THESIS:

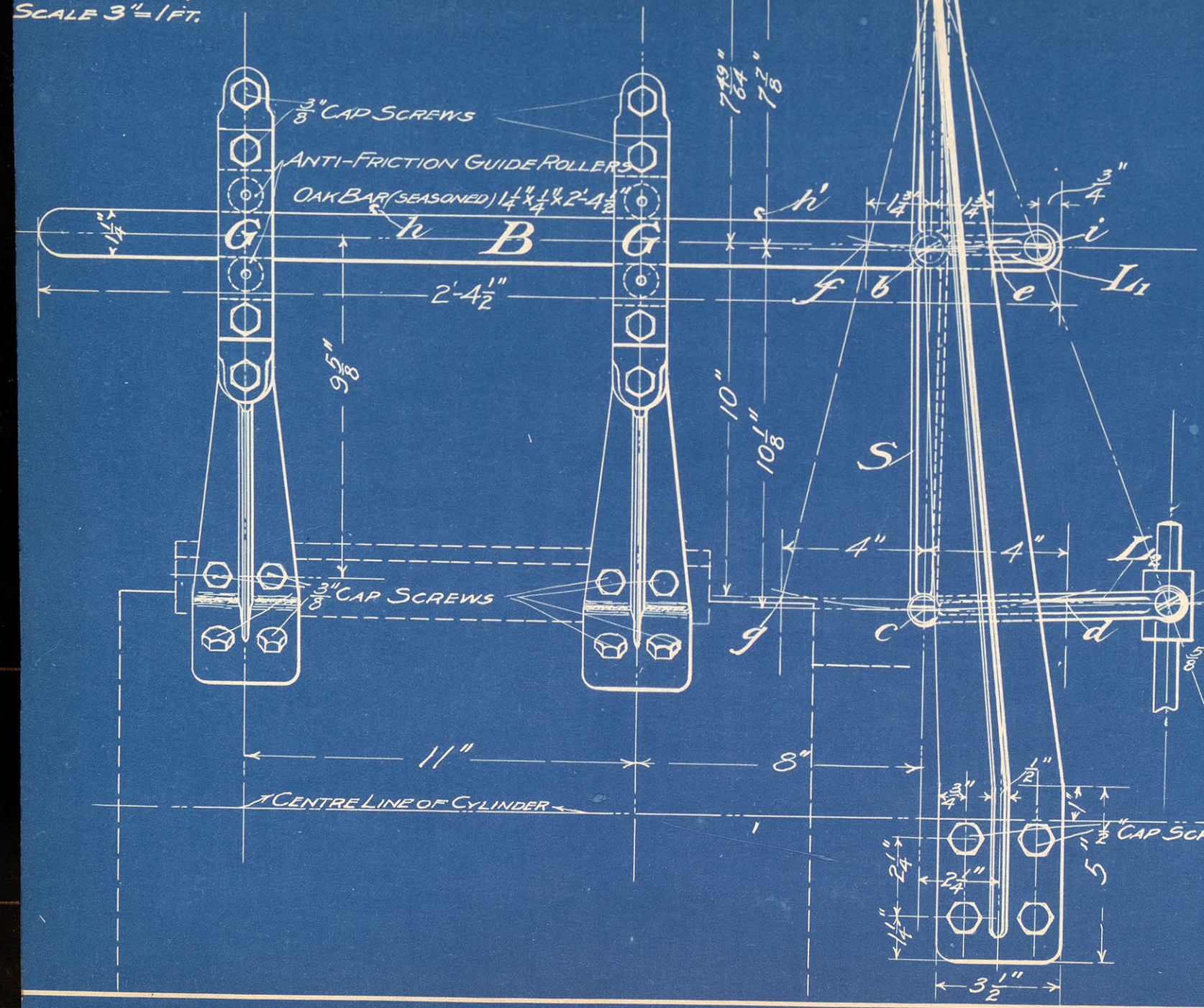
SUBJECT:

INDICATOR REDUCING MOTIONS.

DEPARTMENT
OF
MECHANICAL ENGINEERING,
KANSAS STATE AGRICULTURAL COLLEGE
MANHATTAN · KANSAS.

HOWARD McCUNE CHANDLER
CLASS OF 1903.

THESIS:
INDICATOR REDUCING MOTION, No 1.
FOR AIR COMPRESSOR AT K.S.A.C. Eng. Lab.
ELEVATION (front)
SCALE 3" = 1 FT.



This device is an application of simi
triangles for the reduction of an 8'
stroke of an air-compressor to a 3 1/2
movement of the Indicator Drum

B is a bar moving in guides G paral
to piston rod. Link L_1 is attached to
and link L_2 to crosshead. a, i an
must always lie in the same straig
line, then

$L_1 : L_2 = ba : ca = fe : gd$ = length
Indicator diagram : stroke of pist

The cords are hooked on at h
h'

