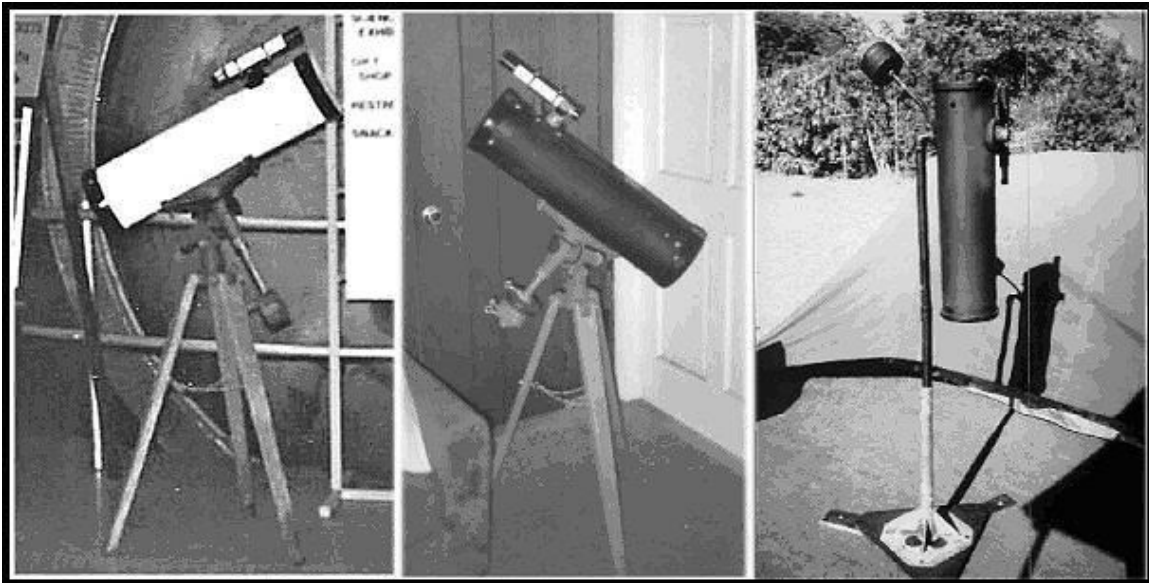


Restoration of an Al Novak Equatorial Mount

By: Jeff Beish

In 1975 I acquired a 6" f/4 from a member of the Southern Cross Astronomical Society in Miami, Florida and for a few years would use it at star parties without a mount. We would hand it around to hold it in our lap to observe and after while the tube began to deteriorate. Some years later I gave it to my son and, then when he went off to the Navy he sold it to a friend who sold it to a coworker, then another coworker until the last person gave it back to me! By then the tube was in bad shape, so a friend was building a long 6" and had cut off a couple of feet of his aluminum tube to give to me. That was perfect for the simple fast Newtonian with a 24.25" (615.95 mm) focal length primary and the existing components.

The mirror was just okay; but a friend, Richard Fagin, refigured it to a nearly perfect 6" and with that the telescope was painted and reassembled. Also, with this scope came an Edmunds Scientific 85-108 equatorial mount and wooden tripod with no motor drive. That worked just fine until another friend, Dave Raden, brought his "Scope-on-a-Stick" to the Winter Star Party and my scope ended up with a new mount, the Raden "Scope-on-a-Stick."



