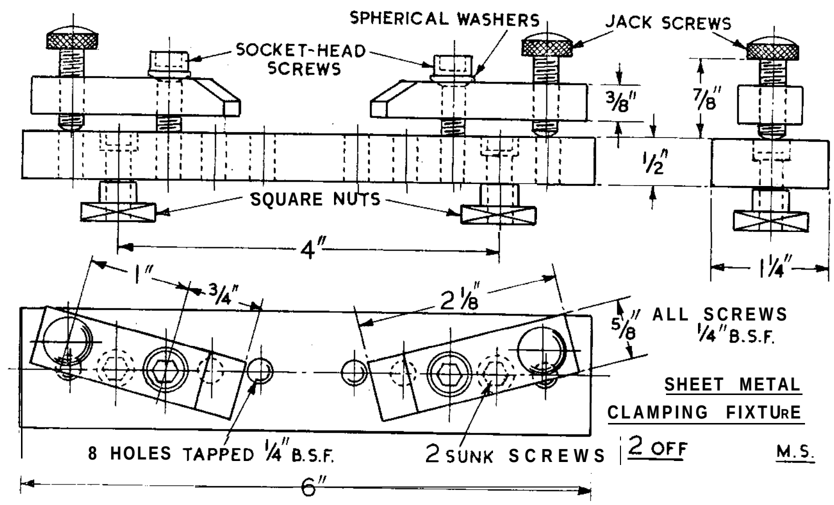
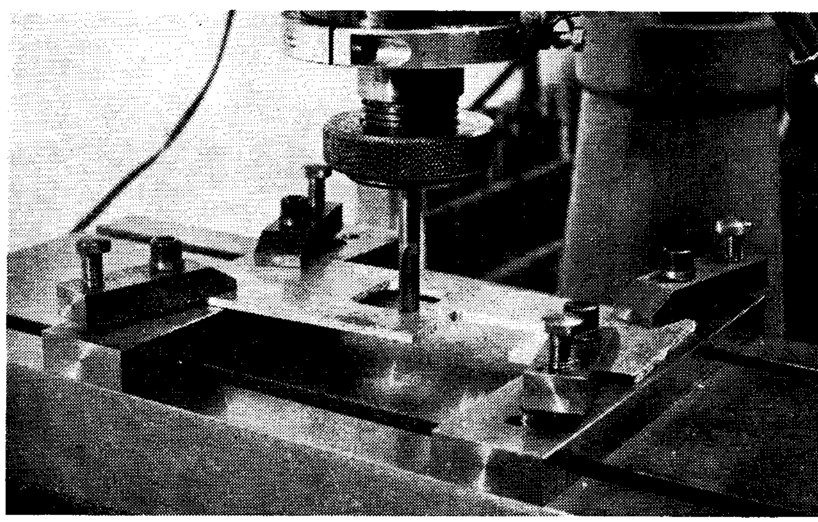
Light vertical MILLING MACHINE

Continued from July 15

by Edgar T. Westbury



Much can be done with these special fixtures



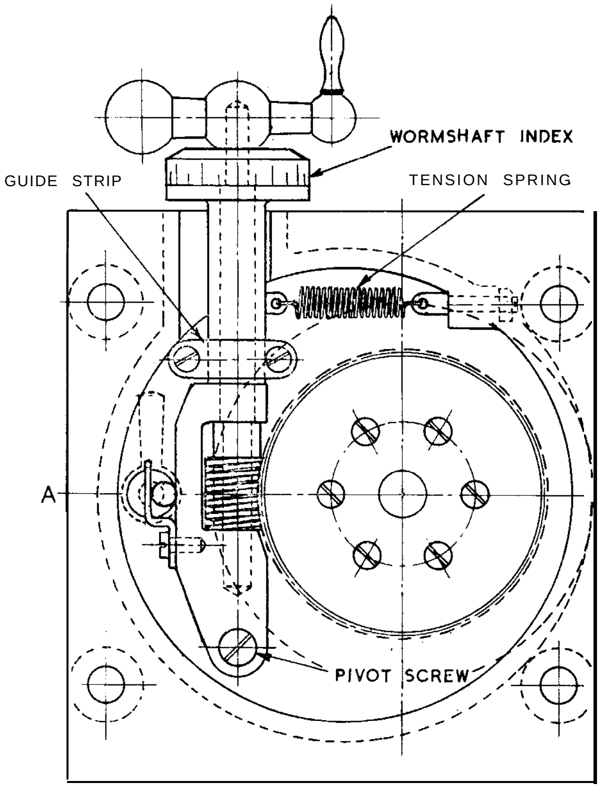
Using the clamping fixture to hold work for the cutting of holes in sheet metal

AMONG the many operations for which a vertical milling machine is well suited, not the least important is shaping, piercing and recessing sheet metal of any thickness, and of a size up to the full capacity of the table, or even larger. On several occasions, I have successfully undertaken the tre-panning of large holes in steel panels; this is not only the most efficient method of producing accurate holes of any considerable size, especially in relatively thin material, but is also economical, as the disc of metal removed from the centre is often usable for some other purpose instead of being simply wasted in the form of swarf. I have cut a 3 in. hole in duralumin sheet I in. thick by this method, working on alternative sides to half depth.