When set up the lever S should h
vertically when piston is at mid-s

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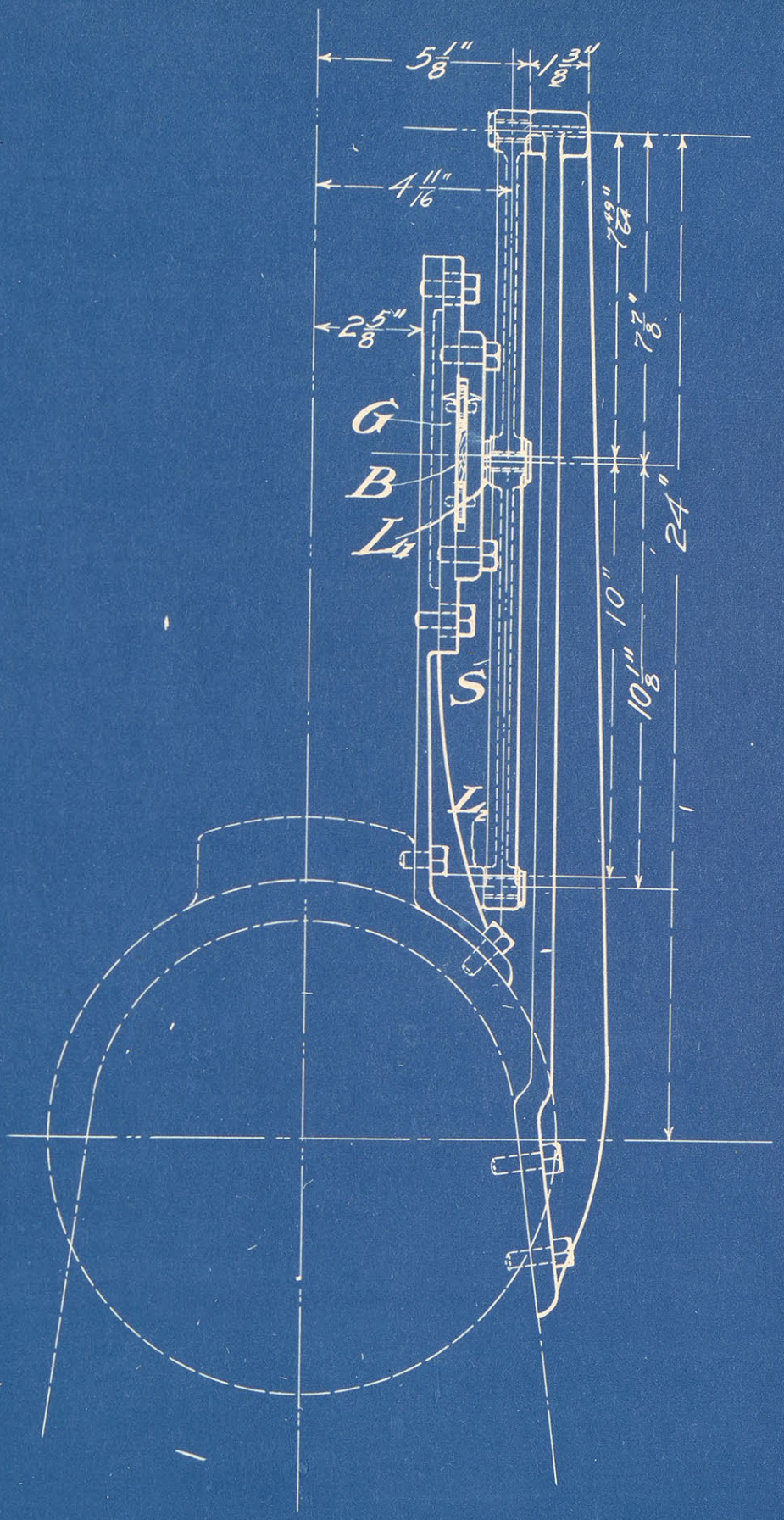
INDICATOR REDUCING MOTION, No. 1

FOR AIR COMPRESSOR AT K.S.A.C. ENG. LAB.

ELEVATION (SIDE)

SCALE 3" = 1 FT.

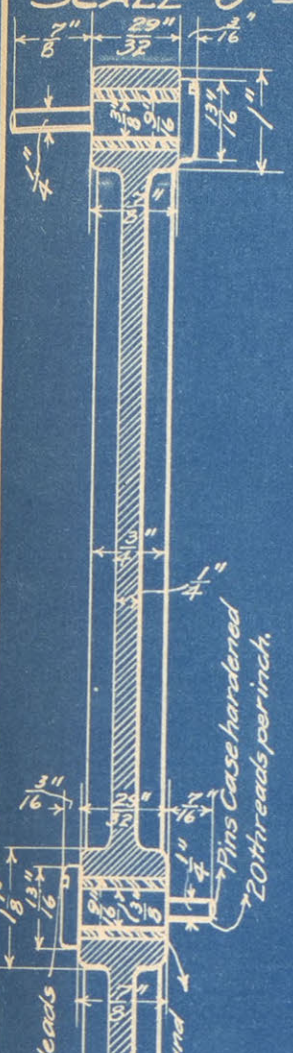


INDICATOR REDUCING MOTION, No 1
FOR AIR COMPRESSOR AT K.S.A.C. ENG. LAB.

