Friktion

The Lighter Side of Billiards
Alcock's Sporting Review   July 1913

Being a selection of the latest & most popular fancy & trick shots known on the billiard table.

By Sidney T Felstead   Badminton Magazine

............***One masse' only i have included, it is George Gray's wonderful shot by which he goes right round the apex of the triangle & makes a cannon.***

.... I have seen a good many professionals attempt this stroke, but Gray is the only one who can do it with any certainty..........

Gray'z Masse'

This trick of Gray'z raizez a tricky question.
Where would u place the triangle, to best do this trick.????

Minimum Friktion What i meen iz, which direction on the table givz the minimum friktion ?? This trick iz difficult. It takes a lot of well directed power, & u need everything on your side, helping, rather than hurting your effort.

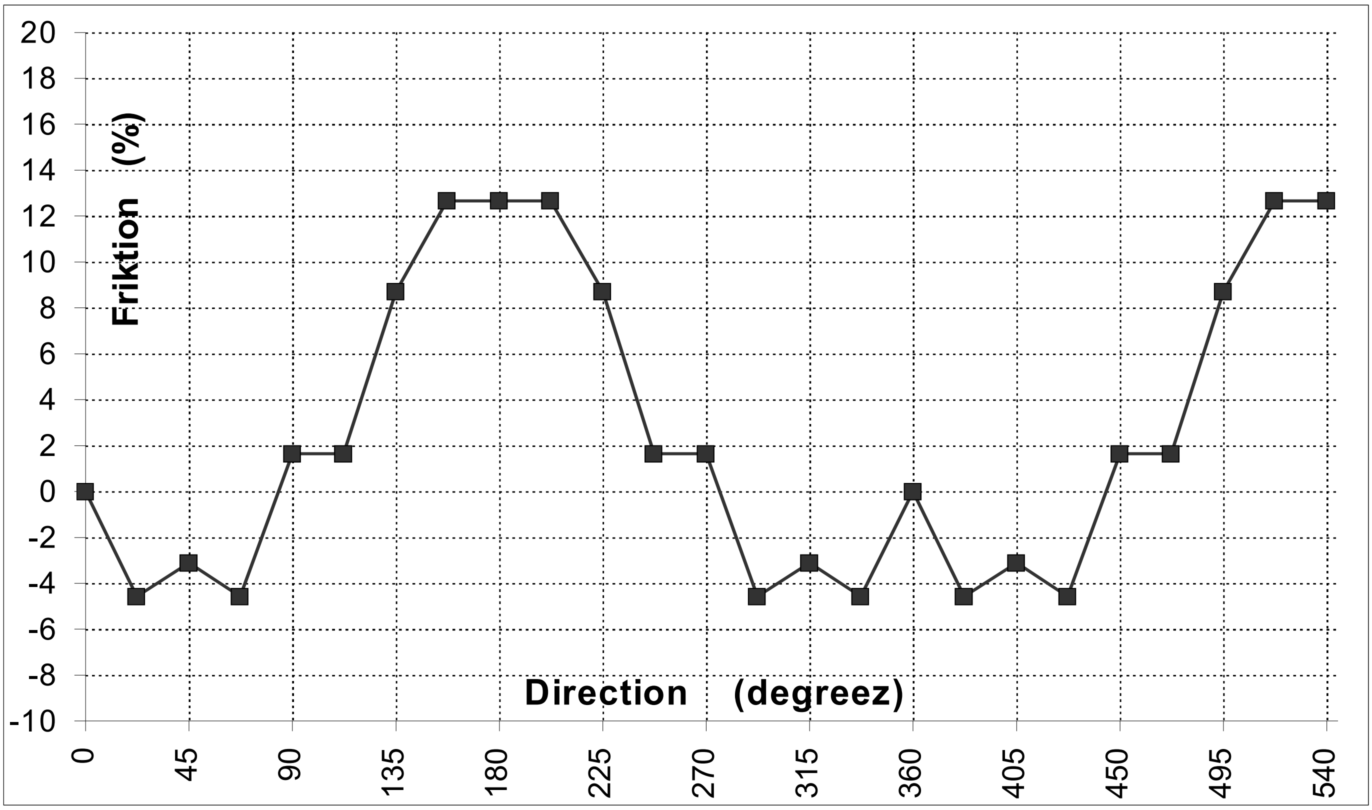
Obviously if u want the ball to skid out all that way to the apex of the triangle & still hav lots of reverse rotation to bring it back down the other side it might help if u pick the direction that givz the minimum friktion.

