

THE HELIXSONGS, AND A BAGPIPE SCALE

The HelixSongs are a set of structures made of the combination of two intersecting harmonic series, each spanning an octave.

Originally the HelixSongs were made into instruments using (but not limited to) 2 inch aluminum tubing. There are three rows of tubes with an upper and lower harmonic series and a middle row where the tones found in both series are placed.

This middle row also contains the starting and ending point of each series which need not start with 1 or its octave multiples. In fact, the one based on F uses harmonics 6 to 12.

Later HelixSongs show different sections of the harmonic series in combination but still beginning and ending on a shared middle row tone.

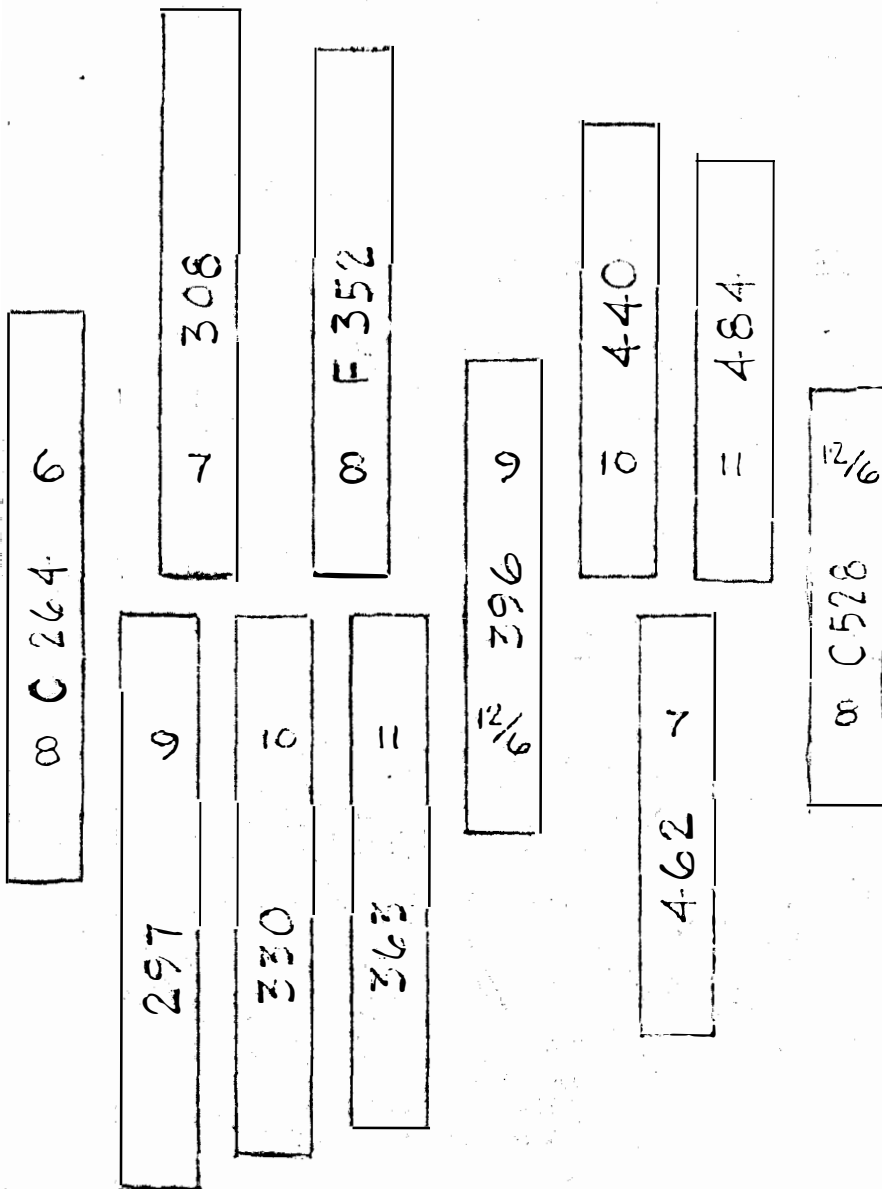
The 11-limit and 17-limit HelixSongs in this paper contain two harmonic series that intersect at points that are a $3/2$ apart. Wilson also includes an example where the harmonic series intersect at a tritone ($10/7$).

