from 0·0031in to 0·1575in per revolution of the table. The hob saddle is traversed vertically on the column by an accurate lead screw giving a range of feeds from 0·0063in to 0·3150in per revolution of the table when hobbing or per revolution of the cutter when single indexing. The swivel head with the hob spindle has a cavity of ample size to accommodate large-diameter mills and fly cutters, and has an angular adjustment through more than 180 deg. This adjustment is made with reference to a graduated scale and vernier reading to an accuracy of 20 seconds. Hob spindle speeds from 6 to 68 r.p.m. are available and the spindle is driven through bevel and spur gearing on the standard machine. If required, a swivel head for particularly high-precision work and which has a worm drive to the spindle can be supplied.

Amongst the attachments available with the machine is a worm gear hob saddle for producing large lead worm wheels by tangential feed. The gearing in this saddle provides a tangential cutter feed dependent upon table motion and gives the additional table movement through a differential. End mill attachments are also provided for cutting external and internal gears, and a reversing gear can be used for the production of double and triple helical gears in one cut. A shaving attachment can be fitted on the hob slide for fine finishing without removing the work from the machine.

A new vertical boring machine shown by the firm was fitted with an electro-hydraulic automatic cycle control mechanism for the vertical and side heads. With this mechanism all slide movements are predetermined by the setting of stops and the cycle preselected by the setting of switches. A hydraulic profiling attachment is also fitted to this machine.

C.V.A. Jigs, Moulds and Tools, Ltd.

The equipment exhibited by C.V.A. Jigs, Moulds and Tools, Ltd., of Brighton, included single-spindle automatics from ¼in to 1¼in capacity, a toolroom lathe and a high-speed dieing press. One of the Kearney and Trecker

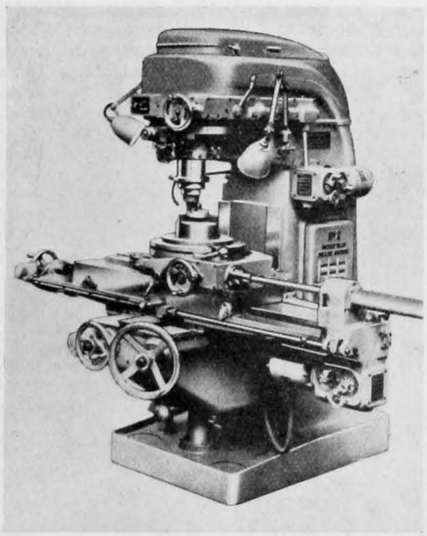
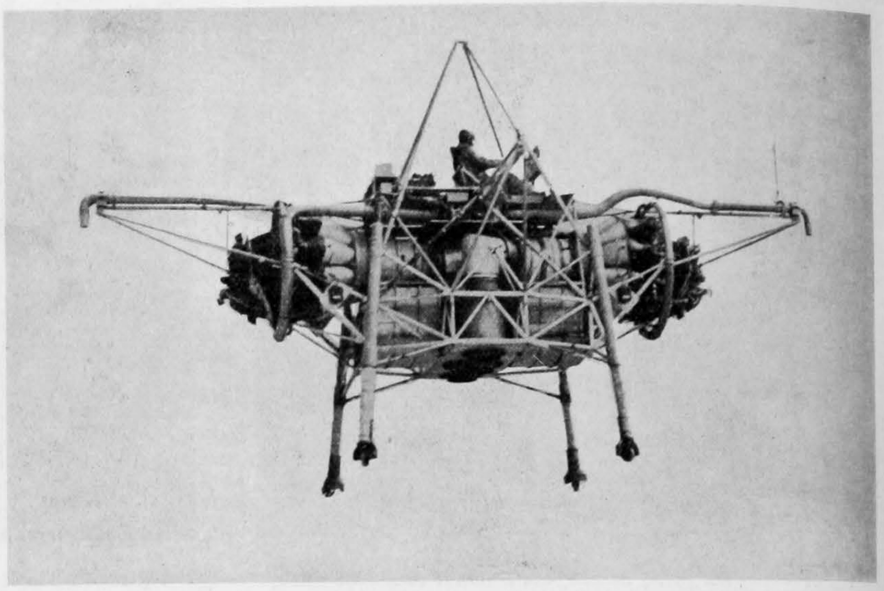


Fig. 27—Rotary head milling machine

machines built under licence in this country by the firm is the rotary head milling machine in Fig. 27.

In this machine the spindle is mounted on a cross slide that can be offset radially and rotated in a horizontal plane through 360 deg., while the spindle is rotating. Both the spindle and the rotary head can be rotated in either direction independently of each other. The spindle has a range of speeds from 210 to 3300 r.p.m. and over its 3in vertical adjustment has eight feed rates from 0·0002in to 0·008in per revolution. The spindle can be offset up to 4in from the centre of the rotating head, which has sixteen feed rates from $\frac{1}{6}$ to $2\frac{1}{2}$ r.p.m.