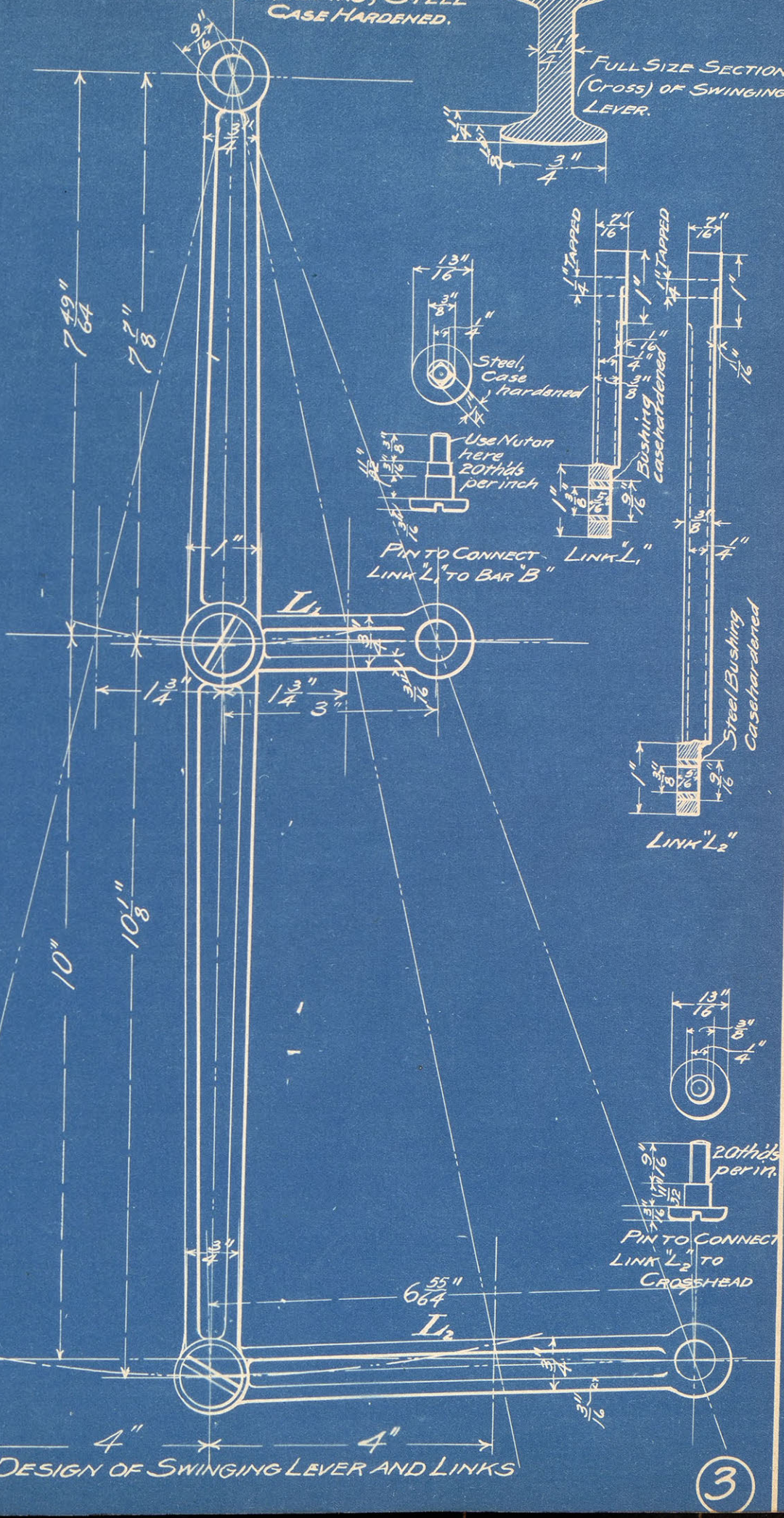
DETAILS

SCALE 6" = 1 FT.

MATERIALS { LEVER AND LINKS; CAST IRON
BUSHINGS AND PINS; STEEL CASE HARDENED.

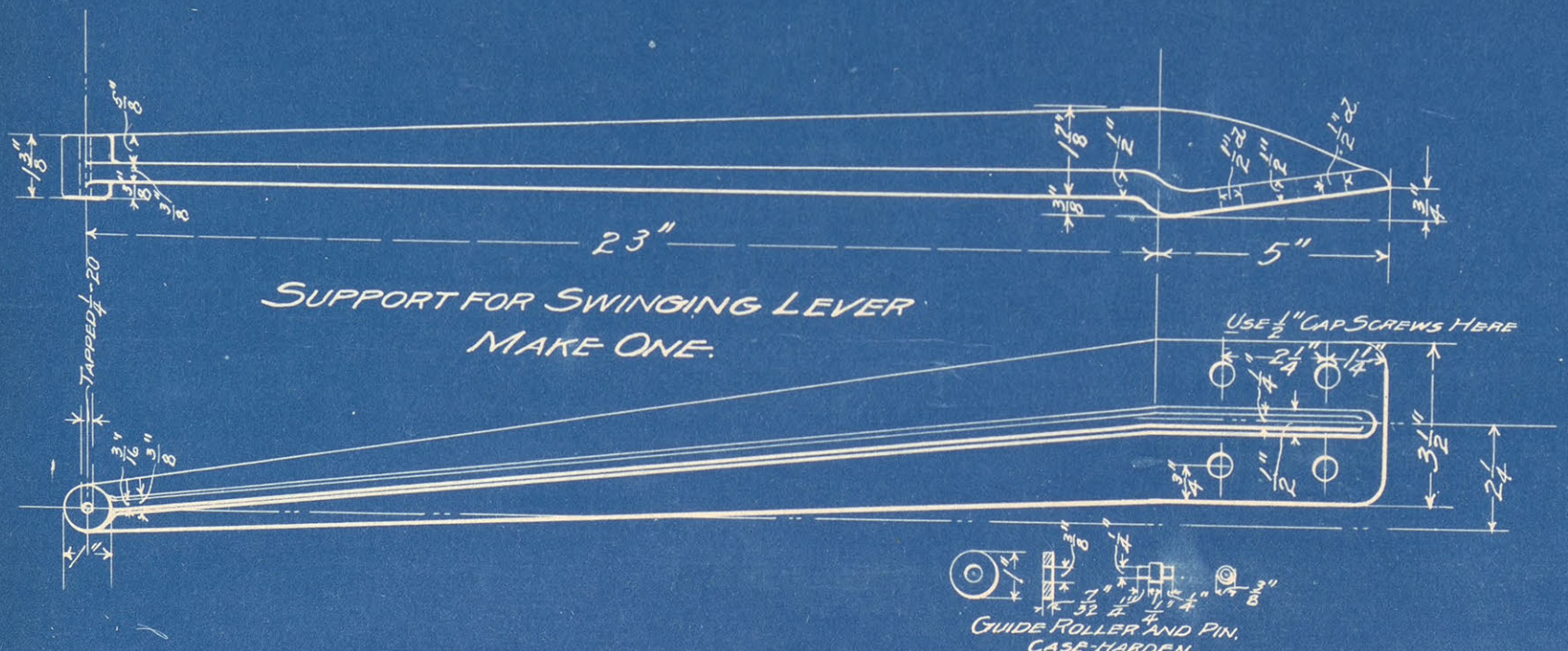


SECTION OF SWINGING LEVER AND PIN BEARINGS.

