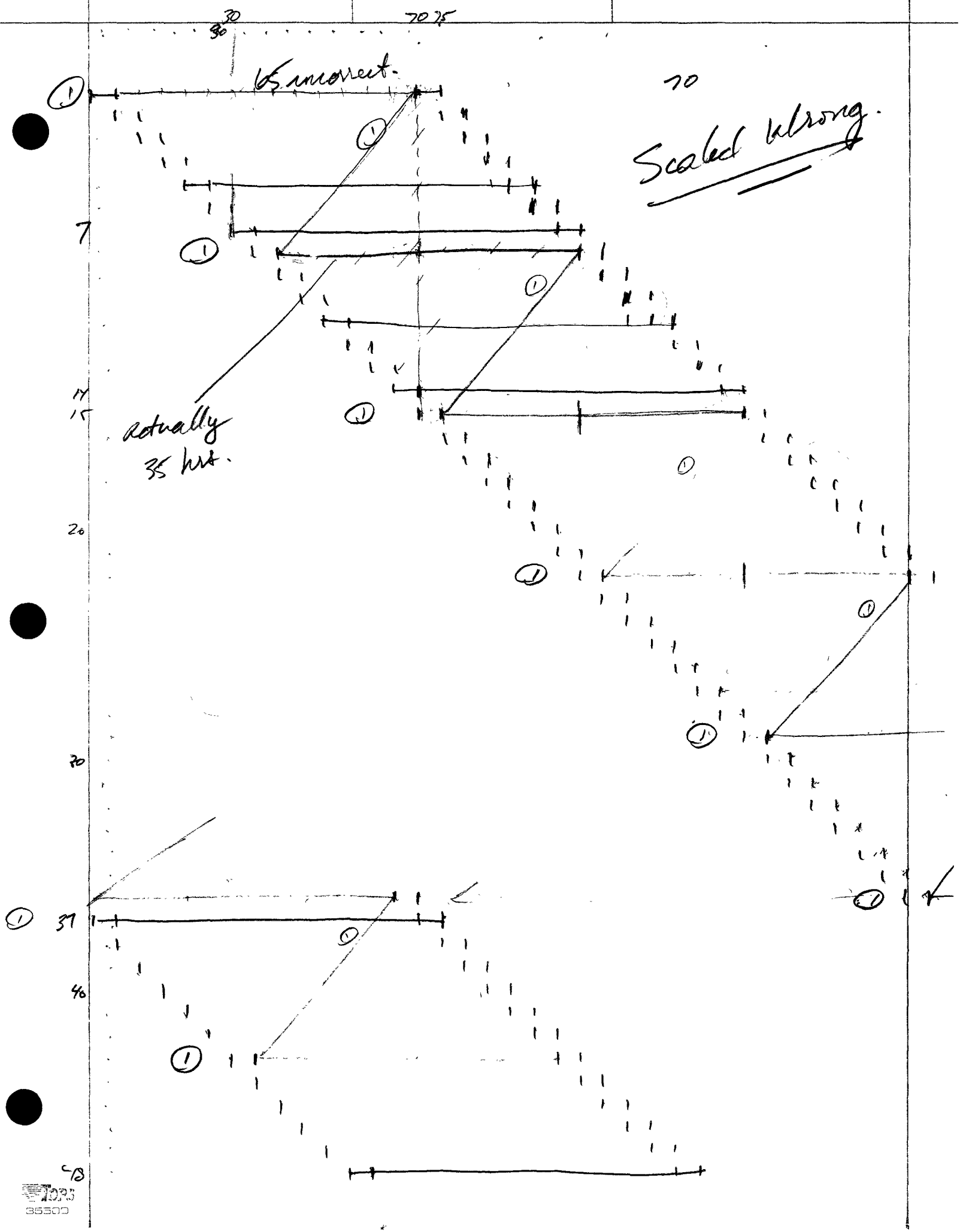
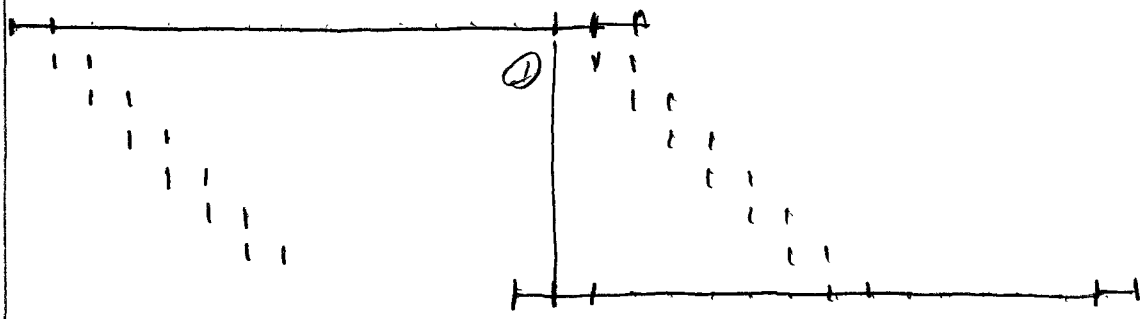

