

35: Flat bar riffles – 1980s research in Yukon, 1990s research in Mongolia



**Figure 72. FLAT BAR RIFFLES**  
Slanted flat bar riffles on ribbed rubber matting at a placer mine in the Zaamar Goldfield of Mongolia. (photo: Jeanie Barnett of GSA)

Flat bar riffles consist of flat metal bars inclined across a sluice box to trap black sand and gold. They have been popular for at least 70 years.

**1980s tests in the Yukon, Canada**

Flat bar riffles on unbacked Nomad™ matting were slanted at various angles to the sluice-box floor in tests by Randy Clarkson and Owen Peer [8]. When slanting 15° upstream, flat bar riffles choked with sand faster than if slanting 15° downstream. Slanting downstream produces a slower vortex with its eye closer to the centre, and the vortex launches material at a lower angle. Performance was inferior to Hungarian riffles.

**1990s tests in Mongolia**

Slanted flat bar riffles on ribbed rubber matting were tested by a Soviet team led by Ms. Tsevel Delgertsoo in 1991-95 at four placer gold mines – about 25 tests in all. Each test consisted of panning to estimate the head-grade, measuring the volume washed in an 8-hour shift (1-2,000m³) and sampling tails every 15 minutes across the sluice. Careful panning was done in a gold room. Recovery was 60-70% for medium to large gold. Fine gold was not fully tested – it was often present but lost.

**Operation**

First, black rubber mats are laid on the floor of the sluice box, with the ends of the mats either butted together or slightly overlapping, imbricated down-slope.

About 6-20 riffles are welded to side bars to create a 'riffle set'. In Mongolia the flat bar riffles are severely slanted at 30-45° to the sluice-box floor.

Each set of riffles is slotted into the sluice-box and bedded down on the black rubber mat. The riffle sets are secured by metal or wooden chocks.

Generally the riffle sets are orientated with the riffles slanted down-sluice. This helps to stimulate vortices and shields metalwork from damage and abrasion from stones. For clean sands, a 30° slant is preferred. For clay-rich sands the slant may reach 45°. Sometimes the riffles are slanted upstream to act as a nugget catcher.

Flat bar riffles are commonly used in conjunction with a Siberian-style PgSh wash-plant typified by violent surging and wide fluctuation in flow and density of slurry.

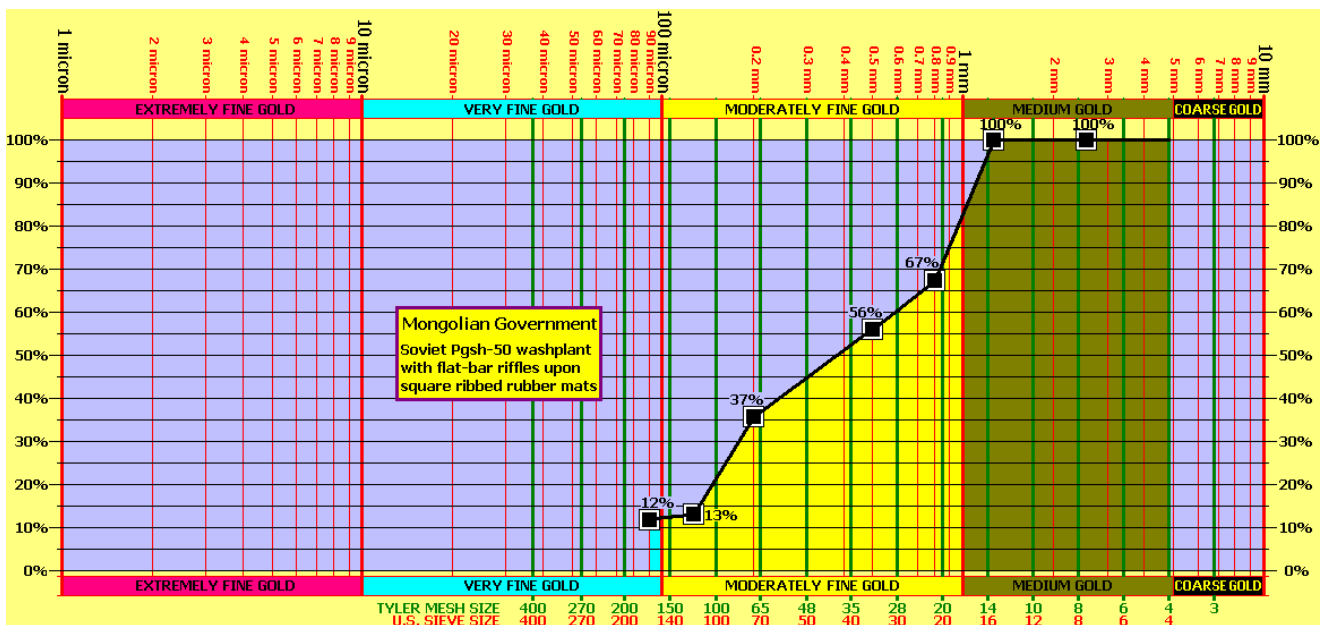
Lacking a lip, a flat bar riffle is less able to guide sand into a vortex, and sand exits its vortex instead of being led into the next vortex. This "severely reduces the opportunity for gravels and gold to enter the riffles" and "the turbulence... destroys effective vertical segregation." [8]

Vortices cease after a few hours choked with sediment, yet washing continues for an 8-hour shift.

Flat bar riffles are less strong than angle iron (Hungarian riffles) and more prone to bending.

**Adoption by placer gold miners**

Slanted bar riffles on square-ribbed black rubber mats are the norm for placer gold mines in the former Soviet Union and Mongolia.



**Figure 73. GOLD RECOVERY BY SLANTED FLAT BAR RIFFLED SLUICE – Mongolia tests**  
Recovery of placer gold by slanted flat bar riffled sluice on ribbed rubber matting, tested by Mrs. Tsevel Delgertsoo. (compiler: Robin Grayson)