Adams Township, MI

Symons Cone Crusher

Morenci 7 ft. standard were to be set at 1-1/2 to 2", and they screened out -5/8" and split the product from one 7 ft. Stnndard Cone to two 7 ft. short heads, and predicted 800 tons per hour. Now for White Pine Gruender says at 5000 tons in 16 hours equals 300 tons per hour, a 5-1/2 Standard set at 1-1/4" should produce about 300 tons per hour and product produce 30% -1/4 so it leaves 200 tons to be split between two 5-1/2' short heads or 100 tons which is what each should handle in closed circuit making a minus 1/4" product.

Cost F.O.B. Milwaukee

5-1/2 Standard	$19,200	requires	200 HP	Weight 88,000 lbs.
5-1/2 Short Head	19,875		200 HP	90,000
5-1/2 Heavy Duty	23,000		200 HP	45,000

to be handled by crane of 25 ton

Delivery 8 months We would screen out 1/4 product of Standard

@ 6000 tons in 15 hrs. = 400 tons this may be too much for the above crusher

But @ 6000 tons in 18 hrs. = 333 tons this may be too close to be practicable

But @ 6000 tons in 20 hrs. = 300 tons may be practicable

But @ 6000 tons in 22 hrs. = 275 tons this would be safe and allow for inspection and minor repairs.

Adams Township, MI

Simons Cone Crusher

Morenci · 7 ft. Standard
were to be set at 1½ to 2". and they screened out – 7/8".
and split the product from one 7 ft. Standard Cone
to 2 – 7 ft. short heads. and predicted 800 ton per hour.

Now for White Pine Gruender says.

. at 5000 tons in 16 hours. = 300 tons. per hour.
a 5½ Standard set at 1¼" should produce
about 300 tons per hours and Product would
produce 30% – ¼ so it leaves. 200 tons to be
split between 2 – 5½ ft. short heads or 100 tons. which
is what each should handle in Closed circuit.
Making a Minus ¼" Product.

Cost. FOB Mil

wt.	5½ standard	$ 19,200	requires	200 HP Motor @
88,000 lb.	5½ " Shorthead "	$ 19.875	"	200 HP. " @
90,000 lb	5½ Heavy Duty "	$ 23.000.	"	200 HP. " @

46,000 to be handled by Crane or 25 ton.

Delivery 8 months. We would screen out ¼" Product of Standard.

If @	6000 ton in 15 hours.	= 400 tons	this may be to much for the above crush	
But @	6000 " " 18 "	= 333 "	" " " to close to be practicable	
" @	6000 ton " 20 "	= 300 "	" " " practicable	
" @	6000 ton 22 "	= 275 "	" would be safe and allow for inspection and Minor Repairs.	

Adams Township, MI

White Pine Hoist Notes

(Frank Spring
Otto Schubert
G. E. Co.)

15 hours hoisting — 1-3/4 rope balanced operation
15 seconds acceleration — 1 hoist for ore and 1 for cage
15 seconds diceleration — dyn. brak.
10 seconds loading
Cage 1 — 15,000 lbs — 2 decks 35 men each @ 200# = 14,000 # live
Rock 1800'/min. skip 14000 lbs + 20,000 live
1st chute 850'
2nd chute 1,225'
2,000' limit at 1,800 ft. can get 7,200 tons
1 - 500 HP 450 R.P.M. for cage at 1,200'/min.
2 - 800 HP 600 R.P.M. for ore at 3,125'/min.

Hoist design for 2,000' 40°C will get hotter at shorter runs but O.K.
Counterweight 22,000 lbs. = cage + ½ live + 15,000 + $\frac{14,000}{2}$

1,200 tons per 24 hr. Marcy Mill per section x 6 sections = 7,200 tons in 24 hr. mill
6 ton locomotive and est. 15 ton heaviest crusher part. 8 ton Conway cage 15 ft. x 5 ft.
D.C. Motor will normally carry 200% rating with peak 250%, will hoist larger load than it will lower - dynamic braking use slip regulator for controlling Induction motor speed to 15% variation.

Get price on Induction motor only for cage and also Induction motor plus generator plus DC Motor plus flywheel set.

