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Draftsmen's Sketch Book for Parts for the Ford Motor Company

M. M.

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<td>Bed</td>
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<td>Adj. Loc. Bushing</td>
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TO BE USED BY THE DRAFTSMAN FOR ALL SKETCHES, NOTES, CALCULATIONS AND DATA RELATING TO THE ABOVE COMPANY ONLY, UNDER NO CIRCUMSTANCES ARE LOOSE SHEETS OR PRIVATE NOTE BOOKS TO BE USED.

NO UNUSUAL EFFORT SHOULD BE MADE AT NICETY, BUT EACH ENTRY SHOULD INVARIBLY BE COMMENCED WITH THE SUBJECT AND DATE OF THE WORK, AND FULL NOTES MADE OF DATA ON WHICH CALCULATIONS ARE BASED AND THE RESULTS OBTAINED CLEARLY STATED.

BOOKS ARE TO BE ALWAYS QUICKLY AVAILABLE TO RECEIVE INSTRUCTIONS, SKETCHES AND DATA AS MAY BE GIVEN THE DRAFTSMAN AND HE WILL BE RESPONSIBLE FOR THEIR DELIVERY AT ANY TIME.
Estimate of weight of fall for 12" wall

<table>
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<tr>
<th>Subject</th>
<th>Weight of fall (42&quot; wall)</th>
</tr>
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<tbody>
<tr>
<td>Company</td>
<td>Property of Morgan Construction Co.</td>
</tr>
<tr>
<td>Date</td>
<td>Worcester, Mass.</td>
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</table>

**Weight of Wall for 12" Wall**

- 4-34 x 34 = 34
- (Weight of A) dia 21 x length 26 = 545
- 34.5 x 21.25 x 28 = 2590

**Distribution of weight on arch**

- To find reaction at B
  - 6BB = (15500 x 34) + (3520 x 73) + (2260 x 95) + (917 x 106)
  - (8040 x 106)
- 6BB = 527000 + 256500 + 216200 + 97200 + 85130
- BB = 1949200
- B = 28665

**Total weight of fall** = 24810

**Weight of Nick Bearing**

- 30 x 27 x 15 x 33 = 4000
SUBJECT: Company

DATE:

\[ s = \frac{6.619}{2304} \]
\[ \theta = 397.14 \]
\[ b = 17.23 \]

Section of beam 10" from either post

\[ M = \frac{Wx}{L} = \frac{1.291,665 \times 10}{2} \]
\[ M = 6,458,325 \]
\[ 322.9" \text{ shrinkage modulus} \]

Section as drawn: 

\[ S = \frac{(3.7)(2304)}{2} = 29,973 \]
\[ = 4985 \]
**Adj Screw Bushing**

**Total load on bushing = 3291.665**

- 15" area = 254.469
- 13.5/2 area = 14.3
- Bearing area = 111"

Bearing pressure per 5" = 1291.665 ÷ 111 = 11.63 (approx)

Bearing area of threads 300° (approx)

\[ \frac{1291.665}{300} = 4.300 \text{ in}^2 \]

Bearing pressure on threads for dead load = 116.2

\[ \frac{1}{\sqrt{2}} = \frac{1}{1.41} \]

\[ \frac{1}{\sqrt{3}} = \frac{1}{1.73} \]
SUBJECT: Adjusting Screw

COMPANY:

DATE: 11/12/24

- Main radius = 4.15"  Pitch = 1"  3 R.P.M.
- Main dia = 9/16"  Cm. = 29.8  29.8 x 3 = 89.5"  L = Min.
- Lead of conical screw = 33,000

\[ F = \frac{W(\tan \theta + \tan \phi)}{\alpha} \]
\[ F = \frac{33000(4.15)(.3 + .335)}{12} = 99,500 \]
\[ F = 8280# \]

In making 3 revolutions, screw travels 9.43 feet.