While the HelixSongs are presented in a harmonic context and the Diaphonic Cycles (see <http://anaphoria.com/diaphonicset.pdf>) in a subharmonic context, both can be realized in either form. They can be considered complementary opposites of each other.

"Helix Song" Musical Instrument

Harmonic, 11-Limit

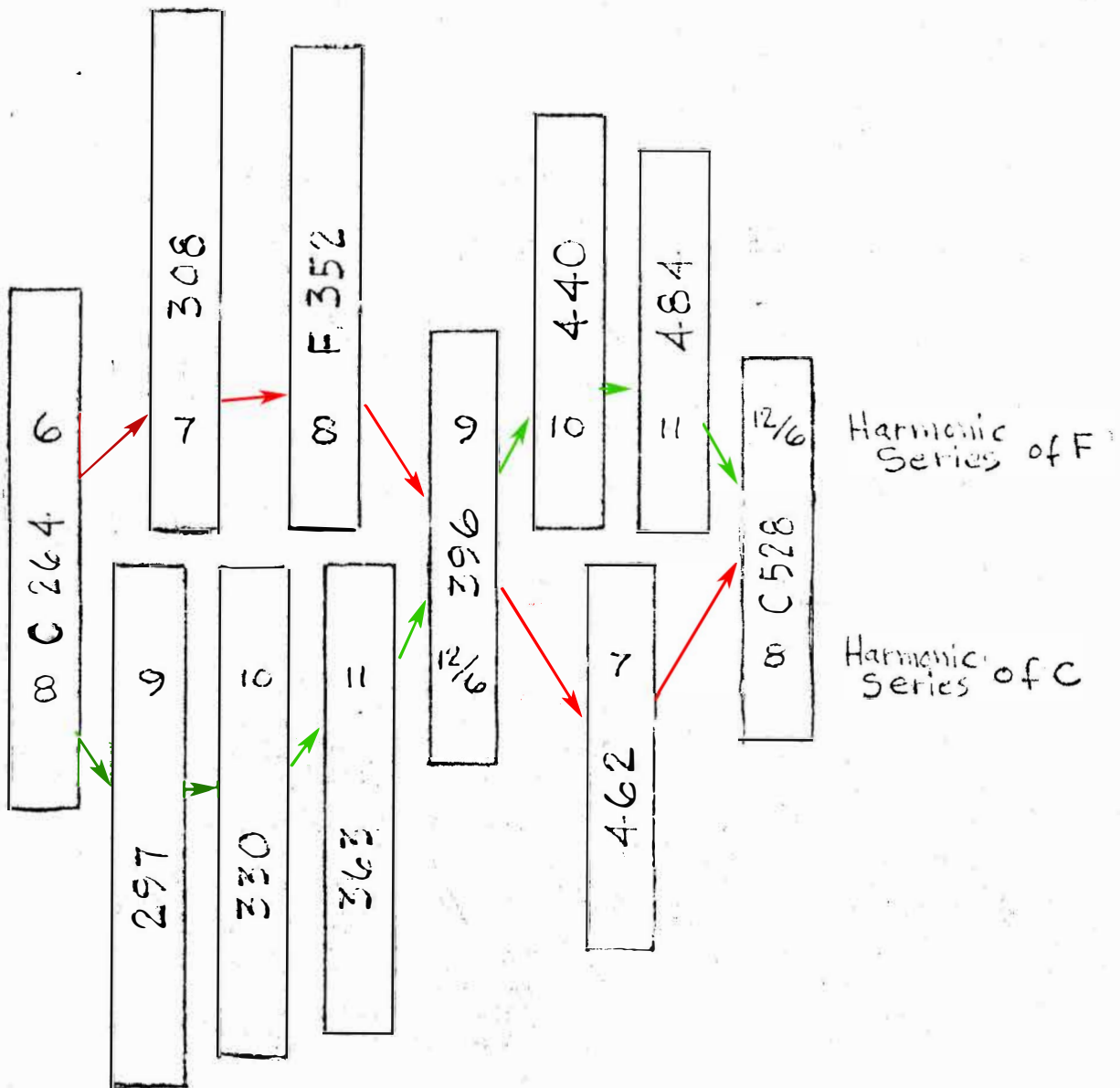
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"Helix Song" Musical Instrument

