

Converting Hand Shaper to Power Drive

by A. S. Keep

THE No. 2 Adept Hand Shaper is a deservedly popular little machine and model engineers have increased its usefulness by adding various refinements which could not be included by the makers at the original selling price, but so far the writer has not seen any conversions to power drive.

As the arrangement described below has proved very satisfactory it may serve as a useful basis for others who find hand shaping of any considerable surface with a fine feed a lengthy business.

Most small hand shapers, including the Adept, differ from larger power driven machines in that the ram, in addition to the fore and aft stroke, is moved sideways to traverse the work, which remains stationary, while the usual practice for power machines is for the ram to have fore and aft motion only, the work being carried on a movable table traversing the stroke of the ram.

This, of course, simplifies the application of power to the ram.

The obvious way of driving the ram on the Adept was by some form of crank to give the necessary reciprocating motion, but to allow for the traversing, a universal joint had to be introduced realising that the crank and ram would only be working in the same plane in the mid position of the cross traverse, and, therefore, that certain side loads would be introduced.

To get smooth running and ease the load on the power stroke it was necessary to introduce a flywheel, and, as it was intended to drive by electric motor, the flywheel could be small, and running at high speed store up plenty of energy and use gearing between it and the crank.

Before attempting the conversion, scale line

diagrams were made to see what the angularity of the thrust loads and the corresponding side loads on the slides of the ram were likely to be.

Taking a thrust load of 200 lb. on the power stroke, it was found that by using a connecting

rod 18 in. long to transmit the power from the crank to the ram the side loads would be under 30 lb. with the ram in the extreme cross traverse position and the maximum offset of the connecting rod from the plane of the crank only six degrees.

These preliminary details have been gone into at some length in case any readers decide to make the conversion in some modified form.

The writer strongly recommends that the connecting rod should not be made less than 18 in. long or the side loads will be considerably increased, and also that a flywheel should be incorporated.

Photo No. 1 gives a general idea of the com-

plete plant with 25 V motor drive and speed control rheostat mounted on the left side. The motor on full load takes eight amps, and has ample power.

The bed of the machine consists of two lengths of angle iron 2 in. $\times$ $\frac{1}{4}$ in. $\times$ 24 $\frac{1}{2}$ in. long. The shaper is bolted at one end, and across the other end is a piece of $\frac{1}{2}$ -in. steel plate 6 in. wide by 12 $\frac{1}{2}$ in. long. This carries the reduction gear and crank.

The reduction gear and casing were bought from the local scrap merchant and had been part of the retracting gear for an aircraft undercarriage. It is a 40:1 gear, and when bought had a 24 V motor for driving. The motor was useless for driving the shaper, being a very heavy duty type intended for short periods of running