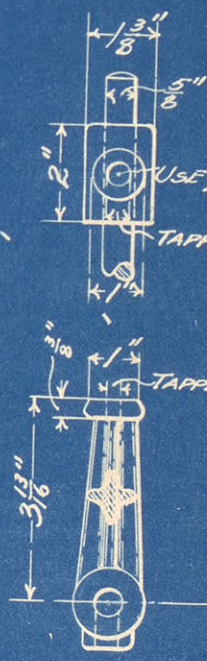


DESIGN OF SWINGING LEVER AND LINKS

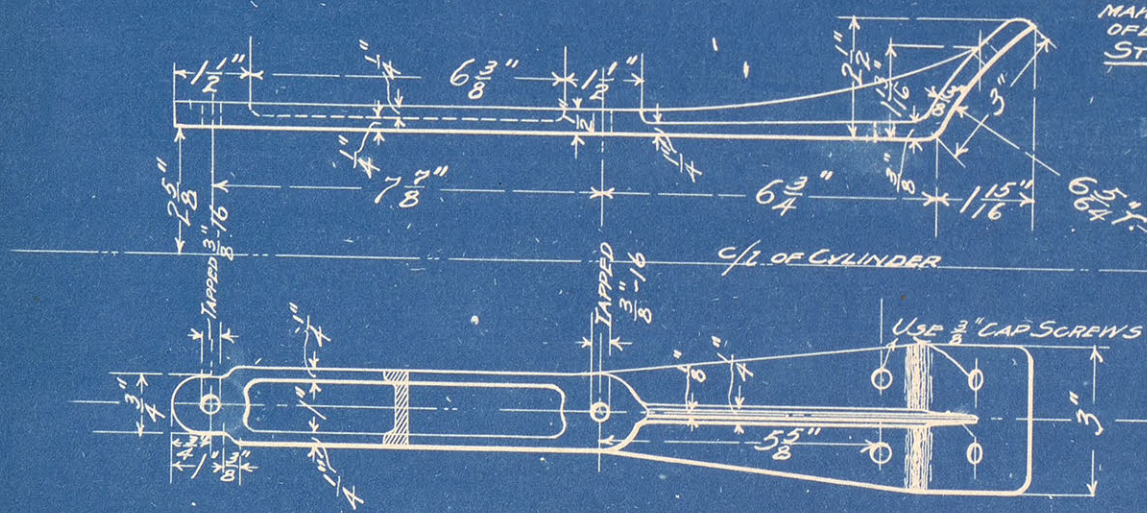
3



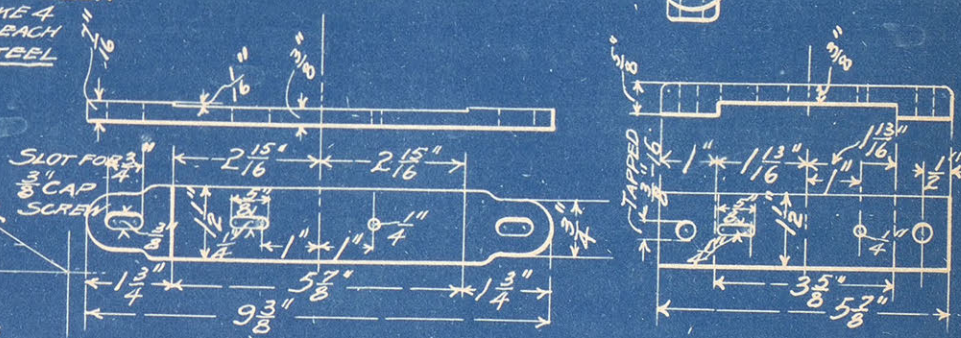
SUPPORT FOR SWINGING LEVER
MAKE ONE.



ARM FROM
CROSSHEA
TO LINK I



SUPPORT FOR ADJUSTABLE GUIDE.
MAKE TWO.



ADJUSTABLE GUIDE AND COVER
MAKE TWO OF EACH.

THESIS:
INDICATOR REDUCING MOTION, No. 1
FOR AIR COMPRESSOR AT K.S.A.C. ENG. LAB.
DETAILS
SCALE 3" = 1 FT.

MATERIAL: CAST IRON UNLESS OTHERWISE NOTED

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CASE HARDENED STEEL BUSHING

TIGHT FITTING STEEL PINS

HARDWOOD SIDE BAR.
MAKE ONE.

8'-0"

SET SCREW

4-⅜" SET SCREWS

JOINT "A"

JOINT "B"

JOINT "C"

31"

2 25/32"

2"

SIDE BAR FOR INDICATOR CONNECTION

12½"

GUIDE BRACKET

2"

STEAM OUTLET TO INDICATOR

23/32" 23/32"

℄ OF CYLINDER

32"

42 1/4"

JOINTS "B"

90°

1" WROUGHT IRON PIPE

CROSSHEAD CONNECTION TO PANTOGRAPH

d

JOINT D'

24"

g

FASTENED WITH BOLTS OR LAG SCREWS.

THESIS:

INDICATOR REDUCING MOTION, NUMBER 2

FOR CORLISS ENGINE AT

Manhattan Milling Company's Mill

ELEVATION (side)

