

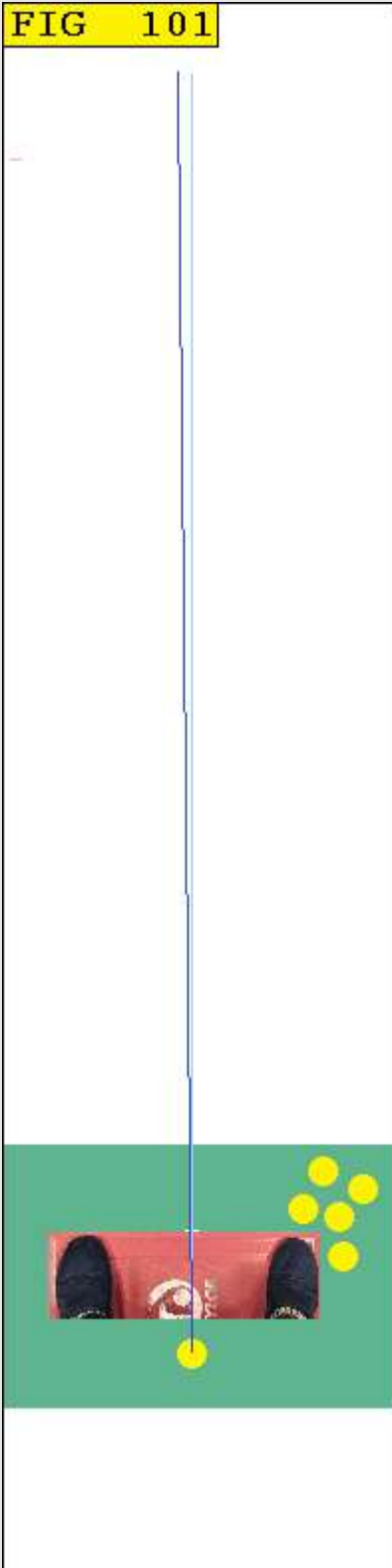
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ch #12 **THE FUNDAMENTAL FORMULA**

ver: 25/10/26

This chapter introduces the famous
fundamental formula of bowling.

FIG 101



THROWING JACKS

I tested my swing by throwing jacks (because they run straight).

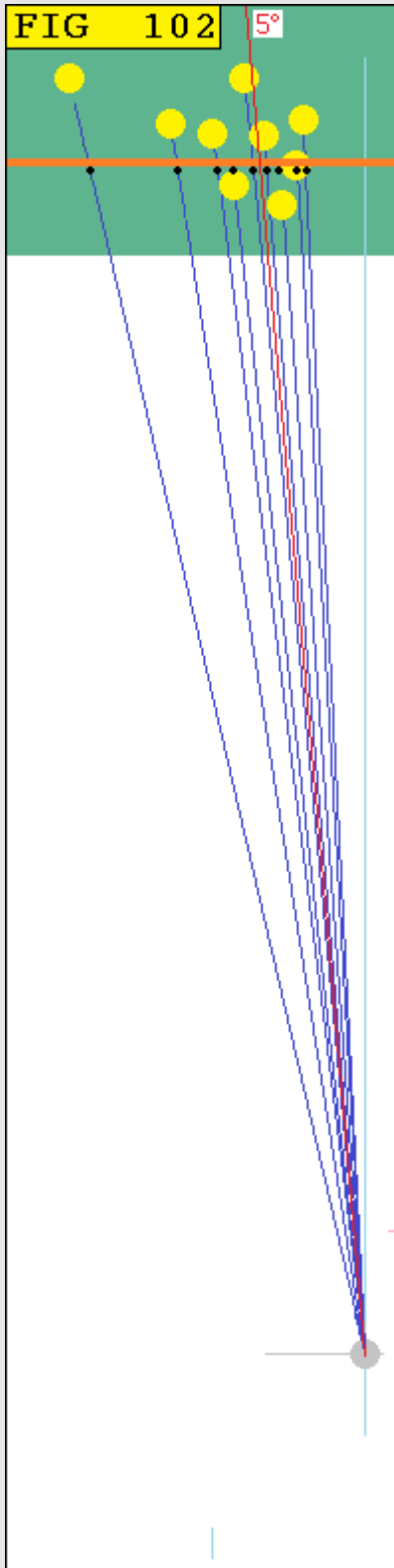
I stood symmetrically about the CL and threw the jacks at the 1m spot. All the jacks arrived to the L of the CL. I assumed that my backswing was not along the CL and threw the jacks again, concentrating on swinging the woods straight along the CL. Again the jacks arrived L of the CL. I called this the **alpha error** and named it α (alpha).

Why are angles denoted by Greek letters ?

Because the Greek Tourist Board pays a reward.

I suspected that the apogee was not above the CL.

Probably because my throwing arm moves towards my throwing leg during the backswing.