Harmonic, 11-Limit

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"Helix Song" Musical Instrument

Harmonic, 17-limit

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F harmonic
Series

C harmonic
Series

12
16 C 528

11
= 484

15
B 495

14
462

10
A 440

13
429

$\frac{10}{9}$
12 G 396

17
374

11
363

16
F 352

15
10 E 330

14
308

9
D 297

13
286

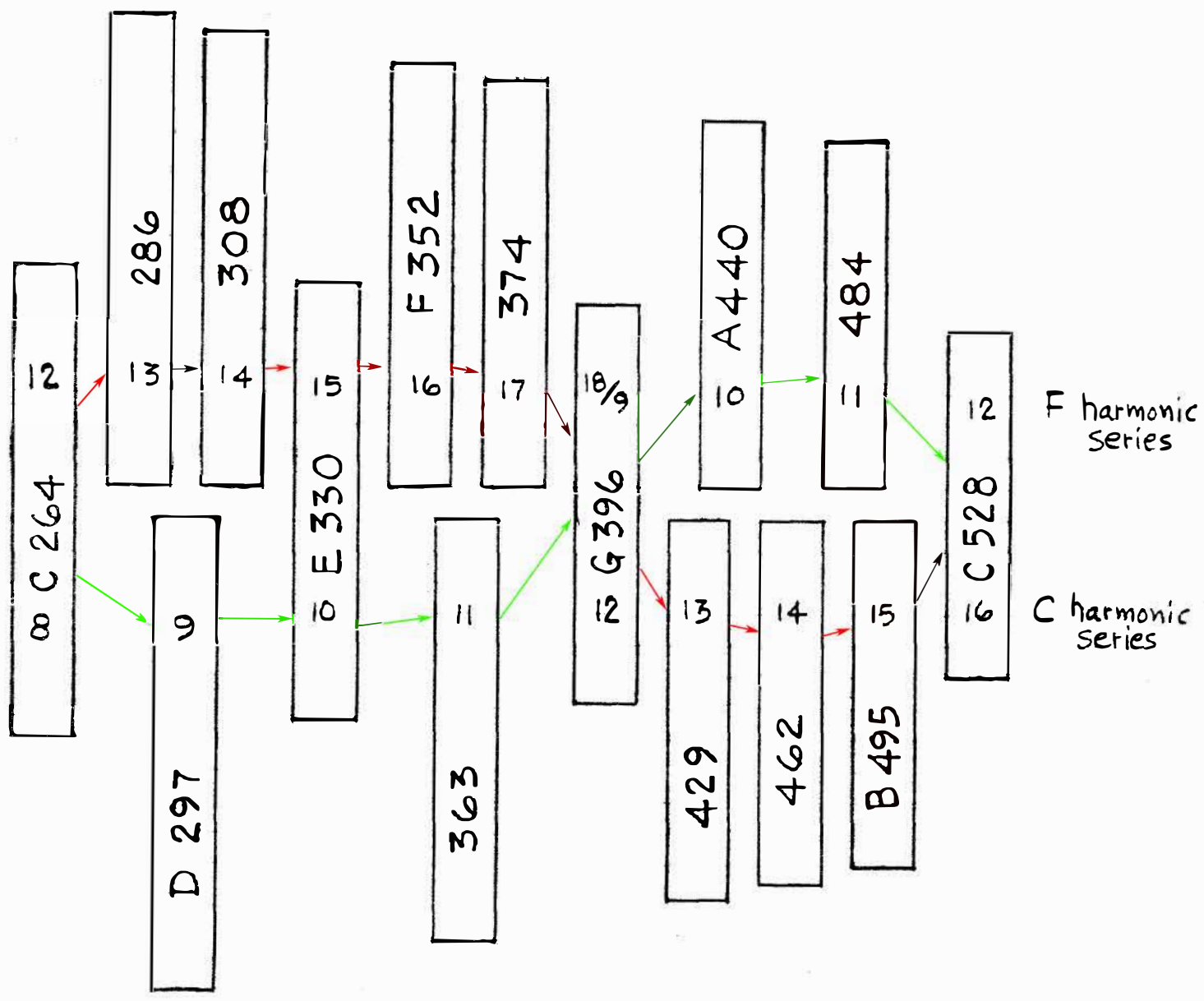
12
8 C 264

"Helix Song" Musical Instrument

Harmonic, 17-limit

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2 Forms of the Helix Sing E.W. 4-14-90

