mounted and roller-backed automatic gripper in the middle, and a chain sling at the bottom.

Unloaded, each car weighed around 240 pounds.

The cars would roll underslung along the track cables and, when the gripper was closed, got towed by the tow cable. On the down trip, the cars would get used in pairs. One near each end of one dozen boards or half a dozen timbers. The cars would thus typically be six to ten feet apart. Iron guides and channels "squared up" the chain slings to match the load. There was a hidden quick release under each bottom support channel.

On the up trip, the cars usually returned singly. Mostly empty, but sometimes carrying a sack of grain, mail, a bale of hay, or whatever.

The gripper mechanism showed some creative design. There was a rolling ball the size and shape of a trailer hitch which activated an overcenter two-state toggle mechanism. Sort of a mechanical set-reset flip flop. Ball up and the gripper was open; ball down and the gripper grabbed the tow cable. Deflection plates mounted on the stations would automatically release or grab as needed.

These plates would be placed after the ends of the track cables but before the loop of the tow cable. At activate time, the car would be riding on a set of high rails similar to those in a large meat locker.

The gripper casting seemed to include an obvious bell. Presumably it dinged once on each grab or release.

**Tension Stations**

Rather than trying to manhandle (and mulehandle) some fifteen miles of cable through country that would make a marine drill sergeant blanch, the track cables were broken up into mile long segments. One end of each cable was secured to a giant eye set in a solid concrete foundation. The cable would then route up and over the top saddles of a dozen or more towers and end at a tension station.

Besides allowing shorter cables, the tension stations kept the track lines from sagging under load.

At the tension station, the track cables would go over large pulleys and hang on floating concrete weights.

These humongous blocks weighed in from 8000 to 30,000 pounds. Made from iron-reinforced cement poured around groups of locally gathered large rocks. Gneiss, mostly. The weights would ride up and down in massive wood guides reminiscent of a double hung window.

At a tension station, the cars would leave their entry track cable, traverse a short transition sheave to a fixed horizontal rail, traverse a second transition sheave, and end up on the exiting track cable. The moving tow cable was oblivious to the bait-and-switch, and simply dragged the cars along. The fixed rail was supported by cast iron "J" skyhook rails bolted to upper support timbers.

Three "double" tension stations held two weights and two anchors each. Two "quad" tension stations supported four weights but no anchors. The remaining eight anchors were paired at the upper terminal, the lower terminal, or at either end of the transfer station.

Down track weights were always heavier.

Much of the aerial tram was built from parts recycled from earlier tram and mining ventures. The tension pulleys form a curious mix. Obviously gleaned from a variety of strange sources. In several cases, a rod hoop got welded onto a mine car wheel to form a cable guide pulley.

As you might guess, 30,000 pound concrete blocks are somewhat vandal resistant. Many survive intact to this day. Even so, at least one of them has gotten hauled off as a tourist memento. In operation, these tension stations must have been extremely impressive.

It is still a stunning adventure to come upon a station unexpectedly in heavy brush. I’m trying to reconstruct their engineering drawings. But exact details of their upper reaches still remains elusive.

The transfer station and the Pima terminal also were long and rather elaborate wooden structures which allowed for intermediate storage and routing of the loaded cars. At the transfer station, the uncoupled cars would get slid along skyhook rails and recoupled to the second leg of the tram route. Human intervention was apparently required. A few tantalizing photos show how big and how complex these stations really were. But they don’t reveal much in the way of precise technical details.

Little remains of most of these sites today.

**Gravity Powered?**

Local lore has the tram running entirely by gravity. And having enough energy left to run the sawmill as well. There was in fact a steam boiler at the sawmill and an engine at the nearby tram terminal. Motive power apparently was coupled to the lower tram leg at the transfer station by a vertical axle and pair of gripper wheels.

Let’s see. Take 400 pounds or so of wood and drop them 5000 feet. That is around 2 million foot pounds of work.

Make the trip in, say, 40 minutes.

This gives you something like three horsepower’s worth of effort. Per load. Because of loading times, I’d think it unlikely that the average loads could be closer than seven minutes apart. Guessing six loads active at any one time yields you something around 18 horsepower derived from gravity. But two of those loads would cancel each other out going over the ridge.

Leaving you with a net 12 horsepower.