

# **„BenTen“**

## **or**

### **The evolution of the Fancy Feast alcohol stove**

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# Mission

- Create a stove that provides a more reliable pot stand
- Create a stove that has a more protected wick
- Create a stove with scalable output power

## With other words:

- Modify the Fancy Feast, and make it more „**Ben**efitable“
- Name it „**BenTen**“

# Alcohol stove state of the art (as of 2016)

„Type Fancy Feast“



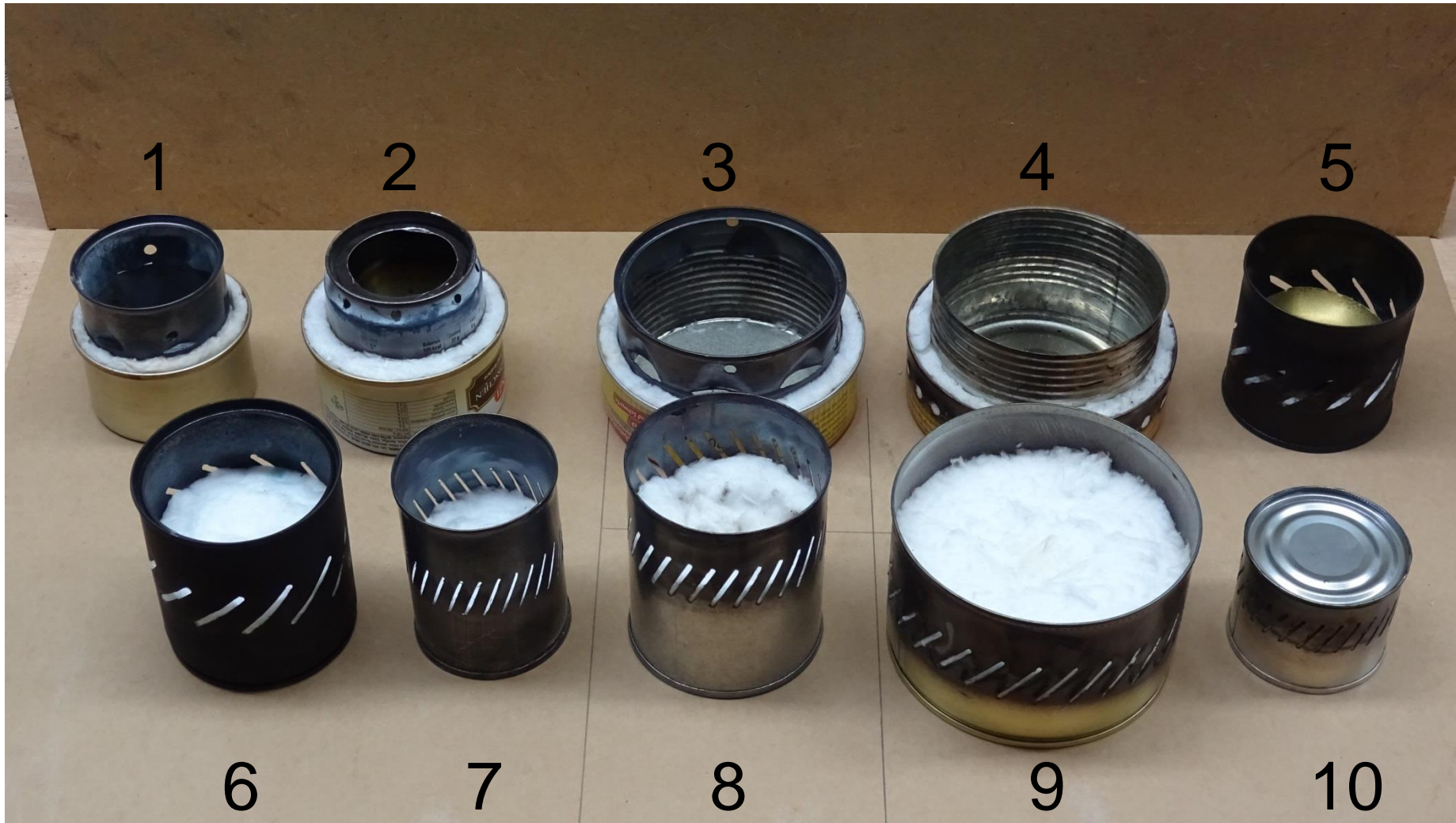
BenTen (Ben10) is made from a simple and cheap food or condensed milk can. For example a 170 ml can makes a nice strong stove, suitable for cooking 1 to 4 cups of water in a 12 to 20 cm pot on top