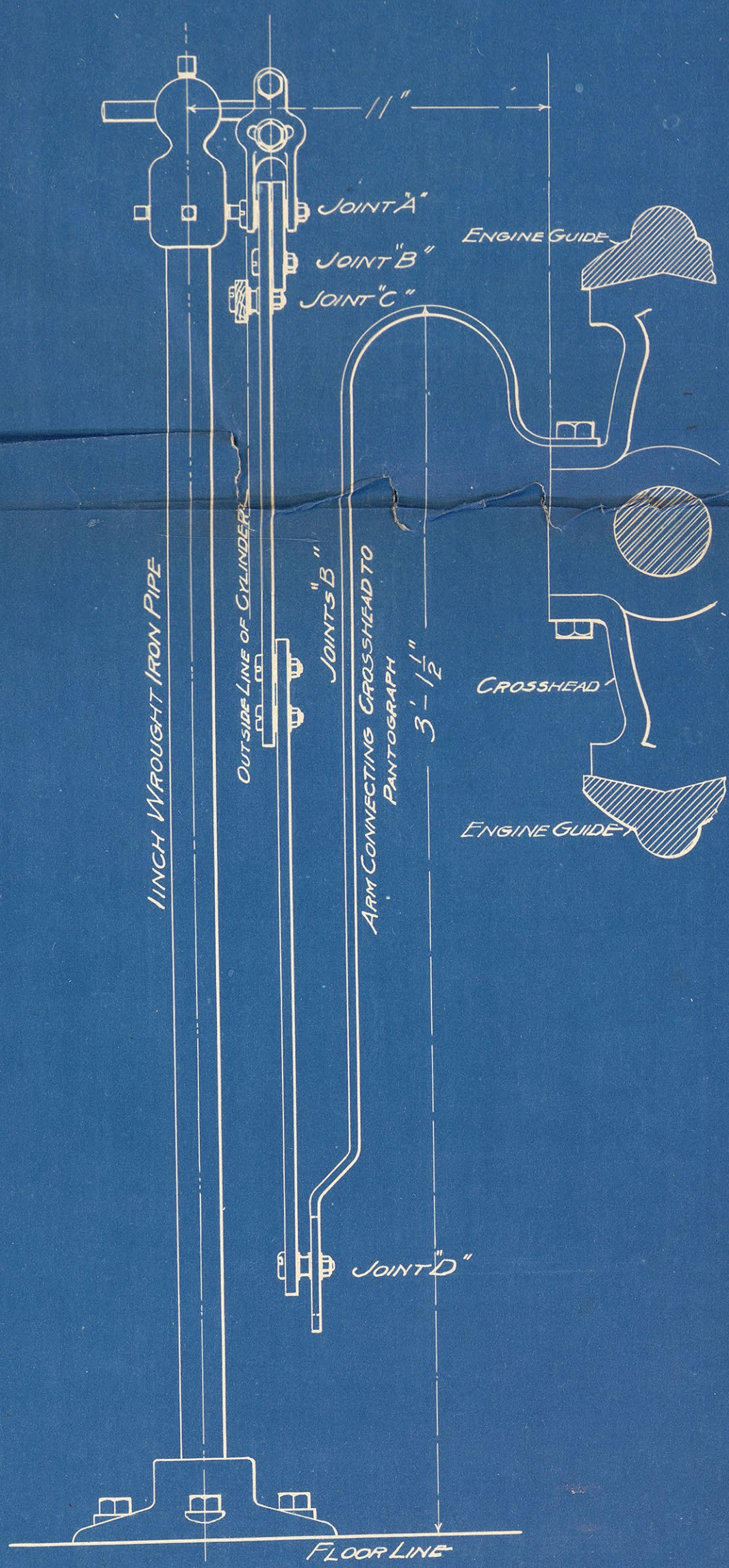
Scale 3"=1ft.

NOTE¹: The principles of the Pantograph are utilized in this mechanism for the reduction of a 48 inch stroke on the engine to a 4 inch movement of the Indicator drum. The Indicator cord is attached to the side bar. The end *d* is attached to a fixed arm on the crosshead. The fixed fulcrum is at *a*. *d*, *c* and *a* must always lie in the same straight line and be parallel and equal to *af*. Also, $df : ef$ = stroke of piston to length of Indicator diagram; for $df : ef = da : ca = dg : ch$ = stroke of piston to length of Indicator diagram.

NOTE²: The mechanism is to be placed in position when the crosshead is at exactly mid-stroke and adjusted to the dimensions on this Sheet A and next Sheet B.

A

(A)



THESIS:
INDICATOR REDUCING MOTION, NUMBER 2

FOR CORLISS ENGINE AT

Manhattan Milling Company's Mill

ELEVATION (END)

SCALE 3 IN. = 1 FT.

FINISH ALL EXPOSED SURFACES.

B

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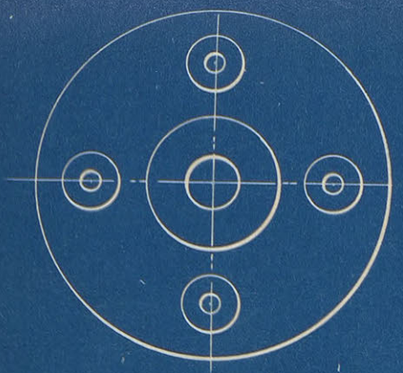
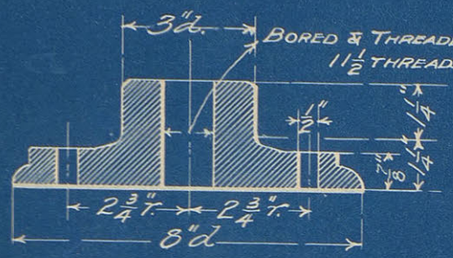
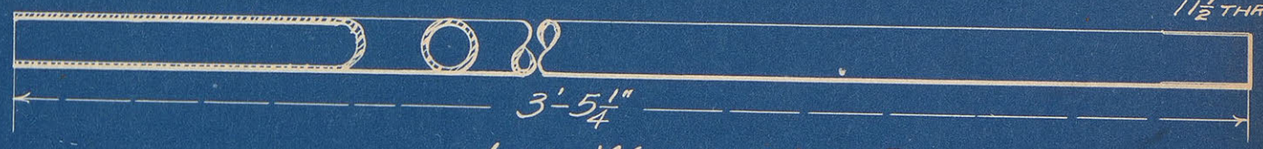
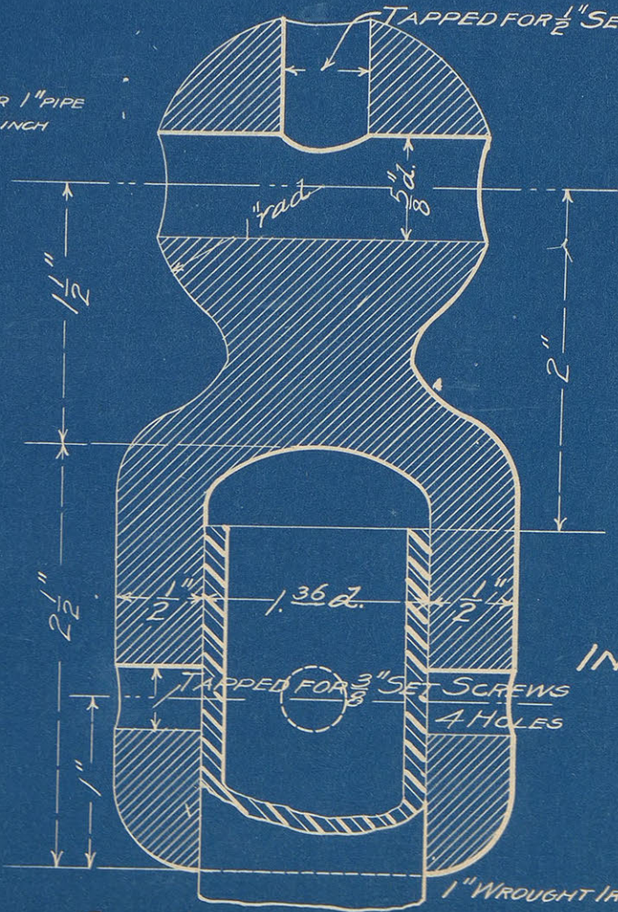




