PART 1

Introduction – and the application of basic typographical theory

PART 1

Key references

Chapter 1

1 Screw
2 Escapement
3 Ingot chain
4 Hook
5 Metal ingot
6 Screw
7 Iron float
8 Float chain
9 Escapement brake operating bar extension

Chapter 5

1 Sighting plate
2 Micrometer knob
3 Slip gauge

Chapter 7

1 Upper handwheel 'type' scale
A Coarse graduations: 0·1 in (1/10 in)
B Four sub-divisions of (A): 0·025 in (1/40 in)
C Thousandths scale: 0·001 in (1/1000 in) – twenty-five sub-divisions of (B)
D Vernier scale: 0·0001 in (1/10 000 in) – ten sub-divisions of (C)
E Ratchet stop
F Thimble
G Spindle and anvil faces
H Sleeve

CHAPTER 1

General information

1.1 Product range

Type (and unit borders) from $4\frac{1}{2}$ pt to 72 pt

Spacing material (high and low) from $4\frac{1}{2}$ pt to 72 pt

Leads and rules from 1 pt to 18 pt (cut to the required length)

Dashes and clumps from 4 pt to 18 pt (9–16 ems wide)

Tie-up slugs in 12 pt, 18 pt and 24 pt

Continuous borders from 4 pt to 18 pt (cast in predetermined lengths)

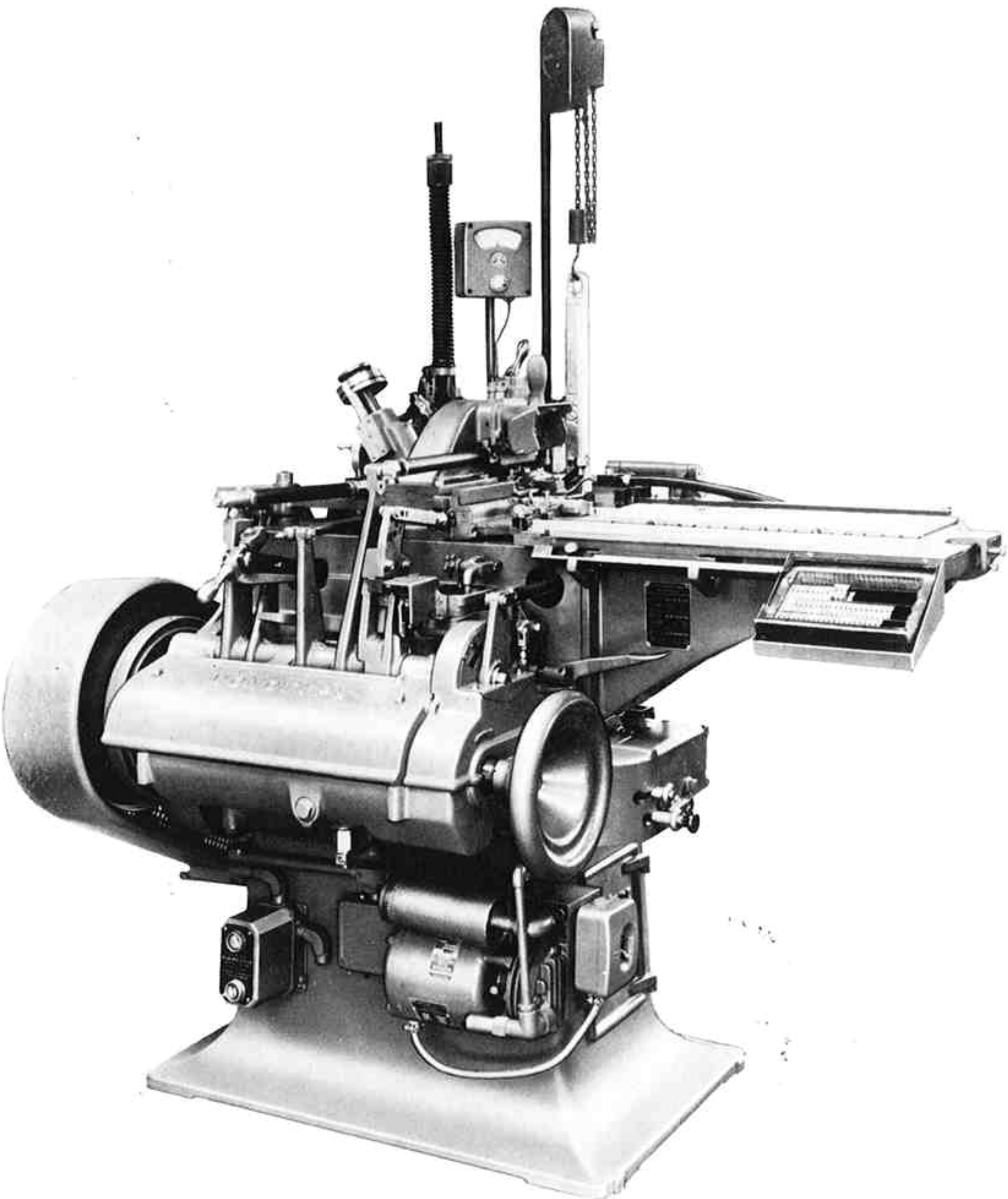
Strip furniture in 24 pt, 36 pt, 48 pt, 60 pt and 72 pt

Two-piece type-high foundry furniture in 36 pt, 48 pt, 60 pt and 72 pt

Block-mounting (and spacing) material including:
Solid quads up to 36 pt × 36 pt
Semi-cored quads in 42 pt, 48 pt, 60 pt and 72 pt
Hollow quotations in sizes ranging from 48 pt × 24 pt to 72 pt × 72 pt
Wooden-cored quotations in 72 pt × 36 pt and 72 pt × 72 pt
Strip material in 24 pt, 36 pt and 48 pt

1.2 **Specification**

Weight (approx.)	1484 lb (673 kg)
Working area	8 ft 0 in × 8 ft 0 in (244 cm × 244 cm)
Electricity consumption	3·6 kW
Motor	$\frac{3}{4}$ h.p. (560 W)
Speeds	2–160 r.p.m.
Metal pot (capacity)	85 lb (38·5 kg)
Metal heating and temperature control	'Funditor' or 'Rototherm'



