THE BALDWIN LOCOMOTIVE WORKS
ENGINEERING DEPARTMENT
PHILADELPHIA, PA.

STANDARD PRACTICE
SHEET 14-13
DATE 6-13-47.

DRAW BAR CALCULATIONS

SUPERSEDING (4-2A)-10-3-33.

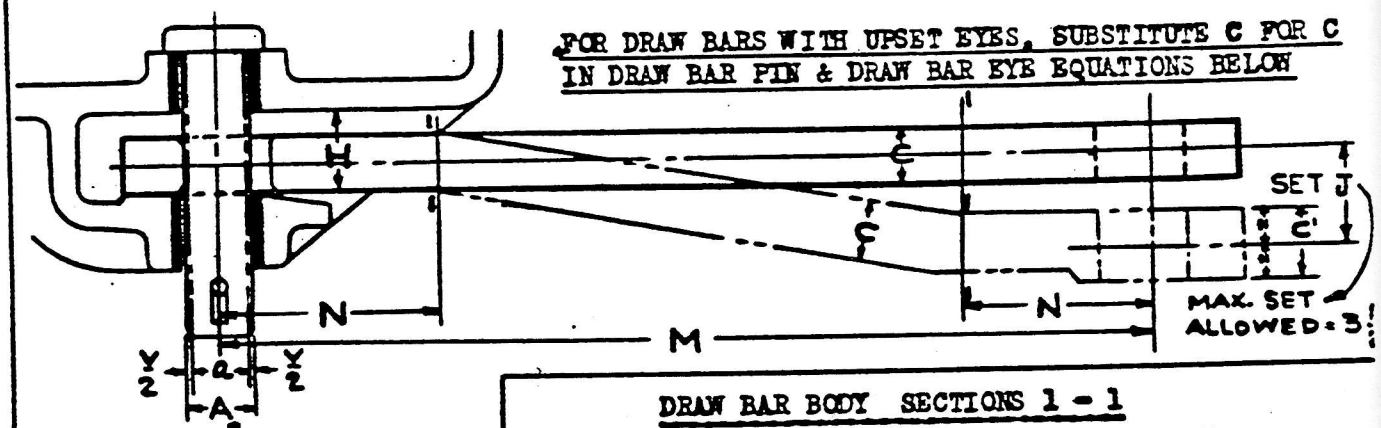
APPROVED F.L.V.

THE FORMULAE GIVEN BELOW ARE BASED ON WORKING STRESSES WHICH ARE SAFE FOR MATERIALS HAVING THE FOLLOWING MINIMUM PHYSICAL PROPERTIES:

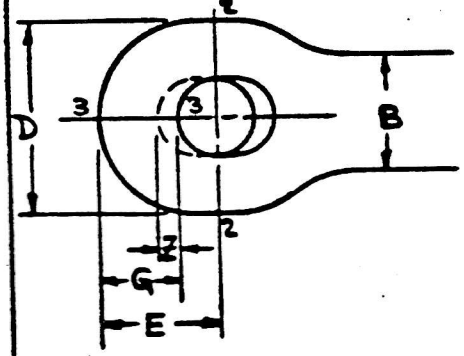
DRAW BAR : ULTIMATE T.S. 47,000 p.s.i. YIELD POINT 23,500 p.s.i.
DRAW BAR PINS : ULTIMATE T.S. 54,000 p.s.i. YIELD POINT 30,000 p.s.i.

W = RATED TRACTIVE EFFORT = $\frac{.85 \times \text{WKG. PRESS.} \times (\text{CYL. DIA})^2 \times \text{STROKE}}{\text{DIA. OF DRIVERS.}}$

TO THIS ADD THE TRACTIVE EFFORT OF THE BOOSTER WHEN A BOOSTER IS USED.



FOR DRAW BARS WITH UPSET EYES, SUBSTITUTE C FOR C IN DRAW BAR PIN & DRAW BAR EYE EQUATIONS BELOW



DRAW BAR BODY SECTIONS 1 - 1

FOR STRAIGHT BARS AND FOR BARS WITH SET "J" EQUAL TO OR LESS THAN - $\frac{C \times M}{18 \times N}$

$$B = \frac{W}{4500 \times C}$$

(MAX. ALLOWABLE DIRECT STRESS = 4500 p.s.i.)

(COMBINED DIRECT BENDING STRESS BETWEEN 4500 p.s.i. AND 6000 p.s.i.)

FOR BARS WITH SET "J" GREATER THAN $\frac{C \times M}{18 \times N}$

$$B = \frac{W}{6000 \times C} \times \left(1 + \frac{6 \times J \times N}{C \times M}\right)$$

(MAX. COMBINED DIRECT BENDING STRESS = 6000 p.s.i.)

DRAW BAR PIN

MIN. WORN DIAMETER : $a = \frac{\sqrt[3]{W \times H}}{18.15}$

WEAR ALLOWANCE : $V = \frac{W}{18{,}000 \times a \times C}$

MIN. DIAMETER, NEW : $A = a + V$

MAX. CAPACITY: $W_{MAX} = \frac{6000 \times C \times A^3}{C \times H + A}$

STRESS WHEN WORN: $S_B = \frac{2 \times H \times W}{\left(A^2 - \frac{W}{6000 \times C}\right) \times A}$

(MAX. ALLOWABLE BENDING STRESS = 12,000 p.s.i. WEAR ALLOWANCE APPROX. $\frac{1}{16}$" PER 1000 p.s.i. BEARING PRESSURE ON NEW PIN)

DRAW BAR EYE - SECTION 2 - 2

$$D = A + \left[.875 + \sqrt[2]{\frac{15000 \times C \times A}{W}} + .765\right] \times \frac{W}{10{,}000 \times C}$$

(MAX. COMBINED DIRECT + BENDING STRESS AT THE EDGE OF THE HOLE: 10,000 p.s.i.

SECTION - 3-3

$$Z = \frac{W}{4000 \times A \times C} \qquad E = \frac{D}{2} + Z \qquad G = \frac{D - A}{2} + Z$$

(WEAR ALLOWANCE 1/4" PER 1000 p.s.i. BEARING PRESSURE ON NEW PIN)