1/1	7/6		4/3		3/2		5/3		11/6		2/1
7/6		8/7		9/8		10/9		11/10		12/11	
9/8	28/27	15/14	16/15	33/32	12/11	10/9	21/20	22/21	12/11		
9/8	10/9		11/10		12/11	7/6		8/7			
1/1	9/8		5/4		11/8		3/2		7/4		2/1



1/1	13/12		7/6		5/4		4/3		17/12		3/2		5/3		11/6		2/1		
13/12		14/13		15/14		16/15		17/16		18/17		10/9		11/10		12/11			
13/12		27/26	28/27	15/14		16/15		33/32	34/33	18/17		13/12		40/39	21/20	22/21	45/44	16/15	
9/8			10/9			11/10			12/11			13/12		14/13		15/14		16/15	
1/1	9/8			5/4			11/8			3/2			13/8			7/4		15/8	2/1



2 Forms of the Helix Song E.W. 4-14-90

$1/1$	$7/6$		$4/3$		$3/2$	$5/3$	$11/6$		$2/1$
$7/6$		$8/7$		$9/8$		$10/9$	$11/10$		$12/11$
$9/8$	$28/27$	$15/14$	$16/15$	$33/32$	$12/11$	$10/9$	$21/20$	$22/21$	$12/11$
$9/8$	$10/9$		$11/10$		$12/11$	$7/6$		$8/7$	
$1/1$	$9/8$		$5/4$		$11/8$	$3/2$	$7/4$		$2/1$



1/1	13/12		7/6	5/4	4/3	17/12	3/2	5/3		11/6		2/1							
13/12		14/13		15/14		16/15		17/16		18/17		10/9		11/10		12/11			
13/12		27/26	28/27	15/14		16/15		33/32	34/33	18/17		13/12		40/39	21/20	22/21	45/44	16/15	
9/8			10/9			11/10			12/11			13/12		14/13		15/14		16/15	
1/1	9/8			5/4			11/8			3/2		13/8		7/4		15/8		2/1	

Helix Song
 (in the harmonic genus
 where Diaphonic Cycles of 12 & 17 tones
 intersect on the frequency ratio $10/7$)