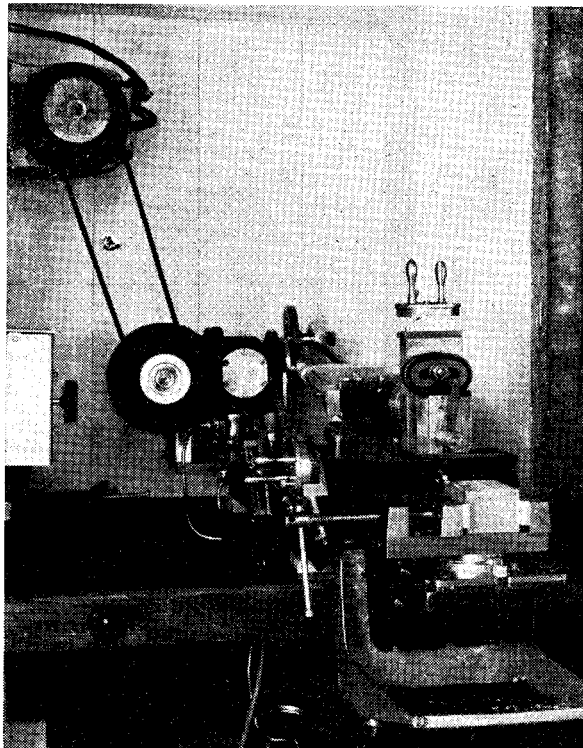


Photo No. 1. General assembly of shaper with motor and rheostat

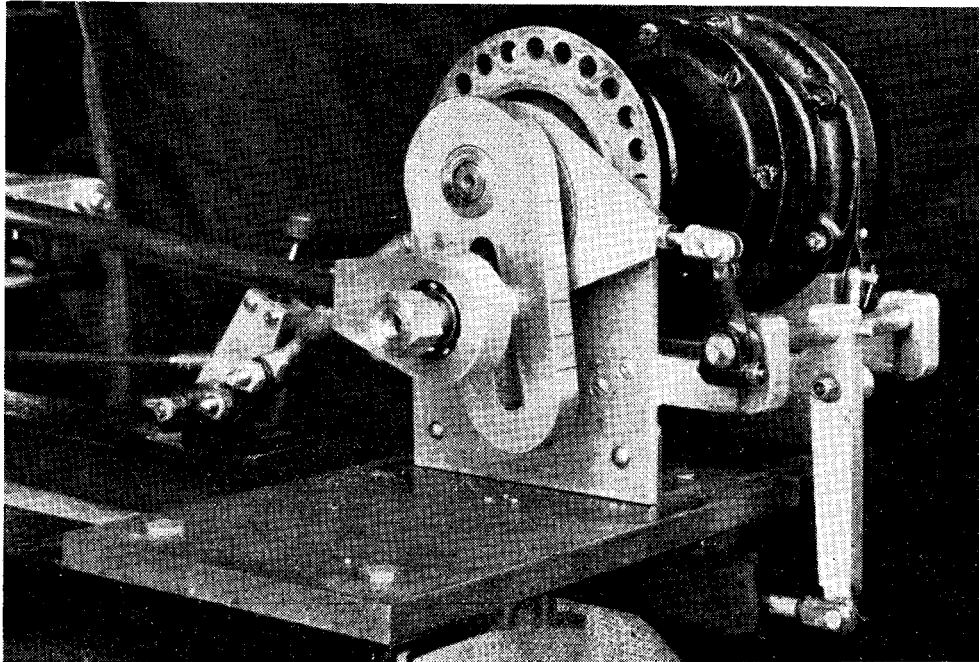


Photo No. 2. Slotted crank and eccentric gear

at high power. It was removed bodily and a new shaft turned to carry the bevel pinion on the end of the armature shaft and a new ball-bearing in a plate to replace where the end of the motor

had been. On the outer end of the shaft a 6 in. diameter flywheel and pulley were fitted. The reduction gear also contains a plate clutch, which can be set to slip at a predetermined load. This is

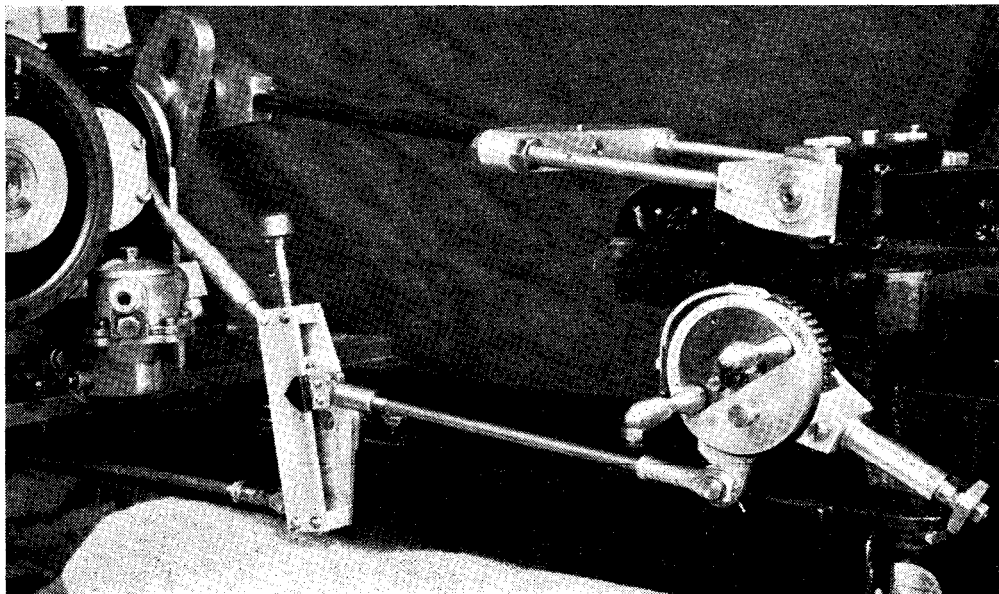


Photo No. 3. Automatic feed and crosshead

a very useful addition and prevents damage should too heavy a cut be attempted.