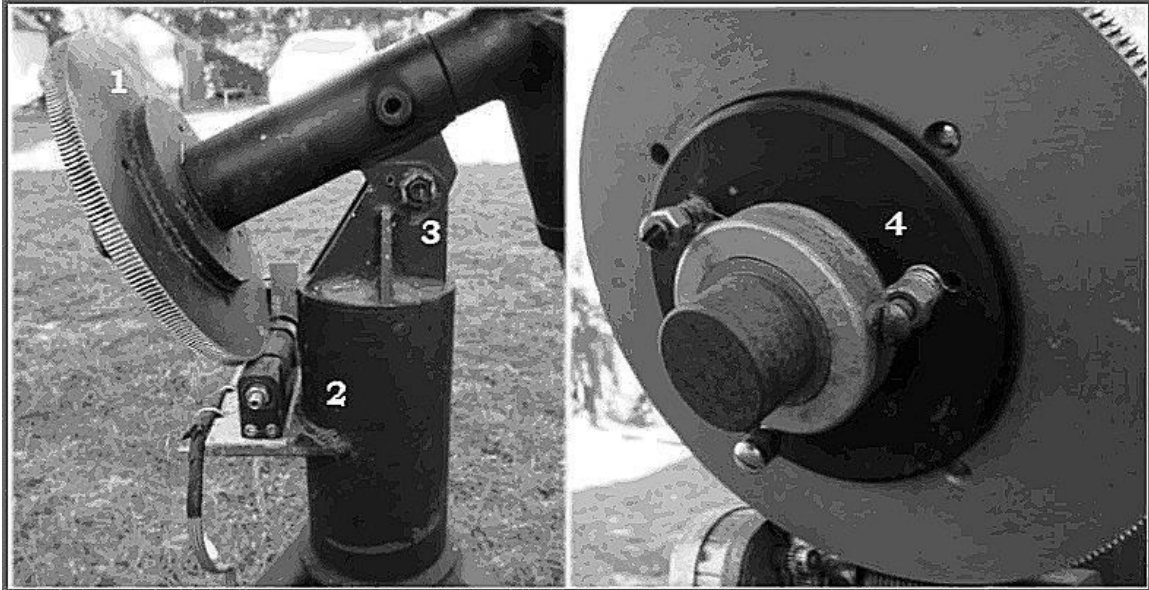
LEFT: 6" f/4 in 1975 with Edmunds mount. CENTER: Refigured primary mirror and refurbished. RIGHT: New aluminum tube and "Scope-on-a-Stick" Mount.

After retiring to a new home in central Florida, during mid-2001, the 6" was mounted on a Park's mount ordinarily used for my 12.5" f/7 Newtonian. A little overkill but it worked out nicely until my observing site was more organized. This mount was built back in the late 1970's to be used on my 12.5" f/30 Classical Cassegrain, then on my 12.5" f/7 Newtonian. When we left Miami for Virginia it was sold to a friend and after returning to Florida he gave it back to me due to lack of space at his new home. That was nice because it is still being used today and works perfectly. Then in 2003 he gave his Al Novak, so-called "Chicago Mount," to another friend who then gave it to me. It had been modified with less than proper workmanship, so it sat around here unused until this year when I took it apart, cleaned, fabricated new parts, painted and assembled back into working order.



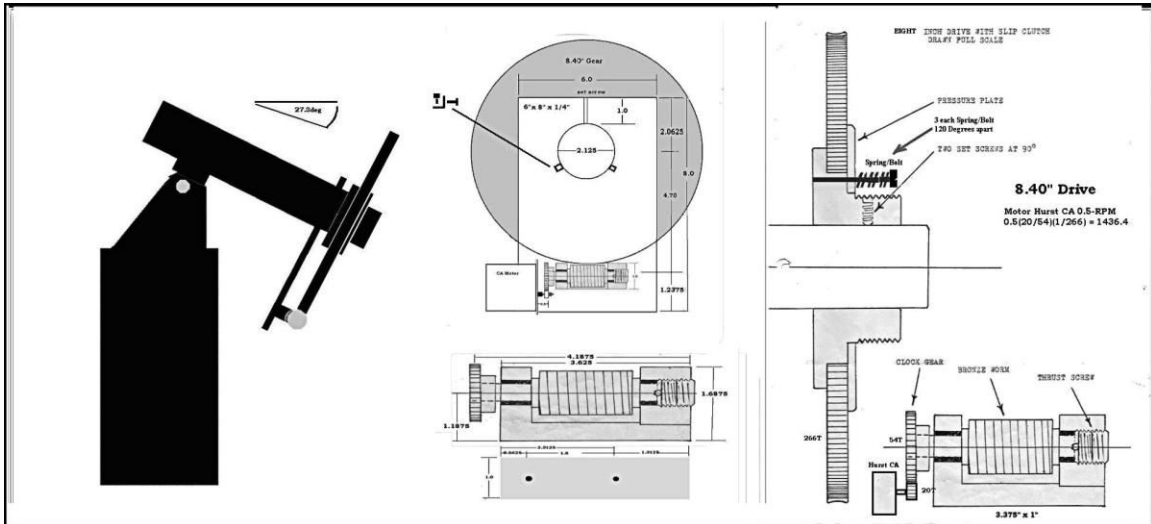
LEFT: Temporarily on Park's mount. CENTER: Mounted on the so-called "Chicago Mount" RIGHT: The renovated AL Novak "Chicago Mount."