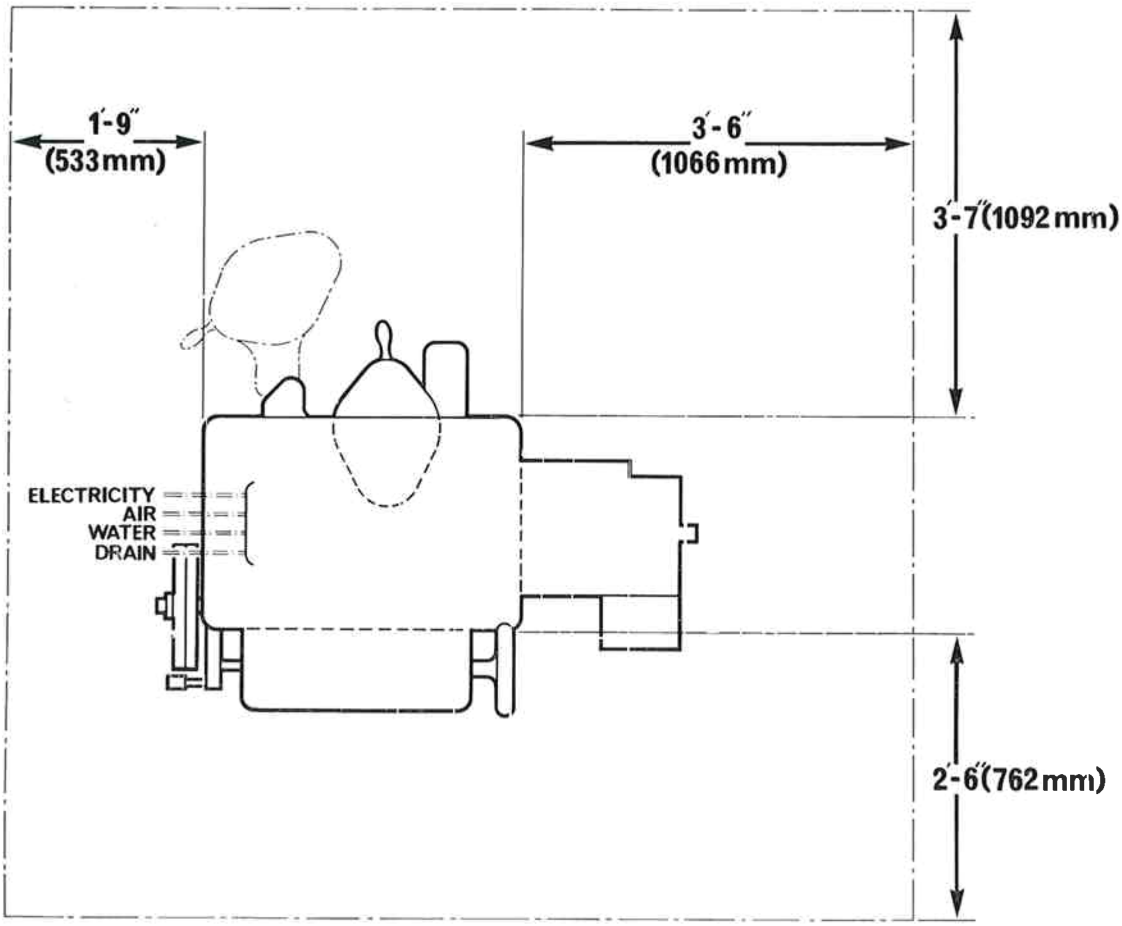
1.3 Installing the machine

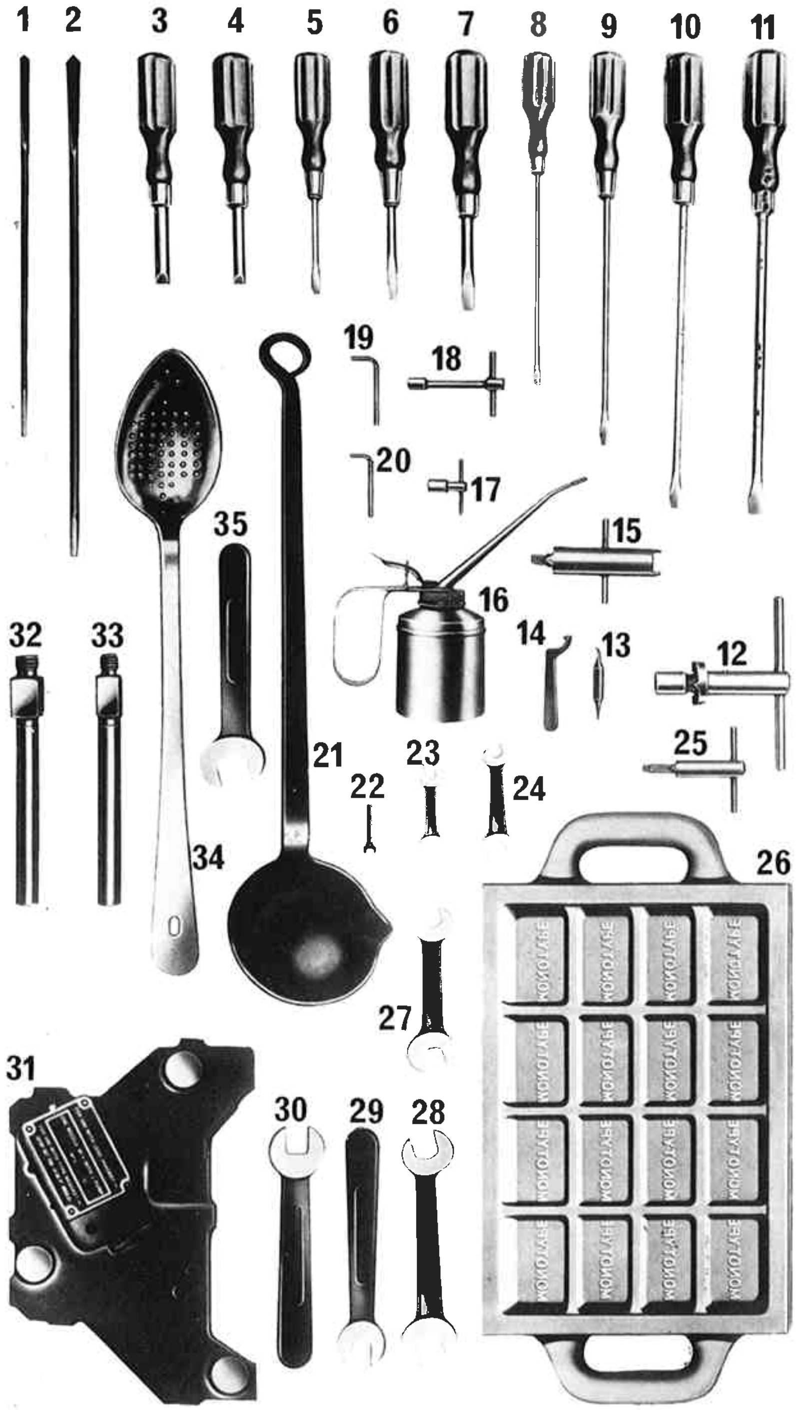
A 'Monotype' Super caster installation requires good lighting conditions and a dust-free atmosphere. A strong bench with a wooden or other soft working surface; a drawer for tools and a mechanic's vice should be provided, as well as a suitable cupboard for storing accessories and spare parts.