The crank web is cut out of $\frac{1}{2}$ in. steel plate screwed on to a steel boss. The web has a $\frac{1}{2}$ in. wide slot enabling the crankpin to be set at varying distances from the centre of the shaft giving a stroke anywhere between three and six inches. The stroke can be altered in a few seconds by slacking a nut on the crankpin projecting beyond the big-end, and the throw

revolves clockwise, this ensures that on the power stroke the ram and cross traverse slide are pressed down on the bed and not lifted up.

Both the handwheels for the vertical feed for the cutting tool and the cross traverse are fitted with micrometer heads. These are aluminium alloy rings (turned out of old pistons) engraved, and can be locked in any position by means of a clamping plate and knurled knob which can be seen in the photograph.

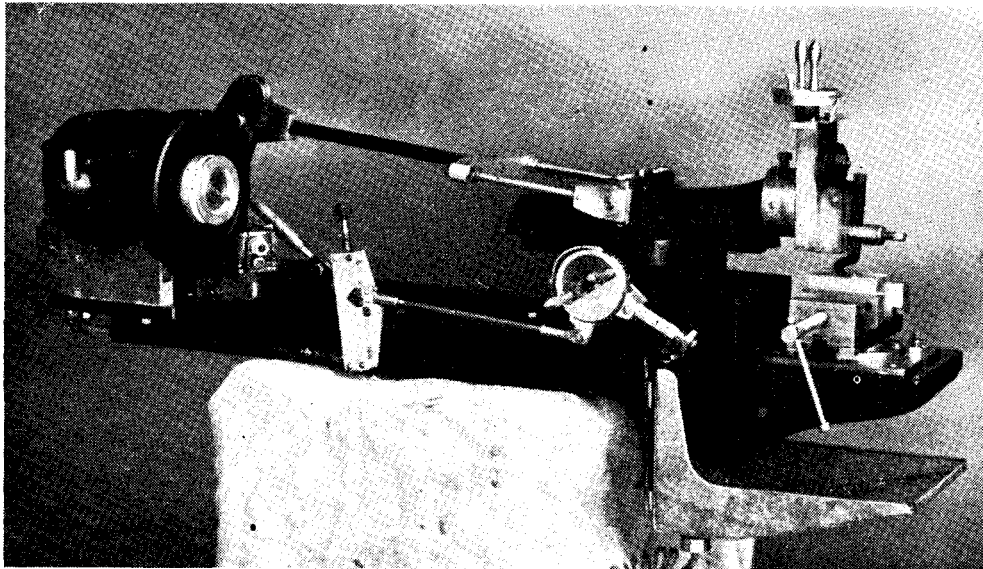


Photo No. 4. Side view of complete machine

can be seen in the photograph marked on the edge of the crank web (Photo No. 2).

On the boss of the crank behind the web is carried an eccentric of $\frac{1}{8}$ in. throw. This operates a rocking shaft which works the automatic cross traverse and also a suds pump.

The big-end is cut out of $\frac{3}{8}$ -in. thick dural and carries a double row self aligning ball-bearing shrunk in. A spigot is forced into the tubular connecting rod and pinned.

At the other end of the connecting rod is the crosshead (Photo No. 3). This carries two $\frac{1}{2}$ in. plain bearings of $\frac{3}{8}$ in. dural working on trunnions. The hand operating lever supplied with the shaper was removed and replaced by the two trunnion shafts which are held between two flat steel bars with $\frac{1}{4}$ -in. bolts in reamed holes.

Incidentally no alteration has been made to the shaper and if desired at any time the trunnion shaft can be removed and the hand lever replaced.

The height of the crankshaft above the bed is the same as the height of the trunnion bearings so that with the crankshaft horizontal, the connecting rod is also horizontal. As the crankshaft, looked at from the reduction gear end,

The vertical feedscrew is 16 t.p.i. and so the micrometer head is divided into 125 divisions which gives a $\frac{1}{4}$ thou. feed for each division.

The traverse screw is 10 t.p.i., and the micrometer head is divided into 100 divisions giving one thou. feed per division.

The automatic cross traverse has worked in very compactly and gives a feed varied at will from two to twelve thou. per stroke.

The ratchet wheel was cut out of $\frac{1}{4}$ -in. steel plate in the form of a ring about $\frac{1}{4}$ in. larger in diameter than the handwheel. This was fixed on the back of the handwheel by three countersunk screws, turned concentric with the handwheel, set up on a dividing head and 50 square teeth milled. The ring was then removed and case hardened.

