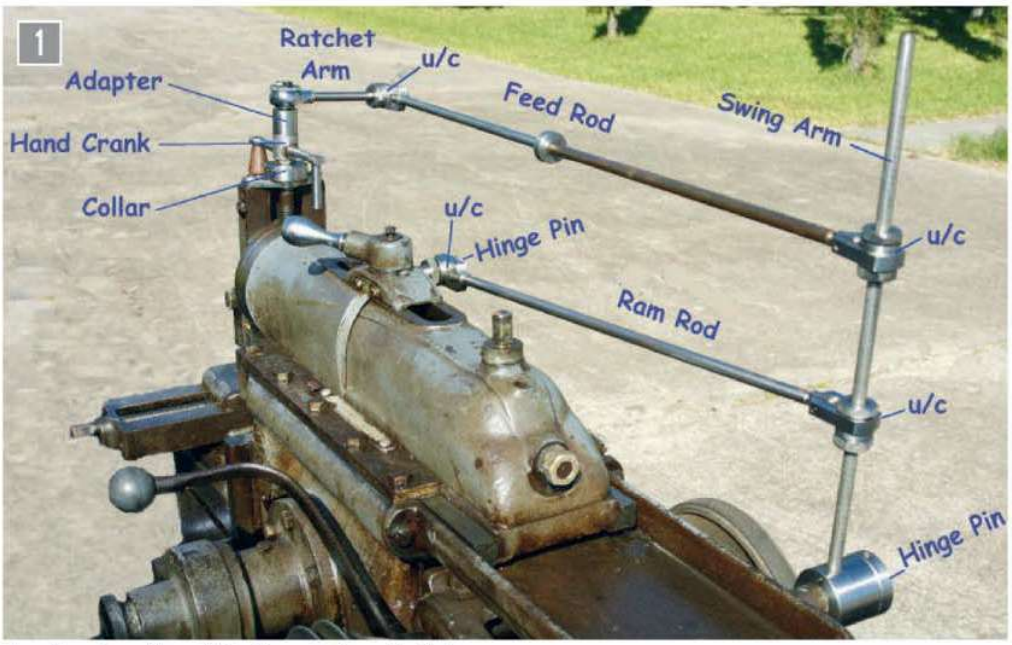
A Vertical Power Feed for your Shaper

Dennis E. Fielder
improves a workshop workhorse.



The adapted machine with its bits and pieces labelled.

You may well ask why you would need a vertical feed system on your shaper. I can only tell you that I often wonder how I got along without it. Not only does it do a good job but it's fascinating to watch it in operation and your fellow model engineering buddies will be enthralled.

As to whether there is a place for shapers in today's workshop, let me refer you to **www.lathes.co.uk/atlasshaper/index.html** where Tony Griffiths Engineering says it much better than I could. Tony Griffiths' well illustrated web page (click on the picture links under the Home Page heading) also provides an excellent background to the uses of the shaping machine; I quote his introduction :-

'Often greatly underrated, even by experienced engineers, the shaper is a machine-tool that was largely displaced for many years by a flood of cheap, far-eastern vertical millers. However, this surprisingly versatile machine is staging something of a renaissance - and the many knowledgeable enthusiasts who baulk at spending large sums of money on easily-damaged tooling for their miller know that much the same effect can be obtained with a shaper and a cutting tool worth a few pence ...'

As you can see from the first picture (**photo 1**) the vertical power feed is a fairly simple arrangement of levers and push rods, the details for which are quite simple. However, while they work very well on my 1938 Atlas shaper, they might need some modifications to work on your machine. So, I'm going to describe the principles of the vertical feed system as it relates to the motions of the shaper. That way you can readily adapt the principles to your machine and modify the bits and pieces accordingly.

Photograph 1 presents the geometry of the machine and names the parts of the vertical feed system. The main drive component is the vertical swing arm. This arm is long enough to stand above the height of the vertical feed-screw and is secured to its sleeved boss with a set screw (**photo 2**). The Arm is mounted on a hinge pin and secured with a retaining ring (**photo 3**). The hinge pin >>

Swing arm assembly.

Swing arm boss and retaining ring.

Swing arm hinge pin.

Ram rod hinge pin.

Ram rod - hinge pin connection.