Sufficient space should be allowed around the machine to permit free access by the operative to any part of the mechanism.

'Monotype' machines are normally installed by the Corporation's engineers or agents, but in the event of a user undertaking the installation of his own Super caster, the layout illustrated here will provide a useful guide in respect of suitable clearances around the unit. In locating the machine the possibility of an increase in plant should always be considered. Space should be left for additional machines, and piping should be laid out to take care of this.

Essential services are: mains water supply and drainage for mould cooling, at approximately 6·5 gallons (29·5 litres) per hour; compressed air for matrix cooling at 5 lbf/in² (0·352 kg/cm²); electrical supply for a ¾ h.p. (560 W) motor, melting pot elements and machine lighting (about 4 kW).

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1.4 Tools supplied with the machine

The illustration shows the tools which are supplied with the machine. These tools should always be maintained in good condition, and as each one is designed for a specific purpose, they should be selected with care. With regard to screwdrivers, for instance, even though any given size may be applied to duties properly intended for the larger and heavier members of the range, the strict use of the appropriate one for the job in hand will make for its more convenient use, and greatly extend its useful life.

Never use a screwdriver for stirring the metal or for testing it to see if it has begun to melt, as this softens the point, and when it is used on hardened screws it will become blunt and burred. The point of a screwdriver must always be kept correctly tempered, and should be ground so that it has no tendency to slip out of the screw slot. When tightening or loosening a screw, the driver should be held firmly down in the slot of the screw head. If it is allowed to slip out frequently the edges of the screw slot will become damaged, making it impossible to tighten the screw thoroughly, or to loosen it when required.

Full details of all the tools supplied with the machine are as follows:

1 Well Arm Drill, $\frac{7}{8}$ in Pump
2 Well Arm Drill, $1\frac{1}{4}$ in Pump
3 Cleaning Tool, Pump Body Bearing, nozzle end
4 Cleaning Tool, Pump Body, nozzle end
5 Screwdriver, $\frac{7}{32}$ in × 0·032 in × 3 in
6 Screwdriver, $\frac{9}{32}$ in × 0·040 in × 3 in
7 Screwdriver, $\frac{13}{32}$ in × 0·051 in × 3 in
8 Screwdriver, $\frac{5}{32}$ in × 0·025 in × 7 in
9 Screwdriver, $\frac{1}{4}$ in × 0·032 in × 8 in
10 Screwdriver, $\frac{3}{8}$ in × 0·051 in × 10 in
11 Screwdriver, $\frac{9}{16}$ in × 0·062 in × 10 in
12 Cleaning Tool, Pump Body Bush, lower
13 Pin Wrench (2), 0·093 in diameter
14 Pin Wrench (2), 0·125 in diameter
15 Cleaning Tool, for $1\frac{1}{4}$ in Pump Piston Washer Seating
16 Oil Can (3)
17 Box Wrench, $\frac{7}{32}$ in square, (2), for Matrix Clamp Screw, lead and rule moulds
18 Box Wrench, $\frac{7}{32}$ in square, for Type Mould Screws
19 Allen Wrench, $\frac{1}{8}$ in hexagon
20 Allen Wrench, $\frac{3}{32}$ in hexagon (for 'Funditor' Heater Relay Box). A $\frac{5}{32}$ in Allen Wrench is supplied for machines fitted with 'Rototherm' heaters
21 Iron Ladle
22 Single Wrench, $\frac{7}{32}$ in jaw
23 Double Wrench, $\frac{5}{16}$ in and $\frac{13}{32}$ in jaws
24 Double Wrench, $\frac{13}{32}$ in and $\frac{1}{2}$ in jaws
25 Cleaning Tool, for $\frac{7}{8}$ in Pump Piston Washer (also wrench for adjusting Piston Stem End screw with square recess in head)
26 Ingot Mould
27 Double Wrench, $\frac{5}{8}$ in and $\frac{3}{4}$ in jaws (2)
28 Double Wrench, $\frac{13}{16}$ in and $\frac{7}{8}$ in jaws (2)
29 Single Wrench, $\frac{5}{8}$ in jaw, for nozzle
30 Single Wrench, $\frac{3}{4}$ in jaw, for nozzle
31 Pump Nozzle Setting Gauge
32 Nozzle Squaring Post, $1\frac{1}{4}$ in Pump
33 Nozzle Squaring Post, $\frac{7}{8}$ in Pump
34 Skimming Spoon
35 Single Wrench, $1\frac{1}{16}$ in jaw (2)

1.5 Attachments

Adaptor bases: Adaptor bases are provided for the Super caster, for use with moulds not originally designed for the machine.

There are two different bases; one which is used with both the small-type and large-type composition moulds, and the quad and space and short lead and rule moulds (also the Duplex, Triplex, split-fraction and dual-type moulds) all originally designed for the composition caster; while the other is used with the 14–16 pt display-type machine mould.

Additional adaptor base equipment is available for use with the Triplex moulds (and the Duplex low-quad mould).

Ingot feeder: The ingot feeder attachment provides an automatic and gradual feed for a metal ingot (5), whereby the molten metal in the melting pot is maintained at a constant level. This device avoids the sudden drop in temperature which a reduced quantity of molten metal undergoes when a fresh ingot of relatively cold type metal is introduced, since the ingot is pre-heated by continued contact with the metal in the pot. The steady, continuous replenishment of the pot before any appreciable amount of the molten metal is consumed therefore helps to maintain consistency in both the temperature of the metal and the quality of the type.

The mechanism consists of a sensitive escapement (2) which is regulated by an iron float (7) on the surface of the molten metal. As the level of the metal in the pot is reduced, the consequent float-fall causes the float chain (8) (which connects the float to the escapement brake operating bar) to release an escapement brake shoe, so that the ingot suspended on the ingot chain (3) begins a controlled descent. Melting of the immersed end of the ingot is immediate, and as the level of the metal rises again in consequence, the float is likewise raised, and friction is applied to the escapement brake disc. This prevents any further descent of the ingot until the falling metal level again signals the need for further supplies.

Moulds are supplied for casting feeder ingots for this attachment. The ingots weigh approximately 16 lb (7·26 kg) each.

The products of the ingot mould are cast with an eye, by means of which they are suspended from the hook connection (4) on the ingot chain. When loading the attachment with a fresh ingot, remember that a pull on the escapement chain releases the escapement, and that raising the chain has a locking effect. This being so, the most convenient method of ensuring that a newly mounted ingot does not immediately activate the escapement, and descend under its own weight, is to lift the float out (by the chain) and rest it on the brim of the pot. Next pull the loose loop of suspension chain (3) to raise the hook to its highest position, and then hang the new ingot. With the ingot steadily suspended in position, grasp the escapement chain and deposit the float on the metal surface. The automatic feeding mechanism will then come into operation and the system will find its own balance. The only adjustment which can be made to the attachment regulates the strength of the escapement brake which is adjusted by means of an eccentric stud on the escapement brake operating bar spring post, inside the body cover.