The boss of the handwheel was also turned to 1 in. diameter concentric with the rim and this carries the rocking cage which holds the spring-loaded pawl engaging with the toothed ring. The pawl can be rotated so that it drives the toothed ring in either direction, giving right- or left-hand feed, or by turning through 90 deg. can be disengaged altogether.

As already mentioned the cross traverse feed is operated by the eccentric and rocking shaft. A lever on the rocking shaft works a push-pull rod which is attached to the gear for altering the rate of feed. This can be clearly seen in Photo No. 3. It consists of a vertical slide pivoted at its centre. There is a quick thread screw running the length of the slide carrying a bronze block which can be screwed from one end of the slide to the other. The screw is rotated by the knob at the top of the slide. From the bronze block is another push-pull rod to the carrier, housing the spring-loaded pawl operating the ratchet wheel.

According to the distance the block is raised above, or lowered below the rocking centre of the slide the arc through which the pawl will rotate increases. The block is raised above the centre for feeding from left to right and depressed below the centre for the opposite feed. This is so that the feed shall always take place on the

backward stroke of the cutting tool. The block carries a pointer which moves over an engraved scale on the side of the slide, the figures representing thousandths of an inch feed, from two to twelve. Each tooth of the ratchet gives two thousandths of an inch feed.

To get a nice surface, plenty of cutting oil is needed and this is ensured by the suds pump which can be seen just below the reduction gearbox and is a small a.c. petrol pump. Cutting oil is pumped over the work, drained into the suds tray and filtered, after which it runs back into the container from which it is pumped round again.

Photo No. 4 gives a good side view of the complete machine. It is particularly smooth working, with a complete absence of chatter even on the heaviest cuts. This is largely due to the flywheel running at 2,000 r.p.m. giving fifty strokes a minute to the ram and to the general rigidity of the angle-iron base and the gearbox housing.

CLUB ANNOUNCEMENTS

Sutton Coldfield and North Birmingham Model Engineering Society

Owing to the room available at the Station Hotel, Station Street, Sutton Coldfield, not being now large enough to house us, all future meetings will be held at the Yenton Hotel, Sutton Road, Erdington, Birmingham, on alternate Tuesdays. Hon. Secretary: C. F. PALMER, 77, Hartley Road, Kingstanding, Birmingham, 23.

Dundee Society of Model Engineers

The A.G.M. of the above society will be held in the Royal Hotel, Dundee, on Sunday, October 9th, at 2.15 p.m. All interested are cordially invited. Plans for our exhibition in April, 1950, are now well advanced and the society extends an invitation to all "lone hands" in Dundee and Angus who would care to have their models shown, to let the hon. secretary know as early as possible.

Hon. Secretary: G. A. MILTON, 10, Forthill Drive, Broughty Ferry.

Eastbourne Society of Model Engineers

Meetings of the above society commenced on Wednesday, September 21st, and are again being held at the Technical School, St. Annes Road, Eastbourne, at 7 p.m. As before, meetings will be held fortnightly.

Hon. Secretary: C. T. UPTON, 13, Lawns Avenue, Eastbourne.

Harrow and Wembley Society of Model Engineers

The last gala day of the season was held by the H. & W. S.M.E. at the Grange, Kenton, on Sunday, September 18th. New interest was created at this meeting by a new 5-in. gauge G.W.R. pannier tank engine built by Mr. C. R. Jeffries,

the society's chairman. This engine was undergoing its first track test, and, though unfinished, it shows promise of being a very powerful and handsome locomotive.

Three other engines were running, Mr. A. D. Pole's L.N.E.R. "A5," Mr. E. R. Uphill's 3½-in. gauge "Princess Marina," and Mr. L. J. Lawrance's new 3½-in. gauge tank engine "Juliet."

Hon. Secretary: J. H. SUMMERS, 34, Hillside Gardens, Northwood, Middx.

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Readers desiring to see the Editor personally can only do so by making an appointment in advance.

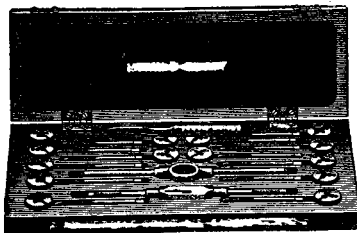
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