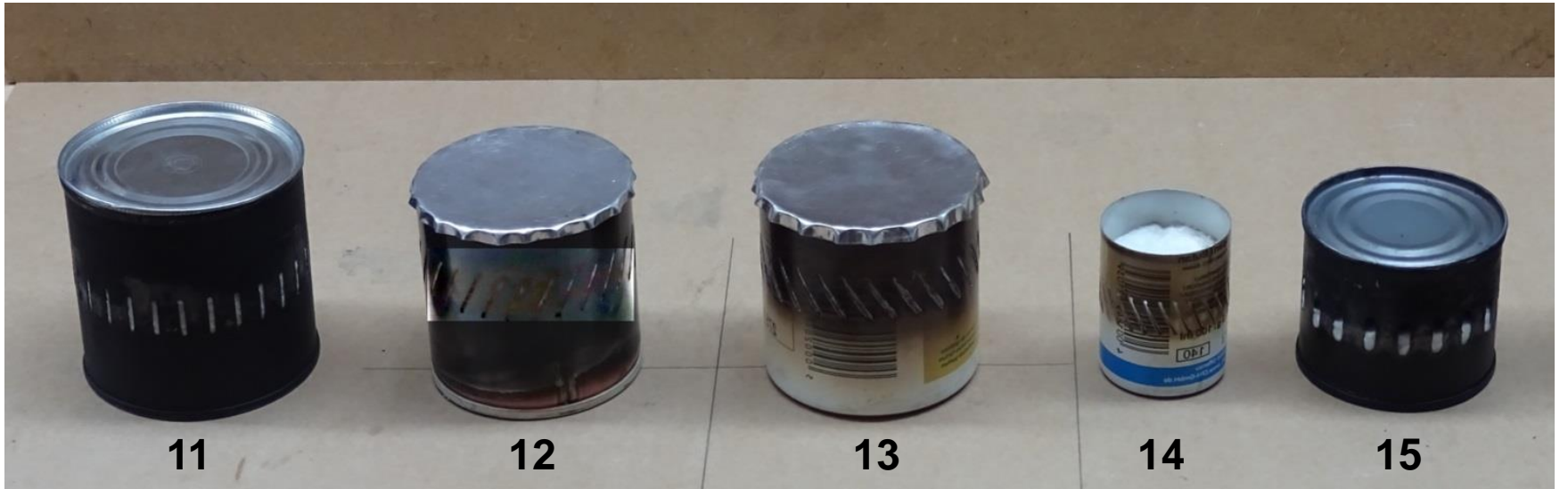


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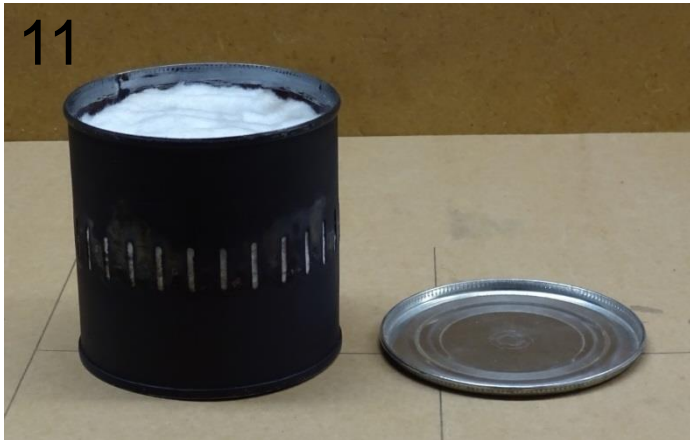