MEASURING ALPHA

I decided to measure α by throwing many jacks and calculating the average value as follows:

- 1) Throw a jack.
- 2) If it arrives within 30cm of the TL, place a coin where it crossed the TL.
- 3) Repeat.
- 4) When you run out of coins, place a tape measure along the TL and measure the x-distance of each coin from the CL.
- 5) Calculate the average x.
eg 256cm
- 6) Determine the length (between the Ts)
eg $32.5 \times 100 = 3250\text{cm}$
- 7) Maths

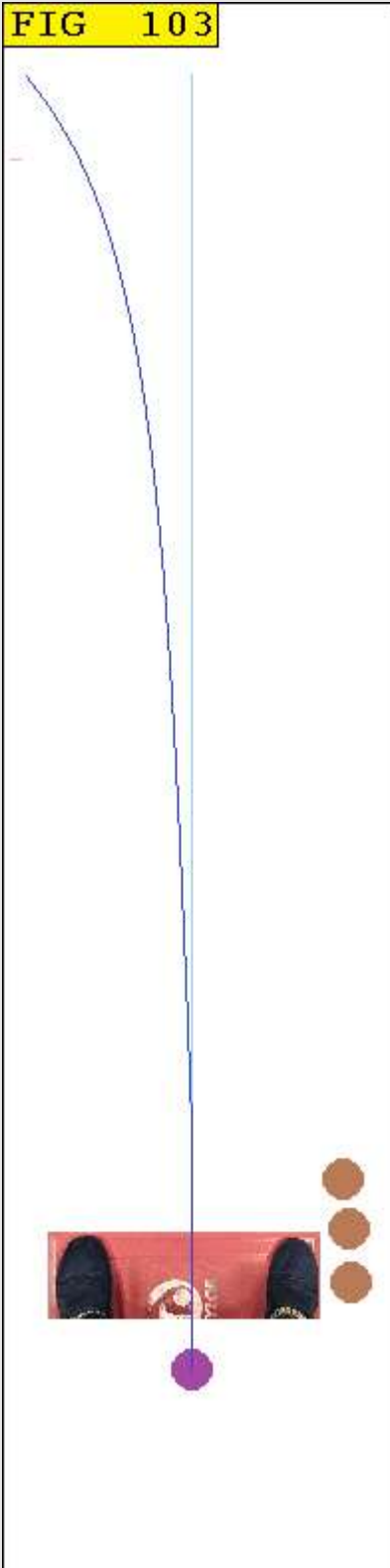
$$\tan(\alpha) = 256/3250 = 0.079$$

$$\alpha = 4.5^\circ$$

NOTE

When I repeated this a few months later, I found $\alpha = 2^\circ$

FIG 103



THE DELTA ANGLE

I repeated the process using woods. They arrived miles away from the CL. I expected this because of the bias.

I calculated the angle to be 14.8° and named it δ (delta).

I suspect $\delta = \beta + \alpha$

which would give:

$$\begin{aligned}\beta &= \delta - \alpha \\ &= 14.8 - 4.5 = 10.3^\circ\end{aligned}$$

I decided to round the values to whole numbers:

$$\alpha = 5$$

$$\beta = 10$$

$$\delta = 15$$

I repeated the above tests a few months later and got:

jacks: $\alpha = 2$

RF: $\beta = 9.5$ so $\delta = 11.5 \rightarrow 12$

RB: $\beta = 8.2$ so $\delta = 10.2 \rightarrow 10$

Also, the values were slightly different when throwing in different directions.

For some unknown reason, the differences were greater for backhand throws.

Why don't you use a chute ?

NOTE

A difference in 1° in the throwing angle generates a difference of approx 50cm over a range of 30m.

THE ADJUSTED FORMULA

The following formula takes into account whether each angle is positive or negative.

+ve angles are measured clockwise from 12oclock.

-ve angles are measured anticlockwise.

So we have the **Fundamental Formula for Bowling**:

$$\delta = \beta - \alpha$$

I've finally (after 50yrs) a Fundamental Formula for something.

Assuming $\alpha = 2$ and $\beta = 10$:

For a RF throw:

α is minus 2 because its anti-clockwise from N.