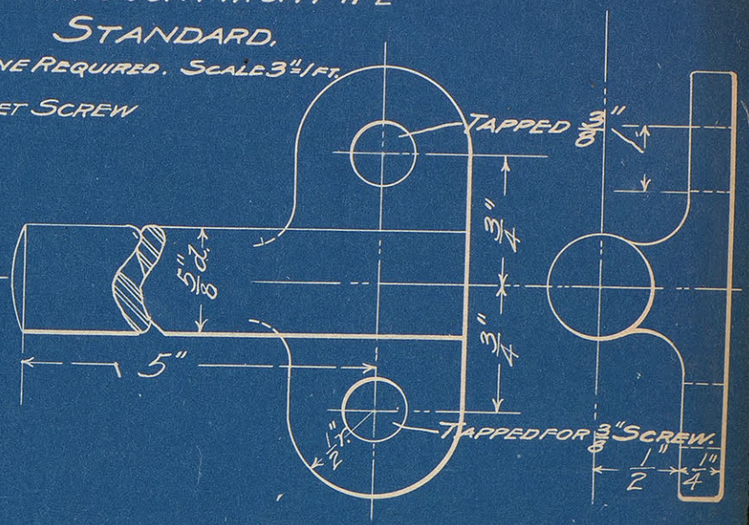
CAST IRON BASE
OF STANDARD.
SCALE 3"=1FT.
MAKE ONE.



1 INCH WROUGHT IRON PIPE
STANDARD.
ONE REQUIRED. SCALE 3"=1 FT.



CAST IRON CAP FOR STANDARD.
SCALE FULL SIZE. MAKE ONE.



PANTOGRAPH SUPPORT ARM.
STEEL FORGED.
FULL SIZE
MAKE ONE

THESIS:
INDICATOR REDUCING MOTION No 2
FOR CORLISS ENGINE AT
Manhattan Milling Company's Mill
DETAILS.

FINISH ALL EXPOSED PARTS.

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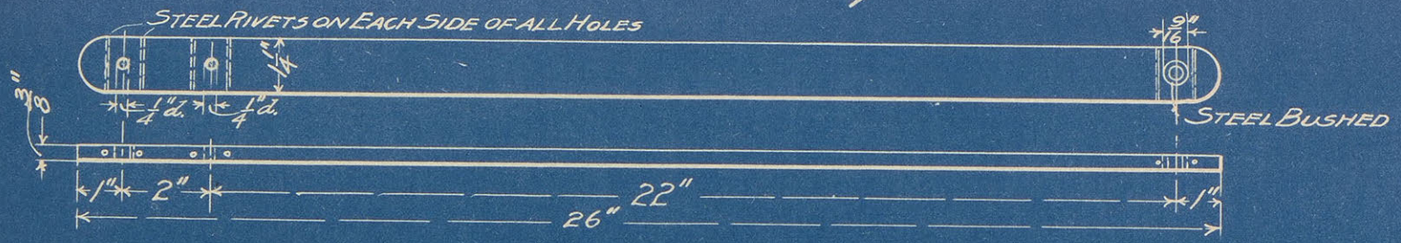
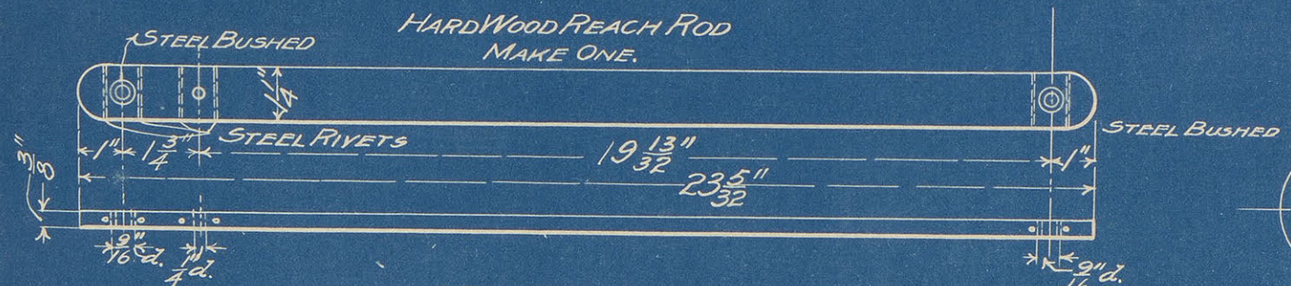
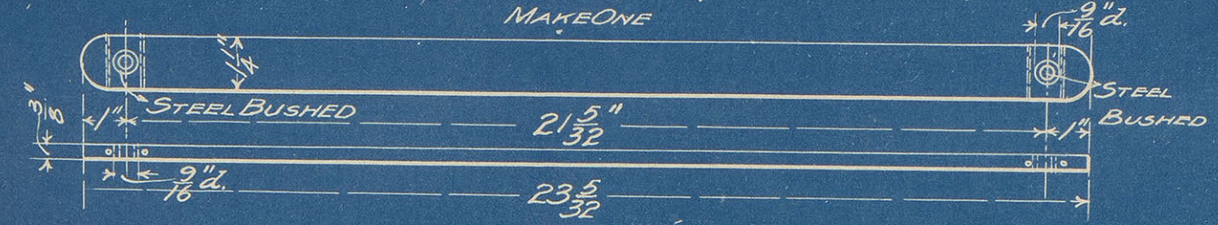


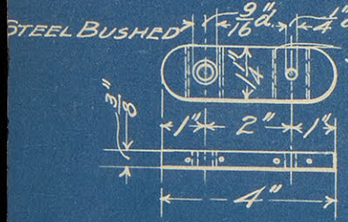
HARD WOOD REACH ROD
MAKE ONE.