# The Evolution









#14



Weight 10g  
3:05 for 200ml Water

#15 Full Wick for Test





# Comparison between 15 and 16



## Stove Data

Stove (Video Link)	Diameter		Height		Fuel capacity		Weight		Boil Test			
	mm	Inch	mm	Inch	ccm	fl oz	gramm	oz	Pot (Photo / Link)	Water ml	Burned Fuel ml	Time mm:ss
<b>FF #1</b>	66 mm	2.60 in	63 mm	2.48 in	81 ccm	2.74 fl oz	23 g	0.81 oz	<a href="#">IMUSA 12cm</a>	500 ml		07:00
<b>FF #2</b>	76 mm	2.99 in	67 mm	2.64 in	116 ccm	3.93 fl oz	26 g	0.92 oz	<a href="#">Primus Primetech 1L</a>	500 ml		03:30
<b>FF #3</b>	99 mm	3.90 in	57 mm	2.24 in	191 ccm	6.46 fl oz	49 g	1.73 oz	<a href="#">Bonfire Kettle</a>	2000 ml		14:00
<b>FF #4</b>	99 mm	3.90 in	59 mm	2.32 in	102 ccm	3.44 fl oz	55 g	1.94 oz	<a href="#">Bonfire Kettle</a>	2000 ml		10:30
<a href="#">#5</a>	63 mm	2.48 in	62 mm	2.44 in	50 ccm	1.69 fl oz	29 g	1.02 oz	<a href="#">Wok pan 20cm</a>	500 ml		05:10
<a href="#">#6</a>	65 mm	2.56 in	73 mm	2.87 in	106 ccm	3.59 fl oz	46 g	1.62 oz	<a href="#">Wok pan 20cm</a>	1000 ml		07:00
<b>#7</b>	53 mm	2.09 in	73 mm	2.87 in	48 ccm	1.61 fl oz	28 g	0.99 oz	<a href="#">Primus Primetech 1L</a>	500 ml		04:30
<a href="#">#8</a>	66 mm	2.60 in	77 mm	3.03 in	71 ccm	2.41 fl oz	50 g	1.76 oz	Wok pan 28cm	2000 ml		15:30
<a href="#">#9</a>	99 mm	3.90 in	63 mm	2.48 in	105 ccm	3.54 fl oz	80 g	2.82 oz	Wok pan 28cm	2000 ml		08:20
<b>#10</b>	53 mm	2.09 in	45 mm	1.77 in	31 ccm	1.04 fl oz	26 g	0.92 oz	<a href="#">Primus Primetech 1L</a>	500 ml		05:00
<a href="#">#11</a>	63 mm	2.60 in	62 mm	2.48 in	130 ccm	4.58 fl oz	44 g	1.55 oz	<a href="#">Wok pan 20cm</a>	500 ml	28	04:00
<a href="#">#12</a>	58 mm	2.28 in	58 mm	2.28 in	110 ccm	3.72 fl oz	39 g	1.38 oz	<a href="#">Primus Primetech 1L</a>	500 ml	21	04:15
<b>#13 Alu</b>	59 mm	2.32 in	59 mm	2.23 in	115 ccm	3.89 fl oz	41 g	1.45 oz	<a href="#">Wok pan 20cm</a>	500 ml	28	04:45
<a href="#">#14 Alu</a>	35 mm	1.38 in	45 mm	1.77 in	18 ccm	.61 fl oz	10 g	0.35 oz	<a href="#">Stainless 8cm</a>	200 ml	10.3	03:05
<a href="#">#15</a> 18 slots in middle 3x10.5 mm, wick half slot height	53 mm	2.09 in	45 mm	1.77 in	35 ccm	1.25 fl oz	23 g	0.81 oz	<a href="#">AluPot 11.5cm</a>	375 ml	25	05:00
									<a href="#">Primus Primetech 1L</a>	500 ml	20	04:50
									<a href="#">Wok pan 20cm BenTen stuffed full Wick</a>	500 ml	29	04:40
<a href="#">#16</a>	73 mm	2.87 in	58 mm	2.26 in	100 ccm	3.38 fl oz	48 g	1.60 oz	<a href="#">Wok pan 20cm</a>	500 ml	24	04:12

# YouTube Video Links



**Boil test with BenTen #5** HD

**Wok Pan 20 cm**

[https://www.youtube.com/watch?v=tSqGK1mj\\_0M](https://www.youtube.com/watch?v=tSqGK1mj_0M)