A Butchered Al Novak, "Chicago," mount: Here is the wrong way to treat a very good Al Novak German Equatorial Mount (GEM). This mount had been completely butchered by someone (name withheld) that; 1) painted the main gears and other parts of the drive system, 2) mounted the worm on a steel flange welded to the pier. This caused the two gears to regularly separate when the mount is moved or telescope repositioned, 3) the bolt and nut that holds together the polar axis housing to the pier hub was either glued or welded so the polar axis cannot be positioned for the observer's latitude and 4) the original Mathis clutch pressure ring was replaced with Rube Goldberg bolts and springs, and some gasket material between the pressure plate and the main gear. To add insult to injury the three spring/bolt holes are not 120 degrees apart and not evenly spaced away from the shaft. After attempting to make this mount work properly it was decided to completely disassemble it and rebuild it for use with my 6" f/4. Without the machine shops from my past it will take a little longer to rework this great Al Novak GEM.



LEFT: 1) painted gears, 2) worm welded to pier, 3) pier hub and polar housing welded and RIGHT: 4) original Mathis clutch pressure ring missing, replaced by nuts, bolts and springs

The plan for rebuilding this mount was to install a 6" x 8" x 1/4" hardened aluminum plate on the polar housing; then measure, drill holes and mount the worm and motor attached to the plate with a bracket. Below are the diagram for the Mathis 8.40" drive and my new setup drawings for the mount. Since we have a limited number of junk yards around here the eBay had some cut aluminum plates available, so that was ordered and the arrived within a week.



LEFT: A silhouette of the mount pier, worm mounting plate and gear. CENTER: Layout plan for the worm gears and motor placement. RIGHT: Mathis 8.40" worm drive schematic.

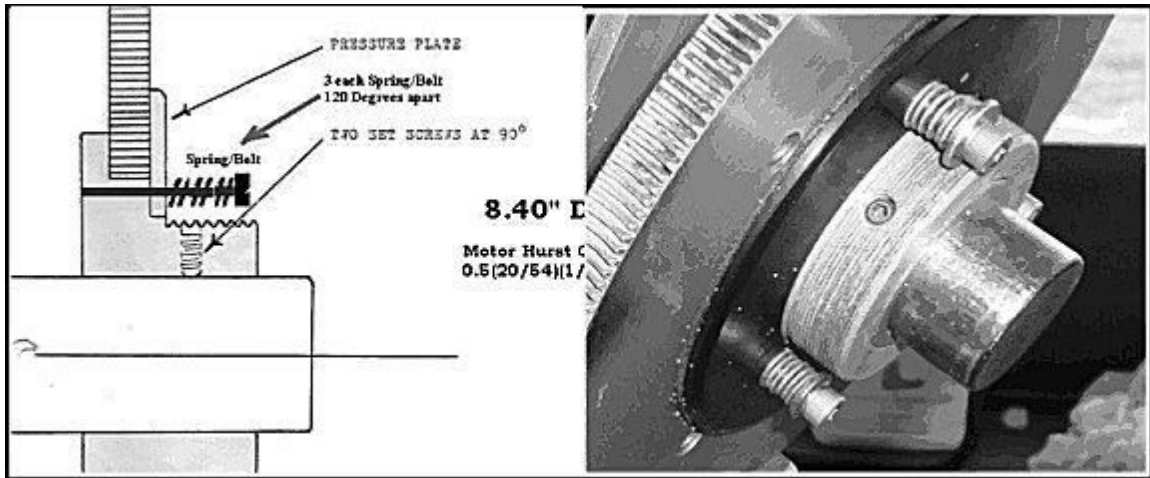
After drilling out the nut end of the bolt it was removed from the pier hub and polar housing connection surfaces were prepared for a new bolt. The polar housing was reversed on the pier to make room for the plate at rear of polar housing. Then rust was removed and pings in the shafts were filed down and polished. Next step was to clean and lubricate the bearings, install the shafts to make sure they were turning smoothly.



TOP-LEFT: Rust removal from shafts and cleanup. **TOP-RIGHT:** Polar housing and pier with both shafts removed. **BOTTOM-LEFT:** Polar housing reversed and attached to pier hub with new bolt and nut. **BOTTOM-RIGHT:** Bearings and shafts cleaned and polar shaft installed in housing.