6,200 HP x 360 days at mill and 5,050 HP x 310 days at mine
20,000 KW generator capacity

Estimated prices G.E.Co.

$100,000	1,600 HP (2 x 800)	Induction motor, DC gen., DC motor, flywheel
13,000	500 HP	Induction motor only
40,000	500 HP	Induction motor, DC gen., DC motor, flywheel
35,000	500 HP	Synchronous motor, DC gen., DC motor, flywheel
55,000	800 HP	Induction motor, DC gen., DC motor, flywheel
	600 HP	costs proportion = 1/5 over 500 HP

Spare 800 HP 600 RPM armature costs $8,000 to $10,000.

Flywheel eliminates high peak using an induction motor

Synchronous motor gives point peak

Induction motor only gives sustained peak

Adams Township, MI

Mather Hoist Notes (Moore and Spring)

20 seconds acceleration
15 seconds deceleration
15 seconds load

Balance operation

2,000'/min. cage 2 - 1500 HP 600 RPM DC hoist motor for ore
2,400'/min. ore 1 - 1500 HP 600 RPM DC hoist motor for cage

Cage has generator 1,250 KW, 1 motor 1500 HP flywheel.
Ore has two generators, 1,250 KW each, 1 motor 2500 HP 720 RPM flywheel and 40 KW exciter.
Generator and motor armatures are interchangeable - coupled.
Use amplidyne on each hoist. Generators 600 volts, exciter 250 V. Induction motor 2200 volt
Flywheel 103,000 lbs. WR^2 1,130,000 (radgyr 2/3) 117" dia. steel plates.
75 men in 2 decks in cage.
10 ton locomotive sectionalized.
Skip steel 12,000 lbs. 12 long tons live.
Cage aluminum 12,000 lbs. If steel equivalent to 16,000 lbs.
Flywheel cuts peak load from 4500 HP to 2500 HP with 15% control in slip regulator.
15,000 lb. live load on cage 75 men x 200 lbs.
Counterweight = cage weight plus $\frac{1}{2}$ live weight is standard practice.

Jan 19-1942

Impact Crushing by Symonds

Related by Mr. Gruender

Mr Symonds inventor of Symonds Cone Crusher has been working during the past 5 years on Impact Crushing at Yerington Nev. (?) Mr Gruender said Symonds is treating all kinds of ore in his experimental Plant when he crushes ore down to 1½" size by jaw crusher and then reduces it to -28 mesh by impact crushing. and claims he can free enough values in most ores. by this method to make grinding and classifier unnecessary he says he may sacrifice 10% of the values but avoids a greater cost than this for the crushing and grinding of these ore by Ball Mills & classifiers.

Dia of his impeller is 30" with 4" Penetration or 26" Mean of Impact. Dia. and velocity of this dia. is 9000 ft per Minute or 150 ft. per Sec. Gruender said their Impact Impellers operate at 9000 ft per min but in some instances had to go to 10,000 ft on limestone containing 3 to 4% Silica. To get break that would produce -10 Mesh product running 40% between -20 and +40 Mesh. Symonds also claims reduction down to ¼ Mesh can best be done by Standard & Short head Cone crusher and then follow this by Impact crushing. Symonds is using a vertical rotating vibrating screen and does his screening wet to produce products -28 Mesh and less.

If Symonds can produce -28 Product on machine
run @ 9000 ft per Minute at Mean Impact D.V.
then the Multi Impeller machine with opposing
velocities of same speed should produce a
considerably finer product because the breaking
energy varies as the square of the velocity and
if we have an equivalent velocity of twice
what he uses we should have nearly 4 times the
breaking force and certainly on the
White Pine Sandstone where grain size runs down to
65 Mesh This ore should readily break
down to this size by impact crushing
and probably eliminate 2/3 of the grinding and
classifying machinery necessary if done by
Grinding only. We should in turn our
machine in closed circuit and determine
how fine it will reduce this ore and
what capacity machine has when producing
this size product. The cost of this
reduction should be only a fraction of
the grinding cost. WHS.