7:43



**Burn test with BenTen #11**  
**Pan 24cm** HD

<https://www.youtube.com/watch?v=Q0wHNzDdP7I>

0:53



**Burn test with BenTen #6** HD

<https://www.youtube.com/watch?v=WEJAX96Cwpk>

0:16



**Burn test with BenTen #12**  
**Primus Primetech Eta 1L** HD

<https://www.youtube.com/watch?v=c3LfVPxIDqM>

0:23



**Burn test with BenTen #8**  
**Bonfire 2L Kettle** HD

<https://www.youtube.com/watch?v=bCSWF5Hx5Lg>

0:33



**Burn test with BenTen #14**  
**Stainless Pot 8cm** HD

<https://www.youtube.com/watch?v=T6NkihCmIFU>

0:34



**Burn test with BenTen #9**  
**Wok Pan 28cm** HD

<https://www.youtube.com/watch?v=9M0F3sTYPE8>

0:42



**Ignition test with Fancy Feast #1**  
**Alu Pot 11.5cm** HD

<https://www.youtube.com/watch?v=sRu87mJ8-t8>

1:06



**Ignition test with BenTen #16**  
**Wok Pan 20cm** HD

<https://www.youtube.com/watch?v=-Yp9QUzb5Pk>

1:07



**Ignition test with BenTen #15**  
**Alu Pot 11.5 cm**

<https://www.youtube.com/watch?v=5b1P9gNO9fw>

1:51

# The First BenTen (No5)

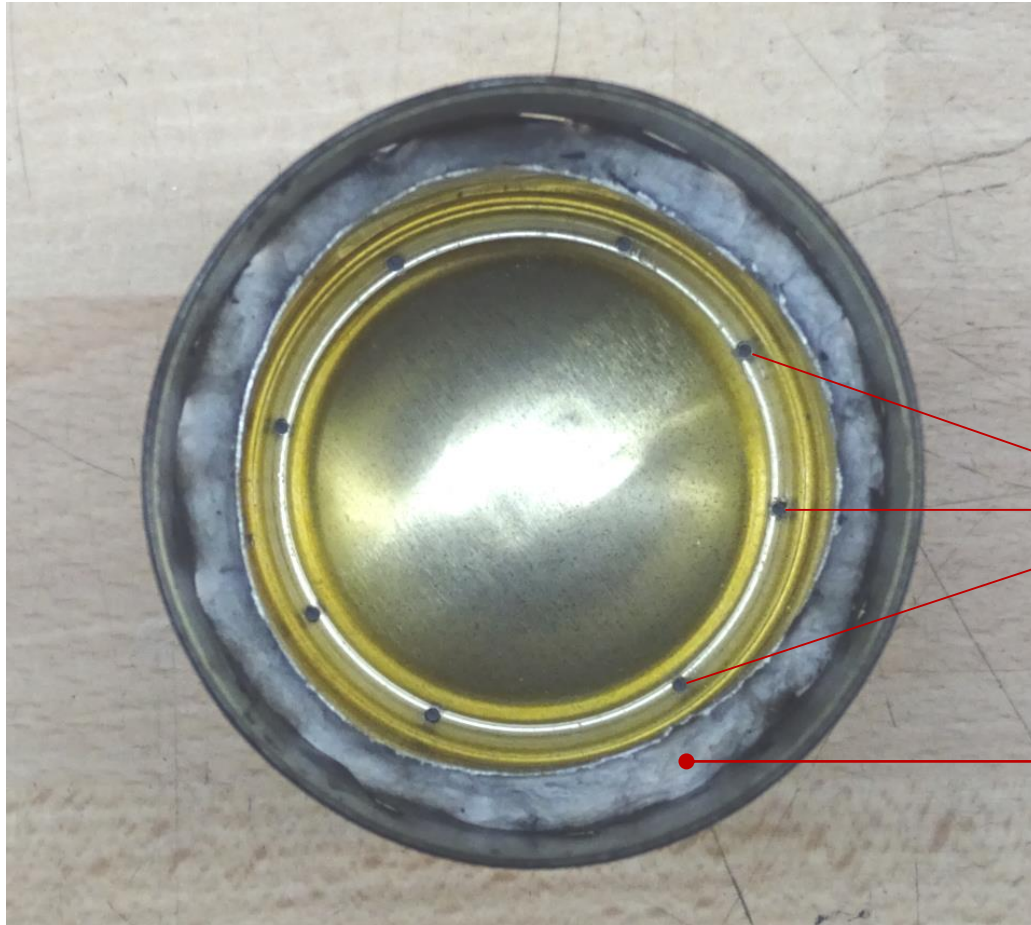




# The pot stand is now the outer can



# Top View



A inner can holds the wick in place. Used is the bottom part of a pop can (RedBull)

Fuel drain holes

Wick made from ceramic felt



# BenTen\_#5 Boil Test

Watch the boil test video on YouTube: [https://youtu.be/tSqGK1mj\\_0M](https://youtu.be/tSqGK1mj_0M)



There is no voice and no music in the video. Just watch the Flames and hear the little noises the stove makes. Sorry for the "pumping" focus. I will do it better next time!