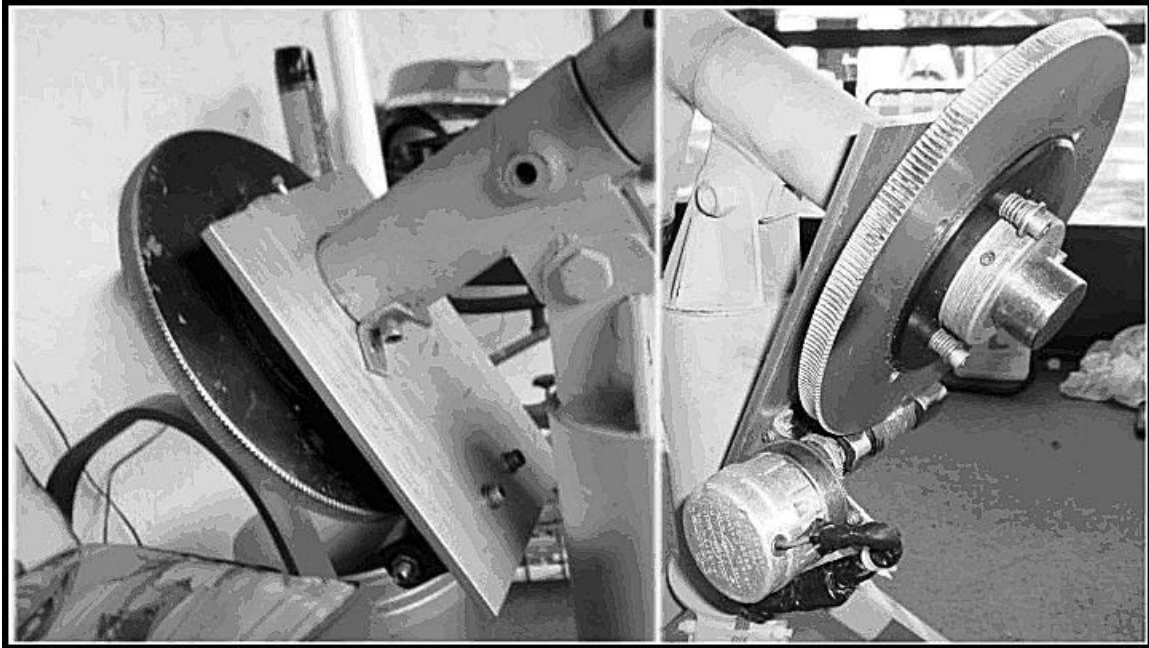
The polar housing is 2.125" in diameter, so a hole was made in the plate to fit the housing and then a set screw was added to the top of the plate to secure the plate. Two small aluminum angles with screws were attached to the plate to secure the bottom of the plate. Measuring the actual components made it easy to align the gears together for proper placement of the components and insure accurate tracking.

The original drive/clutch hub was for 2-inch shaft, so an insert was added to fit the 1.5" polar shaft. Some run-out in the gear was measured so the insert ring was filed and smoothed then and shimmed to remove the run-out. New hex bolts and springs replaced the old ones in the clutch pressure plate and a thin Nylon membrane was added with an ample amount of white lithium grease to allow proper slippage in the clutch with enough friction to hold the telescope on target.



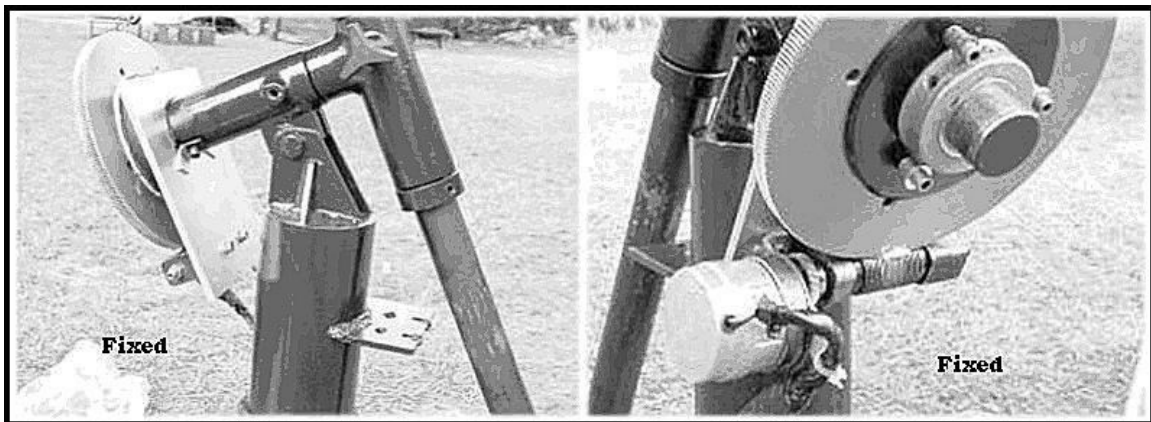
LEFT: Diagram of Mathis 8.40" drive with Nylon membrane inserted between clutch pressure plate and main gear.
 RIGHT: new hex bolts and new springs for clutch friction adjustment.