Work done per min = \( \frac{8280 \times 9.43}{525} \) = 150 W

\[ \frac{31200}{150} = 206 \text{ W per min} \]

\[ \frac{78,200}{206} = 381 \text{ W per min} \]
\[ \frac{33,000}{2.35} = 14,000 \text{ H.P.} \]

3,900 HP = Total

HP absorbed by friction = \( \frac{2.35}{1.42} \) = 1.64

Total HP per min = 2.77
SUBJECT
COMPANY

Gear D
Pitch dia = 3 3/4"
Pitch = A
15 tpi
R.P.M. = 57.25
Surface speed = 36.5 F.P.M.

5 x 33,000 = 165,000
165,000 = 2930 # tooth pressure
56.25

W = 5\% F
2930 = (20,000 x 78) (0.92) F
2930 = 1435 F
F = 2 1/2" width of face

Gear E
Pitch dia = 0.002"
Pitch = 1/2"
21 tpi
R.P.M. = 57.25
Surface speed = 150 F.P.M.

1 F.P. x 33000 = 231,000
231,000 = 1540 # tooth pressure
150

W = S.P.F.Y
1540 = (17500)(1.75)(1) F
1312 F = 1540
F = 1 1/2"

Gear B
Pitch dia = 6 1/2"
Pitch = 2
13 tpi
R.P.M. = 9.23
Surface speed = 15.7 F.P.M.

5 F.P. x 33,000 = 165,000
165,000 = 10,500 # tooth pressure
15.7

W = S.P.F.Y
10,500 = (20,000)(x7)(0.83) F
2,606 F = 10,500
"F = 2 1/2"

Gear A
Pitch dia = 20"
Pitch = 2
40 tpi
Face = 4"
R.P.M. = 3
Surface speed = 15.7 F.P.M.

Gear C
Pitch dia = 23"
Pitch = 9.3 tpi
R.P.M. = 9.23
Surface speed = 56.5 F.P.M.
(Gear A) Pitch dia. 20"  Pitch 2"  40 teeth  
Face 4"  RPM 3  Surface speed 15.7 FPM  

51P x 33000 = 165,000"  per minute  
165,000 / 10,500  = 16.5"  per tooth  
16.5 / 0.583 = 28.5 teeth  
W = 28.5

(Gear B) Pitch dia. 12"  Pitch 2"  15 teeth  
R.P.M. = 9.23  Surface speed 15.7 FPM  
51P x 33000 = 165,000"  per minute  
165,000 / 10,500  = 16.5"  per tooth  
16.5 / 0.583 = 28.5 teeth

(Gear C) Pitch dia. 22.5"  Pitch 2.5"  
Face dia. 37.5"
Shaft

Worm shaft 202.1.1 in.

\[ d = \frac{3(210000)}{1726000} \]

\[ d = 1.06'' \text{ dia} \]
(A) Bevel Gear Pitch dia. 20" D.P. = 2
40 teeth. 3R.P.M. Surface speed 15.7 F.P.M.

(B) Bevel Ring Pitch dia. 6 1/2" D.P. = 13 teeth
9.23 R.P.M. Surface speed 15.7 F.P.M.

5TP x 33000 = 165000
165000/10500 = 15.7

W = SPFY
10500 = (28000)(1.5)(0.03) = 4206 F = 10500

F = 4" face

W = SPFY
3640 = 6000

(C) Worm Gear Pitch dia. 22.71
C.R. = 1.0524, Single Lead 6.5 teeth
9.23 R.P.M. Surface speed 54.5 F.P.M.

6TP x 33000 = 198,000
198,000 = 3640 # tooth pressure

W = SPFY
3640 = 1000(1.0524)(1.14) = 4740

F = 2.8 width of face

(D) Worm Gear Pitch dia. 33.446
Single Lead

1.0524, Pitch 10.524

Head 1.0524, Spinal Angle 5° 43' 10"
Average dia. of shank = 10.5"

Root = 81.5"

Stressed to 1,600 #/".

Stress of 20,000 = 0.00066 elongation

30,000,000 = per inch at 20,000#

0.00066 x 46" = 0.3036" elongation of contraction

0.0066 = 105°F

Bar must be treated 105°F above atmospheric temp.

