

COVENTRY DIE HEADS & CHASERS, OPERATING.

Coventry die heads and copies thereof (Rubometric, OSG etc) are the most commonly used thread cutting die heads. They are reliable, hard wearing, simple to set and use, and can be used on manual or automatic (and CNC) machinery. Maintenance and repair can be easily carried out in house, chasers are cheap and thread changeover is fast and easy.

HISTORY

Prior to the introduction of self opening die heads external threading was almost exclusively carried out on turret lathes using solid or split dies which had to be reversed and screwed off the work piece. This was time consuming and could cause damage to the thread. It was difficult to obtain accurate fit of thread due to limited adjustment, it was impossible to resharpen the dies, and there was often pitch error caused by distortion due to hardening, and errors in the master taps from which the dies were made.

Early die heads were opened and closed by hand and though they reduced threading time compared to dies, generally produced inaccurate threads with poor finishes as the chaser dies were crudely made using a master tap, which in itself was inaccurate. There was also no feature built in to preserve pitch consistency.

When the first self opening die heads were introduced the threading time was again reduced but there were still many problems, as with the manual heads. These included thread form and pitch errors, tapering of threads due to the chasers being pushed out under pressure of the cut, and poor thread finish. Also different die heads could not produce identical threads due to inaccuracies in manufacture, and there was no method of regrinding the dies except by hand which, being done by eye, one at a time, meant that all were slightly different.

In 1901 Alfred Herbert Ltd of Coventry produced it's first experimental self opening die head that was designed to overcome all of the problems of the old heads. Eventually on February 26 1904 this die head was featured in "The Engineer" magazine, which extolled its virtues. Alfred Herbert was subsequently obliged to devote a special department to the manufacture and development of die heads and dies. This resulted in many modifications and improvements and the eventual launch in 1907 of the Style C diehead, which was hugely successful.

EXTRACT FROM ALFRED HERBERT FIRST BOOK OF THE DIE HEAD

ALFRED HERBERT LTD. COVENTRY.

Leading features of the Style C Die Heads. ACCURATE PITCH, produced by the guiding action of the patent "straight-cut" dies.

ADJUSTABILITY, providing fine regulation of diameter, combined with wide variation in size cut by each set of dies.

CLEAN AND SMOOTH THREADS, resulting from the fact that the Dies have ample cutting clearance.

PARALLEL THREADS, owing to the efficient nature of the supporting and guiding surfaces.

RIGHT- OR LEFT-HAND THREADS cut equally well.

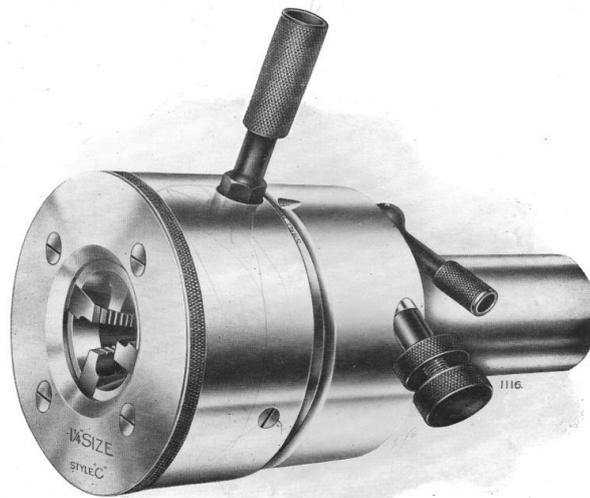
COMPACTNESS, permitting the Die Heads to be used on capstan rests, in which the height of the tool holes above the slide is limited.

INTERCHANGEABILITY, enabling replace parts to be readily obtained from stock.

ROUGHING AND FINISHING ATTACHMENT for obtaining extra high finish on large diameters or on material of an exacting nature.

EASE OF GRINDING THE DIES, as it is the only Die Head the dies of which can all be ground at once, and to definite angles which are uniform for all sizes of dies and Die Heads.

ALFRED HERBERT LTD. COVENTRY.



Coventry Patent Self-opening Die Head.
Style C. 1 1/4 in. size.

The attributes listed here are still good for the Coventry die heads in use today. The C Style head is similar in appearance to the CH Style. C types can still be found in use, a testament to the durability of the Coventry die head.