Nearly complete; the worm gear is mounted to the plate and then the plate mounted to the polar housing. After the main drive gear and clutch hub was installed on the polar shaft rendering everything aligned and then adjusted to fit components for proper tracking. Holes for the motor bracket were drilled and then motor were installed. Some gray Zink Cold Galvanizing Compound primer was sprayed on the housings and pier to prevent rust.



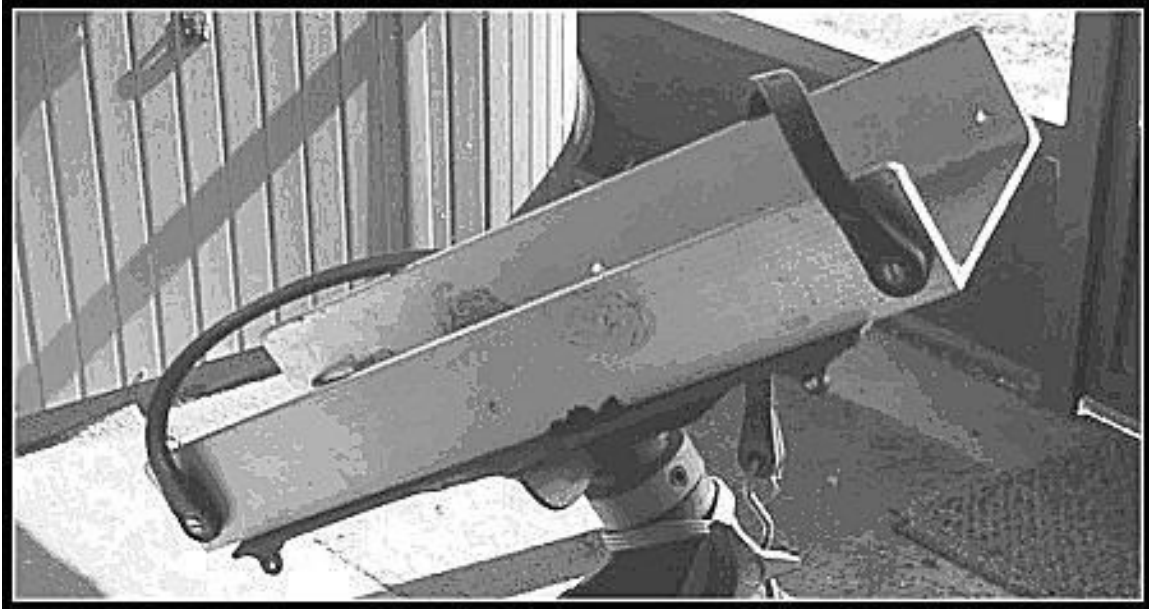
LEFT: 6" x 8" x 1/4" hardened aluminum plate secured to polar housing with set screw from top and side mounted angles and set screws. RIGHT: Motor bracket and motor mounted to plate. Mount housings and pier painted with Zink Cold Galvanizing Compound primer.

After the power was turned on and the drive tested for proper operation the mount was completely disassembled again to remove paint from the gears and other components the housings. The pier and housings were painted with hammered black and the mount was reassembled. The gears were lapped using lapping compound, cleaned and lubricated.



Restored and painted Al Novak Equatorial Mount; "Chicago Mount."

The old saddle was discarded and new 182mm tube mounting rings were purchased from Orion Telescopes. The telescope was then mounted and the system tested during that evening for proper tracking and smooth operation. This 6" telescope is used primarily used for Solar Observing using a full aperture Baader Solar Filter.



Old saddle made from aluminum U-channel and rubber bungee straps.



6" f/4 Newtonian telescope attached to restored mount using Orion tube rings.