMA, are controlled manually in Zone III, which necessitates signalling from Zone I to an operator in Zone III to regulate the flows. It was suggested that motorized valves be used which could be remotely controlled from Zone I, and that valve stem cones be designed which would control the flows of oxygen and hydrogen fluoride under Task II specifications. These valves would also provide complete closure as well as close regulation of furnace gas flow.

Objective

To design HF-resistant valve stem cones which could be used in a one-quarter inch Aveco-monel valve body, powered by a throttling motorized valve operator, to control the flows of oxygen and hydrogen fluoride under Task II specifications.

Summary and Conclusions

Monel and Teflon valve stem cones to be used with a one-quarter inch Aveco-monel valve body and a Barber-Colman throttling motorized valve operator (Figure III) to provide sensitive remote control of Task II furnace gases, have been designed and tested. Recommended stem cone dimensions are shown in Table I and Figures IV and V. . Because of the design of the valve bodies, the gas flows obtained will depend markedly upon the accuracy of the fabrication of the valve stems and the uniformity of the 0.205 inch diameter valve body cylinders. These valve stem cones may be reproduced in the 200 West maintenance shops.

Two motorized valves with the valve stem cones herein described, are being tested on furnace number one, Task II, RMA, for ease of operation, corrosion resistance, and durability.

Discussion

An Aveco one-quarter inch valve body was used having a 0.205 inch I.D. straight cylinder bore, 3/8 inches in length. Teflon was tried first, but proved unsatisfactory as the material of construction for the valve stem cone in the valve for hydrogen fluoride service. The Teflon cones had variances in the taper diameter due to its poor machineability. This taper diameter variance caused flows which were non-linear in respect to the percentage of valve opening, and in some cases there were momentary flow reductions during valve opening.

Monel valve stem cones of various base diameters and taper angles were tested for use in the valve for hydrogen fluoride service. (Figure I, Table I) A monel cone 3/8 inches long, having a 0.204 inch diameter base and 0.15 degree taper, delivered 500 grams per hour of hydrogen fluoride at 10 psi near mid valve opening. (Figure IV). These monel valve stem cones gave linear flow rates with progressive valve opening. If an open line hydrogen fluoride flow is desired at 100 per cent valve opening, the cone length may be reduced from 3/8 inches to 11/32 inches.

An oversize Teflon valve stem cone was found to deliver linearly the low oxygen flows required by Task II furnaces. The tight fit of the valve stem cone in the valve cylinder apparently nullified the variations in the Teflon cone diameter as noted previously. The Teflon cone was 11/32 inches long, had a 0.207 inch diameter base, was tapered 0.1 degree, (Figure V) and metered 250 cc/minute of oxygen at 35 psi near mid valve opening. (Figure II)

A Teflon gasket provides complete closure in both the oxygen and hydrogen fluoride valves.

TABLE I

Valve Stem Cone Dimensions

Cone Material	Cone Dimensions			Angle of Cone Taper (degrees)	Controlled Flow Range (CFM)		Valve Pressure Drop psi	Figure I Designation
	Tip Dia.	Base Dia.	Length		Max.	Min.		
Monel	0.191	0.2035	3/8	1.0	2.12	0.2	10	✕
Monel	0.197	0.2035	3/8	0.5	1.25	0.2	10	⊠
Monel	0.203	0.204	3/8	0.075	0.42	0.1	10	⊡
Monel	0.202	0.204	3/8	0.150	0.57	0.2	10	◬
Monel	0.201	0.204	3/8	0.23	0.73	0.2	10	⊙
Teflon	0.205	0.207	11/32	0.1	3000 cc/min	70 cc/min	35	Figure II

Note: Straight valve cylinder bore was 0.205 inch in diameter and 3/8 inch in length.