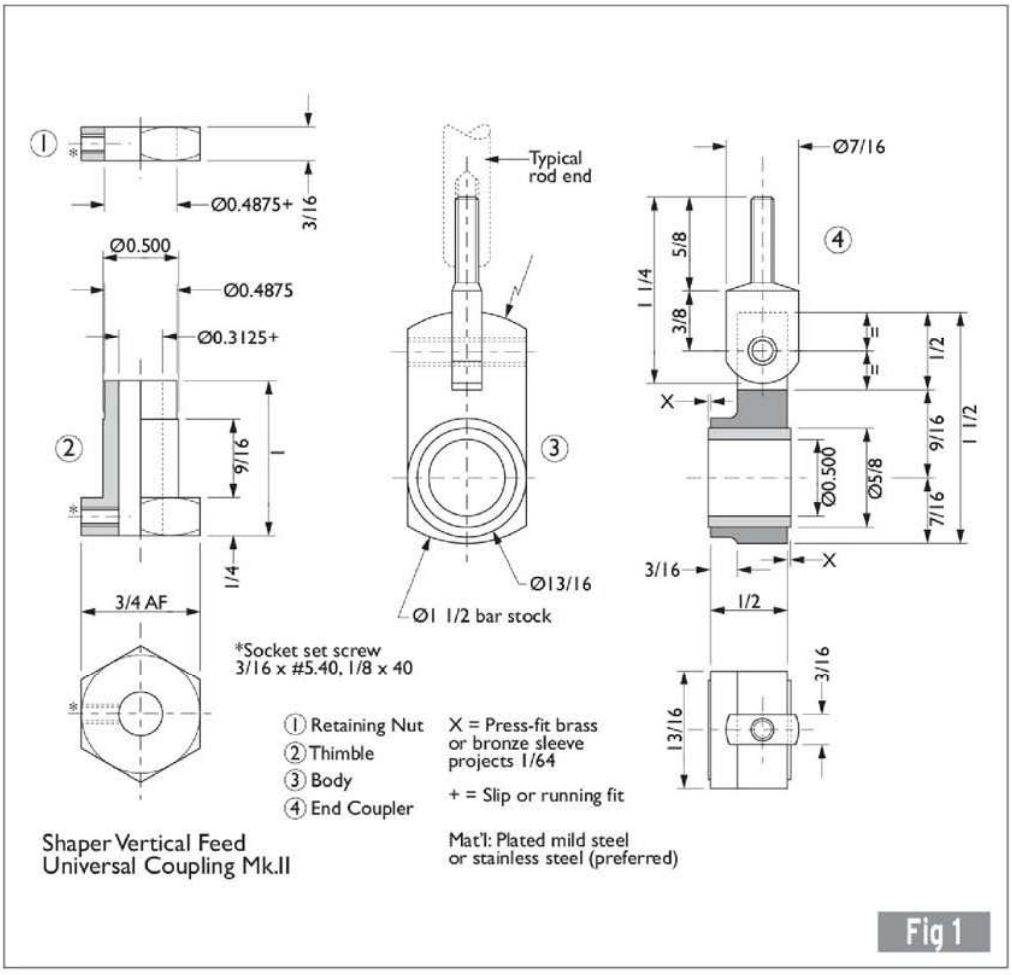


Fig 1

is attached to the body of the shaper - probably the biggest issue is where to put this hinge pin on your machine.

In general, the swing arm hinge pin should be ½ inch in diameter, in line with the ram slides, about 8 inches behind the back of the machine bed, and clear of any drive pulleys. My old Atlas shaper has a substantial projection at the rear (the 'oil pan' in the manual) which protects the rearmost position of the ram; it also has a ½ inch 'pin' (**photo 4**), once used to support a guard for the motor drive belt. This turns out to be a pretty good swing arm hinge pin. If you don't have such a natural location on your machine then you will need to create one.

The vertical feed system uses four Universal Couplings (U/C) to connect the various rods, arms and pins. By maintaining the same diameter (5/16 inch) amongst these items, the same design for the universal couplings can be exploited. Each coupling consists of a ½ inch diameter 'thimble' that can be locked in place at any location along a 5/16 inch diameter, and supports an end-coupler that can screw into the tapped end of a rod or pin (**fig 1**).

Two U/Cs are screwed into the ends of the ram rod and used to connect it between the ram rod hinge pin (**photo 5**) mounted on the ram drive clamp (**photo 6**) and the swing arm (**photo 7**).

When the ram is in motion the ram rod causes the swing arm to oscillate back and forth in sync with the ram. The magnitude of the angular motion of the swing arm is controlled by two factors: the position of the adjustable ram rod connection on the swing arm and the length of the ram stroke. The higher the position of the ram rod on the swing arm, the smaller the deflection. The longer the ram stroke, the greater the deflection. It is this deflection that is exploited to develop the motion of the vertical feed screw.