The ingot feeder can be adjusted to position the ingot free from obstruction, by loosening the screws (1) and (6) and moving the body and cover as necessary. The float chain can also be adjusted, to position the float clear of any obstruction in the metal pot, by loosening the nut and sliding the escapement brake operating bar extension (9) along, until the float is correctly positioned; securing the nut again on completion.

Lighting attachment: This attachment, which is fitted to the swing frame post, provides a light and a magnifying lens which are invaluable for the precise checking of alignment and other routine duties, where good illumination and close scrutiny are required. It comprises a shielded light, with the magnifying lens (on a swivel mounting) built into the shade by which it is contained and protected when not in use.

The lamp is mounted on a parallel link system, which allows completely universal movement and immediate positioning.

Motor belt guard: This is available as supplementary equipment for all machines fitted with an electric motor on the base. The guard can be easily withdrawn to give access to the belt, etc.

Air blower: This is an electrically driven blower which consists of a motor and a rotary blower as an integral unit, mounted on the machine base just beneath the camshaft stand. An air supply pipe connects the blower to the air hose and nozzle, thus providing a constant air blast for mould cooling, should such not be available from any other source.

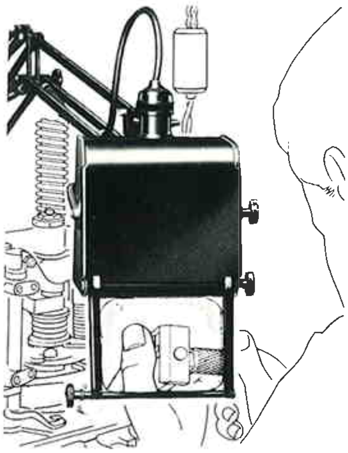
Type stacker: This consists of a support bar which runs the full length of the galley and provides for easier handling of small type up to 24pt. The bar is attached to a frame which is clamped to the galley: it can be adjusted for the size of type being cast, while a line support is used to prevent the end types falling forward as the line is advanced into the extended channel thus formed.

Furniture trimmer: This is designed for trimming the ends of products cast from the furniture mould. It can be attached to the front of the galley plate, above the matrix box tray.

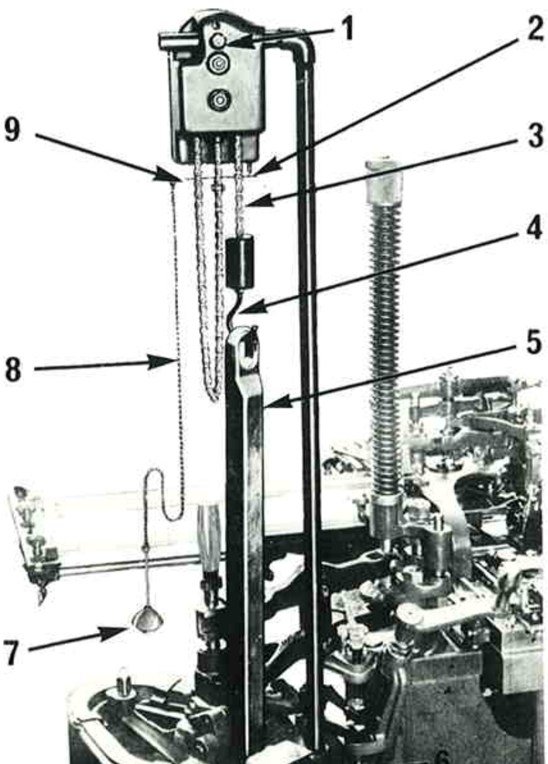
Rule straightening device: This attachment, designed to prevent 18pt full-faced rules bending upwards on emerging from the furniture mould, consists of a small fitting which provides a roller which over-lies the rule and so preserves its alignment.

Pump stroke counter: This constitutes an attachment for automatically counting the number of strokes made by the pump. A plate secured to the top of the piston operating rod transmits the motion through a link which is connected to the arm of the counting instrument.

The bracket which carries the counter is mounted on the swing frame post.



Above: Lighting attachment
Right: Ingot feeder attachment



1.6 Accessories

Micrometer: A standard micrometer caliper instrument which has a vernier reading to 0·0001 in. It is available in two sizes, 0–1 in and 1–2 in.

Type-alignment gauge: This is a screw micrometer instrument, incorporating a relieved platform mounted on the outer sleeve, perpendicular to the axis of the spindle, and a bevelled sighting plate which moves under the influence of the screw. Types (generally capital H) are placed, nick side uppermost on the platform, one on either side of the requisite slip gauge, the top edge of which is compared with the base line of the character.

Type-alignment slip gauges: A range of hardened and ground-steel slip gauges for use with the type-alignment gauge. Each is marked for size, and provided with an eye by which it may be hung on a board. The series covers the most commonly used sizes, and any item can be ordered singly as required.

Microscope type-alignment gauge: This stand-mounted instrument, which incorporates a micrometer sighting plate, is designed for use in conjunction with standard type-alignment slip gauges. With the microscope placed to take the best advantage of ambient light conditions, whether from daylight or artificial source, it produces a hairline sharp image, five times actual size, thus enabling adjustments to be made with ease and precision.

Point measure slip gauges: A set of accurately machined slip gauges, which used singly and in combination, covers the range 2–70 ems (and ½ pt to 12 pt). These gauges, which are arranged on a board in similar manner to the alignment slip gauges, are used to set the length gauge when checking short leads and rules and products cast from the strip moulds.

Sets of these gauges are available for pica measure (0·166 in basis); pica measure (0·1667 in basis); Cicero measure (0·1776 in basis) and Fournier measure (0·1653 in basis).

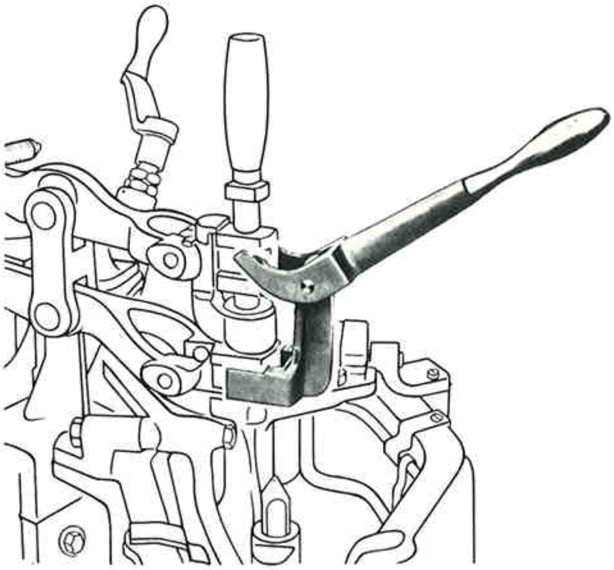
Centring pin auxiliary loading spring: This is used on the composition matrix head in place of the standard centring pin loading spring (and bridge) when casting 14–24 pt type from 0·4 in matrices. It consists of an auxiliary spring, together with a bridge, a cut-out rod (with nut and lock nut) and a coupling head screw.