5000

Double Drum 1 Reyel 1 clutch Drum 12 ft Dia x 78"

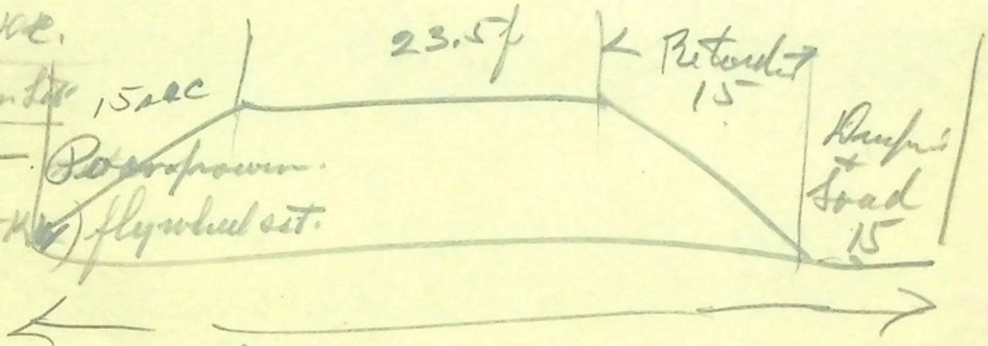
to hoist 20,000 lb of Ore in skip weight 14,000 lb

2000 = 9800 lbs. 1 3/4" factor 5.7.

if we produce 5000 ton in 16 hrs.

rope speed = 1400 ft per minute

2-600 HP Motor DC.
Synchronous Motor Gen Set
$ 68,000
with Induction
running light Loss 125 KW



15
15
15
23 1/2
68 1/2

HP. 1200 600

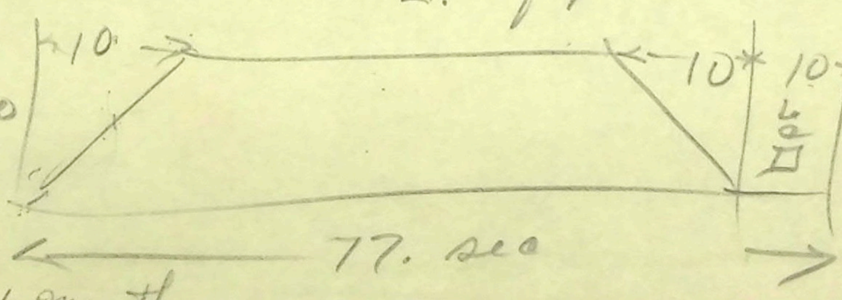
16) 5000
312.5 trips. at 10 ton 31.25 trip hour

that = 115 sec per trip.

Same hoist.

21.00 ft per sec.

2-750 = 1500



Delivery. 12-16 months
2 mo. less if Pinch. Hand. is disc.

$ 100,000 + 2000 automatic slow down

21
60
1260 ft.

cage hoist. $70,000 for 12" Single Drum Man Hoist.

Motor ½ of other
$35,000 motor

70,000
35,000
$105,000

Remaining light loss smaller
fly wheel set. probably 75 KW.

A1 best.

A.2 good. should get that

A1A in shaft. Gear & steal plates for Drums
Allocation so then plates could be rolled
in a certain month.

Cage Hoist - mill run 30,000 above AC.

" " Synchronous without Flywheel 20000 above AC.

Ore hoist Elec. ~~40,000~~ to 100000 Induction Motor Flywheel set. 2(600 RPM 1600 HP) 2-800 HP

Cage hoist. Induction Motor 450 RPM. (13,000 straight AC) (one) 500 HP. Motor

Induction Flywheel set - 500 HP 40,000 for add 400 HP. 1/5

Synchronous without Flywheel 35,000. 1/5

If Duplicate One Motor & Generator 55,000. 1/5

800 HP Max. Armature 600 RPM 10,000

90 00

at. 2000 on this can get 6650 16 hour. 1800.

at 1800 " " 7200 16 hour.

850

15,000 cars.

14000 Skips.

~~Counter~~

Cage Counter = cage wt plus ½ live load.

4 280

70

Counter wt = 72,000

Heaviest wt of Lectwich 36 x 48" crusher (?)

1350

6

8100

200 cal

5

10 00 000

33 200
7500
40,700

Shaft House

370 ton [illegible] cir. Bin.