In the video is shown the whole sequence of boil test from the ignition till the die out of the flame. BenTen was fueled with 28ccm (1fl oz) pure methanol. The pot on top is a 20cm (8 inch) wide wok pan with lid. The pot was filled with 500ml (2cups) of water with initial Temperature 15°C (59°F)

The time from ignition to rolling boil was 5 minutes and 10 seconds.

At 00:23 one can see the immediate "on the click" ignition all across the stove.

From 00:45 to 04:14 one can hear some hissing noise of the liquid alcohol vaporizing.

From 06:55 to 07:25 BenTen is making "whopping" noise telling you that it is running out of fuel and flames are going to die soon. This is a nice audible indication letting you know your coffee water is ready for brew.

Data:

Weight: 40 gramms (1.41 oz)

Height: 62.5mm (2.46 in)

Diameter: 62.5mm (2.46 in)

Fuel Capacity: 42cc max! (1.5 fl oz)

# BenTen #6 is a step in Evolution

- The inner can is replaced by just a bulk of ceramic felt as wick material
- It burns very smooth, see short video on YouTube: <https://youtu.be/WEJAX96Cwpk>



# BenTen #6

This version of BenTen has high fuel capacity and a can of diameter = 65 mm  
It boils one liter (4cups) of water (13°C) in 7 minutes.  
Fueled with 60ml Methanol it burns 10 minutes till it runs dry.  
The pot is a 20cm Wok Pan with lid.

## BenTen #6 mechanical data:

Height: 73mm

Diameter: 65mm

Weight: 49g

Slots: 12

Slot width: 2.4mm

Slot length: 26.8mm

Slot angle: 45 Deg

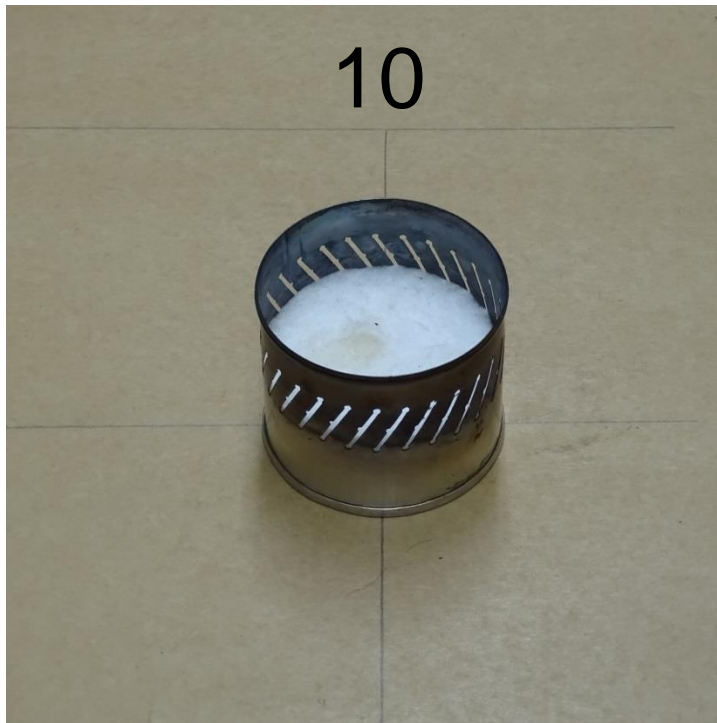
Clearance between top of slots and top of can: 25.4mm (1in)

Fuel capacity: 83 ccm



<https://youtu.be/WEJAX96Cwpk>

# BenTen #10 with Lid



Nr.	Stove Type	Diameter		Height		Fuel capacity		Weight		Boil Test		
		[mm]	[Inch]	[mm]	[Inch]	[ccm]	[fl oz]	[gramm]	[oz]	Pot	Water	Time
10	BenTen	53 mm	2.09 in	45 mm	1.77 in	31 ccm	1.04 fl oz	26 g	0.92 oz	Primus Primetech 1L	500 ml	05:00

# BenTen #11 with vertical slots

(27 slots 1.5mm x 10mm)



Here burning Ethanol not Methanol

Nr.	Stove Type	Diameter		Height		Fuel capacity		Weight		Boil Test		
		[mm]	[Inch]	[mm]	[Inch]	[ccm]	[fl oz]	[gramm]	[oz]	Pot	Water	Time
11	BenTen	63 mm	2.48 in	62 mm	2.44 in	110 ccm	3.93 fl oz	48 g	1.63 oz	Pan 24 cm	1L	7:15

