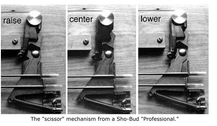
The Kline Guitar



The "scissor" mechanism from a Sho-Bud "Professional."

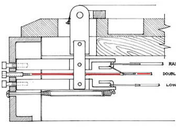
While most manufacturers have settled into a "scissors" type changer, and have a rod pulling system that uses a nylon nut to adjust the length of the rod, and a pedal stop to limit the length of the pull, the Kline is an old "yoke" type puller. The end stop for the change is not at the pedal and adjusted through a rod, but at the end casting. When the tuning screw hits the solid end plate, it is not going anywhere else.


The top row is the raise, the lower row is the lower, and the middle row is a half note raise or lower. The slotted screws at the bottom are for return spring tension.

The few **holes** in the changer block in back of the bridge are for lower stops for those strings where a "tunable split" (i.e., raise and lower activated at the same time). By the way, the "wrench" in the raise nut on the 12th string is super-glued in place. I use it to change the raise on the 12th string E from an F to an F#-- without having to fumble for a tuning wrench.

The **changer** itself is similar to that used in the Sho-Bud "rack and barrel" models, but the pulling blocks are tapped and drilled to accept the hex socket cap screw that serves as a tuner and stop.

The cross-rods are hexagonal in section, turned to a 1/8" round at both ends. The rods rotate in pillow blocks that are fastened to rails that, in turn, are fastened to the front and rear apron of the guitar. The pillow blocks are each held by two screws, so the whole cross rod can be removed by removing those four screws (front and back).



Cross-section of the changer. The half raise / lower is in red.


The hexagonal crossrods with bellcranks and yokes

The **bell-cranks** have a hexagonal hole broached through them. They have one set-screw to tighten them to the cross-rod.

The bell-crank has a flat edge in which rides the yoke. The yoke is stamped steel and slides over the bell-crank. It is held tight in place by the pulling rods.

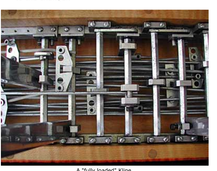
The pulling rods are held to the yoke by a collar with set-screw that passes through one of the four holes in the **yoke**. The rods can sit above the yoke or under the yoke.


The stamped, 4-hole yoke.


The welded loop on the end of the pull-rod.

Each **rod** had a wire loop welded on the end. This loop is hooked over a bent rod in the changer. If the same string is moved to the same place by two separate pedals, then the two rods are both hooked to the changer.

Because the double pulls are not always the same width apart as the holes in the yoke, the rods from the yoke to the changer are not always in a straight line. The underneath may look like a real mess with all the rods at angles and on top of each other, but the mechanism works smooth as silk.


A "fully loaded" Kline.


The plate across the body prevents the sides from spreading. Above the plate, on the left is one of the two pedal stops I have on it just to prevent any mushiness of that pedal. Note the vertical knee lever.

If you want to pull three **strings** with a single pedal, then a rod from the changer goes to one side of the yoke, and the second side is attached to another yoke that pulls the other two strings. The knee lever on the left has a yoke (second from top) above the crossrods that has the rod on the left going to the changer, and the rod on the right hooked to the second yoke (third from top), which in turn is pulling the two other changes.

Unlike most steels, the majority of the bell cranks are below the cross rods (with the guitar upside down). For the knee levers that usually need a "reverse link," the bell cranks and yokes are on top of the rod. No reverse links are needed!

For a single pull, a special single bell-crank is utilized, which has a moveable attaching point to allow varying leverages.

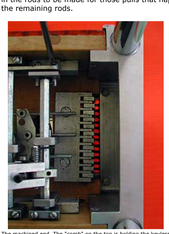

The adjustable single pull crank.

The changer allows any number of pedals to take any string up to a note and down to a note. To have a double raise, i.e., to have the 4th E go up to F and to an F#, a different rod is needed (see section diagram).

The rod used for a double raise/lower has a hook and an extension. The extension is threaded. The rod is hooked to the "middle note" (i.e., the 4th string E to F raise), and is placed through the center row of holes in the end plate. A hex socket cap screw (the same as the others in the changer) is drilled and tapped, and screwed onto the rod extension. This is used to tune the middle note.

Of course, this now takes up the middle hole for that string. If you now want a second lower on the same string or a third raise on it, there are ways of working it out by using another hole as the stop, but this happens so rarely, that the modification was custom done at assembly by Joe Kline.

When "rodding it up" the full pulls go on first, and the 1/2 pulls go second. There is a need for having a pretty good idea of what positions are pulling which strings to allow for the proper bends in the rods to be made for those pulls that happen above the cross-rod and then must go under the remaining rods.


The machined end. The "comb" on the top is holding the keyless tuner.

Since all the tuning and stopping is done at the end plate, there is no need for tight tolerances in the rest of the pulling chain. The cross-rods are fairly loose in the pillow blocks, and the pedals need no stops, although stops were available if the bottom felt too "spongy." The actual rotating shaft at the end of the crossrod is 1/8" diameter-- which really cuts down friction within the pulling train.

The "end casting" is machined from a solid aluminum billet. The cabinet is held to the end by two screws front and back on the inside of the apron. The string tuning unit is screwed through the top, while the rest of the "peg head" unit is screwed to the end plate directly.

The pedals are made from a steel tube, two extensions, and a pedal pad-- all welded together. They don't have the usual aesthetic of cast or extruded pedals, but they work just fine!

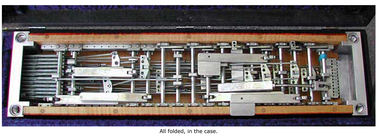

The pedals.

Pedal "feel" has two components: the amount of pressure needed to activate the change, and the amount of pressure needed to hold the change.

Joe and I measured his guitar and my "The Steel" guitar by hooking a fishing scale to a pedal while the steel was upside down, pulling up, and noting at what weight the movement stopped and then, letting up, noting what weight held the change. Joe was of the opinion that the initial measurement had to do, in part, with the force needed to overcome the friction in the system.

"The Steel" took 6.5 pounds to activate the B to C# changes on pedal 1, and 4 pounds to hold. Joe's took 4.5 to activate and 3.5 to hold. A very nice pedal action!

All of the single neck guitars, be they 10, 12, 13 (yes he made one 13), or 14 are all accommodated by the same size cabinet. And it all folds down into a delightfully small case.


All folded, in the case.

One magnificent detail was the mechanism attaching the vertical knee lever to the cross rod. The vertical lever has always been a problem. It needed to be long enough to have the leverage to make the changes easily, but it had to be deep enough within the guitar to let the top close on the case, which usually places it too far above the player's knee. Some manufacturers had the knee levers detach from the actuating mechanism to allow for these two criteria.

Joe Kline solved it magnificently. The vertical knee lever is held in the "up" position by a spring wound around the lever's axle that is resting on the cross shaft and applies upward pressure to the lever. The second end of the coiled spring rests against a flat on a rod through which is a socket head cap screw.


The vertical knee in ready position.

This screw provides the vertical adjustment of the lever and when the lever is lifted slightly, the rod can be rotated by pushing on the screw, rotating the contact point of the screw away from the contact point "shelf" with the cross shaft,


Lifted and screw rotated back.

and allows the lever to fold down. To set it up, all one has to do is pull the lever up until the cap screw clicks onto the contact "shelf."


The vertical knee folded in.