[illegible] Erect Basis 219 sq. [illegible] of Corrug. Corr.

105,000 [illegible] Erected
5,000
100,000 [illegible]
exclusive of sheaves.

1.67 per hour for iron work

---

5) 7" (1
14
4
56

500 HH. 2700

700 HP 3400

700 = $5.80 per hour

3400 × 60 = 204,000) 5.09 per hour

(2.5 cts per 1000 cu ft.

Using 5 m. cu ft. per ton hoisted
= 2.5 [illegible] per ton Broken

6) 14²
24
168

30
05
150

2.5
2.5
6.25 cost per Ton of Rock for Air.

Drifting per day per unit.

Explosives 30.00
Labor 42.00

914 ton) 72.0 (.072

	.005
superv.	.03
Air Drill	.005
[illegible] & [illegible]	.002
Pump [illegible]	.008
[illegible]	.007
Hoist.	.006
Transp.	.002
Power Hauls	
	.137

Haulage

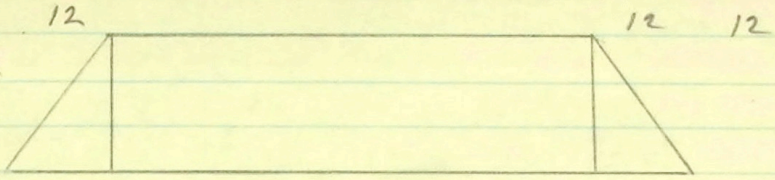
8
7
914) 56.00 (.06
.30

187
147
40

Ore Hoist

750 →

Requires 15 ton Crane



$\frac{6000 \text{ tons}}{15}$ = 400 trips at 10 tons or 40 trips per hour.

3600 ÷ 40 = 90 seconds per Trip.

90 sec − 24 = 66 seconds @ max Speed of 1820 ft. per minute or 30.3 ft/sec.

1st Hoisting level = 950 ft. 950 ÷ 30.3 = 31.5 sec.

31.5 sec + 24 = 5515 time per trip.

2nd Hoisting level = 1300 ft. 1300 ÷ 30.3 = 43 sec.

43 sec + 24 = 67 sec. time per trip.

3rd Hoisting level = 1600 ft. 1600 ÷ 30.3 = 52.8

52.8 + 24 = 76.8 sec. time per trip.

4rd. Hoisting level = 2000 ft. =

(Black Tuff.) steel Buildings.

Chimney 60 × 48 = 8" — 500 to 600 Tons. — Jaw. Co.

1st. hoist — level 55.5 sec. per trip × 2 = 111

2nd " " 67.0 sec. " " × 1 67

3rd " " 76.8 " " " × 1 76.8

4rd " " 90. " " " × 1 90.

5 | 345.0 (78 sec)

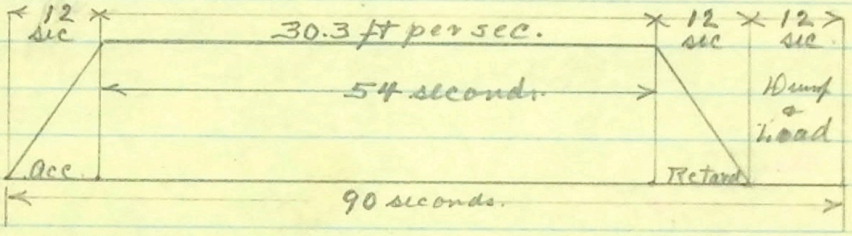
15-hour = 900 min 900 × 60 = 54000 sec 70 sec Avg time per trip when hoist proportionately for all levels.

$\frac{54000 \text{ sec}}{70}$ = 770 skips = 7700 tons per day.

$\frac{54000}{78}$ = 690 skips = 6900 tons per day.

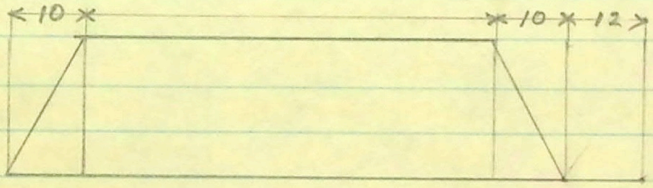
Ore Hoist.