Profiling the edges of metal sheets, cutting gaps or piercing holes of any shape with slot drills, can also be carried out much quicker than is possible by the use of hand tools. A pair of frame plates for a 3 1/2 in. gauge locomotive in 1/8 in. steel plate, bolted together, have been shaped in this way, and stacks of thinner sheet metal, up to half a dozen at a time, have been simultaneously machined.

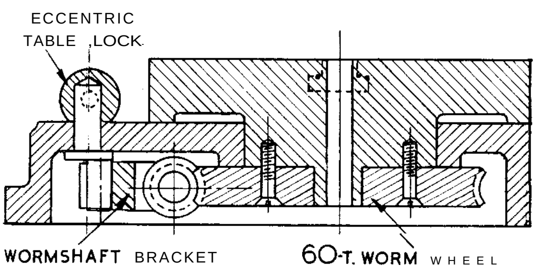
Holding sheet metal parts on the table of the machine can be difficult, as normal clamping fixtures may be cumbersome, and take up room which can ill be spared. The work, where the cutter must pass right through it, needs to be supported clear of the surface, or on expendable packing, so that there is no risk of your cutting into the table. The sheet metal clamping fixture shown in the drawing is very easily made, and has been found useful for many operations on work pieces varying widely in size and shape. A pair of the sets seen here is normally sufficient, but more can be added to provide support for long pieces which may be liable to sag.

The fixture comprises a substantial bar of a length equal to the width of the table, and a pair of toe clamps which can be bolted down on it in various positions. Spigoted

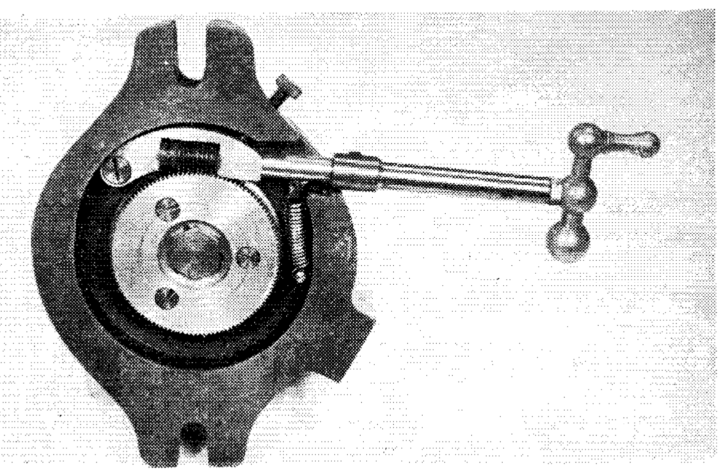


UNDERSIDE PLAN

ROTARY TABLE FOR MILLING MACHINE



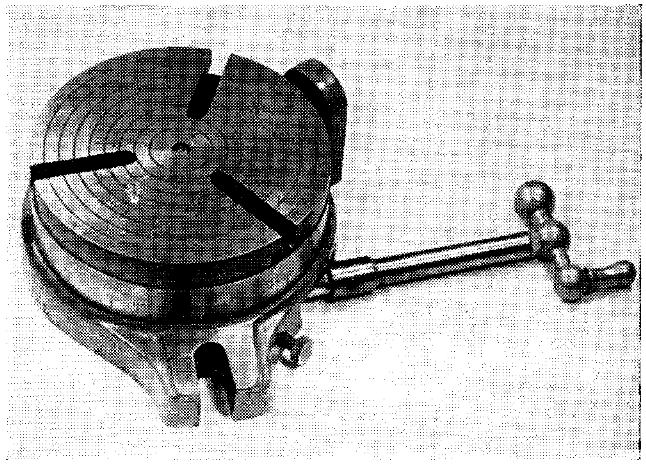
FRONT ELEVATION, SECTION A A



Underside of the rotary table, with the spring-loaded quick-release worm gear

square nuts, of a size which will slide freely in the T-slots of the table, are used with sunk socket-head screws to secure the bar to the milling table. Holes are drilled and tapped in the bar to take the set screws of the toe clamps, which are fitted with jack screws for adjustment to suit the thickness of the metal being held. Spherical-faced washers under the heads of the holding-down screws, fitting seatings of the same shape in the clamp, accommodate any slight tilting movement. The clamps must be set obliquely as shown in the drawing, so that the jack screws bear on unbroken flat surfaces, or must be turned more or less square with the bar and supported on loose packings at the sides of it.

The photograph shows a pair of these fixtures in use,



R.otary table, with extension to wormshaft, as in presem use

holding a piece of 1/8 in. Birmabright alloy sheet for cutting a rectangular hole and an openside gap in it. Ordinary end-mills can be used for profiling or gapping, but slot drills must be employed for piercing holes, unless these are started by twist drills. Cutters of about 1/4 in. diameter, run at the highest spindle speed, are the most suitable; smaller cutters may be used to reduce wastage of metal, or where otherwise necessary.