Figure I:
Hydrogen Fluoride Valve
Percent Valve Opening vs.
Cu. Ft./Min. of Gas at
10 PSI Valve Pressure
Drop

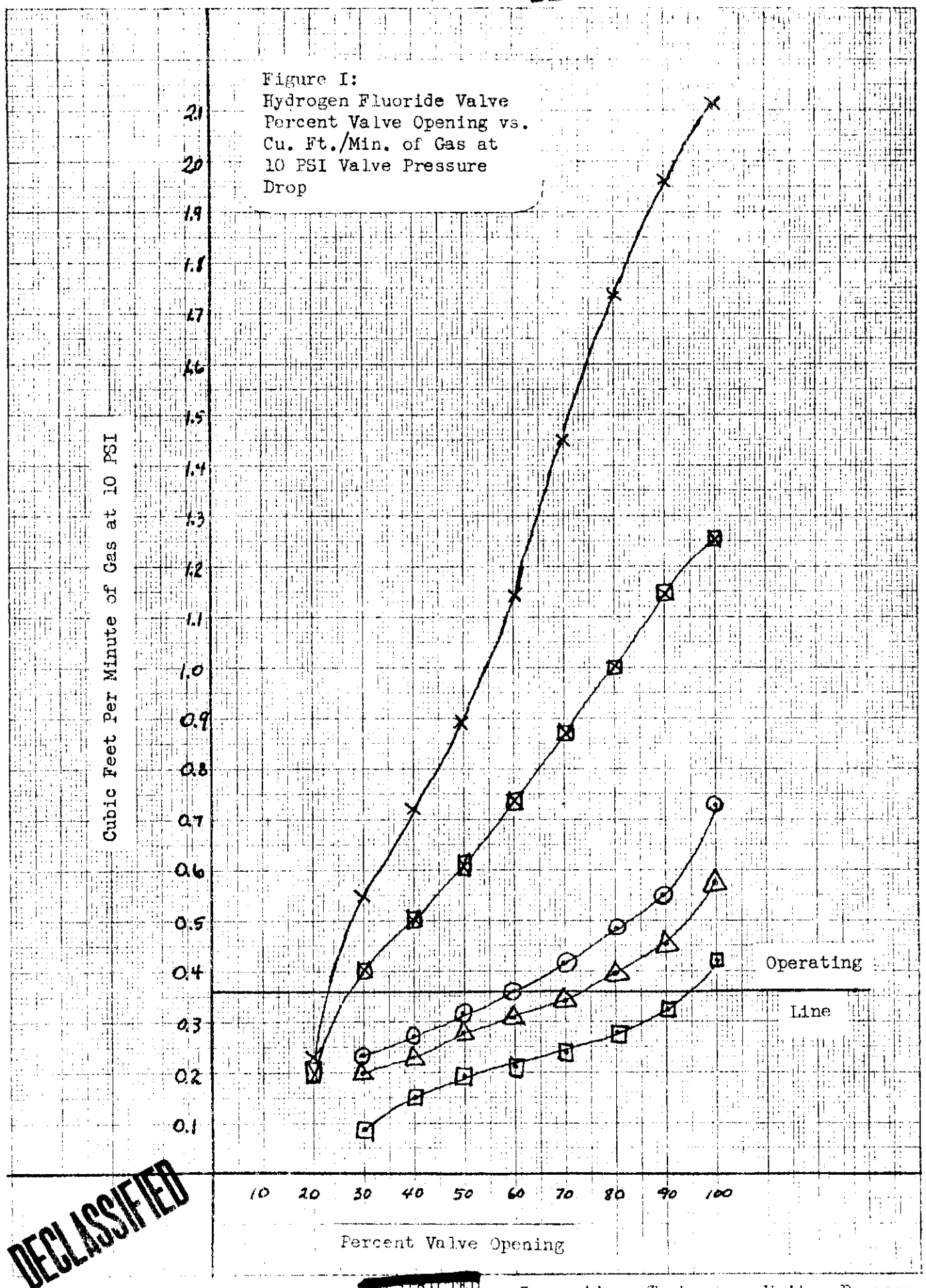