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4 231 21

22 242

23 253

B 247.5 15

6 C 264 24

25 275

280.5 17

26 286

8 D 297 27

28 308

313.5 19

29 319

20 E 330 $\frac{30}{15}$

346.5 21

16 F 352

363 22

17 374

379.5 23

24 G 396 18

412.5 25

19 418

429 26

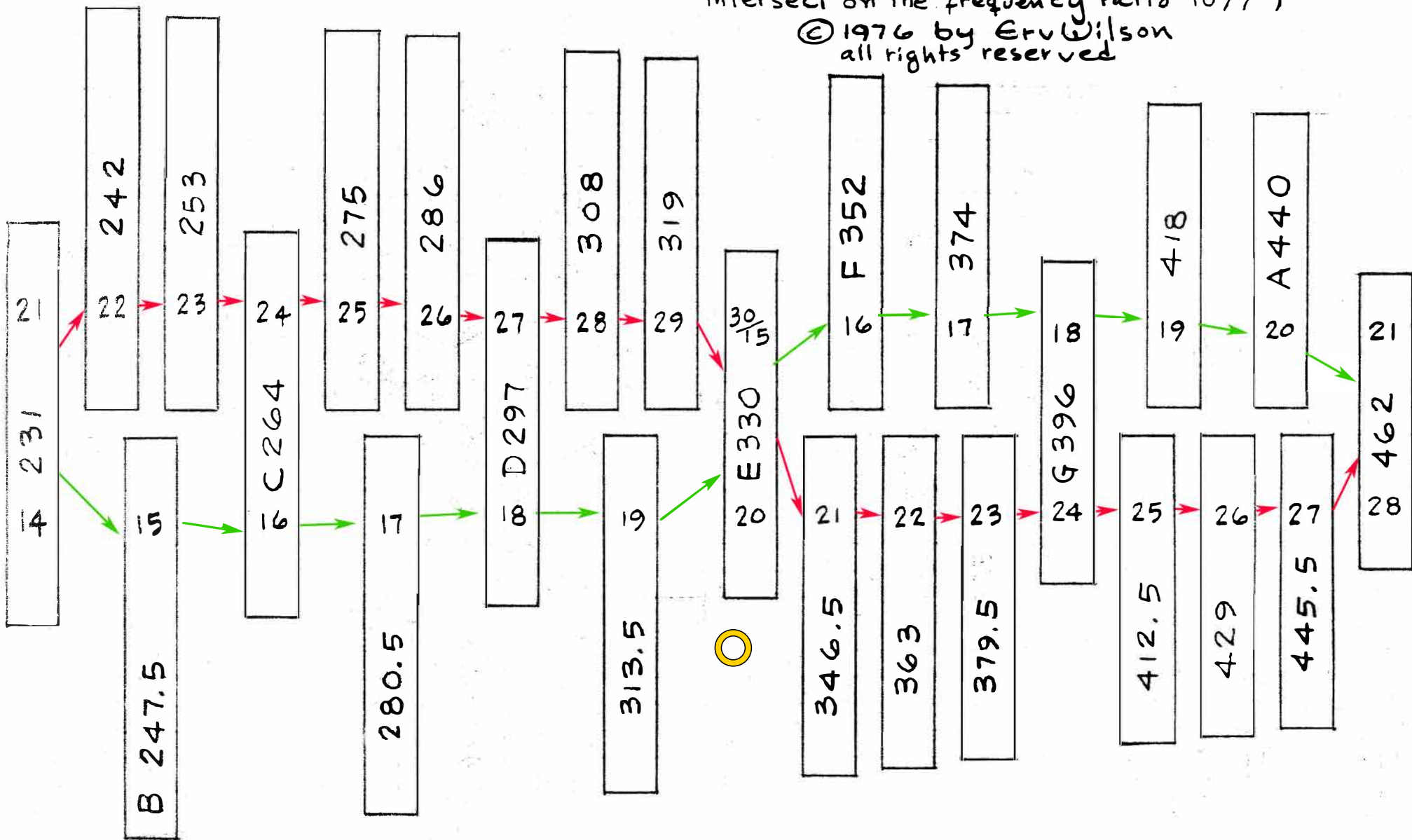
20 A 440

445.5 27

28 462 21

Helix Song
(in the harmonic genus
where Diaphonic Cycles of 12 & 17 tones
intersect on the frequency ratio $10/7$)

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$21/20$	$22/21$	$23/22$	$24/23$	$25/24$	$26/25$	$27/26$	$28/27$	$15/14$	$16/15$	$17/16$	$18/17$	$19/18$	$20/19$										
$21/20$	$\frac{64}{63}$	$\frac{33}{32}$	$\frac{34}{33}$	$\frac{69}{68}$	$24/23$	$25/24$	$\frac{76}{75}$	$\frac{39}{38}$	$\frac{40}{39}$	$\frac{81}{80}$	$28/27$	$22/21$	$\frac{45}{44}$	$\frac{46}{45}$	$24/23$	$25/24$	$\frac{51}{50}$	$\frac{52}{51}$	$27/26$	$28/27$	$\frac{57}{56}$	$\frac{58}{57}$	$30/29$
$16/15$	$17/16$	$18/17$	$19/18$	$20/19$	$21/20$	$22/21$	$23/22$	$24/23$	$25/24$	$26/25$	$27/26$	$28/27$	$29/28$	$30/29$									