STYLES OF COVENTRY DIE HEADS IN CURRENT USE.

CH STYLE

Very similar to the original C Style but the shank is separate to the rear of body.
 Can be used on all manual machinery, popular with model makers.
 Not really suitable for automatic machinery as little spring loading to assist head onto work piece.
 Threaded spare parts (screws etc) are expensive due to use of non standard threads.



CHS STYLE

Shank sprung to body making it ideal for automatic machinery.
 Adjustment by two socket screws.
 Most popular Style of Coventry die head



DX STYLE

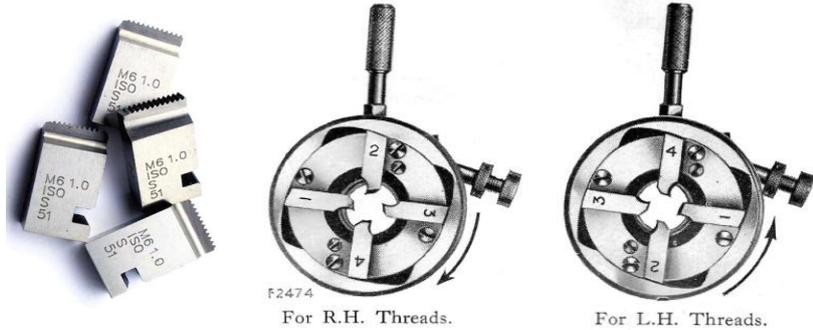
Fitted with external trip to open die head at end of thread. This is to overcome a problem that can occur with C, CH & CHS die heads when cutting short threads in soft materials. In such cases the weight of the head pulling against the thread in opening can strip the thread. External trip also ensures very accurate thread length. Can be operated in 'pull off' mode same as other heads. Designed for automatics so fitted with spring band closer.



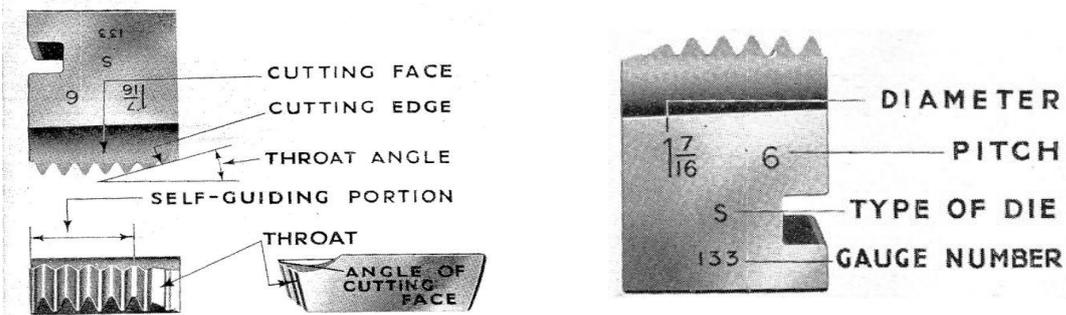
These are the most common Coventry die heads in use today. Many variants were produced for particular applications including taper threading and rotating heads. We can supply more details on request.

COVENTRY CHASERS

For most die head styles there are four chasers in a set. Each is numbered to ensure that they can be loaded in the correct order.
 This is important as each chaser is ground 1/4 pitch apart from the next. Chasers are loaded clockwise.
 For left hand threads the direction of rotation of the work piece is reversed.



Coventry chasers are designed so that cutting of the thread only takes place on the first full tooth. The remaining threads are above centre height so act as a nut on the thread being cut, ensuring perfect pitch. It is important therefore that when the dies are reground proper fixtures are used so that the recommended angles are maintained on all dies.



The correct type of die must be used for the material being threaded. Most common types are:-

TYPE	FOR THREADING
S	Mild Steel, Wrought Iron, Malleable Cast Iron, Copper (nitrided chasers).
B	Brass. Plastics
AM5	High Tensile Steels, Free cutting Stainless Steels
AS	Stainless Steel
M	Cast Iron, Phosphor Bronze, Manganese Bronze, Gun Metal.