30
70 75
Incorrect.
70
Scaled wrong.
7
14
15
actually
35 hrs.
20
30
37
40
48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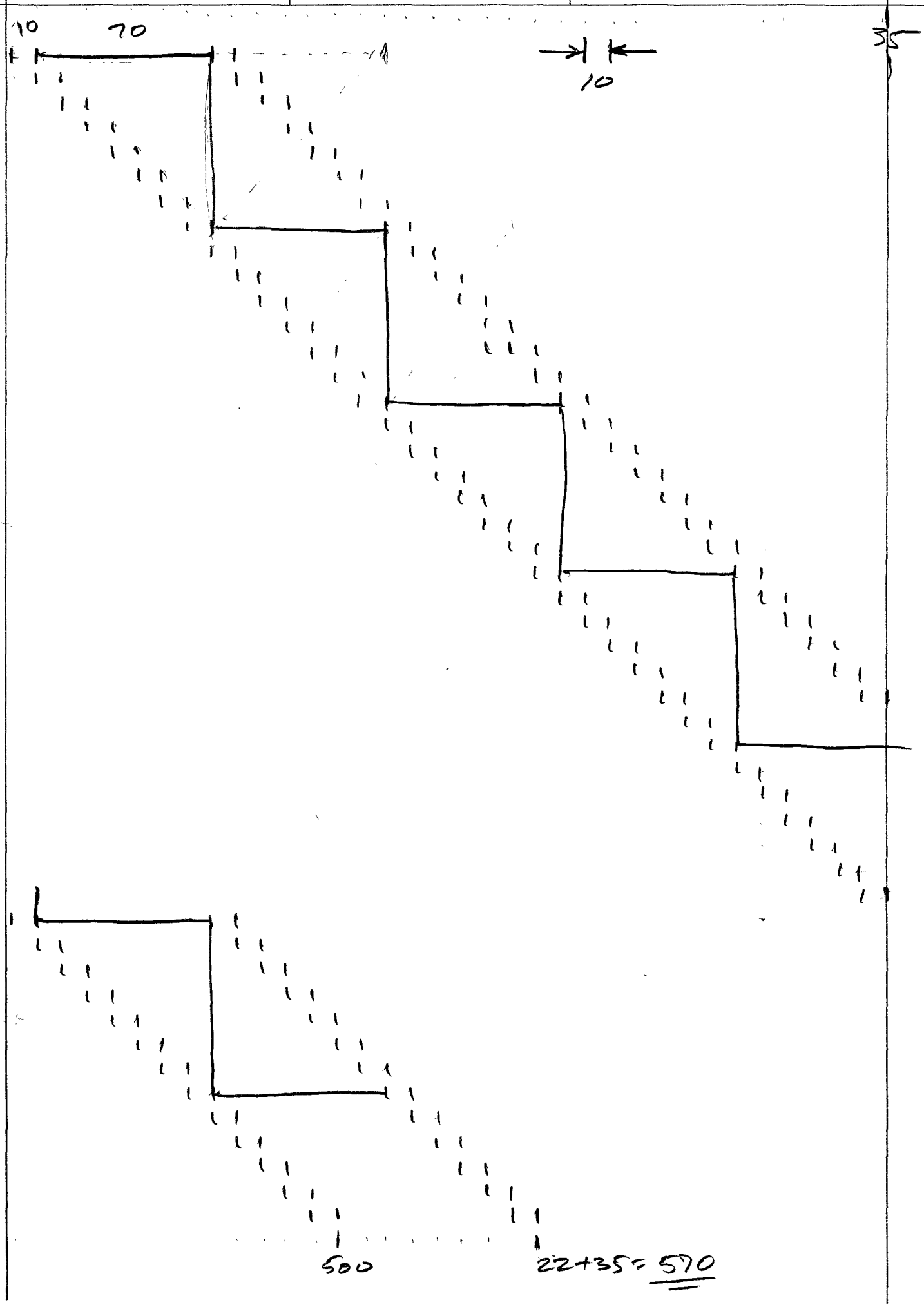
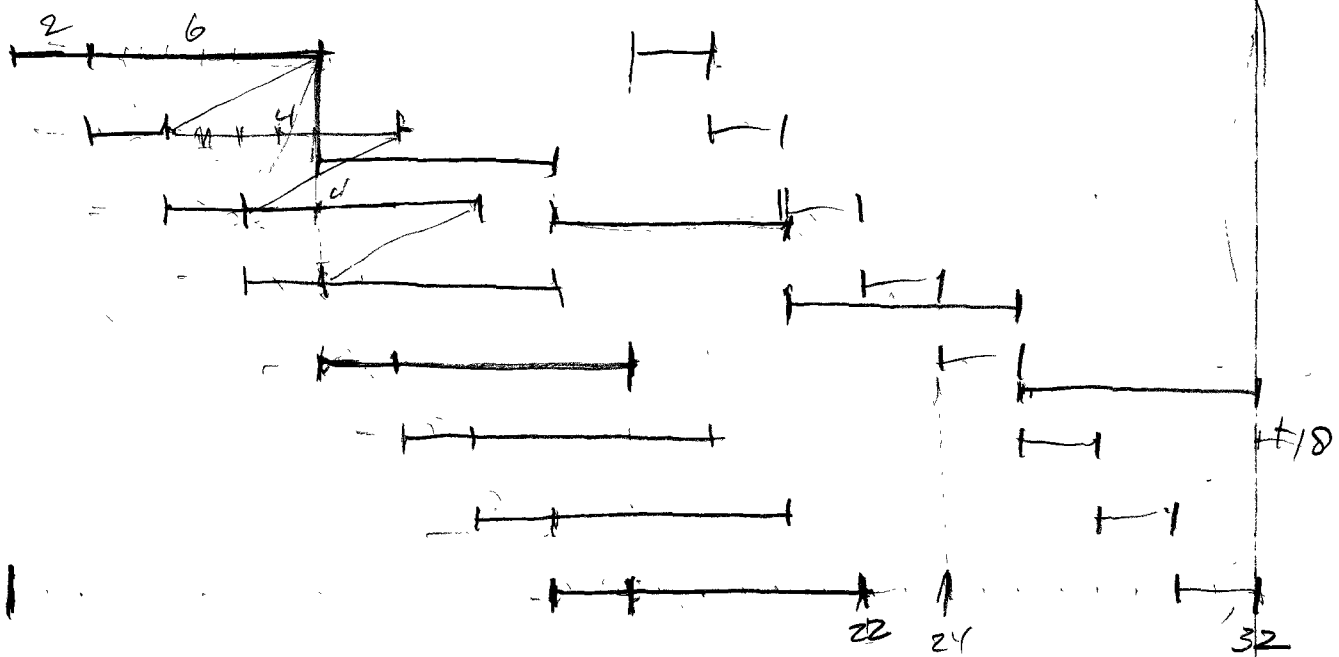