The table has a working surface of 36in by 16in and has both hand and power operation over a longitudinal travel of 24in and a transverse travel of 12in.



A rig sustained in flight purely from the vertical thrust of two turbo-jet engines. Inclining the rig by the thrust outriggers creates a thrust component for horizontal movement

Vertical Take-Off Research Rig

The prospect of launching an aircraft vertically using only the engines provided for its level flight requirements, has been brought much nearer reality in recent years by the rapid evolution of the gas turbine. Since the Whittle "W.1" engines of less than 1000 lb thrust, the specific thrust has been raised from about 1·5 lb per pound weight to that of nearly 4 lb per pound weight in the latest turbo-jet engines in the 10,000/15,000 lb thrust category. These increases have also been achieved without diametral growth. An aircraft with two such engines mounted in the fuselage, could therefore be designed with sufficient thrust to accelerate vertically from rest.

One of the principle problems in such an airframe is that of obtaining initial vertical control from surfaces designed to respond to the very much higher forward speeds of the machine. An illustration of an American machine in this category is shown on page 468. It is believed to have a coupled turbo-propeller engine developing almost 10,000 s.h.p. for a weight of 5000 lb. It will be seen to have vertical and dorsal tail fins. The physiological problems of such an arrangement can also be realised.

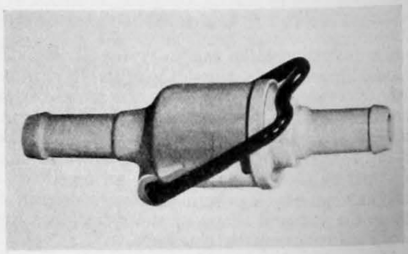
In this country what would appear to be a fundamentally different approach is illustrated by the research rig shown in our illustration which was built by Rolls-Royce, Ltd., for the Ministry of Supply. It is aptly named a "flying bedstead." As can be seen, the engines are mounted horizontally and the efflux is ducted to give vertical thrust, control being effected by small auxiliary jets operating with a moment arm. These presumably would incline the rig and impart to it a horizontal reaction component from the jet. An aircraft employing this ducting and control system would therefore achieve initially a near vertical take-off without assuming a vertical attitude. This rig has been developed solely to investigate the basic control problems involved.

It is powered by two Rolls-Royce "Nene" engines of about 5000 lb thrust, set horizontally in opposition, one on either end of the framework. The jets from these engines are ducted through 90 deg. so that both engines discharge vertically downwards under the centre of gravity. This is a favourable arrangement for balancing the device and eliminates gyroscopic effects. The pilot sits on a platform above the two engines. The control moments are supplied by compressed air jets which are discharged through nozzles at the ends of cross arms which can be seen clearly in the illustration. The air for these nozzles is bled from both engines and the pilot, using a conventional control column and rudder bar, regulates the flow through the nozzles. In this way the necessary pitching, rolling and yawing moments are obtained. In the initial tests, in order to safeguard the machine and the pilot, the "flying bedstead" was tethered to allow it only the limited freedom of a few feet of movement. With increasing experience and confidence the freedom permitted was increased. On August 3rd all check wires were removed and the machine took-off at Hucknall for the first time in free flight. It remained airborne for nearly ten minutes and during this time it moved about over the ground under the pilot's control at heights of from 5ft to 10ft, returning finally to alight at its starting point. For subsequent flights it has been flown free at heights up to 25ft.

Self-Sealing Air Hose Coupler

A new air hose coupler now being produced by Victor Products (Wallsend), Ltd., of Wallsend-on-Tyne, Northumberland, is designed for high and low-pressure airlines. It incorporates a rubber seal ring with a simple action. When the stem of the coupler is inserted into the spud and the air is turned on, the pressure causes the rubber ring on the stem to "rock" forward giving the initial sealing action. As the air pressure is increased so the sealing action is completed.

The coupler requires no spanners or tools to couple or uncouple, and it cannot be uncoupled whilst under working pressure. Additional safety is given by a spring bridle which holds the



Self-sealing air hose coupler with a spring bridle which holds the parts together, and allows the stem to be rotated to remove kinks and twists in the hose

two parts together, and this bridle allows the stem to rotate within the spud so that kinks and twists in the hose can be removed. The rubber sealing ring, which is completely protected from damage and has a long life, is simple to replace, if necessary.

The couplers are being manufactured to cover hose sizes of ½in, ¾in and 1in both for hose-to-hose or compressor-to-machine connection.

The coupler stem is manufactured in three forms, whilst seven forms of spud fittings are available. One form of coupling can be seen in the illustration above.