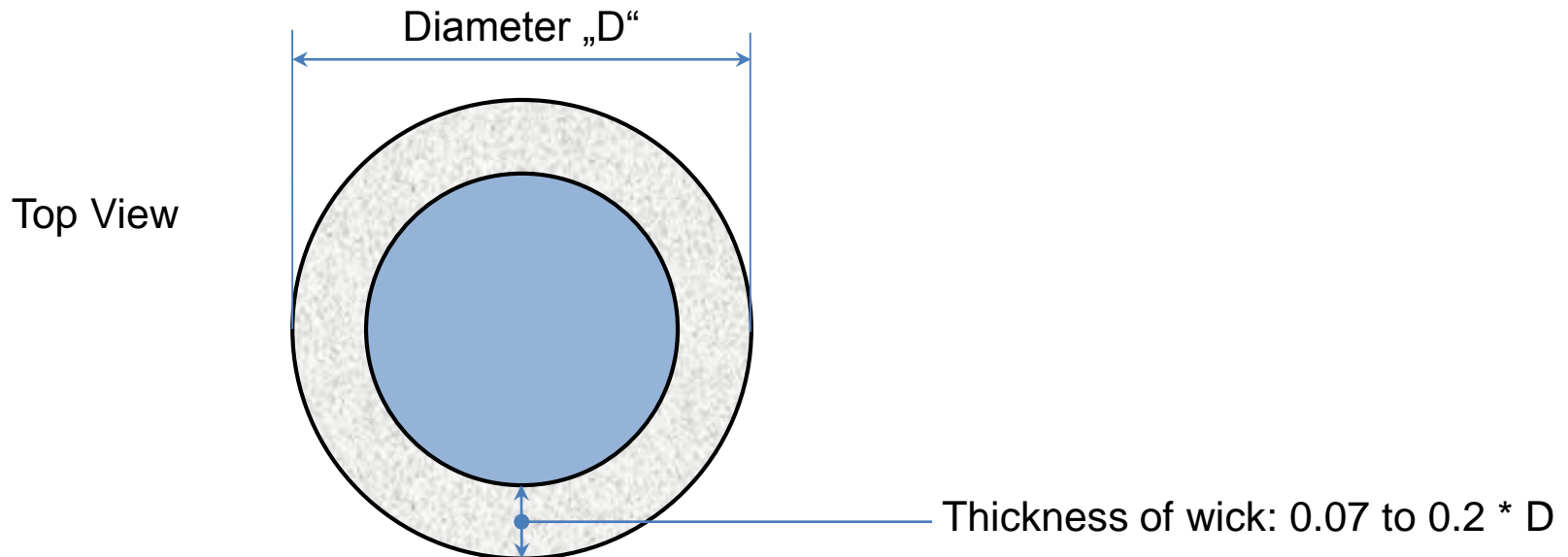
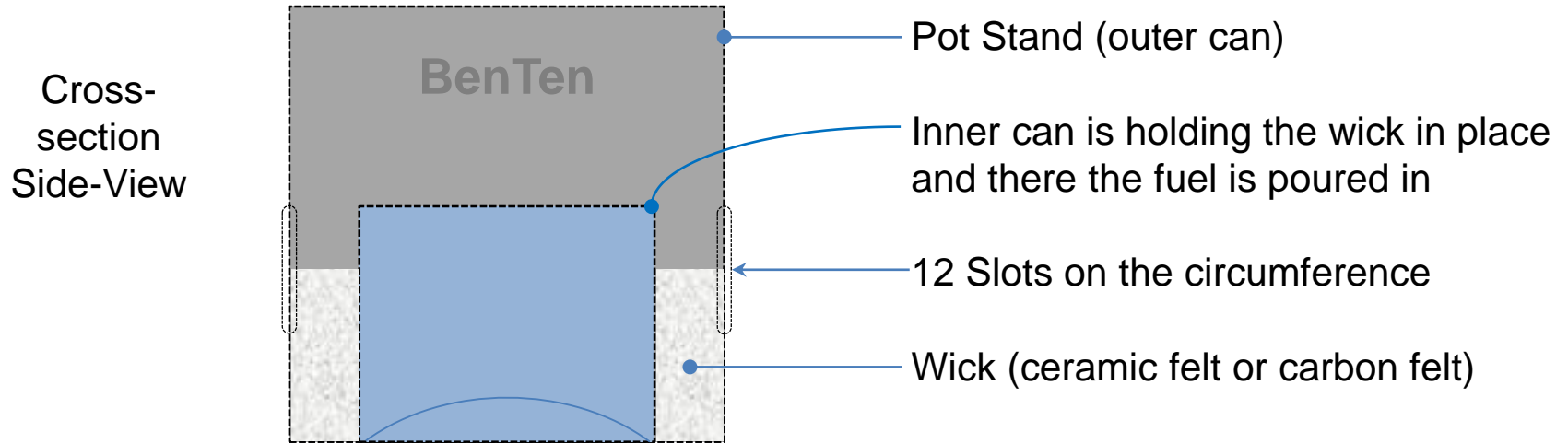
# BenTen #15