Standard throat angle is 20 degrees. For work close to a shoulder shorter leads (33 or 45 degrees) may be required. Shorter leads tend to wear more quickly. For many stocked chasers we keep threaded blanks so that we can grind the cutting face and throat to suit your application. Please enquire.

OPERATING THE DIE HEAD

The die head should be mounted with the closing handle or auto die closer in a convenient position as shown.

The closing handle or auto die closer is then pushed so that the front of the head turns anti clockwise and locks closed. The detent handle has two positions + and - . If the thread is to be cut in two passes the detent handle is first set to + for the first pass then - for the second.

Normally the thread is cut in one pass so the detent handle is at - . When the die head is operated on fast indexing automatics the setting of the detent handle can be changed by centrifugal force. This problem can be overcome by replacing the detent handle with a collar that fixes the handle in the - position.

To adjust the die head to the thread size first set the indicator on the adjustment graduated scale opposite the zero line by use of the adjusting screw(s). Relieve the pressure of the opening springs when doing this by pushing against the closing handle or auto die closer, making it easier to turn the adjusting screw(s) and making the adjustment more sensitive. A thread plug gauge or pre threaded component of the required thread can be inserted into the chasers as a guide to set the nominal diameter. Fine adjustment may be required after testing the first two or three components produced.



Stops are set on the machine to halt the forward travel of the die head when the thread produced is about 1/8" shorter than that required. When the stop is met the front of the die head will continue to travel forward until the detent pin mechanism is released and the die head will then automatically open.

When the die head opens the chasers are in contact with the produced thread and it is this that causes the front of the head to continue forward, therefore there is pressure exerted by the chasers on the thread. If the thread is small diameter and the workpiece material is soft, the thread can be damaged by the pressure. To overcome this a DX die head which has an external trip mechanism can be used. The DX has an external adjustable plunger mechanism which can be operated by arranging it to abut against a stop set on the machine.

DX PLUNGER

DX style can be set to operate by plunger only or by normal detent operation as in CH & CHS



SPEEDS & FEEDS

The operating speed depends on various factors including the material to be threaded, the thread form to be produced and the quality and finish required.

$$\text{Spindle Speed} = \frac{12S}{\pi \cdot D}$$

Where D = Thread diameter, $\pi = 3.142$, S = Feed Speed (Feet per minute).

S varies depending on the material to be threaded. A guide for feed speeds is :-

Stainless steels and tough materials	5 - 8 feet per minute
Mild steel	10 - 20 feet per minute
Cast iron	8 - 12 feet per minute
Brass and Copper	Normal turning speed.

A rule of thumb is that threading speed should be approximately 50% of turning speed. Many materials are now made free cutting' by the addition of lead and other ingredients. If in doubt start at lower speeds and work up to the optimum.

CUTTING THE THREAD

Pre turn the material to around 0.001" above the required thread major diameter. Ensure a good flow of cutting fluid, preferably through the die head shank, this will wash out any swarf chips, improve the thread finish and extend the life of the chaser dies. A steady gentle pressure should be applied to feed the head onto the work piece and maintained during the cut. When the required thread length is reached the diehead's travel must be arrested by a stop arranged on the machine. The front of the die head will travel around 1/8" beyond the stop causing the head to open.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REMEDY
Head will not open	Opening spring broken Chasers faulty Die head clogged with chips Chasers too sharp (especially AM5)	Replace Replace Clean out Dull cutting face with stone
Head will not close	Tooth or detent pin worn	Replace or regrind
Head opens too soon	Indexing throwing head open	Close head on last index before threading.
Thread diameter varies	Tooth or detent pin worn Chasers not correctly ground	Replace or regrind Regrind or replace chasers
Tapered threads produced	Front plate loose Tooth or detent pin worn Chasers not correctly ground Die head worn	Tighten Replace or regrind Regrind or replace chasers Repair or replace
No thread produced	Chasers faulty or incorrectly fitted Short thread in soft material can be stripped as die head tries to pull open.	Replace or refit Use die head with external trip mechanism e.g DX style.
Poor thread quality	Chaser wrong rake e.g using B instead of S type on steel. Chasers incorrectly ground Head misaligned on machine Die head worn Material too tough for thread cutting	Fit correct chasers Regrind using correct fixture Check, correct Repair or replace Try thread rolling.