Double Drum one Keyed one Clutch Drum 12 ft. dia x 78" wide
to hoist 20,000 lbs. of Ore in skips weighing 14000 lbs
2000 ft. of 1¾" Rope = 9800 lbs. factor = 5.7 times.
Hoisting 6000 tons. in 15 hours. rope speed would be 1820 ft per Min.



$\frac{6000 \text{ tons.}}{15 \text{ hours}}$ = 400 trips at 10 tons each or 40 trips. per hour.
3600 seconds = one hour. $\frac{3600}{40}$ = 90 seconds per Trip.
90 sec − 24 = 66 seconds @ Max Speed. $\frac{66}{60}$ = 1.1 Minute per trip.
$\frac{2000}{1.1}$ = 1820 ft. per Minute Rope Speed. or 30.3 ft per sec.

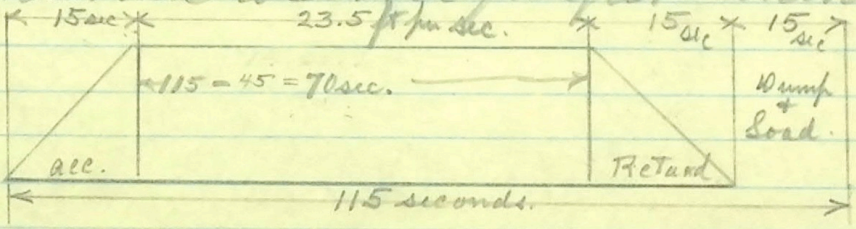
Same hoist to hoist 7200 tons in 15 hours. rope speed would be ft per Min



$\frac{7200 \text{ tons.}}{15}$ = 480 trips. at 10 tons. or 48 trips. per hour.
$\frac{3600}{48}$ = 75 seconds per trip.
75 sec − 22 = 53 seconds @ Max Speed. = .883 Minute per trip.
$\frac{2000}{.883}$ = 2265 ft. per Minute Rope Speed. or 37.75

Ore Hoist.

Double Drum one Keyed one clutched Drums 12 ft Dia x 7 ft
to hoist. 20,000 lbs. of Ore in skips weighing 14000 lbs.
2000 ft. of 1-3/4" Rope = 9800 lbs. factor = 5.7
If we produce 5000 tons in 16 hours.
rope speed would be 1400 ft. per minute.



$\frac{5000 \text{ tons}}{16 \text{ hours}} = 312.5$ trips at 10 tons each $= 31.25$ trips per hour.

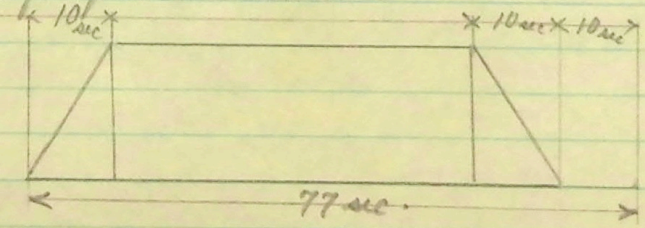
60 minute x 60 second = 3600 sec per hour.

$\frac{3600}{31.25} = 115$ seconds per trip.

115 second per trip.
30
85 second at max speed $\frac{2000 \text{ ft.}}{1.42 \text{ min.}} = 1410$ ft. per minute Rope speed. ✓

$\frac{85}{60} = 1.417$ minute per trip. Requires 2-600 HP. DC Motors with Synch. Motor Gen Set with flywheel and induction Motor 68000 Run light. Sum 125 KW.

Same Hoist If we produce 7500 tons in 16 hours.
Rope speed = 2100 ft. per minute.