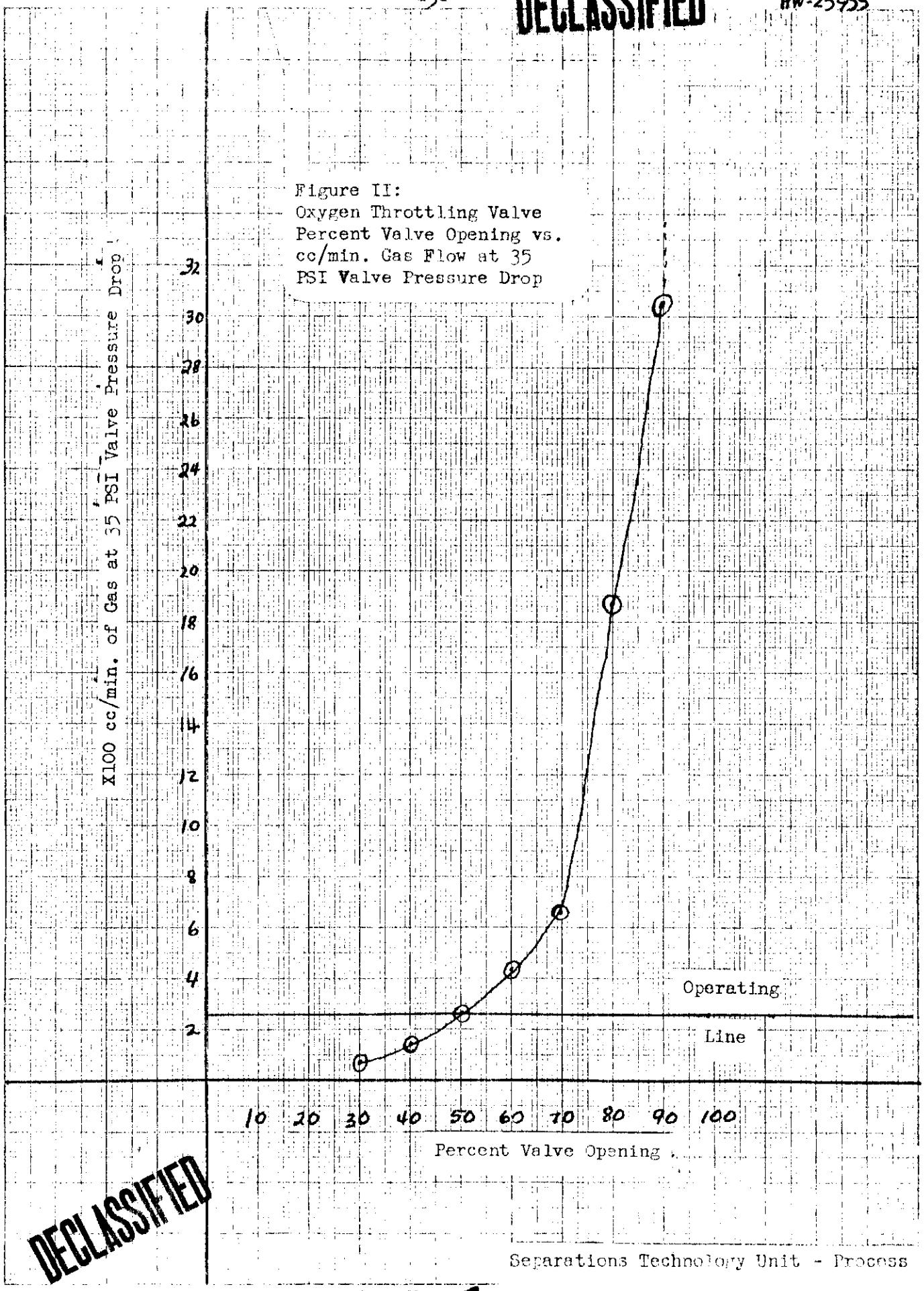
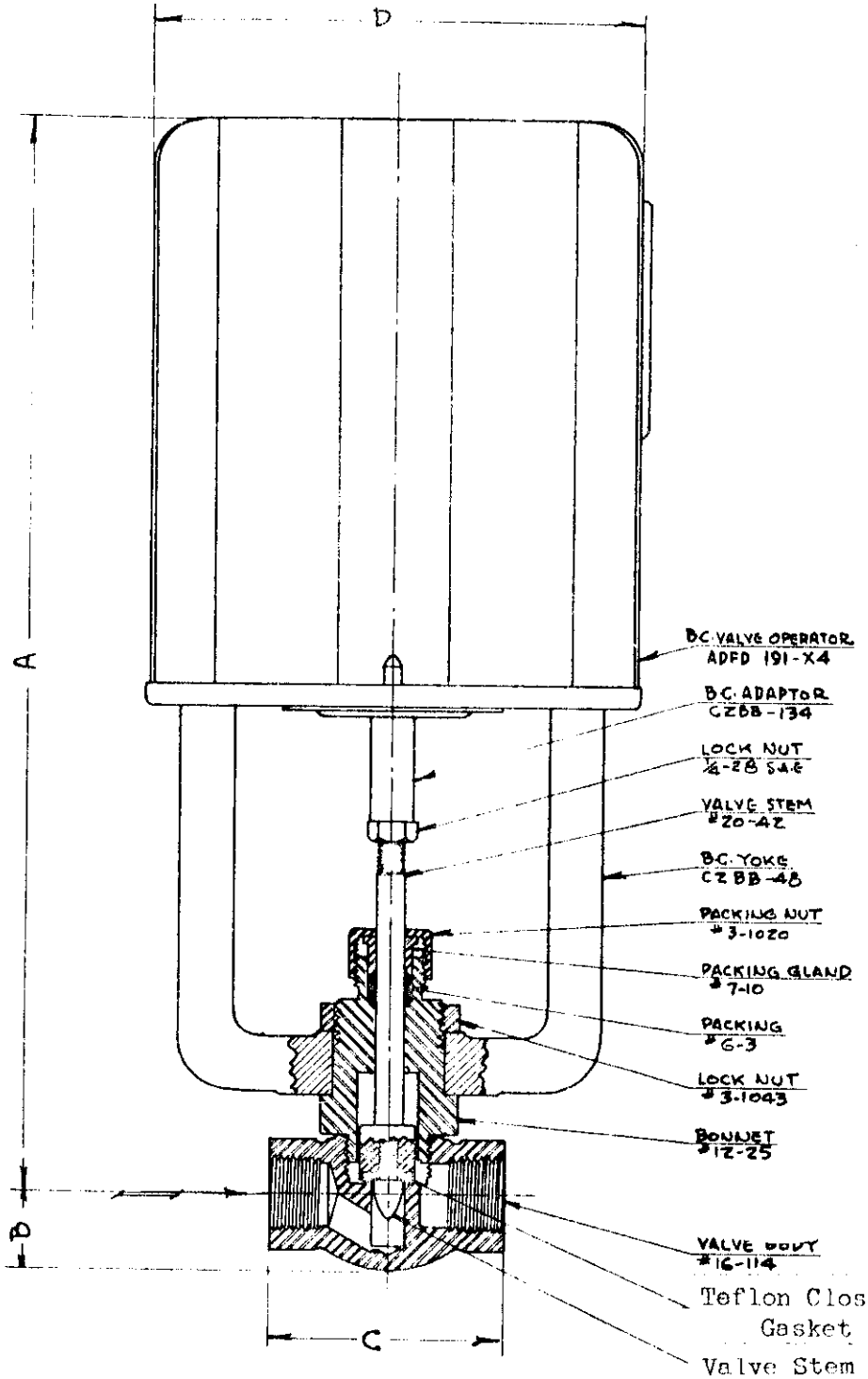