Expansion of 10.5" Dia

10.25 x 0.000063 x 105 = .0068"

Wt. of shank = 3.464" x .75" x 56.25

(3.464 x .75) = 195"

195 / 119 x 10 = 1,190 x 2.8 = 333 #
<table>
<thead>
<tr>
<th>Weight of top Roll Mill</th>
<th>3,000#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of (2x4x5) x 2</td>
<td>150#</td>
</tr>
<tr>
<td>Weight of Yoke</td>
<td>18.5#</td>
</tr>
<tr>
<td>Weight of Y Support</td>
<td>3.92#</td>
</tr>
<tr>
<td>Total Cradon C weight</td>
<td>6,250#</td>
</tr>
<tr>
<td>42&quot; Mill</td>
<td></td>
</tr>
<tr>
<td>Heavy</td>
<td>34,915#</td>
</tr>
<tr>
<td>Light</td>
<td>10,435#</td>
</tr>
<tr>
<td>Total Cradon C weight</td>
<td>17,940#</td>
</tr>
<tr>
<td>32&quot; Mill</td>
<td></td>
</tr>
<tr>
<td>Heavy</td>
<td>23,690#</td>
</tr>
<tr>
<td>Light</td>
<td>13,455#</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length has 6 to 1 ratio</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>For 42&quot; Mill</td>
<td></td>
</tr>
<tr>
<td>Heavy side</td>
<td>3915</td>
</tr>
<tr>
<td>Light side</td>
<td>10,435</td>
</tr>
</tbody>
</table>

| For 32" Mill            |       |
| Heavy side              | 23,690|
| Light side              | 13,455|

<table>
<thead>
<tr>
<th>Weight of C weight sector</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>For 32&quot;</td>
<td></td>
</tr>
<tr>
<td>70.84 x 4.75 = 33.50</td>
<td></td>
</tr>
<tr>
<td>4.245 x 26 = 110.0</td>
<td></td>
</tr>
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</table>

WORCESTER, MASS.

PROPERTY OF MORGAN CONSTRUCTION CO.
SUBJECT: Continued

COMPANY: And Morton

4.0000 x (1.425)(.3 + .025) = 9280
12
F = 9280 / 773
12 ~ 118.5°

Advance 10 ft hammer drilling 3 ft

FS = MY

118.5° = 100 x 13
32.2°

v = 1690
76314
x = .042" = .264"

WORCESTER, MASS.

Section at AA

I = \frac{1}{12} (6.25)(10.6) - \frac{1}{12} (149) + (2)(9.3)
I = 68.2 - 87.05 + 178.6
I = 246.8

\frac{I}{3} = 82.2

Required SMA for AA = 18,000 x 2.5

(see p.33)
\[
\begin{align*}
10000 \times 6 &= 100000 \\
15.4 &= \text{SM} \\
S.M. &= \frac{6.5 \times 18}{6} = 19.1 \\
\text{Select through the middle} \\
S.M &= \frac{5 \times (4.5)}{2} = 17 = \text{SM} \\
11 \times 15000 &= 165000 \\
27 &= \text{SM of 3700} \\
\end{align*}
\]
Solve to find reaction at B

\[
56B = (4000 \times 120.5) + (620 \times 112) + (3320 \times 91) + (13,500 \times 43)
\]

\[
56B = 482,400 + 116,000 + 320,500 + 581,100
\]

\[
86B = 1,499,900
\]

\[
B = 17,440
\]

\[
\text{load at } B = 17,440
\]

\[
86B = 1,499,900
\]

Then reaction at A

\[
24,645
\]

\[
17,440
\]

\[
7,205
\]

\[
\text{load at } A = 7205
\]
Subject

Company

Property of Morgan Construction


\[ B_m = 10,000 \times 4 = \frac{72,000}{7,000} \times 10 = \text{section module} \]

Actual modulus of section is equal to:
\[ \frac{t^2}{2} = \frac{11.625}{2} = 11.625 \text{ Actual SM} \]

Section at center of mass
\[ B_m = \frac{72,000}{700} = 10 \text{ SM} \]

\[ \frac{10}{9} = \frac{6.33}{6} = 10 \]
\[
\frac{F_s}{2} = \frac{m u^2}{2} \\
1180 = 2 \cdot \frac{20}{13^2} = \frac{20}{(1180)^2} \\
3 = \frac{3370}{2360} \\
S = 1.4
\]