- Wick level is half height of slots
- 18 Vertical Slots 3mm x 10.5mm
- Lid can be on top during burn
- “On the click” ignition of all 18 slots
- Short startup time, only 8 seconds
- Boils 375ml Water in 5:00
- Optionally the whole can could be filled to with wick material this will give a much more intense burn and shorter boil time.
- Fuel efficiency mainly depends on type of used pot



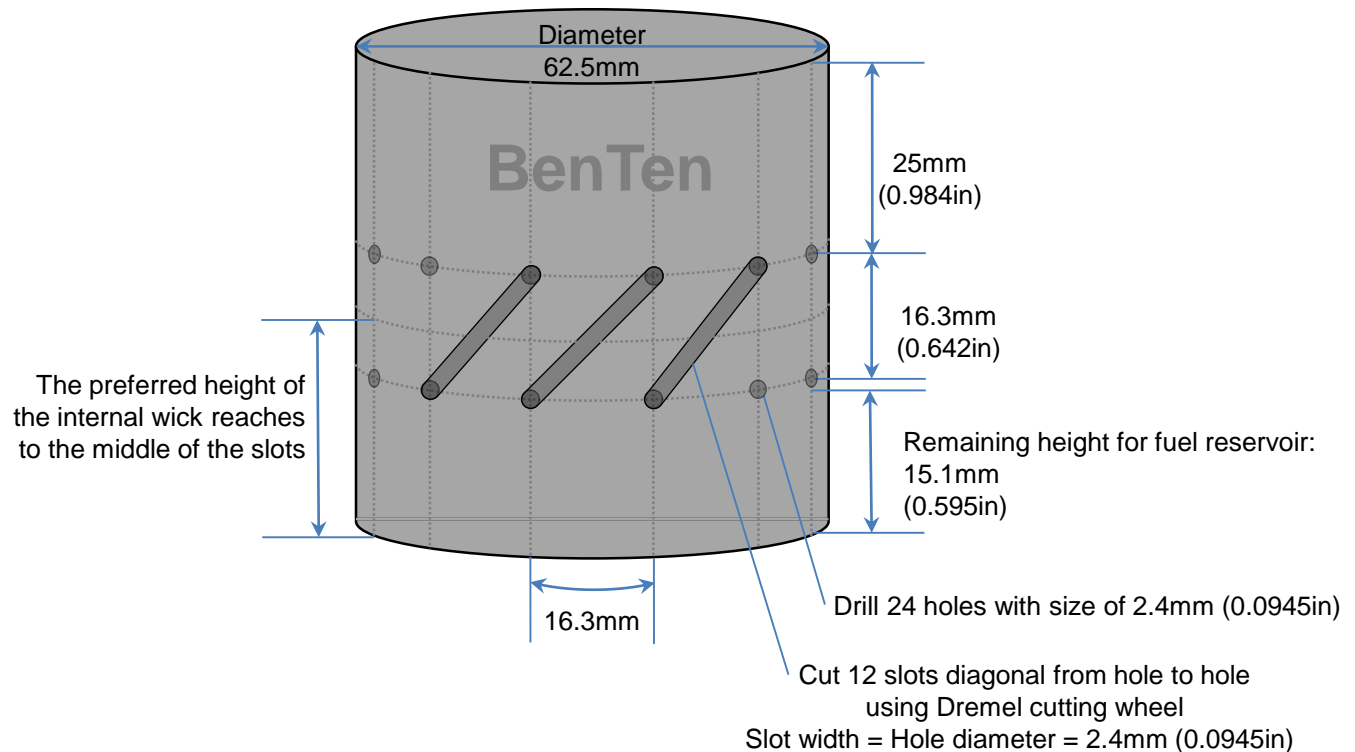
# Design Details (1)