Figure II:
Oxygen Throttling Valve
Percent Valve Opening vs.
cc/min. Gas Flow at 35
PSI Valve Pressure Drop



Separations Technology Unit - Process

FIGURE III



MOTOR OPERATED VALVE 1090

As Required | Full Size | APRIL 29, 1952

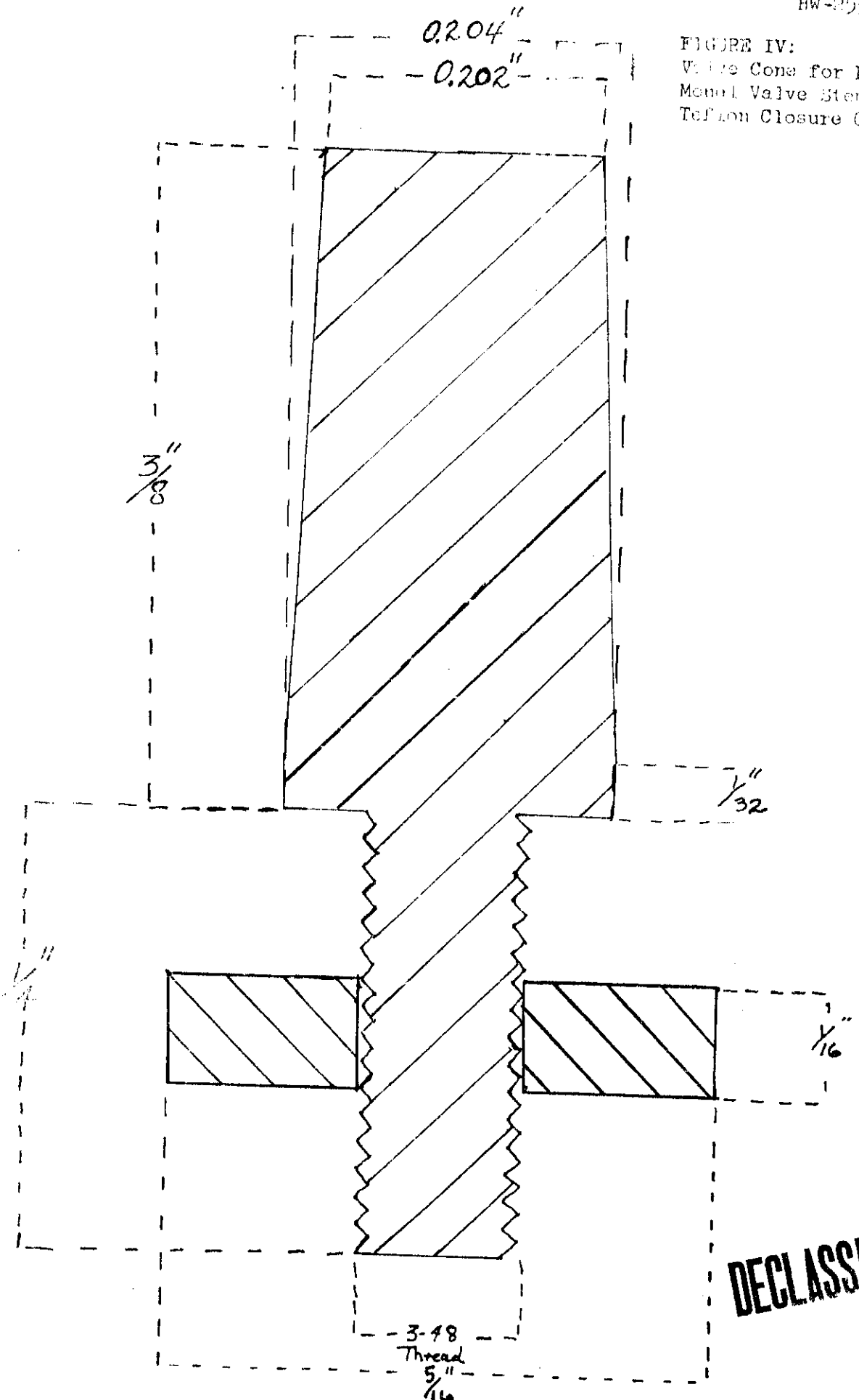
ASSOCIATED VALVE & ENGINEERING CO. CHICAGO, ILLINOIS

3/8" VALVE SHOWN ON THIS DRAWING.