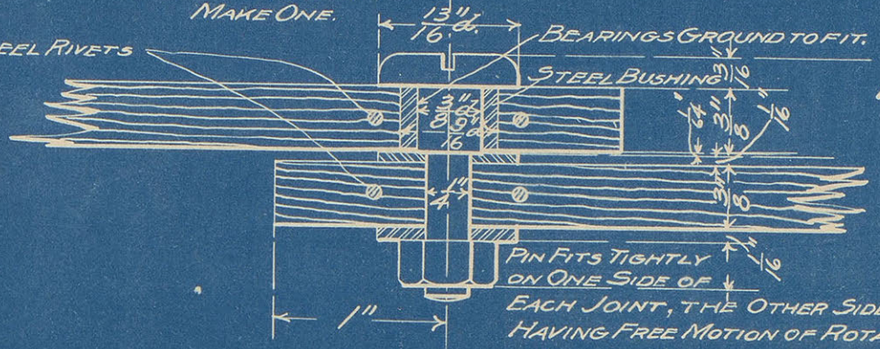
HARD WOOD LINK.
MAKE ONE



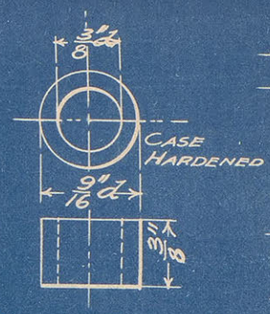
HARD WOOD LINK
MAKE ONE.



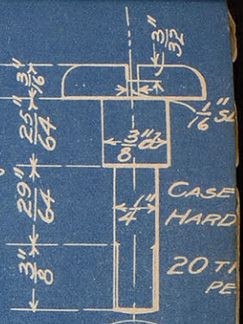
HARD WOOD
LINK.
MAKE ONE.

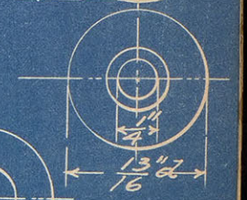


PIN JOINT "B"
FULL SIZE

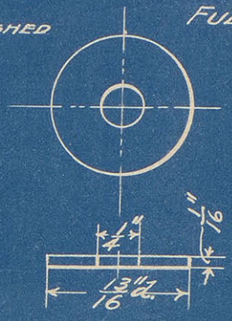


STEEL BUSHING
MAKE 7
FULL SIZE

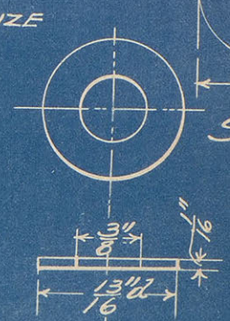




STEEL PI
MAKE 3
FULL SIZE



STEEL WASHER.
MAKE 9
FULL SIZE.



STEEL WASHER.
MAKE 3
JOINT "A"
FULL SIZE.

THESIS:
INDICATOR REDUCING MOTION
FOR CORLISS ENGINE AT
Manhattan Milling Co's. Mill.
DETAILS.

SCALE 3" = 1 FT. UNLESS OTHERWISE MARKED.
FINISH EXPOSED SURFACES.

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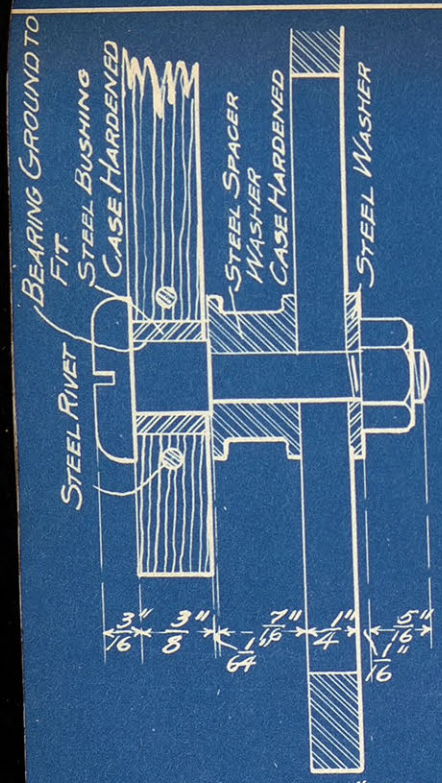
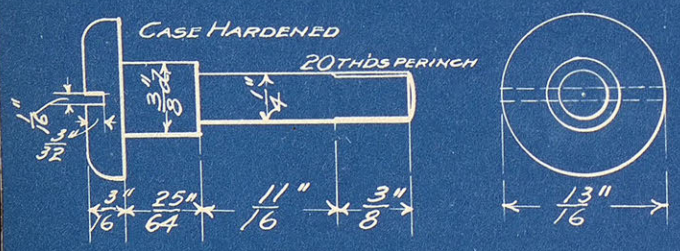
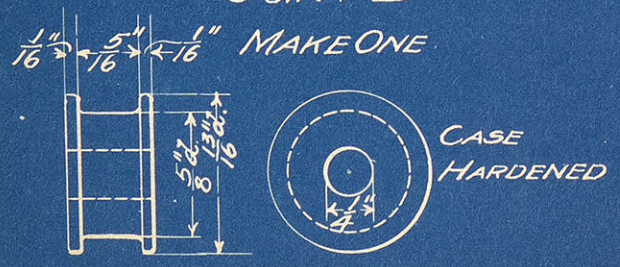