Operations which call for slotting or recessing or for profiling the arcs of circles can be dealt with most efficiently with some form of rotating fixture. Sometimes the fixture may have to be improvised; a typical example is the milling of curved links for valve gears. Several ingenious devices for carrying out these operations in the lathe have been described in ME, and can easily be adapted to the milling machine with its added facility and convenience.

With horizontal and vertical milling machines the geared rotary table is a standard accessory which may well be considered indispensable for many operations. But the ready-made fixtures are expensive-they may cost almost as much as a complete machine tool-and may not be very handy for fitting to a small milling table. Small and relatively simple rotary tables have been described in these pages, and at one time castings were provided for their construction. I have adapted one of these fixtures, of unknown origin, by fitting a home-made worm and wheel, with means of quick release for coarse movement. The base casting is provided with a lug to take a spring plunger for direct indexing of the table. This would no doubt be very useful for some purposes. I have not needed it myself, and the plunger has never been fitted. In the form shown in the photograph, the fixture has done much good work on the vertical milling machine, but it is not ideal for the machine in design or as convenient for fitting as it might be. With only two bolting lugs, it must be located diagonally across the table, and fitted with an extension spindle to overhang the side of the table for operating the worm gear.

A new rotary table design

I have redesigned it in a form specially suited to the vertical milling machine, and simplified in construction, with the minimum number of parts requiring precision machining and fitting. It employs a worm and wheel which can be had ready-made, and it retains the quick-release. The base casting has a square mounting flange with four holes positioned to suit the milling table T-slots.

Many of the standard rotary tables and similar indexing fixtures designed for industry are difficult to use on small machines with limited head-room under the cutter because of the excessive height of the table. The extent to which the height can be reduced is limited, because the table must be fairly massive for the sake of rigidity, and the gearing must be sturdy to stand up to heavy torque. Of the few possible ways, the simplest is to extend the wormshaft beyond the width of the table so that it can be set as close as possible to the base, while it is readily operable by an overhung balanced handle or handwheel.

As in the earlier fixture, the wormshaft bearing consists of a bracket which is pivoted at one end on a screw fitted in the underside of the base, and free to swing at the other end for the disengaging of the worm from the wheel. Normally, the worm is held tightly in mesh by a strong tension spring, so that no backlash in the gearing is possible, but an eccentric locking device permits it to be held positively in mesh or in disengaged position. To ensure that the bracket can move only in a horizontal plane, we fit a guide strip to span the extended end of the bracket and allow the required latitude of movement.

The construction of the rotary table fixture is quite straightforward and involves no special machining problems. For the baseplate and table, iron castings should be used; the table is machined all over and must be true on all surfaces. I recommend a gunmetal casting for the wormshaft bracket, but you could fabricate it from rectangular bar by brazing the index disc on the end. Except for the ready-made worm and wheel, all the other components are machined from mild steel stock.

To be continued

They sailed to Bermuda ...

Continued from page 555

During the week that the Tall Ships were in Lisbon, weather conditions were poor. With a threatening forecast for the day of the start, it was decided that instead of leaving the city on June 4 for anchorages nearer the starting line, all ships should remain at their berths and leave under power early on June 5. The prophesies of bad weather were not fulfilled, and the fleet left the Tagus in brilliant sunshine with a Force 3 breeze which freshened to Force 4 by mid-morning.

The starting line off Cabo Rasco, three miles or so west of the fishing port of Cascais, ran from a lighthouse on shore to a Portugese sloop, the ***Bartholomeu Dias,*** at the outer limit about four miles off shore. Admiral Americo Thomaz, President of Portugal, radioed the starting signal from the lighthouse to the sloop and the gun for " off " boomed at 1.30 p.m.

Over the line first was the Italian Co-rsaro ZZ, closely chased by the STA entry ***Tawau. Six*** minutes after the gun, the Portugese barque ***Sagres*** passed the mark ship to the cheers of her crew. Her white hull and cream canvas, with the traditional red crosses of Christ on her square sails, made an impressive sight.

Three minutes later the ***Danmark*** crossed the line with the @an ***Sebastian De Elcano,*** the ***Gorch Fock*** and the little Peter non ***Danzig*** next in line, pitching into the Atlantic swell. The ***Libertad, Merlin, Sorlandet*** and ***Statsraad Lehmkuhl were*** the last over the line and were soon disappearing towards the horizon under a press of canvas-an unforgettable sight unlikely to be equalled in European waters.

The race ended for all vessels at 17.00 hours on July I. After the ceremonies in Bermuda, vessels sailed for New York, where they took part in the Operation Sail review and made calls at United States ports. Most of them were due back in Europe at the end of August. ❑

These were the final placings

Class I:

I. Christian Radich
2. Danmark
3. Gorch Fock
4. Libertad
5. Sorlandet
6. Statsraad Lehmkuhl
7. Juan Sebastian de Elcano

The Sagres did not finish.

Class ZZ:

I. Corsaro II
2. Tawau

Class ZZZ:

I. Peter von Danzig
2. Merlin

MODEL ENGINEER EXHIBITION

AUGUST 26-29, Cora Hotel, London