ClockWize Say that the eezyst direction for the masse' for u iz clock-wize around the triangle. Then i reckon that u should place the triangle against the right-hand cushion. Naturally u would place it in the baulk area, koz the ball iz going to make a big permanent footprint.

60° Each corner of the triangle iz 60°. So, the above placement of the triangle will rezult in an initial ball direction 60° left of the direction of the nap. What iz the friktion in this direction -- i meen compared to other direktionz ??????

Tests Luckyly for me, i mezured the friktion for varyus directionz a few yearz ago (for Billiardz Arithmetically Treated), & the rezulting graff iz az followz.

Friktion Tests



00° Az karnt be seen, i have massaged the friktion figurz two wayz. Firstly, the friktion with the nap (ie at 00°) iz taken az being 100% by definition. Secondly, i hav called this value 0%.

Maximum The maximum friktion woz against the nap, ie at 180°, which gave a figure of 112.7%, which i hav called 12.7%.

Minimum Az ken be seen, the minimum friktion woz at 22° & 67°. This woz almost 5% less than the friktion at 00°. But let's just say that the minimum friktion iz somewhere in the range 22° to 67°. Here the 22° iz 22° left of 00°, & equally 22° right of 00°.

Triangle Now, az i sed, the first side of our triangle iz on an angle of 60°, & this iz the direction taken by the ball. But we karnt congratulate ourselvz yet. Koz, in the masse', the ball iz sent off with backspin. And this backspin iz on about an angle of say 80°. The ball itself goze off at 60°, along the first side of the triangle. So, from the cloth's point of view, the bottom of the ball iz initially skidding at an angle of say 70°. Later, when the ball gets to the apex, it iz hardly mooving, but still haz much of it's backspin. So, near the apex, the cloth thinks that the skidding iz at say 76°. The average skidding for the first stage of the trip iz say 73°.

Bottom Cushion If theze sorts of figurez are correct, & looking at the above graff, placing the triangle against the ***bottom cushion*** iz actually almost az good az placing it against the ***right side cushion***, if u do the calculationz.

Top Cushion Anyhow, placing the triangle against the ***top-cushion***, or the ***left cushion***, would moov thingz over to the higher part of the graff, bad newz for our masse'.

Nursery cannonz

So, how duz this friktion factor affect a run of nursery cannonz.?? Probably very little. The difference between the minimum & maximum valuez of friktion iz ***18%***, which iz a big difference. We would probably be more familiar with massez on the top-cushion, where the friktion iz at its maximum (if u are aiming against the nap, ie at 180°). Therefore, massez on the top-cushion would be the most difficult on the table. If u ken play them well here then u will find them even eezyr on the other cushionz.

If so, then when we hav to play a masse' on the side cushion, which we are not so familiar with, perhaps the qball would shoot out further than we wanted, & perhaps the qball would pass beyond our intended contact. This assumez that our aim, the initial trajectory, iz at say 90°.

Screw-backs

Friktion probably affects screw-shots more so than massez. I know that more than once i hav kum to grief at top-of-the-table, due to an over-played screw-back, when potting the red into a top pocket, on say a 45° line. Uzually this haz happened on a strange table, with a newish slippery cloth. But, looking back, i ken see that the added effect of the ***Directional Friktion Factor*** sealed my doom.

Which raizez an interesting question. If u wanted to set a new world'z-record for a screw-back, what line would u pick for the stroke ?? Pretty obviously somewhere between 22° & 67°. I would favour something near 67°, koz, on the way back, the qball would meet less rolling rezistance. See the chapter on Rolling Rezistance.

Baulk Loozerz.

And what about loozerz into the baulk pockets. How many timez hav u overplayed theze little suckerz.?? Often, the angle looks a little too wide, so, naturally, u hit a little harder, but, az uzual, the qball adopts such a wide trajectory that u hit the side cushion, az uzual.

We all know that u get a wider Deflexion Angle for loozerz into a baulk pocket than for loozerz into the top pockets, but its alwayz hard to compensate, your natural instincts take over. But, now that i know the cauze, i find it eezyr for my grey matter to accept, & i rarely miss nowadayz.