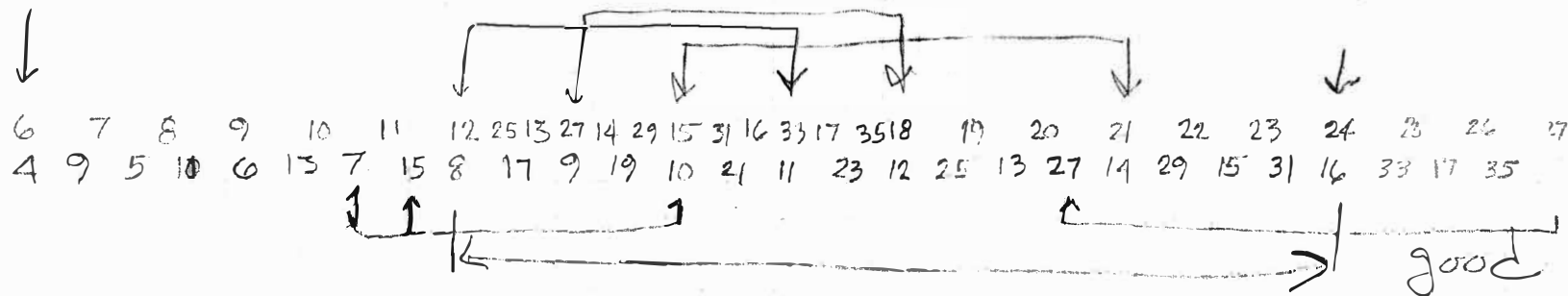
21/20	22/21	23/22	24/23	25/24	26/25	27/26	28/27	15/14				16/15			17/16		18/17		19/18		20/19		
21/20	$\frac{64}{63}$	$\frac{33}{32}$	$\frac{34}{33}$	$\frac{69}{68}$	24/23	25/24	$\frac{76}{75}$	$\frac{39}{38}$	$\frac{40}{39}$	$\frac{81}{80}$	28/27	22/21	$\frac{45}{44}$	$\frac{46}{45}$	24/23	25/24	$\frac{51}{50}$	$\frac{52}{51}$	27/26	28/27	$\frac{57}{56}$	$\frac{58}{57}$	30/29
16/15		17/16		18/17		19/18		20/19		21/20		22/21	23/22		24/23	25/24	26/25	27/26	28/27	29/28	30/29		