ROUGHING-IN DIMENSIONS

VALVE SIZE	A	B	C	D
1/4"	9 3/8"	1 3/32"	1 3/4"	4 1/2"
3/8"	9 1/16"	1 1/16"	2 1/8"	4 1/2"
1/2"	9 13/16"	13/16"	2 1/2"	4 1/2"

FIGURE IV:
Valve Cone for HF Service
Monel Valve Stem Cone
Teflon Closure Gasket



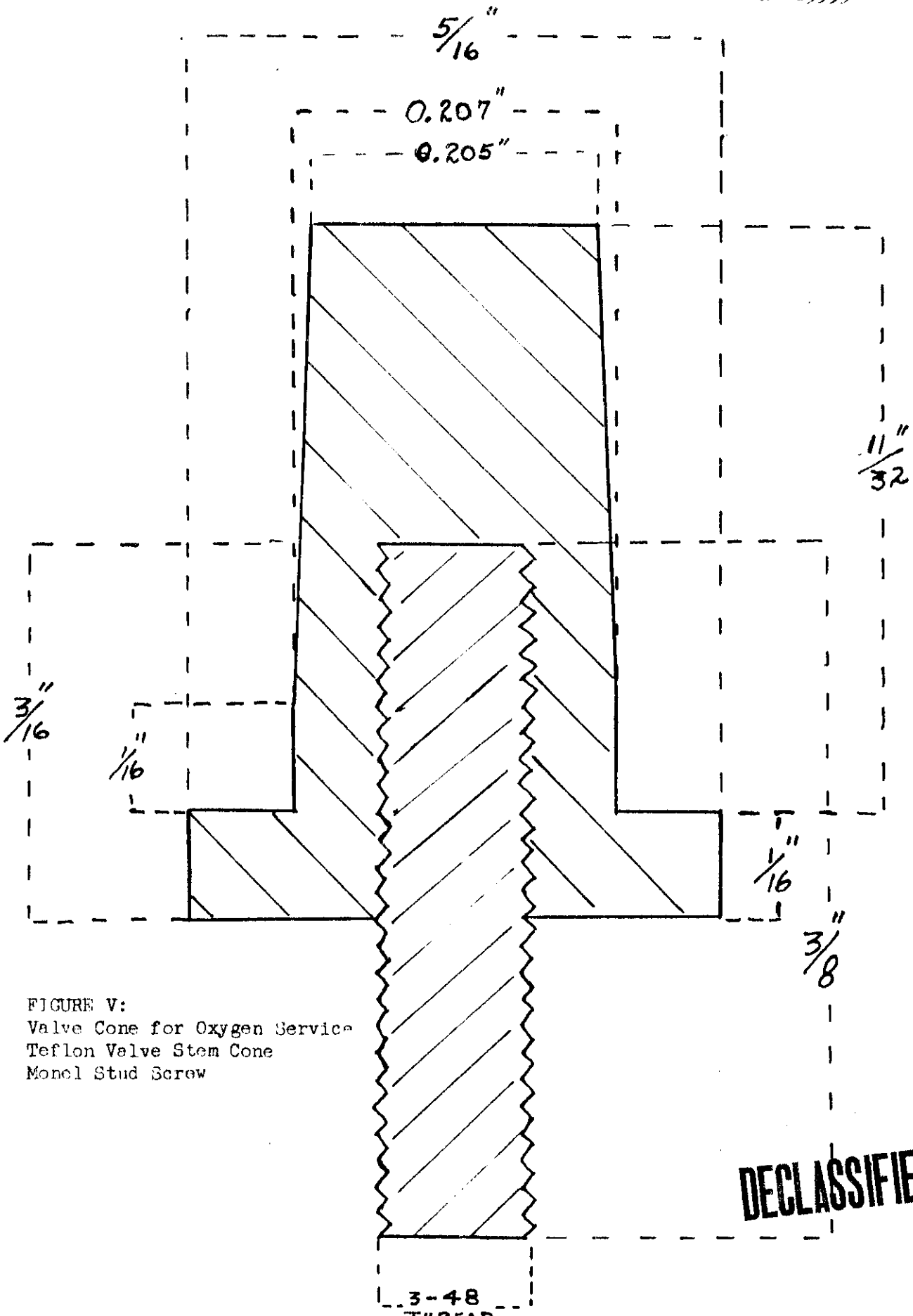


FIGURE V:
Valve Cone for Oxygen Service
Teflon Valve Stem Cone
Monel Stud Screw