TOPS 35500



$$\begin{array}{r} 32 \\ +18 \\ \hline 50 \end{array}$$

$6 + 4(7)$

$4(7) = 28$

$$\begin{array}{r} 22 \\ \hline 50 \end{array}$$

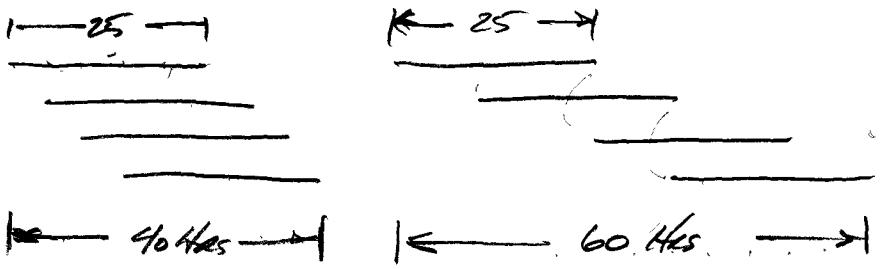
One Man

$1(6)(8) = \underline{\underline{48}}$ man-hours.

Two-Men

$2(6)(4) = \underline{\underline{48}}$ man-hours.

TOPS
35500



4 men

$4(25) = 100$

$4(40) = 160$

2 men

$4(25) = 100$

$2(50) = 100$

$2(60) = 120$

$3 \times 7 = 21$ men.

$(72 \text{ hrs/burner})(3 \text{ men/burner})(48 \text{ burners})$

$3 \times 72 \times 48 = 3 \times 7 \times U$

$U = \dfrac{3 \times 72 \times 48}{3 \times 7} = 493 \text{ hrs}$

$21 \quad \underline{30\%} \quad \boxed{\dfrac{3 \times 72 \times 48}{80\%}}$

TOPS 35500

$$\frac{(26)(500)}{48 \text{ burners}} = \frac{13{,}000}{48} = 270 \frac{\text{man-hours}}{\text{burner}}$$

$270 \frac{\text{man-hours}}{\text{burner}}$ Pull & Push

$3(72) = 216 \frac{\text{man-hours}}{\text{burner}}$ Repair

$$\left[486 \frac{\text{man-hours}}{\text{burner}}\right](48 \text{ Burners}) = 23{,}328 \text{ man-hours}$$

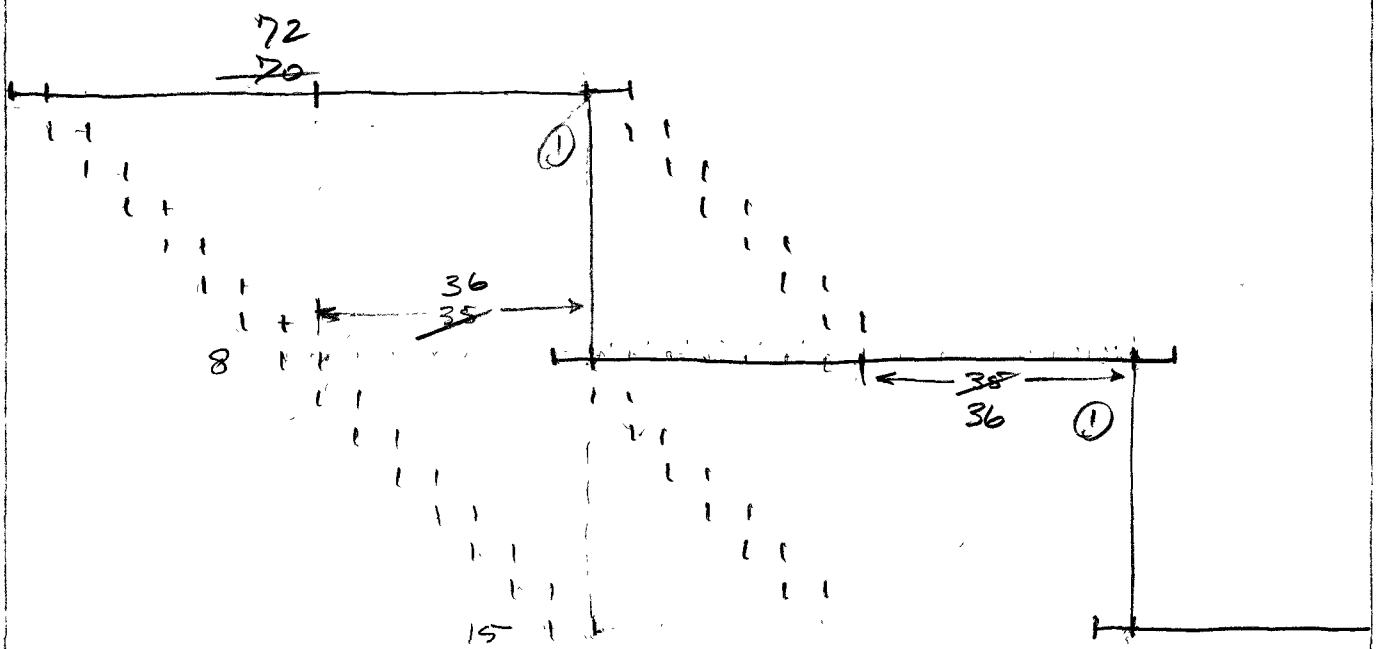
vs. 13,000

$$\frac{\left[23{,}328 \text{ man-hours}\right]}{47 \text{ men}} = 500 \text{ hrs.}$$

$$\begin{array}{r} 26 \\ +21 \\ \hline 47 \end{array}$$ men.