Consider a half-ball loozer. The cueball iz rolling at say 1.0 m/s (ie velocity iz 1.0 m/s and topspin iz 1.0 m/s) and it comes away from the red ball at 0.500 m/s and at 60° (a bit less really) to its original line. But it haz the same topspin (1.0 m/s) az before it collided with the red (neglecting friktion & tranzmitted side). The new velocity of 0.500 m/s haz a component of 0.250 m/s on the original line, and 0.433 m/s at 90° to that line.

Az the cueball haz a topspin of 1.0 m/s, the bottom of the ball iz skidding backwardz at 1.000 minus 0.250, which iz 0.750 m/s. At the same time, the bottom of the cueball iz skidding sidewayz (at 90°) at 0.433 m/s. So, the bottom of the ball iz actually skidding over the surface of the cloth at 0.866 m/s, at an angle of 150° (mezured from the original line of travel).

Therefore, for a half-ball loozer into a top pocket, if the cueball iz initially rolling at 0°, the initial angle of skidding of the bottom of the cueball, after hitting the red, iz 150° (for all such half-ball collizionz). A look at the graff'chart for friktion showz that the friktion acting on the bottom of the ball iz (initially) nearly at its maximum, it iz 112.6%.

For a half-ball loozer into a baulk pocket, if the cueball iz initially rolling at 180°, the initial angle of skidding of the bottom of the cueball iz 30°. For this angle, the friktion iz at its minimum, it iz --4.4%, or 95.6%. So the difference iz 95.6% minus 112.6%, which iz a difference of -17%. This iz a huge difference in friktion.

It explainz why the cueball spreadz so wide, ie why it takes such a large Deflexion Angle when you are trying to get a loozer into a baulk pocket. In all casez the cueball'z initial deviation (trajectory) iz alwayz nearly 60° (for a half-ball contact), and then in all casez the excess of topspin cauzez it to kurv to the uzual final trajectory of approximately 33° (i am told). The difference iz that when there iz less friktion, the cueball will skid wider before it happily takes up its final trajectory.

Hence, the final Deflexion Angle iz much more than this 33°, & it iz much more than our familiar Deflexion Angle of 35°, it iz possibly over 40° (for a short range from the red to the pocket, less for longer rangez).

But, of course, the real reazon that the qball spreadz wider, iz that we are more familiar with loozerz into the top pockets. Otherwize we would be saying -- *why do loozerz into the top pockets spread narrower.*

Reverse Anglz

And what about loozerz into the baulk pockets from the reverse angle. U are in-hand. The red iz just out of baulk, near the brown spot. U place the qball near the green spot, & play a half-ball loozer into the baulk pocket. But, here the qball runz ***narrower*** than u thort, & hits the side cushion or the nearer jaw. The opposite error to the above.

How many timez hav u underplayed theze little suckerz.?? This little trap iz probably more potent than the previous trap. One bite ken kill 6 adult playerz. Koz here u hav 2 effects working against u. If the cueball iz initially rolling at 85°, the initial angle of skidding of the bottom of the cueball, after collizion, iz 150° off, az uzual, ie 125°. For this angle, from the graff, the friktion iz about +6.5%, well below the +12.6% that we know so well.

So, potentially, the Deflexion Angle should be wider than our familiar half-ball angle. But, the qball haz some collizion-induced english, az Jack Koehler would say (The Science of Pocket Billiardz, 1989). This side-spin rezults in much NapKurv. Az NapKurv iz at a maximum on this trajectory, it rezults in much narrowing of the angle, hence the strange rezult.

Try it. This applyz to all contacts, ie quarter-ball, half-ball, three-quarter-ball etc. Its not really the Directional Friktion Factor Effect working here, it's the NapKurv Effect. Actually, the Directional Friktion Factor Effect tryz its best to widen the angle, to be perfectly fair to it.

But, it gets worse. If the angle looks & iz widish, we may decide to hit harder, to widen the Deflexion Angle. But here we miss again. Koz the harder we hit the more induced side-spin, & the more NapKurv. The initial kurv iz wider, but this iz only piddling in comparison to the NapKurv.

If we hit harder still, enuff to double the red over to the other middle-pocket, we finally start to get some value, some wider angle, albeit still narrower than we think.