possible to more than briefly note their chief characteristics. A special feature of the "Pittler" universal turret lathe is the method of mounting the turret, which carries sixteen tools altogether, thus providing for a large number of operations without necessitating changing tools; there is also an automatic threading lathe, which only requires an attendant for putting in and taking out the work. The "Whitcomb-Blaisdell" "second belt" planing machine, which planes 2 ft. by 2 ft. by 6 ft. long, is fitted with a leather belt for connecting the high-speed driving shaft to the gear



Gear Planer, Zimmerman.

operating the table rack, thus doing away with a train of gearing and its attendant noise and liability to set up vibration, which would show upon the finished surface of the work. The very quiet and smooth reversal of the table on this machine is very noticeable. Messrs. John Lang & Sons, Johnstone, near Glasgow, have on view a 30-in. wing surfacing and boring lathe fitted with a patent variable speeddrive and speed-changing mechanism. The bed of the lathe has a plate covering upper surface, so as to prevent the cuttings from falling on the working surfaces. Special attention may be directed to the surfacing feed; as the tool travels towards the centre the lathe automatically increases in speed, and thereby keeps the cutting speed of the tool practically constant.

Some wood-working machines exhibited by Messrs. Wadkin & Co., of Leicester, show special features of construction which make them particularly applicable to the numerous and ever-varying details of pattern work. For this class of work there is a patent mechanical woodworker which has universal motions to the cutter-head and the table, and both are provided with quick and fine positive feed motions. The spindle being carried (absolutely free from vibration) in the revoluble head of an overhanging arm, the cutter spindle can work in any angular position between the vertical and horizontal. The cutter spindle, moreover, has a reversing motion and is free to slide independently of any movement of the head. The work supporting table is so mounted as to move freely with longitudinal and cross motions. It can be raised and lowered, and will move through a complete circle horizontally. The turning of the table and swivelling of the head can be instantly effected and the motion of the spindle can be reversed when working in any position. Amongst other machines shown by this firm is a wood skiver, which, being driven by power, will take a much longer cut than a hand machine, and leaves the operator with both hands to feed and manipulate the work. The knives are of the usual kind, and automatically move to and fro the whole length of the machine, but they can also be regulated to take a long or short cut from either fence as required, being actuated by a shaft continuously revolving in one direction. A circular saw bench shows good features of design, and is provided with an improved vertical adjustment of the table. A corner lock-jointing or square dovetailing machine also commands attention, principally from the fact that its design is in direct opposition to the old-fashioned system of laboriously arranging and clamping

down and cutting a number of pieces at one time. The work is fed singly to the cutters, and is actually cut and finished as fast as it can be fed.

Among the heavier British lathes should be mentioned combination turret lathe by Messrs. Alfred Herbert, a Limited, of Coventry. This has been specially designed for dealing with heavy chucking work, but may also be employed upon bar work. The machine, as seen, has a powerful headstock, which is provided with duplex back gear and quadruple friction clutches, which are operated by two levers in front of the headstock. This arrangement enables nine speeds to be instantly obtained at any time without shifting the belt upon the cone pulley. The spindle is exceptionally large, enabling 51/2-in. diameter bars to pass through. The saddle is fitted with patent chasing mechanism so arranged that when the nut is put into gear with the leader the tool is simultaneously moved into its cutting position, and when the nut is withdrawn from the lever the tool is automatically withwrawn from its work. Another tool shown by this firm is the No. 2 hexagon turret lathe, in which some notable improvements have been introduced to adapt the lathe for use with modern cutting tools of highspeed steel. The machine is fitted with patent single pulley head. Sixteen spindle speeds are obtainable forward or reverse, arranged in geometrical progression. Patent dial feed motion is fitted. To obtain any feed, the dial is rotated until the number corresponding to the required feed comes opposite the point. The feed rack which actuates the turret is inverted, so that chips cannot get in. A new and interesting tool is in use upon this machine, this being a new patent roller steady tool, which is easily set, and in which the cutter does not require to be forged. Among a number of other interesting machines shown are a Newall universal grinding machine and a vertical milling and profiling machine.

Yet another British firm of machine tool makers deserving of special mention are Messrs. John Stirk & Sons, of Halifax. An electrically driven high-speed radial drilling machine, 3 ft. 6 in. radius, has balanced spindle and reversing motion for tapping. The spindle is 2½ in. diameter, and is bored to receive a No. 5 Morse taper shank. It is carried in a bush, which revolves in phospher bronze bearings. The main driving wheel is placed near to the lower bearing, so as to drive the spindle as near to the work as possible, and the spindle is placed close into the arm, so that the twisting stress on the arm is kept down to a low limit.\* The carriage rests on flat surfaces on the arm, and



Hexagon Turret Lathe: Alfred Herbert and Company.

may be conveniently locked in position by a handle at the right-hand end of the carriage. A vertical handle on the left of the carriage operates a clutch, which causes the spindle to be driven through single gear at a quick speed, or through double gear at a slow speed. Another lever on the right-hand operates a reversing motion, having positive clutches of a special design, so that the motion of the spindle may be stopped, started, or reversed without shock while the spindle is running at high speeds. There are four positive feeds to the spindle, viz., 1-32, 1-48, 1-72, and 1-105