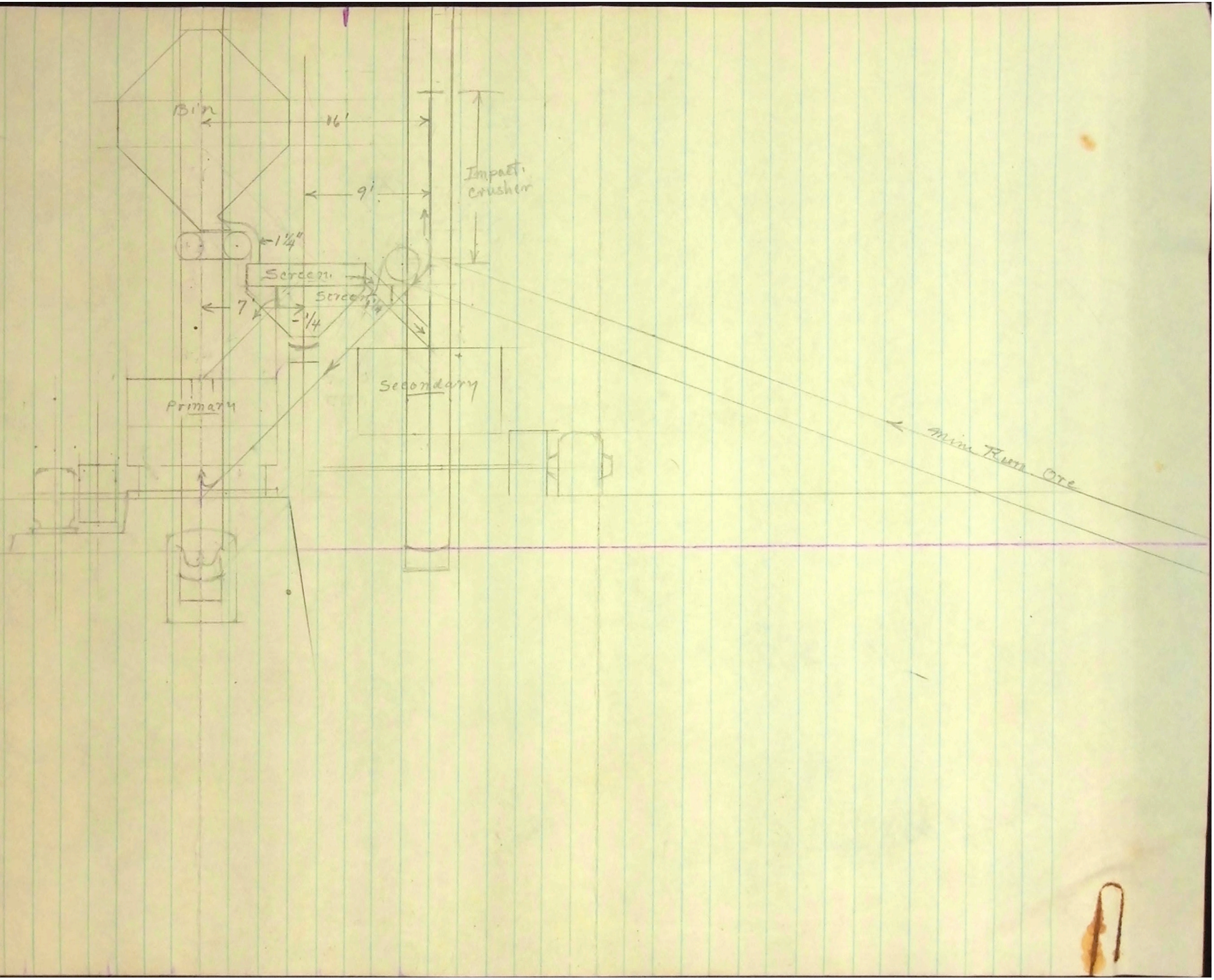


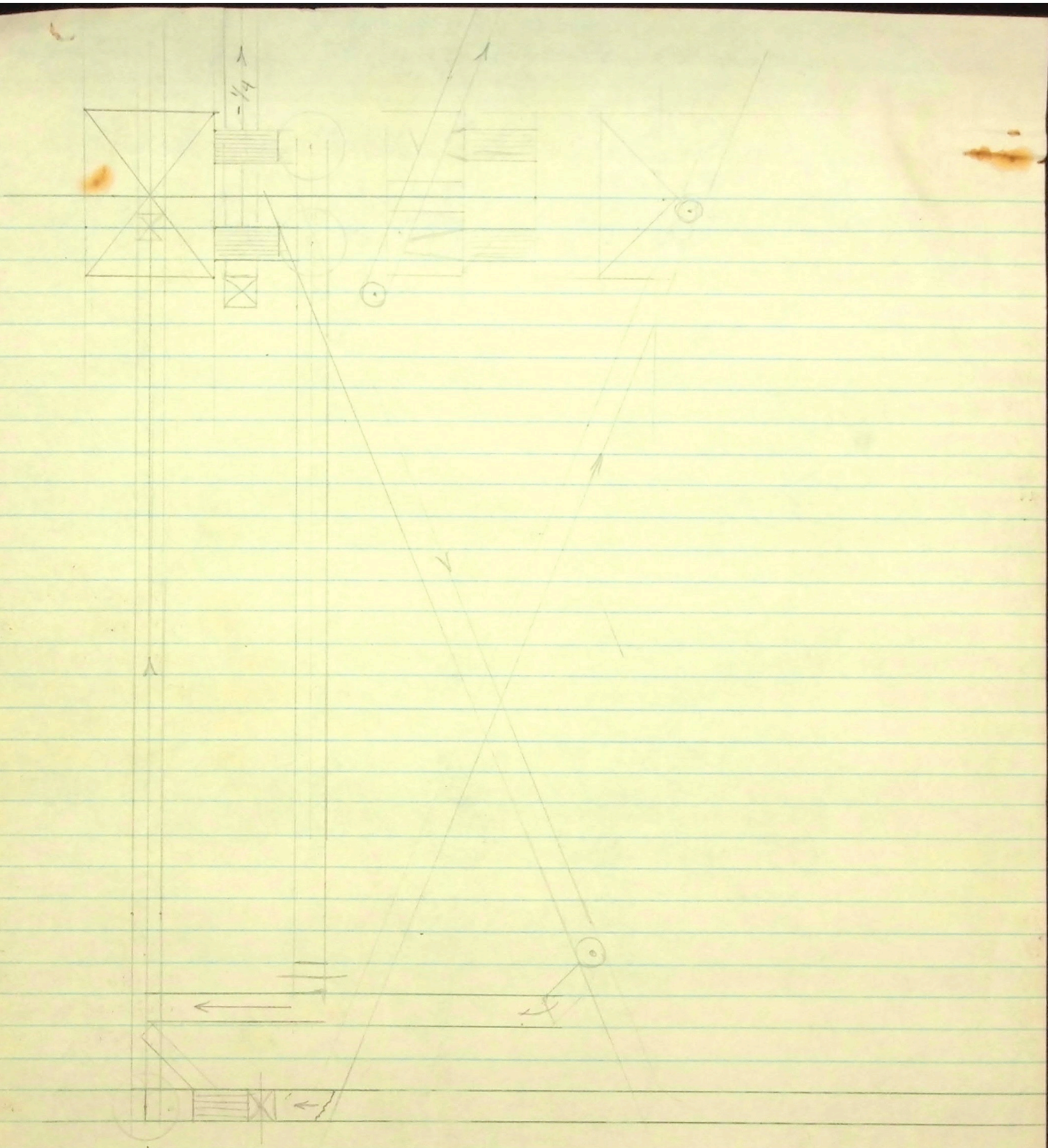
1800

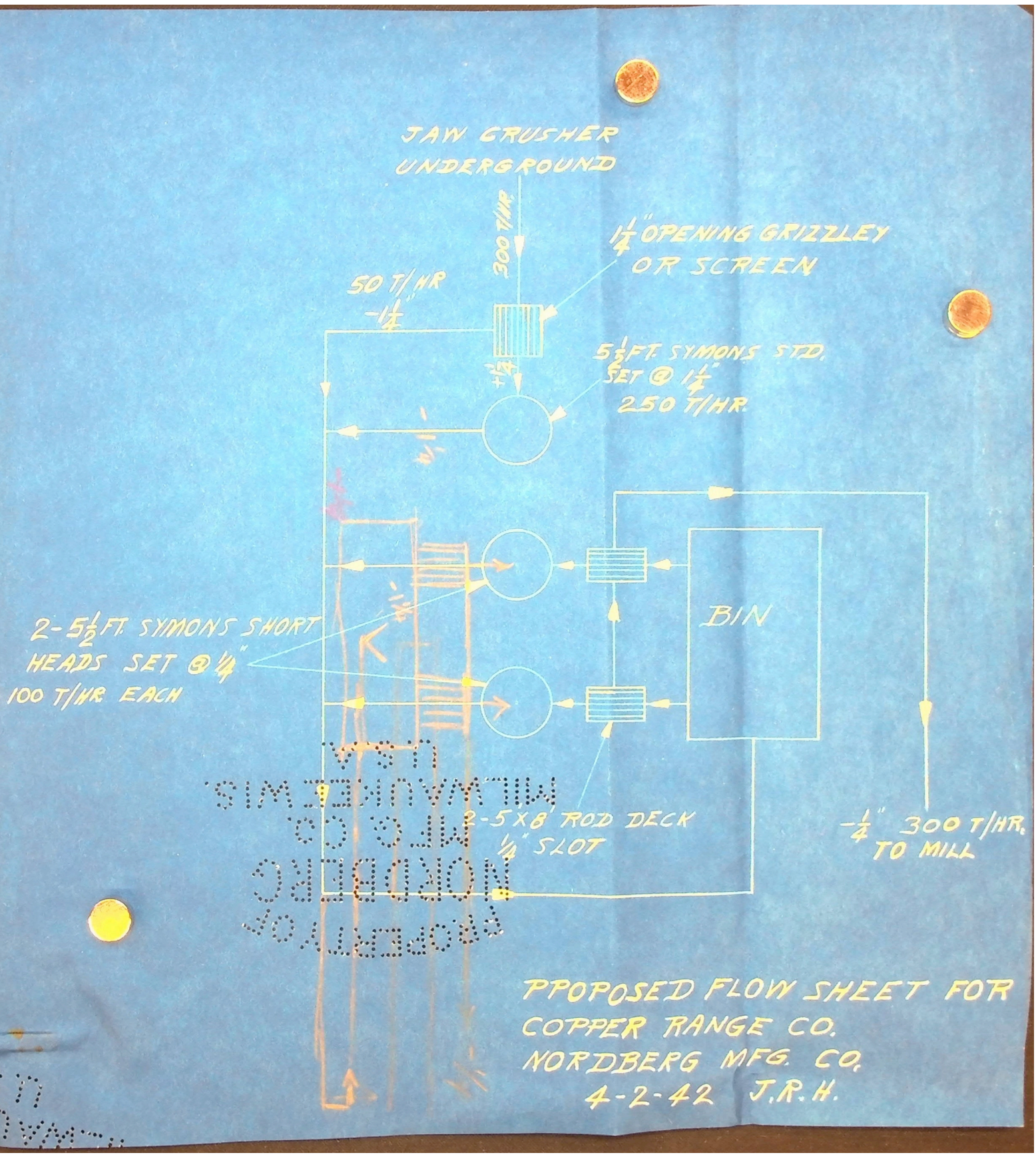
$\frac{7500 \text{ tons}}{16} = 469.$ trips at 10 tons each $= 46.9$ trips per hour $\frac{3600}{46.9} = 77$ sec/trip.

77
20
57 sec at max Spud $\frac{57}{60} = .95$ minutes per trip. $\frac{2000}{.95} = 2100$ ft. per minute Rope Speed.

Requires 2-750 HP. Motors. Delivery 12-16 months. and 2 mo. less if Hoist same as Park. Math is used.
Hoist $106,000 + 2000$ for Automatic Slow Down.


Bin
16'
9'
Impact crusher
1¼"
Screen
Screen
7'
¼
¼
Primary
Secondary
Mine Run Ore




JAW CRUSHER
UNDERGROUND
300 T/HR
1¼" OPENING GRIZZLEY
OR SCREEN
50 T/HR
-1¼"
+1¼"
5½ FT. SYMONS STD.
SET @ 1¼"
250 T/HR.
2-5½ FT. SYMONS SHORT
HEADS SET @ ¼"
100 T/HR EACH
BIN
2-5'X8' ROD DECK
¼" SLOT
-¼" 300 T/HR.
TO MILL
PROPOSED FLOW SHEET FOR
COPPER RANGE CO.
NORDBERG MFG. CO.
4-2-42 J.R.H.