Adapting the top of the vertical feed screw may also call for some user innovation;

it involves a new crank, an improved graduated collar and an adapter providing a socket for the ratchet arm. When the retaining nuts, the crank handle and the graduated collar are removed, the top 1½ inches of the feed screw are exposed (**photo 8**). The lowest part of the exposed screw is smooth, the centre section is slotted and the top is threaded, ⅜ inch x 24 tpi.

The original graduated collar (or dial) left something to be desired, the diameter (1 inch) was too small and the markings were hard to read. A new collar 1½ inches in diameter was marked with 100 one thou increments, 20 five thou marks and 10 ten thou marks (the feed-screw thread is imperial and not easy to convert to metric). This graduated collar is the same height as the original collar and fits over the smooth section of the exposed feed screw, and can be locked to any rotary position with a set screw (photo 8). The collar is retained with a nut on the feed screw.

A new, reversible crank handle (**photo 9**) was made with relatively short handles. The ⅜ inch bore of the new crank is slotted to engage a woodruff key in the slotted section of the feed screw and gives a very positive drive. The crank can be put on the feed screw either with the handles up for routine manual operation, or with the handles down for the vertical power feed while providing clearance for the feed rod (**photo 10**). The crank can be used at any time to adjust the tool in the direction of the ratchet setting, even while operating the vertical power feed.

The bottom of the adapter is tapped ⅜ inch x 24; it screws onto the top of the feed screw and retains the new crank in position. The top of the adapter is broached to provide a ¼ inch square socket. Into this ¼ inch socket goes the ratchet arm - a standard ¼ inch square, reversible ratchet drive with a handle about 6 inches long turned to a constant 5/16 inch diameter. Using the ratchet arm as a wrench, and with another wrench on the nut above the collar, both wrenches are adjusted and tightened to lock the assembly onto the vertical feed screw while, at the same time, setting the allowable backlash for the feed screw. Finally, the set screw at the bottom of the adapter is tightened to lock it in place (**photo 11**).

Set the ram to the centre of its stroke and the ratchet arm at 90 degrees to the ram (**photo 12**).

The adjustable length feed rod is made from a 5/16 inch steel bar telescoped into a brass tube, providing about eight inches of adjustment while still leaving several inches of the bar inside the brass tube. A simple friction sleeve clamp over the slotted end of the brass tube does the trick (see later). The open end of the tube is plugged with couple of inches of steel bar; again, two universal couplings are screwed into the ends of the feed rod that connects the swing arm (above the ram rod coupling) to the ratchet arm (**photo 13**).

Voila! As the ram reciprocates, the ratchet arm will oscillate and increment the vertical feed screw.

To be continued.

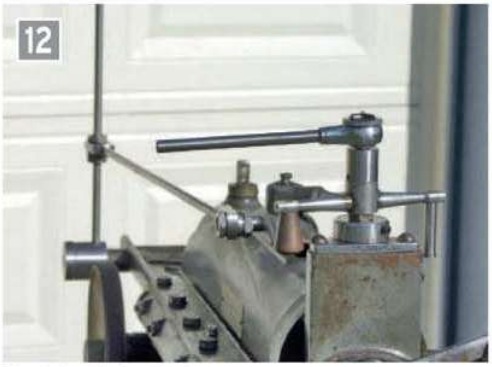
Ram rod - swing arm connection.

Collar and nut on the tool post.

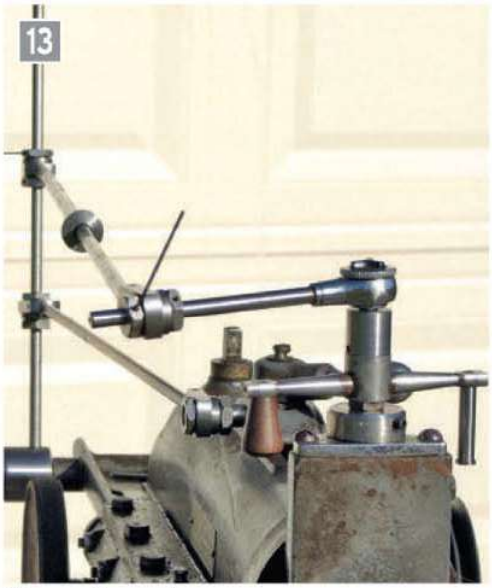
Upper tool post components.

Crank handle installed on the feed screw.

Quarter inch socket adapter installed on the feed screw.



Ready for the feed rod.



All connections made.