Double man-hours but then doubled the manpower. ∴ Takes the same amount of time.

TOPS



21 men

7x3 Teams. 36 hr delay for each burner the team works on.

# of burners/team $48/7 = 6.9$

$6.9(36) = 248$ hrs.
$+ 72$ first burner.
320
$+ 504$ pull and push all burners.
824 hrs.

42 Men

14x3 Teams. 0 hr delay for each burner

$48/14 = 3.4$

$3.4(0) = 0$
$+ 72$ first burner
72
$+ 504$ pull and push all burners
576 hrs.

TOPS 35500

Burner Repair Costs

Total Costs

Number of Burners	Labor	Material	Cost Per Burner	Grand Total
48	$1,797,023	$937,560	$56,970	**$2,734,583**

Labor For Burners

Hourly Rate =	$27.50	*Total Man-Hours =*	34168
Burden Rate =	53%	*RG hrs =*	17084
Total Hourly Rate =	$42.08	*OT hrs =*	17084
Overtime Percentage =	100%		

(i.e. 40 hrs RG & 40 hrs OT = OT 100%)

$$\left(\frac{H_{TOT}}{1+OT_{\%}}\right)H_R + \left(H_{TOT} - \frac{H_{TOT}}{1+OT_{\%}}\right)H_R(1.5)$$

Function	Manpower	Hours	Man-Hours	Cost/Burner	Total Cost	
Remove All Burners	26	250	6500	$7,122	$341,859	*250 Hrs of Clock Time*
Upfront Setup						
Remove Insulation						
Remove Elbow & Diffuser						
Remove Nozzle						
Gouge Out Cover Plate						
Remove Burner						
Repair Work	42	504	21168	$23,194	$1,113,305	*Adds 72 Hrs to Clock*
Outer Register						
Front Plate						
Back Plate						
Vanes						
Back Plate						
Inner Register						
Spin Vanes						
Reinstall All Burners	26	250	6500	$7,122	$341,859	*250 Hrs of Clock Time*
Reinstall Nozzle						
Reinstall Elbow						
Reinstall Insulation						
Total			34168	$37,438	**$1,797,023**	

– 8% for small tools & consumables.

– Tool Rentals.

Material For Burners

SYM	*Component*	*Material*	*QTY*	*Brn's to Repair*	*Cost/Comp*	*Cost/Burner*	*Total Costs*
A	Outer Sliding Sleeve	Flat Bar, 3/16" x 18'	1	48	$400	$400	$19,200
	Outer Registers						
C	Front Plate	1/2"? Plate, 6'3" OD x 40" ID	1	48	$1,800	$1,800	$86,400
B	Back Plate	1/2"? Plate, 6'3" OD x 58" ID	1	48	$1,800	$1,800	$86,400
	Bracket (Between Plates)	Angle Iron, 3" x 3" x 11"	16	48	$50	$800	$38,400
	Doors (Vanes)		16	48	$100	$1,600	$76,800
	Gussets	Angle Iron?,	8	48	$25	$200	$9,600
h	Bell Crank		16	48	$100	$1,600	$76,800
	Door Shafts (Hinge Pins)	11"	16	48	$100	$1,600	$76,800
d,e	Linkage, Turnbuckles	Approx 16" x 1/2"	16	36	$40	$480	$23,040
D	Throat Sleeve	Pipe, 58" OD x 9-1/8"	1	48	$200	$200	$9,600
F	Coal Nozzle	Pipe, 22"ODx21"IDx10'5-5/8"	1	2	$15,000	$625	$30,000
	Nozzle End	Alloy Pipe, 22"OD x 21"ID x 22"	Included above				
G	Inner Air Sleeve	Alloy Pipe, 40" ID x 20-5/8"	1	48	$1,800	$1,800	$86,400
H	Segmented Coal Elbow		1	0	$0	$0	$0
L	Cover Plate (Outside Wall)	1/2"? Plate, 6'10-1/8" x 24"ID	1	2	$300	$13	$600
M	Mounting Plate (Outside Wall)		1	48	$50	$50	$2,400
P	Handle/Quad (Vane Control)	3/4"?x 7' 9-1/8" Rod	1	48	$20	$20	$960
Q	Handle/Operator (Slide Control)	3/4" x 7' 10-1/4" Rod	1	48	$20	$20	$960
R	Handle/Quad (Outer Register)	3/4" x 8' 6-3/8" Rod	1	48	$20	$20	$960
	Stabilizer	S/N 68962,68963	1	48	$5,000	$5,000	$240,000
S	Oil Lighter		1	0		$0	$0
T	Observation Door		1	0		$0	$0
U	Scanner Support Ass'y		1	0		$0	$0
V	Register Support Bracket	C-Channel, 6" x 2" x 9' total	1	24	$50	$25	$1,200
	Inner Registers						$0
W	Air Vanes (Spin Vanes)	1/4" Plate	8	24	$100	$400	$19,200
	Gear Drive/Bell Crank		8	12	$250	$500	$24,000
	Linkage, Turnbuckles	Approx 12" x 1/2"	8	12	$40	$80	$3,840
AL	Scanner Pipe	Pipe, 3" Sch 40 X 6' 10"	1	48	$100	$100	$4,800
	Back Plate (Air Damper)		1	0		$0	$0
	Sliding Damper		1	24	$800	$400	$19,200
	Total					$19,533	$937,560