$$\text{So } \delta = 10 - (-2) = 10 + 2 = +12^\circ$$

For a RB throw:

$$\beta = -10, \alpha = -2$$

$$\text{So } \delta = \beta - \alpha = -10 - (-2) = -10 + 2 = -8^\circ$$

For a LF throw:

$$\beta = -10, \alpha = +2$$

$$\text{So } \delta = \beta - \alpha = -10 - (2) = -10 - 2 = -12^\circ$$

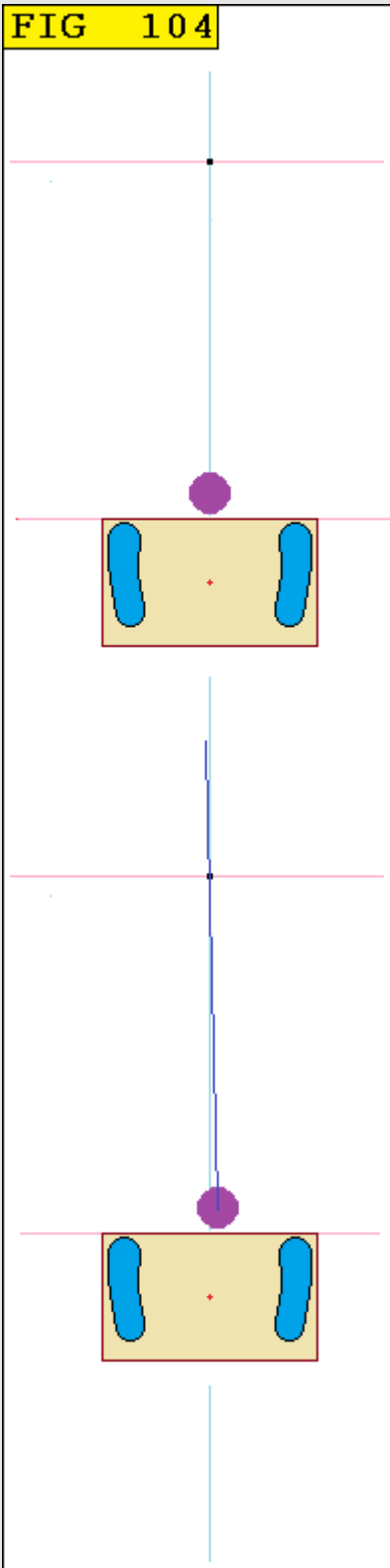
For a LB throw:

$$\beta = +10, \alpha = +2$$

$$\text{So } \delta = \beta - \alpha = 10 - (2) = 10 - 2 = +8^\circ$$

I use the remainder of the chapter to explain the alpha error.

FIG 104



HOVERING

I place a wood on the CL in front of the mat then adopt my stance. I exhale, bend down and grasp the wood.

I inhale and lift the wood off the floor.

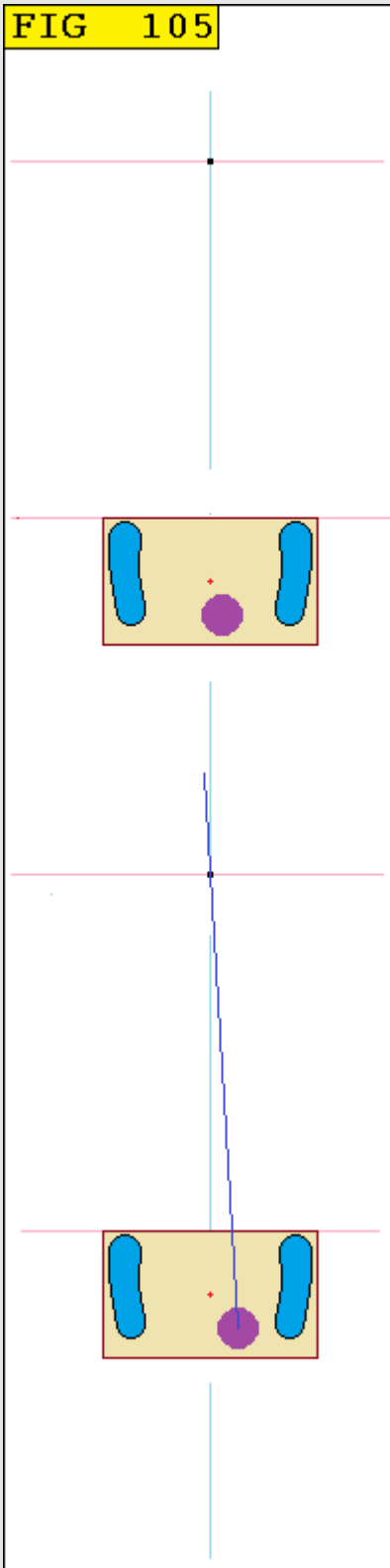
I allow my arm to hang freely.

I am now **hovering**.

The wood is no longer on the CL. It has moved several cm towards my throwing leg. I call this **offset**.

If I throw from this position towards the 1m spot, the wood will run to the L of the CL. This would generate a small α .