The complete assembly can also be used with 0·2 in matrices, provided the nuts are adjusted to lock the auxiliary spring solid, thus placing it out of action.

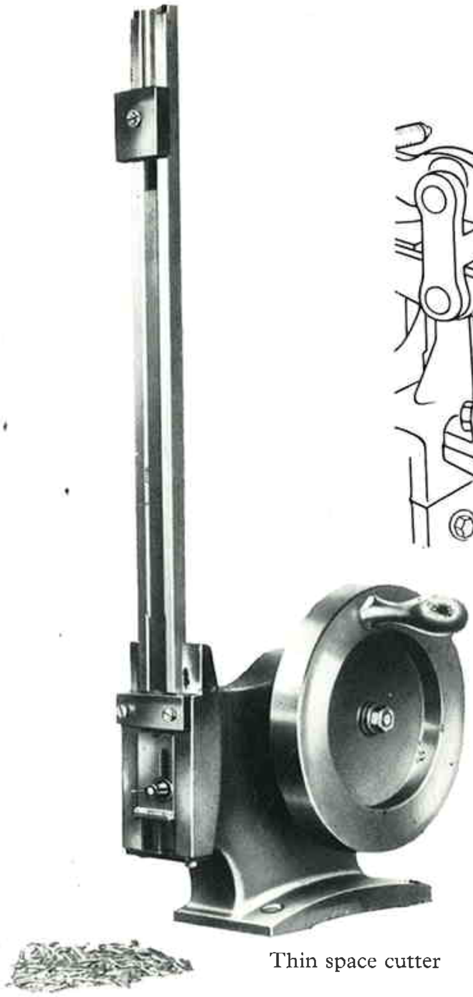
Centring pin gauge: The nose of the centring pin of the composition matrix head can suffer damage, or become distorted due to wear over a period of time, and such a condition can in turn cause damage to matrices, and seriously interfere with the production of good type. This ring gauge carries the female profile of a perfect nose, through which the tip of a faulty pin will protrude.

Pump piston extractor: If its lower end becomes fouled with impurities, a pump piston may suffer partial seizure and become difficult to withdraw. As the illustration shows, the extractor is a simple jacking lever, pivoting on a fulcrum stand, which seats securely on the upper part of the pump body, thus giving effortless manipulation.

Pump cleaning equipment: The cleaning equipment consists of a set of brass brushes for cleaning and burnishing the pistons and the pump bodies, together with a supply of piston paste; all contained in a wooden storage box.

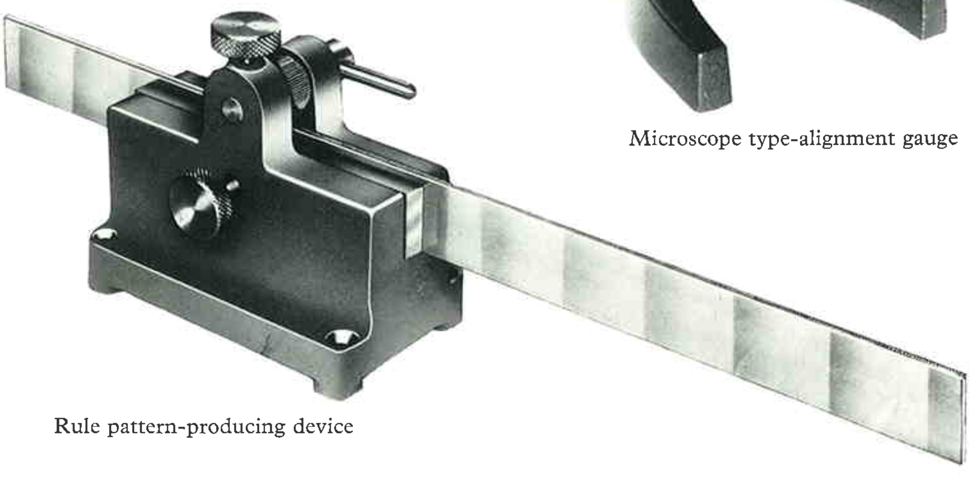


Pump piston extractor



Thin space cutter

Microscope type-alignment gauge



Rule pattern-producing device

Loading fixture for wooden-cored quotations: A loading fixture, which can be attached to the galley, is provided for positioning the wooden cores on the special core pieces used (together with special mould insets and crossblocks) for casting quotations from the 42–72 pt moulds.

Rule pattern-producing device: This simple device, which can be fitted to a workbench or table, is used to produce patterns on plain rules previously cast from the lead and rule moulds, thus making a useful range of patterns immediately available from plain rules held in stock. The pattern is impressed by a knurled wheel which is positioned over a channel through which the rule is drawn by hand. Distance pieces are provided to support $1\frac{1}{2}$–12 pt rule in the channel (and equivalent Didot sizes as required).

Thin space cutter: This cutter will produce all the thin spaces (1 pt, $1\frac{1}{2}$ pt, 2 pt or 3 pt in thickness) needed for any type size from $4\frac{1}{2}$ pt to 72 pt.

Designed for manual operation, it shears off spaces of accurate type body size from the lower end of a suitably sized pre-cast lead which is located in a gravity-fed magazine.

A piece of type of the required size is used as a setting gauge, and the lead, housed in the vertical magazine and fed to the shearing block by a feed weight, is cut to the required size, one piece per revolution of the handwheel.

The cutter is provided with two holes in the base for bench mounting.

Tweezers: Spring forceps with $4\frac{3}{4}$ in (120·7 mm) long pointed prongs, particularly useful for the manipulation of the smaller type sizes.

Eye-glass: A simple monocular magnifying instrument of the type commonly used by watchmakers, jewellers, etc.: it comprises a lenticular lens, mounted in a plastic eye piece.

CHAPTER 2

Introduction to the working of a 'Monotype' Super caster

This brief summary of the basic fundamental principles of the Super caster and the design and function of the moulds will serve to give you, in broad outline, a general idea of the object and usage of what must at first appear as a somewhat unusual machine, and the means by which it sets about achieving its purpose. In this respect, that which follows will prove to be of some service to those who already have some knowledge of printing, but perhaps little or no acquaintance with engineering techniques. This is not to suppose that any attempt will be made to explain all the engineering complexities involved in any detail, or that you will require to be fully conversant with the detailed application of the principles concerned, other than such as are included for your instruction as necessary throughout the manual.