4 (800)
8% for small tools, and consumables.

Phil Hailes

BurnerRepairCostsALLBURNERS.xls

IP7_030216

Total Cost, If All Burners Repaired

$19,200
$0
$86,400
$86,400
$38,400
$76,800
$9,600
$76,800
$76,800
$30,720
$9,600
$720,000
$86,400
$0
$14,400
$2,400
$960
$960
$960
$240,000
$0
$0
$0
$2,400
$0
$38,400
$96,000
$15,360
$4,800
$0
$38,400
$1,772,160

$$T_{\$} = \left(\frac{H_{TOT}}{1+\frac{OT\%}{100}}\right) H_R + \left(H_{TOT} - \frac{H_{TOT}}{1+OT\%}\right) H_R (1.5)$$

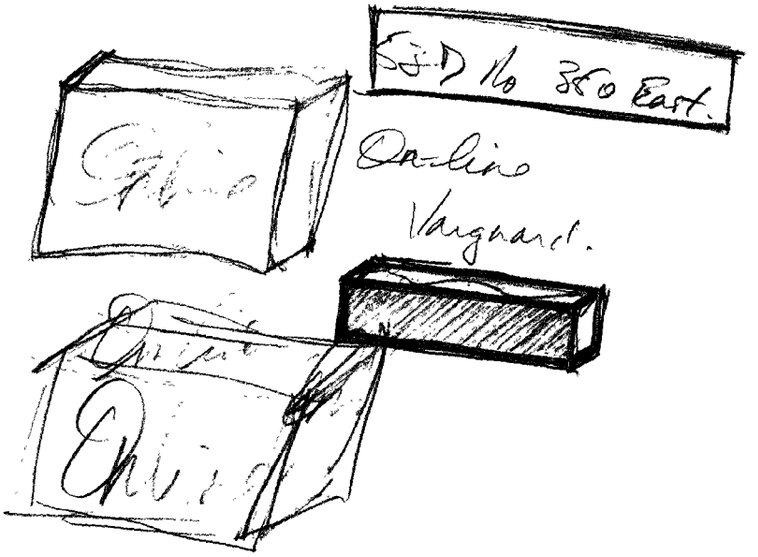
$$= (h_{RG}) H_R + (h_{OT}) H_R (1.5)$$

$$h_{RG} + h_{OT} = H_{TOT}$$

$$\boxed{h_{RG} = \frac{H_{TOT}}{1+OT\%}}$$

$$h_{OT} = H_{TOT} - h_{RG}$$

$$\boxed{= H_{TOT} - \frac{H_{TOT}}{1+OT\%}}$$



Vanguard	Fidelity	Fidelity
Janus	Vanguard.	Vanguard.
Janus	Preffered.	Preferred.
Mercury.	Putnam.	Putnam.

Vanguard.
ST Bond.
IT Bond.
Prime Money Mkt.
Index 500.