3 4 5 6
4 5 6 7 8



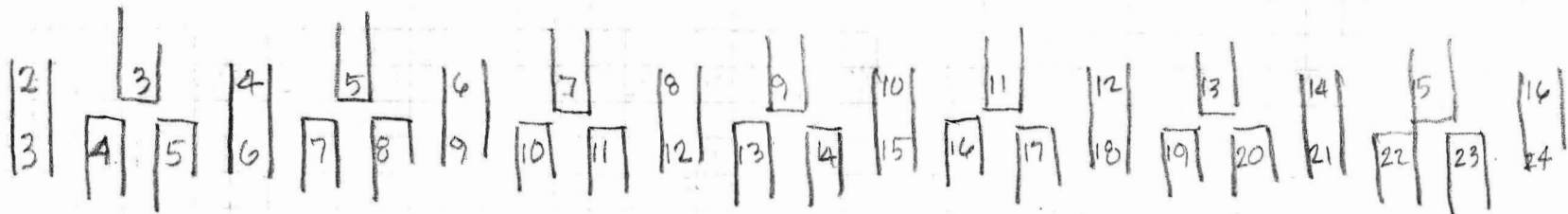
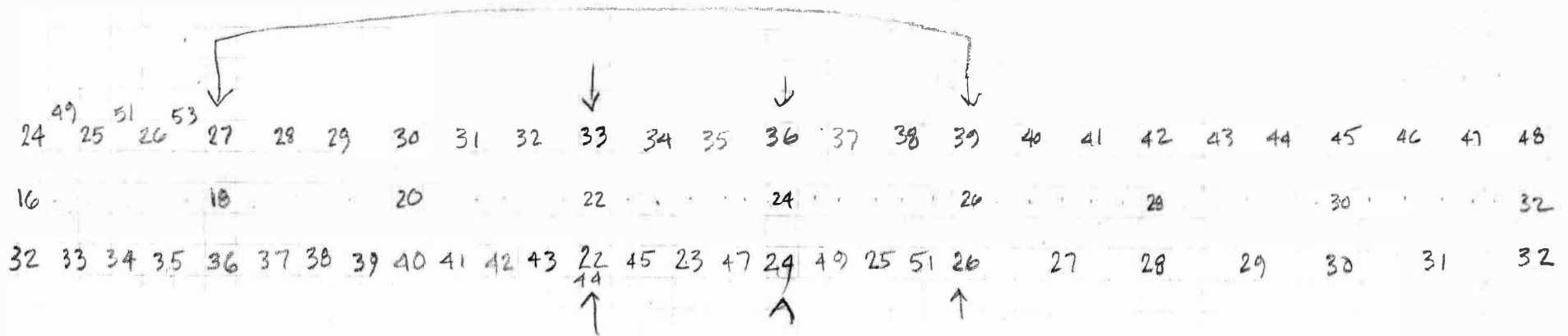
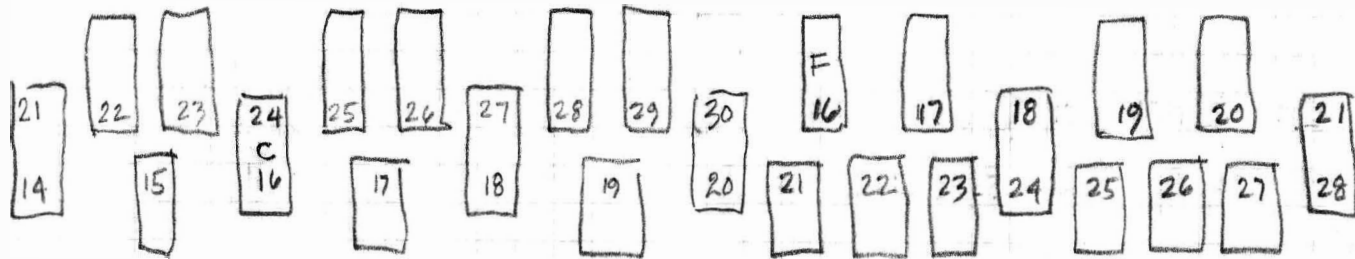
3 7 4 9 5 11 6 7 8 9 10 11 12
4 5 6 7 8 9 10 11 12 13 14 15 16



49 51 53
12 25 13 27 14 29 15 31 16 33 17 35 18 37 19 39 20 41 22 43 23 45 24 47
10 33 17 35 18 37 19 39 20 41 22 43 23 45 24 47 25 49 26 51 27 53 28 55 29 57 30 59 31 61