FIG 105



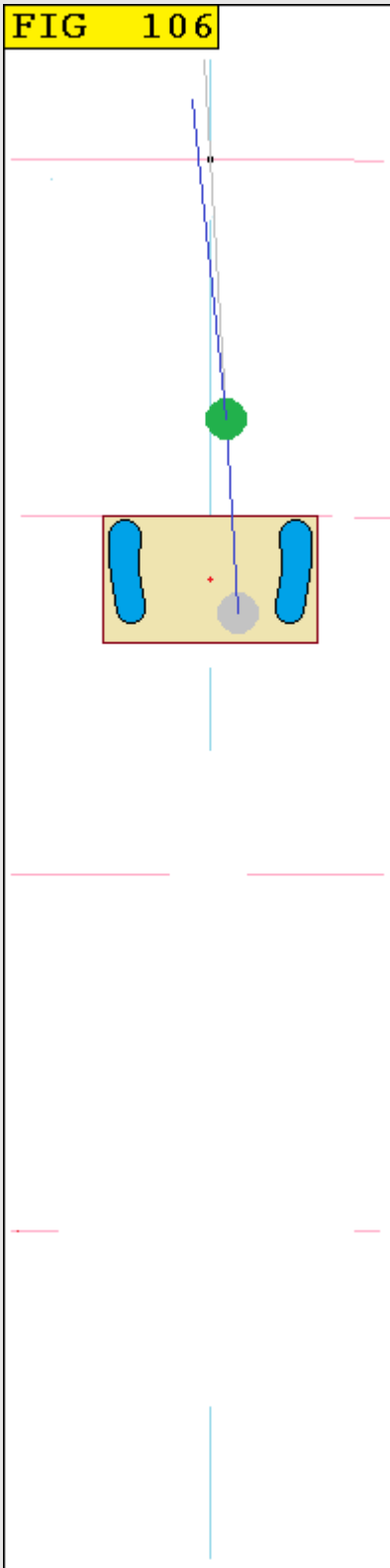
SLANTING

I swing the wood back and pause.
The wood is now at the **apogee**.

The wood is even closer to my
throwing leg.
I call this **slanting**.

If I throw from this position
towards the 1m spot, the wood
runs further to the L of the CL
and increases α .

FIG 106



SCREWING

For a R-handed throw, my wrist rotates anticlockwise before I release the wood.

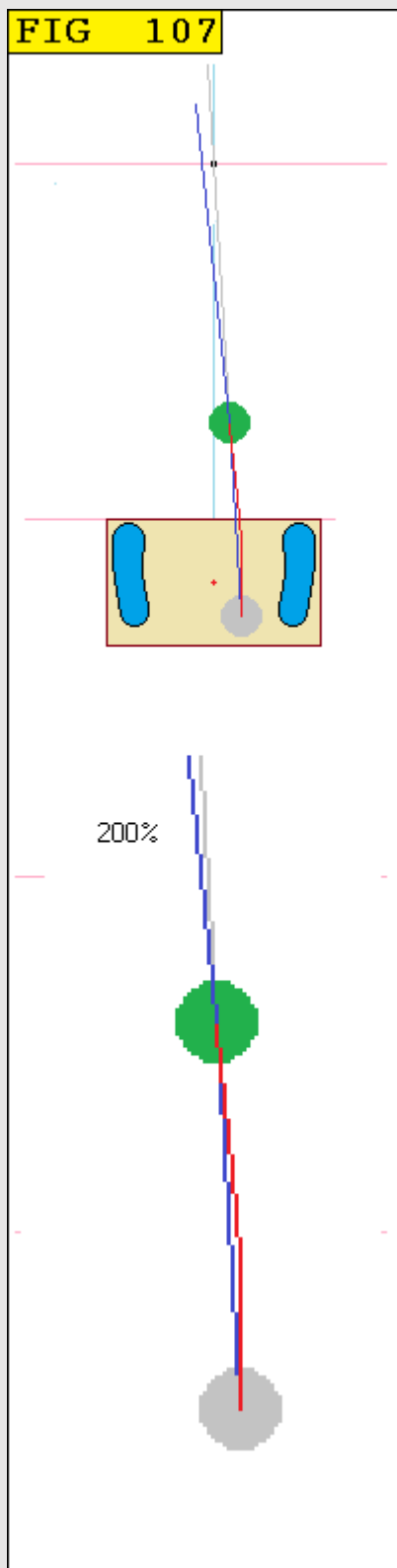
For a L-handed throw, my wrist rotates clockwise.

I call this **screwing** and it increases α .

Is there anything that doesn't increase alpha ?

I'm not sure but lump them all together and forget the details.

FIG 107



THE ALPHA ARC

And another thing:

I suspect my arm travels in an arc during the forward swing.

Why do you think that ?

It's the only way I can explain certain behaviors.

I call it the alpha arc.

It's like a rifle at a dodgy fairground - the front sight is off-centre so you won't hit what you are aiming at.

This makes me ask what is the point of aiming?

There is no point in aiming where you want the wood to arrive because of bias.

There is no point in aiming at the CP because of the alpha arc.

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If you don't know your y , use 10cm.

If you don't know your x . use 20cm.

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