2.1 Fundamentals

The Super caster is designed to produce individually cast types and spaces, leads, rules and borders; also foundry furniture and plate-mounting material, etc., as listed in detail in 1.1. It achieves this by injecting molten metal into a sealed cavity or mould, whereby the metal on solidifying is formed exactly to the shape of the mould in every detail. The cast product is then automatically ejected from the casting cavity and ultimately delivered in finished form, piece by piece, as the process is repeated, on to a galley or the galley plate, to the front of the main stand of the machine.

In order to cast the various products, a variety of items of equipment have each in turn to be assembled on the machine, and a number of precise adjustments have accordingly to be made, to control and, as necessary, vary the movements of the several arms, links, levers, springs and rods involved in the casting process.

Almost every moving part of the machine derives its motion from a series of cams which operate in pairs, mounted on two camshafts concealed in the camshaft stand. A cam, in its very simplest form, can perhaps be described as a circular-shaped plate mounted off centre on a shaft. However, most cams, and this includes those in the Super caster, are not circular but irregular in profile, their design being determined by the nature of the movement they are required to impart to the cam levers as the camshaft revolves.

If a revolving cam acts against one end of a lever which is itself mounted on a pivot, it will automatically pass on its motion to the lever and cause it to move. The extent to which the lever is caused to move in this manner will be greatest when the end of the lever is in contact with the cam at the point which is furthest away from the camshaft centre, and least when the rotation of the cam duly brings the lever into contact with the point nearest to the centre. The same will be true of the other end of the lever, the movements of which of course, due to the pivot mounting, will be in an opposite direction. Thus briefly, do the cams influence the movement of the cam levers on the Super caster; and as the various functional parts of the machine are linked with the cam levers, they can each as required, in this manner, be moved into position automatically to perform a particular job as part of the casting process, and subsequently withdrawn again as the cam revolves.

Just as the design of the cams is determined by the nature of the movement required by the cam levers, so, similarly, the movement required of the cam levers is dictated by the functions which the various connecting rods, arms, levers and spring boxes to which they are connected are called upon to perform in the process of making their contribution to the casting of the product. It will therefore be appreciated that as the cams will be constantly giving the same precise movement to the cam levers, and these in turn to the connecting rods, etc., some measure of control over the latter is essential in order to vary, limit or partially absorb their motion and consequent influence, dependent upon the class or size of product being cast. The adjustments and settings required to achieve this are fully described wherever relevant throughout the book.

The somewhat complex series of motions involved is, of necessity, precisely timed to ensure perfect co-ordination without risk of jamming or collision. There are, in fact, built-in safety devices and adjustments designed specifically to prevent this happening, and they automatically bring the machine to a halt should anything go wrong during casting whereby the mould or the machine could suffer serious damage due to any negligence or oversight on your part. The safety devices consist largely of adjustable springs, plates and plungers, the setting and tension of which you will be called upon to adjust and vary according to the nature of the product being cast.

The cycle of operations which result in the production of type, etc. from the Super caster is timed in degrees around a circle, or 360°, representing one complete revolution of the camshaft. This timing is expressed mechanically through a simple gear system, the order in which the cams are placed, the shape of the cams, and the careful positioning and control of the adjustable parts which translate the initial movement into the specific functional tasks related to the casting of the product.

The speed of casting (the revolutions per minute) is controlled through a variable speed input mechanism, and a gear system, the output from which can be varied as required, from 2–160 r.p.m., the deciding factors being the volume of molten metal involved in each separate casting, the heat factor connected with this, and the effect on the moulds and matrices. A mould water-cooling system is provided to adjust the balance and thereby enable the highest possible production speeds to be maintained, consistent with the operational characteristics of the type metal and other factors related to the quality of the cast product. In addition, an air blast is also used for cooling with certain classes of work.

Closely linked with all this is the temperature of the molten metal itself, which is injected into the mould at frequencies related to both its volume and temperature, so as to ensure that it solidifies during the brief period it is permitted to stay in the mould. In this connection, there is a momentary period of pause in the 360° casting cycle, during which, with the exception of the cams themselves, all but one of the moving parts on the main stand of the machine remain stationary.

This period, the length of which again varies with the nature and size of the product, (and therefore in relation to the casting speed), is timed to occur at the precise moment the molten metal is injected by the pump into the casting cavity of the mould – the very moment at which the casting cavity is completely sealed.

The metal, electrically heated to the required temperature in the melting pot, is supplied to the mould via the pump nozzle, which automatically seats itself in the conical recess in the base of the mould for each separate casting.

Generally speaking therefore, the smaller type bodies can be cast at higher speeds than larger ones, or other bulky products such as furniture, etc. A specially prepared 'Product Information Table' is provided which serves as an operational guide in this respect.

We will now briefly consider the basic principles which govern the function and operation of the various moulds used on the Super caster, which are so largely dependent on the ultimate movements imparted by the cam levers to the various connecting rods, etc. to which the moulds are linked.

2.2 The moulds

The moulds used on the Super caster, as far as basic working principles are involved, fall into two main groups. The group which comprises the type moulds casts individual pieces or bodies, such as type, quads and spaces, and cored quotations as used for mounting line and half-tone blocks for printing. The other group consists of the moulds which cast product in strip form, such as leads, rules, continuous borders, furniture, mounting material, and dashes and clumps. These moulds are collectively termed the strip moulds.

The various moulds, the basic principles of which we shall briefly summarise here, can therefore be classified as follows:

(a) Type moulds. (b) Lead and rule moulds. (c) Furniture mould.

The type moulds cover a number of moulds, ranging from those which cast small composition typefaces such as you are reading now (many are much smaller) to large display moulds which produce type, the body height of the character of which (in 72 pt) can be anything up to about $\frac{15}{16}$ in (23·8 mm). The principles involved in casting from all the type moulds are basically the same throughout. This can also be said to be true in respect of the strip moulds.

You will find that all the moulds are fully explained in detail throughout Chapter 23, whilst the full range of products available from the moulds is listed in 1.1.

All moulds are required to perform two main functions, the nature of which dictates their basic design. First, the mould, aided by its several links with the cam levers which control its moving parts, must provide an exactly sized and positively sealed casting cavity, which will produce perfect casts when the requisite amount of correctly heated molten metal is injected by the pump, during the brief period of pause in the casting cycle. Its secondary role is to eject the completed cast and duly prepare itself to receive the next injection of metal, whereby the casting procedure continues automatically without interruption. Thus the type moulds are designed to do precisely this with individually cast type bodies, etc., whereas the strip moulds likewise cast and eject, except that each successive cast is initially only pushed forward sufficiently to clear the casting cavity, so that the next cast which follows fuses with it; the product consequently emerging from the mould in a continuous strip. The emerging strip, in the case of leads and rules, can be finally delivered, automatically sheared to any required length up to a maximum of 150 ems, whereas furniture, although seemingly likewise in one continuous strip, is actually delivered in separate pieces cast to a predetermined length.