↑ ↑

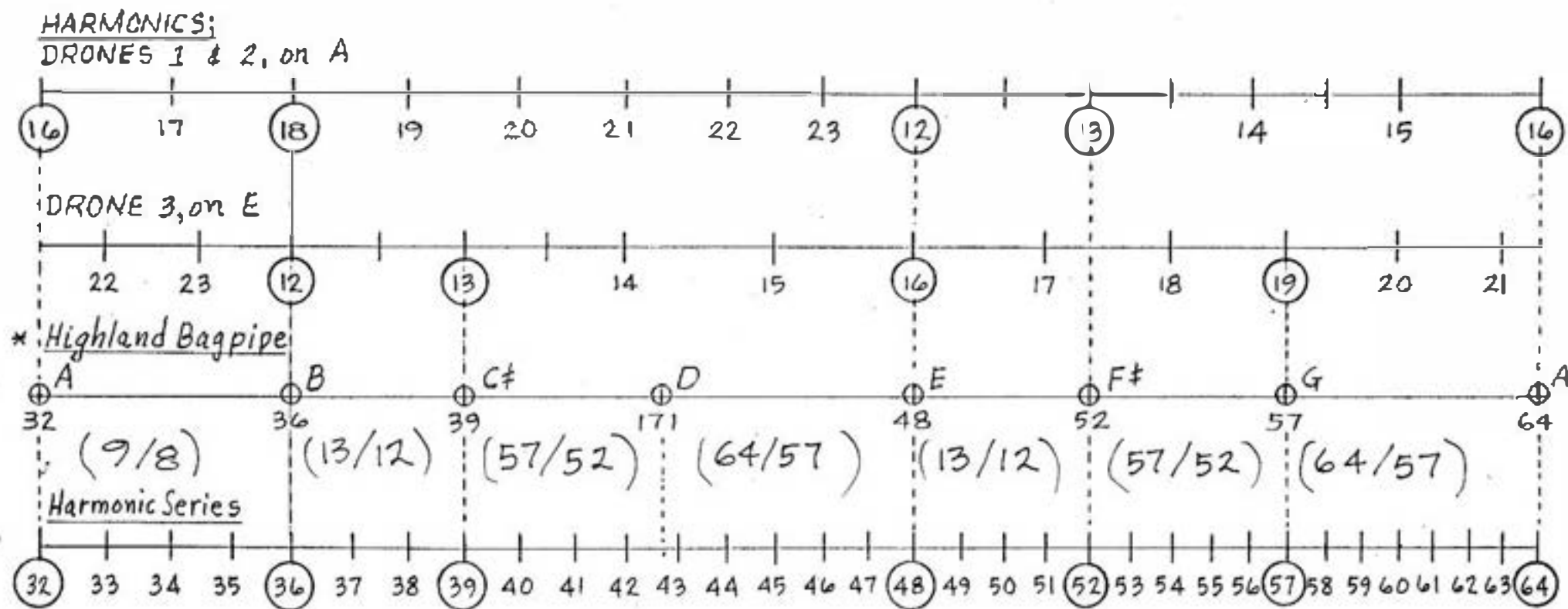
Yes!



4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33

A TUNING FOR THE HIGHLAND PIPES

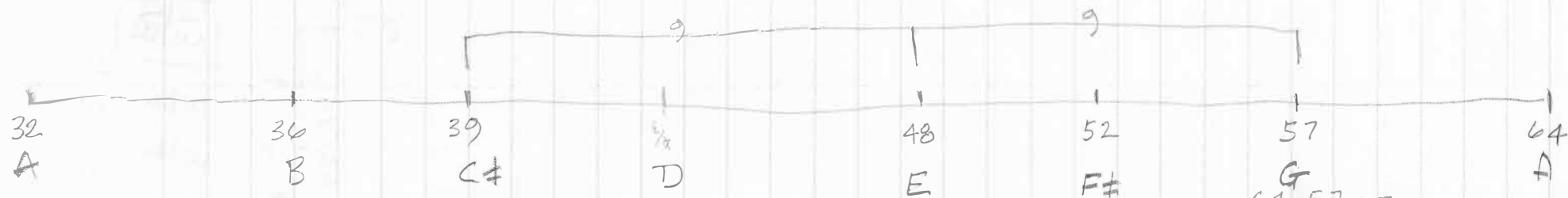
based on the harmonics of the drones
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* This is a theoretical scale. For actual measurements refer to Theodore Podnos(?) p. 37-39.

The 19/16 (at B-D and E-G) compares epimorically with 32/27; $\frac{19}{16} \times \frac{27}{32} = \frac{513}{512}$ (.002815 8ve.).

P39/3 another Scottish Chanter



$$\begin{aligned}
 64 - 57 &= 7 \\
 57 - 48 &= 9 \\
 48 - 39 &= 9 \\
 39 - 32 &= 7 \\
 57 - 39 &= 18 \\
 57 + 39 &= 96 \quad (\div 2 = 48)
 \end{aligned}$$

'+9' '22' '28

→ 6 13 19 32

→ 18, 39, 57, 96

embraced in Fibonacci rapport



4	5	6	15
8	10	12	15

7.81

$$\frac{39}{32}$$

$$\frac{13}{12} + 4$$

$$\frac{3}{2} \times \frac{1}{8}$$

$$\frac{128}{117} = \frac{128}{117}$$

$$\frac{128}{117} \times \frac{1}{13}$$

$$\frac{128}{117} \times \frac{1}{13}$$

$$\frac{128}{117} \times \frac{1}{13} = \frac{128}{1521}$$

See Aricenna p. 190

Drone

A
8

12
9

13
39

(4/3)
171

Drone

E
16
12

13

19
57

16