# Design Details (2)

## Example: Condensed Milk Can

- Volume: 170ml (6 floz)
- Diameter : 62.5mm (2.46in)
- Height: 62.5mm (2.46in)



# Wick height

Intense Burn



Moderate Burn



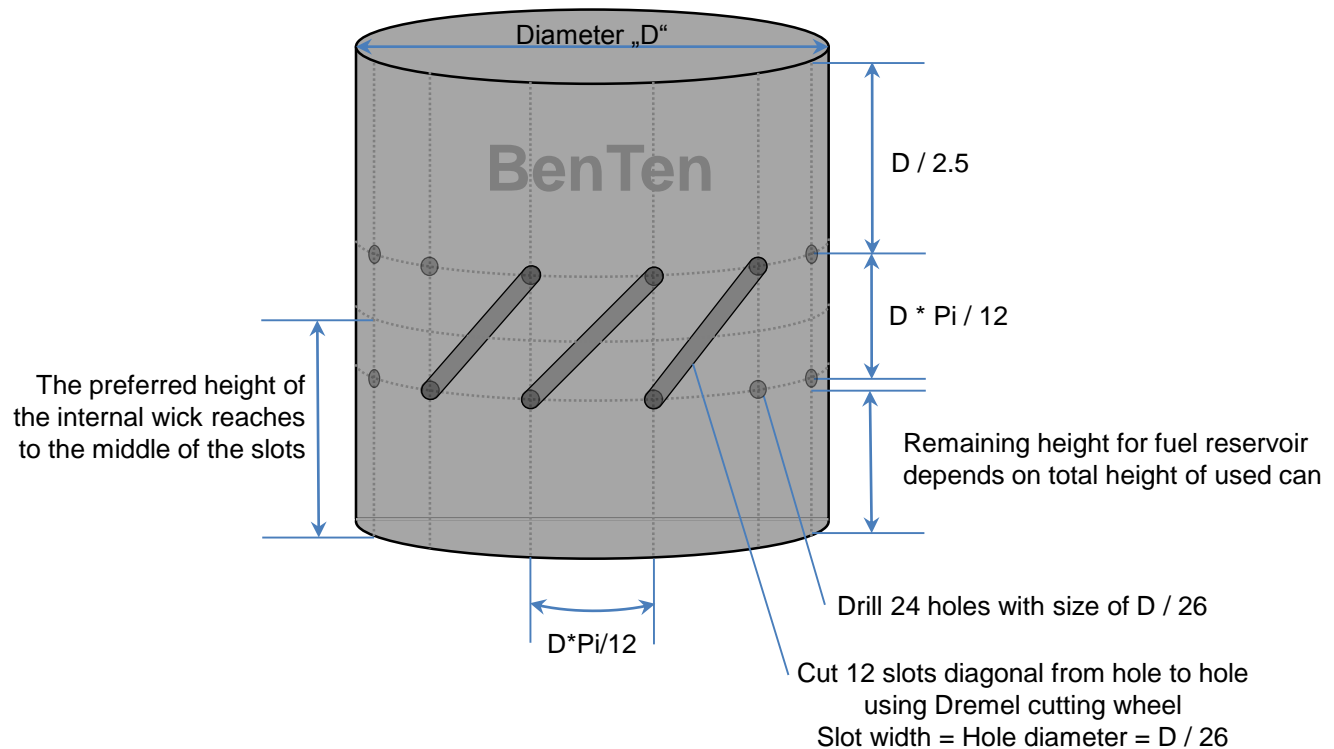
The burn intensity is also quite depending on how tight the wick is pressed against the wall of outer can

# General Design Rules (for scaling BenTen)

All dimensions are based on the diameter „D“ of can

In general it is recommended to use a can with a ratio of height /diameter = 1:1

According to certain needs the ratio can be chosen different of course



# Summary

- **BenTen** is an easy to make scale able low pressure, side burner, wick alcohol stove.
- **BenTen** is a robust powerful light weight stove suitable for backpacking, biking, camping and backyard cooking.
- The wick is inside the metal can and nicely protected
- The pot stand has a large diameter and provides a solid stand
- High output power
  - scale able during manufacturing by dedicated height of internal wick
- No priming required
- Easy lighting form outside