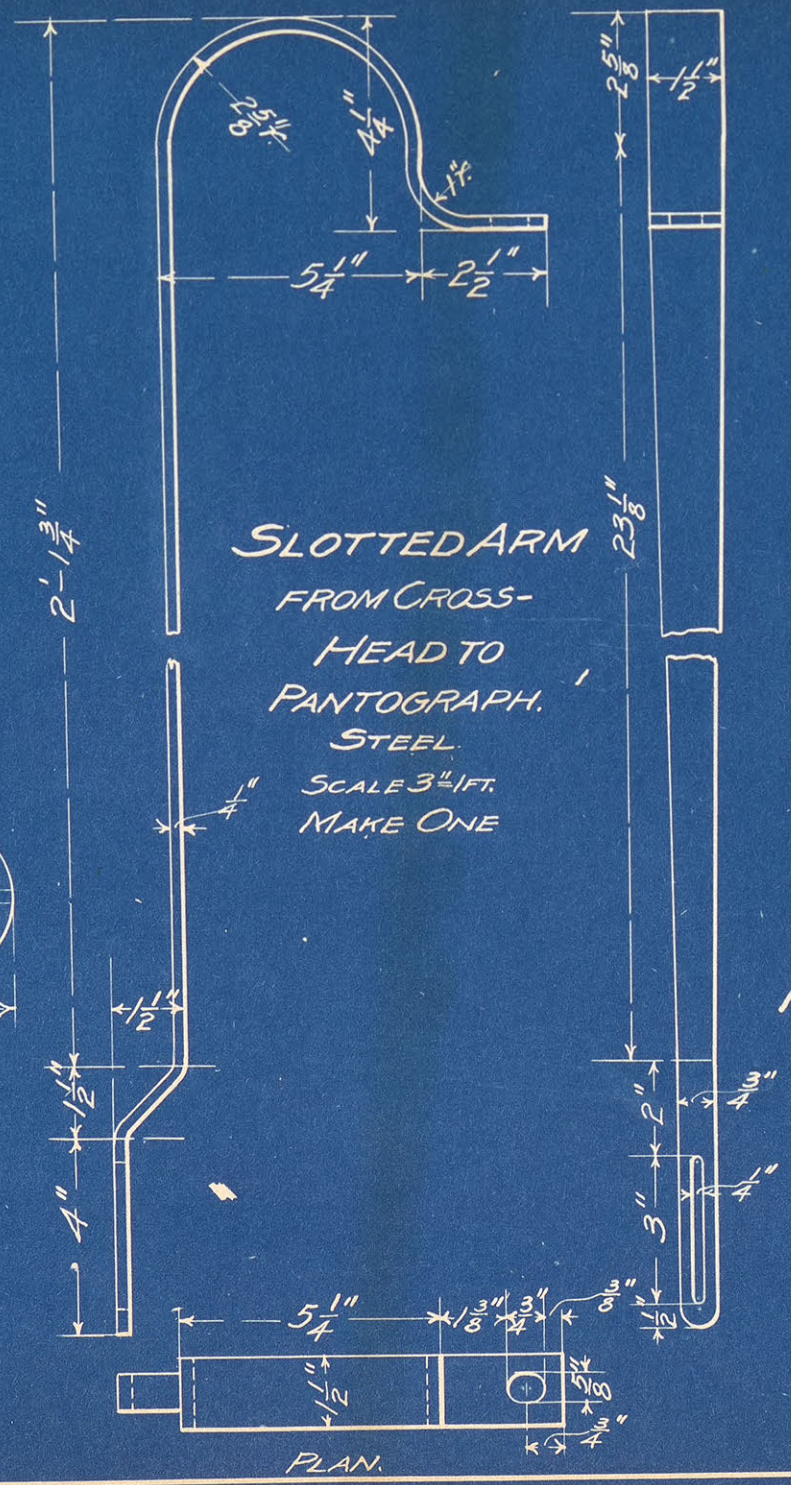
PIN JOINT "D"



STEEL PIN JOINT "D"
MAKE ONE



STEEL SPACER WASHER
MAKE ONE



SLOTTED ARM FROM CROSS-HEAD TO PANTOGRAPH.
STEEL.
SCALE 3"=1FT.
MAKE ONE

PLAN.

THESIS:
INDICATOR REDUCING MOTION, No 2
FOR CORLISS ENGINE AT
Manhattan Milling Company's Mill.

DETAILS
SCALE FULL SIZE UNLESS OTHERWISE STATED
FINISH ALL EXPOSED SURFACES.

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SLOT 2 3/4" LONG

BLOCK TO BE A SLIDING FIT

1 7/8"

1 3/4"

1 1/4"

1"

1/2"

1/8" R.

SPRING RETAINERS MAKE 2 OF EACH.

#1

#2

SLIDING BLOCK

RETAINING WASHER

BEARINGS GROUND TO PERFECT FIT

1/2"

1 1/4"

1 5/16"

1/4" R.

1 1/4" R.

1/8" R.

1 1/4"

1"

1/4"

1 3/8"

1" ADJUSTMENT.

3/8"

2"

SLOT FOR 3/8" CAP SCR.

5/8" R.

3/16" R.

1 1/8"

1/4"

BRACKET FORGED TO SHAPE.

THIS SIDE OF BRACKET GUIDE FASTENED TO CORNER IRON OF CYLINDER

SLIDING BLOCK
STEEL CASE HARDEN.
MAKE 2

#1

20 THD'S PER"

CASE HARDENED

#2

20 THD'S PER"

STEEL ROLLER PINS.
MAKE 2 OF EACH.

1 1/2"

SPRING
No. 12 PIANO WIRE.
16 TURNS IN 1 1/2 IN.
MAKE 2.

15/16" d.

1" d.

17/32"

3/8"

5/8" d.

STEEL ROLLER
CASE HARDEN
MAKE 4.

THESIS:
INDICATOR REDUCING MOTION
No 2
CORLISS ENGINE
AT
MANHATTAN MILLING CO'S MILL.

SIDE BAR GUIDE AND DETAILS.

2 REQ'D SCALE FULL SIZE

FINISH ALL EXPOSED SURFACES.

G