

# Contents

## PART I. NOMOGRAPHY

### 1. INTRODUCTION

1. Uniform and Logarithmic Scales . . . . .	3
2. Scales in General . . . . .	3
3. Equations of Scales, Scale Modulus . . . . .	4
4. First Steps in Plotting Scales . . . . .	6
5. Plotting Scale Subdivisions . . . . .	8
6. Scales for Two Variables; Matching Points; Plotting Modulus . . . . .	10
7. Negative Plotting Modulus . . . . .	15
8. Difference between Scale Modulus and Plotting Modulus . . . . .	16

### 2. PARALLEL SCALE NOMOGRAPHS

#### 9. Equations with Three Variables

$$f_1(u) + f_2(v) = f_3(w); \quad f_1(u) \times f_2(v) = f_3(w) \quad \dots \dots \dots \quad 18$$

10. Dependent Variable; Test Product . . . . .	29
--	----

#### 11. Equations with Four or More Variables

$$f_1(u) + f_2(v) + f_3(w) + \dots = f_4(t); \quad f_1(u) \times f_2(v) \times f_3(w) \dots = f_4(t) \quad \dots \dots \dots \quad 33$$

12. Special Scales; Scale Arrangement . . . . .	43
13. Effect of Scale Arrangement upon Relative Errors . . . . .	48
14. Variable with Very Small Range . . . . .	53

### 3. Z-CHARTS

#### 15. Equations with Three Variables

$$\frac{f_1(u)}{f_2(v)} = f_3(w); \quad f_1(u) = [f_2(v)]^{f_3(w)} \quad \dots \dots \dots \quad 58$$

#### 16. Equations with Four Variables

$$\frac{f_1(u)}{f_2(v)} = \frac{f_3(w)}{f_4(t)} \quad \dots \dots \dots \quad 63$$

### 4. PARALLEL AND PERPENDICULAR INDEX LINES

#### 17. Equations of the Type

$$\frac{f_1(u)}{f_2(v)} = \frac{f_3(w)}{f_4(t)} \quad \dots \dots \dots \quad 68$$

#### 18. Equations of the Type

$$f_1(u) + f_2(v) = \frac{f_3(w)}{f_4(t)} \quad \dots \dots \dots \quad 71$$

## 5. CONCURRENT SCALES

## 19. Equations of the Type

$$\frac{1}{f_1(u)} + \frac{1}{f_2(v)} = \frac{1}{f_3(w)} \dots \dots \dots 74$$

## 6. RECURRENT VARIABLES

## 20. Equations of the Type

$$f_1(u) + f_2(v) \times f_3(w) = f_4(w) \dots \dots \dots 78$$

## 21. Equations of the Type

$$\frac{1}{f_1(u)} + \frac{f_4(w)}{f_2(v)} = \frac{1}{f_3(w)} \dots \dots \dots 82$$

## 7. COMBINED NOMOGRAPHS

## 22. Equations of the Type

$$f_1(u) + f_2(v) \times f_3(w) = f_4(t) \dots \dots \dots 87$$

## 23. Equations of the Type

$$f_1(u) \times f_4(t) + f_2(v) \times f_3(w) = 1 \dots \dots \dots 88$$

## 24. Equations of the Type

$$f_1(u) \times f_4(t) + f_2(v) \times f_3(w) = f_5(w) \dots \dots \dots 88$$

## 25. Equations of the Type

$$f_1(u) \times f_4(t) + f_2(v) \times f_3(w) = f_5(w) + f_6(t) \dots \dots \dots 89$$

## 26. Equations of the Type

$$\frac{f_4(t)}{f_1(u)} + \frac{1}{f_2(v)} = \frac{1}{f_3(w)} \dots \dots \dots 89$$

## 27. Equations of the Type

$$\frac{f_4(t)}{f_1(u)} + \frac{f_3(w)}{f_2(v)} = 1 \dots \dots \dots 90$$

## PART II. EMPIRICAL EQUATIONS

## 8. METHODS OF CURVE FITTING

28. Curve Fitting in General; Empirical Equations . . . . . 95

29. Method of Selected Points . . . . . 96

30. Method of Averages . . . . . 97

31. Method of Least Squares . . . . . 100

## 9. CURVES OF TWO CONSTANTS

32. Parabolic or Hyperbolic Curves

$$y = ax^b \dots \dots \dots 104$$

33. Exponential Curves		
$y = 10^{a+bx}$	.....	109
34. Hyperbolic Curves		
$y = \frac{x}{a+bx}$	.....	112
10. CURVES OF THREE CONSTANTS		
35. Parabolic or Hyperbolic Curves		
$y = ax^b + c$	.....	116
36. Exponential Curves		
$y = 10^{a+bx} + c$	.....	119
37. Parabolic Curves		
$y = a + bx + cx^2$	.....	124
38. Hyperbolic Curves		
$y = \frac{x}{a+bx} + c$	.....	128
39. Exponential Curves		
$y = 10^{a+bx+cx^2}$	.....	131
11. CURVES OF FOUR CONSTANTS		
40. Curves of the Types		
$y = a + bx + 10^{c+dx}$ and $y = a + bx + cx^d$	.....	134
41. Curves of the Types		
$y = 10^{a+bx} + 10^{c+dx}$ and $y = ax^b + cx^d$	.....	138
42. Curves of the Type		
$y = a + bx + cx^2 + dx^3$	.....	143
INDEX		149