Let us now briefly consider how the various moulds are constructed, how they perform their allotted tasks during casting, and the function of the several parts assembled on the main stand to aid them in so doing.

With all moulds, the basic requirement is the provision of a sealed chamber in which the product can be cast; in short, a six-sided sealed cavity with a top, bottom and four side walls. With the type moulds, this requirement is met, broadly speaking, in the following manner:

The channel walls of all type moulds are designed to produce type of uniform height known as *type height*, which in England is normally standard at 0·918 in, though moulds of varying height up to about 0·996 in can be supplied when requested, and to suit the special needs of users in other parts of the world. The distance between the flanking walls of the channel determines the body or 'point size' of the type. Of the two dimensions described therefore, the type height of the cast character is of necessity constant, whereas the body or point size will vary with each mould or mould blade inset, according to the point size type body it is designed to cast.

With composition moulds in the 5–14 pt range, a different mould is supplied complete for each point size, whilst for large-composition type casting, a mould base and crossblock only are provided, with interchangeable mould insets covering the 14–24 pt range. There are likewise two Super caster display-type moulds with interchangeable insets for each body size, which cover the 14–72 pt type range and cored quotations from 48–72 pt; in addition to a special 'display type machine' mould (14–36 pt) which is similarly constructed.

Thus each type mould provides us with the basic elements of a casting cavity in the form of a channel, the height and body size of which are constant. These dimensions cannot be varied, and type bodies cast will all be precisely the same height from foot to printing surface, and of uniformly exact body size as determined by the point size of the mould. This does not apply in the case of both high and low quads and spaces, special provisions being made whereby they are cast less than type height, as they are not required to provide a printing surface. Refer to Chapter 31 which deals with the casting of low quads and spaces.

We can, however, by adjusting the position of the mould blade, vary the width of the type body to conform to the requirements of the width of the character being cast. The mould blade, the dimensions of which in every instance conform to the fixed dimensions of both the height and width of the casting cavity, thereby provides us with the third side wall of the mould (the channel walls comprising the other two).

The fourth side wall of the type mould is provided by the mould crossblock which, sliding in another channel at right angles to the mould blade, moves into position to seal the open end of the casting cavity during casting, and is subsequently moved to the right to allow the cast product to be ejected into the type carrier. The crossblock is so designed as to also form part of the floor of the casting cavity, in which is located the jet aperture through which the molten metal is injected into the mould. The floor comprises the fifth wall.

The final sealing of the casting cavity of the type mould is completed by the matrix which provides the sixth wall, and produces the character on the head of the type body. The matrix descends on the top of the mould to complete the seal, just before molten metal is injected into the casting cavity.

With the strip moulds, the final sealing of the cavity when casting decorative dashes or continuous borders is also similarly catered for by a matrix which is raised or lowered as required. However, when casting leads, strip rules and full-faced rules, or when casting from the furniture mould, the casting cavity remains sealed at the top throughout, by either a fixed cap or a rule matrix, there being no necessity to lift either cap or matrix off the mould in order to push the product forward to make room for the next cast.

The channel walls of the strip moulds can be adjusted to the required point size, and since the cast product emerges in strip form there is no crossblock to seal the front of the casting cavity. A sliding jet block, however, provides both part of the floor and the jet aperture in a similar manner to the crossblock of the type moulds, whilst the cast product itself acts as the front wall of the mould, being pushed forward by the mould blade after each cast, to make room for the next cast to be formed and fused with it.

Thus far, we have briefly outlined what happens in the mould during casting, and subsequently what takes place as strip material emerges from the mould; and how type itself is ejected from the casting cavity by the action of the mould blade.

After the injection of the molten metal, the cast type body, though still hot, is cooled almost instantly to the point of solidification, and is now ready to be prepared for ejection from the mould. The sliding crossblock, which forms part of the floor of the cavity, is securely linked to the cam-operated type carrier. The type carrier now moves a little to the left, causing the cutting edges of the crossblock jet to completely shear the metal 'tang' which is formed at the base of the type during casting, leaving it with a clean-cut foot.

Continuing movement of the cam lever now causes the type carrier and the crossblock to move to the right. During this movement, a track-cam in the crossblock channel on the floor of the mould actuates a sliding jet blade which presses the cut-off metal tang out of the crossblock, whereupon it falls through an opening in the base of the mould, back into the melting pot. In the type carrier, at the point where it is linked with the crossblock, is a space designed to accommodate the newly cast piece of type, and a lightly spring-loaded type support to prevent the type being overthrown or falling on its side. As the movement of the type carrier brings this space into line with the open end of the mould casting cavity, the mould blade moves forward and pushes the type into the type carrier, where it is held in position by the type support spring.

Immediately the new piece of type has been deposited in the type carrier, it moves to the left, carrying the type to a position outside the mould, whilst at the same time bringing the crossblock back again to the casting position. Meanwhile, the mould blade withdraws to position itself for the next cast.

As the type carrier completes its movement to the left, the type is ultimately gripped by the type clamp, and the type support spring is withdrawn. The type carrier is thereupon temporarily halted during the period of pause, whilst the next cast is taking place; and during this brief moment, the type pusher, another cam-operated mechanism, passes through the type carrier and pushes the type out of the carrier into the type channel on the main stand of the machine, where each successive cast is marshalled in a row, and in this manner gently eased forward step by step on to the galley.

In conclusion, you are recommended to make a close examination of the machine, the various attachments and the moulds, in the light of the foregoing outline description, to slowly rotate the machine, initially by hand (turning the handwheel anti-clockwise), and study the movement of the various cam levers, and the part each one plays in the operation. You can then, in due course, carefully read through the detailed descriptions of each and every one of the items as they are dealt with fully throughout the manual, as you are called upon to bring them into use.

CHAPTER 3

Suggested instructional syllabus

As emphasised in the Foreword, it is not recommended that you should, as a beginner, attempt to read the manual right through from start to finish in the order in which it is written. To do so, would to some extent involve you in detailed study of each of the various parts of the Super caster in turn (and with some of the basic theory and fundamental principles) before you are in a position to fully comprehend the working of the machine as a whole and the role played by the several parts of which it is comprised, all of which contribute to its ultimate function. Your initial studies should therefore be phased to ensure you achieve the desired result as quickly as possible and avoid unnecessary confusion on the way.

To this end, the suggested progressive study sequence which follows, if closely adhered to, should ensure you begin with some understanding of what the machine is designed to do and how it does it; the nature of the products and something of the standards to which they are required to conform (together with some simple basic theory); and an insight into the function of each of the main sections of the machine, and the manner in which the several parts involved are inter-dependent in their contribution to the whole.

