

14: Pan-American duplex jigs – Alaska tests

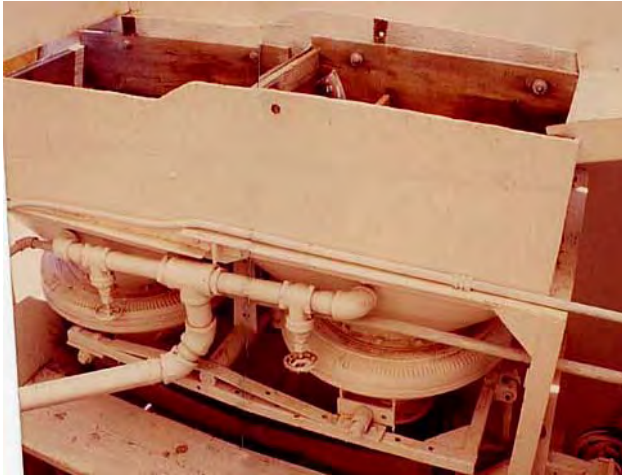


Figure 33. PAN-AM DUPLEX JIGS
 A duplex of Pan-American jigs. (photo: courtesy of the manufacturer, Delta Mining & Manufacturing Co of Nashville, Tennessee - www.graymfg.com/mineral.html)

In the early 1930s the engineers of the Bulolo Gold Dredging Company designed the Pan-American placer jig (Pan-Am jig) that is compact and tolerates wave motion in small dredge ponds or even open sea. By the late 1930s the Pan-Am jig was widely used on dredges for recovery of alluvial cassiterite (SnO₂ tin ore), gold and diamonds.

The Pan-Am jig is a balanced pair of jig cells known as a duplex jig, saving 50% of energy in jiggling. Each cell is underlain by a conical hutch of two parts joined by an annular diaphragm of flexible rubber to allow up-and-down oscillation of the lower hutch. Standard 42inch x 42inch cells (about 1m x 1m) have seven variables [56]:

- ✘ amount of ragging – typically 425lbs (193 kilos) per cell;
- ✘ type of ragging – typically 3/16 inch (4.75mm) steel shot;
- ✘ feed pulp density – 30% to 60% (w/w);
- ✘ feed rate – 20 yd³ to 30yd³ per hour (15 to 23m³ per hour);
- ✘ hutch water added – 2.3 to 4.5m³ per hour per jig cell;
- ✘ stroke length – ¾ inch to 1½ inch (19 to 38mm); and
- ✘ stroke frequency – 120 to 200 cycles per minute.

Operation

The upstroke of the rocker arm lifts the lower hutch and compresses the diaphragm, forcing water up into the upper hutch and up through the static screen to lift in the ragging and its blanket of black sand, so fluidising the sand into a thixotropic ('loose') state.

Less dense particles are flung up and swept away with the tailings. Dense particles remain. Gold particles burrow in the black sand down into the heavy ragging.

The downstroke extends the diaphragm, sucking water down from the upper hutch and down through the static screen to suck the ragging and its blanket of black sand, compressing the black sand into a dilatant ('hard-packed') state. Small gold is sucked down into the upper hutch to fall and settle on the bottom of the lower hutch for continuous discharge with black sand via a spigot.

Gold particles too big to pass though the jig screen remain stranded on the screen awaiting recovery when jiggling stops for cleaning the screen – a batch discharge.

The upstroke of the lower hutch pushes more water through the screen than replaced in the downstroke – compensated by inlets injecting water in the upper hutch.

Adoption by placer gold miners

Pan-Am duplex jigs are fairly popular in many regions, and can be seen in action in Alaska, Yukon, South America, and Africa but are rare in Russia and Mongolia. Pan-Am duplex jigs are made in many regions, e.g.:

- ✘ USA – IRD of Carson City, Nevada
www.ird-jigs.com
- ✘ USA – Delta Mining & Mnfr Co of Nashville, Tennessee
www.graymfg.com/mineral.html
- ✘ USA – Goldfield Engineering Co, of Lindon, Utah
www.goldfieldeng.com
- ✘ Thailand – Dove Engineering
www.dovemining.com
- ✘ China – China National Gold Corporation (CNGC)
www.chinagold.org.placer.html

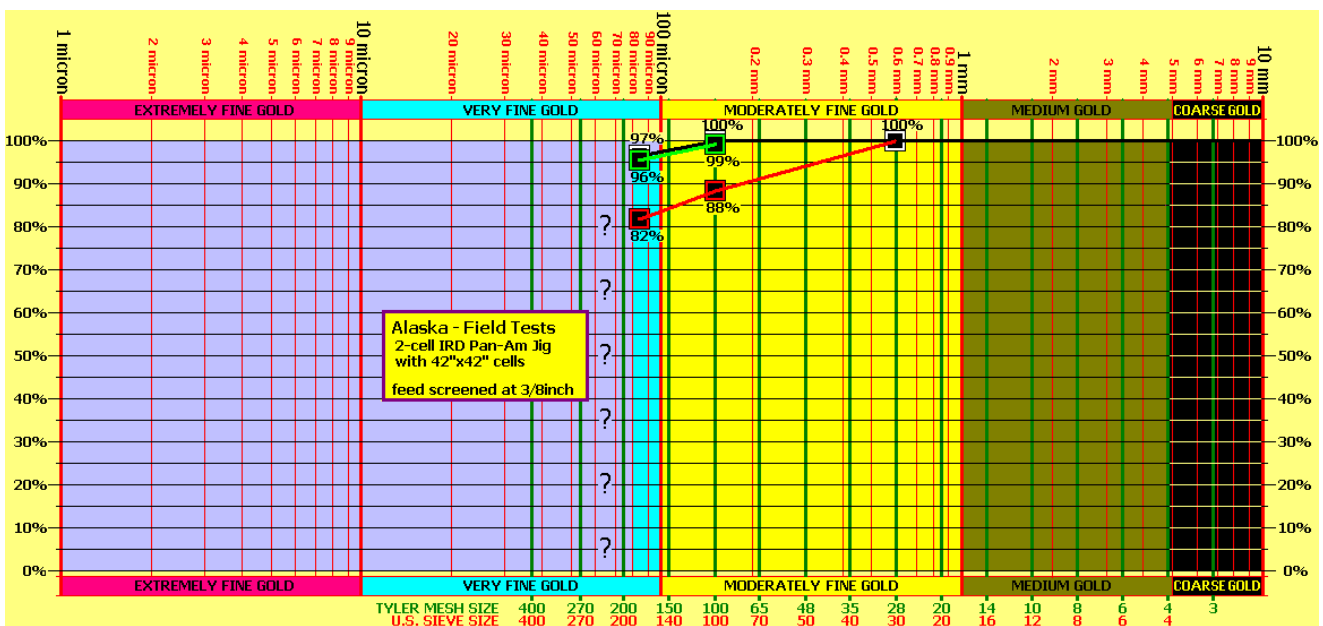


Figure 34. GOLD RECOVERY BY PAN-AMERICAN DUPLEX JIGS
 Good recovery of gold by Pan-Am duplex jigs during tests by MIRL in Alaska [56]. (compiler: Robin Grayson)