The Introduction to the working of a 'Monotype' Super caster (Chapter 2) will give the initial overall picture (as will Chapter 22 in respect of the moulds). Chapters 4, 5, 6, 7, 41 and 42 will provide you with an introduction to type and its production, together with some basic theory; while the chapters contained in Part 2, covering the main sections of the machine, will lead you up to the comprehensive coverage of the moulds contained in Parts 5 and 6, which ultimately brings you to the point where you should be fully equipped to operate the machine and make your first casts.

Furthermore, you will observe that almost every chapter throughout the manual has an introductory section which briefly summarises the functional role and the component parts of the machine section concerned, all of which is duly covered in detail in the sub-sections contained in the ensuing pages of the chapter in each case. Reference is also frequently made to other machine parts with which they are closely linked. The chapters so covered have been written with the object of introducing each section of the Super caster in broad outline, before you embark on a detailed study and go on to the settings and adjustments required when setting-up and operating the machine.

3.1 Progressive study sequence

Foreword

The Manual – and how to use it

Chapter 2: Introduction to the working of a 'Monotype' Super caster

Chapter 22: Introduction to the moulds

Chapter 4: Typographical features and dimensions of type

Chapter 6: Basic unit and set. (Get a grasp of the general idea)

Chapter 8: Introduction to the main sections of the machine

Chapter 9: The mould blade sizing mechanism. (Read the opening paragraphs right through to sub-section (e), then continue with 9.1 and 9.2 only)

Chapter 10: The matrix heads base. (Read the opening paragraphs, ignore 10.1, then read 10.2 and 10.11 only at this point)

Chapter 11: The composition matrix head. (Read the opening paragraphs only at this stage; stop when you reach 11.1)

Chapter 12: The display matrix head. (Read the opening paragraphs, ignore 12.1 and read 12.2 only at this stage)

Chapter 13: The counter bracket and counter mechanism. (Read the opening paragraphs only at this stage, right through to sub-section (d))

Chapter 14: The strip cutting and stacking mechanism. (Read the opening paragraphs and 14.1 only at this stage)

Chapter 15: The pump mechanism. (Read the opening paragraphs and 15.1 only at this stage)

Chapter 16: The Varigear unit and gearbox. (Read the opening paragraphs, and 16.1 and 16.2 only at this stage)

Chapter 17: The cams. (Read only the introductory paragraphs at this stage)

Chapter 5: Type alignment

Chapter 41: The production of good type

Chapter 42: Type metal. (Read to 42.11 inclusive at this stage)

Chapter 18: Matrices. (Read right through to 18.8 inclusive)

Chapter 19: Matrix holders. (Disregard dismantling and assembling procedures)

Chapter 21: Cooling the mould

Chapter 23: Moulds available for use on the Super caster

Chapter 24: Small-type composition moulds 5–14pt
(Follow this through from start to finish in any event, as it takes you up to the point where you are ready to cast, and forms the basis for similar procedures with all the 'type' moulds. Read right through each of the sections contained in Part 2 (the main sections of the machine) as necessary when each in turn is brought into the setting-up procedure)

Chapter 7: Measuring the cast with the micrometer gauge. (Read the opening paragraphs and 7.1 only at this stage)

Follow with study of the other type moulds (and the strip moulds) on similar lines, as dictated by your particular requirements; turning to Part 2 for detailed reference to the main sections of the machine as the necessity arises, and likewise to other parts of the manual.

Ensure you finally cover everything in the manual not thoroughly studied on the initial run-through, especially all the detail contained in Chapter 15 which deals at some considerable length with the pump mechanism.

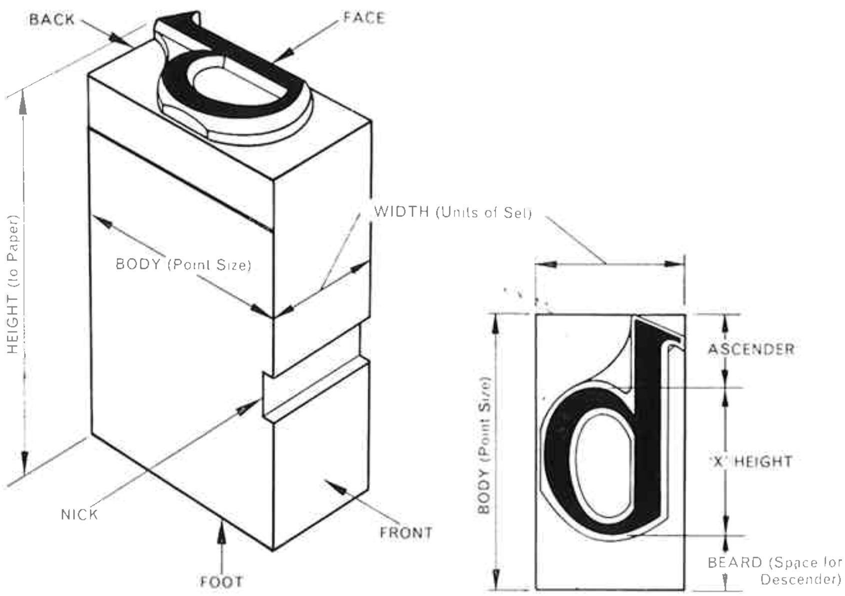
CHAPTER 4

Typographical features and dimensions of type

4.1 Type features A type is a small rectangular block of metal, always about $\frac{15}{16}$ in (23·8 mm) tall (dependent on the 'height to paper' requirements), with thickness (body or point size) and width (set-width) according to the size of the character to be printed. The foot of the type is flat and rests on the bed of the printing machine. The opposite end (the head of the type) is provided with a raised design; this is inked over and paper is then pressed upon it (or an inked impression is transferred to paper). The resulting imprint of the design is a character – a letter, figure, punctuation mark, mathematical sign, or perhaps a symbol from an exotic eastern fount.

The thickness of a piece of type, from back to front, limits the height of the printed letter. The height is related to the letter x (not the capital X). The distance between lines bounding the lower case x at top and bottom gives us a dimension which is termed the 'x-height' of the type fount. The same term is applied to all similar lower case characters in the fount (not f, j, l) including the round letters such as c, e, o, etc., although these are made slightly taller than the x to give an even appearance, and to offset the optical illusion by which the round letters would appear to be small if they were exactly the same height.

The letter b also has an x-height, but, from it, a stroke projects upwards to form an 'ascender', while, from the x-height of the letter y, a stroke projects downwards to form a 'descender'. It is customary for all the x-heights of letters to be in line, top and bottom; the space allowed for in the printed line providing for the inclusion of both ascenders and descenders.



4.2 Type height

The standard height of type cast from English 'Monotype' machines, from foot to face of character is 0·918 in (23·3 mm). Moulds, however, are supplied to suit the requirements of customers throughout the world. The height of type is dictated by the height of the casting cavity formed by the side blocks, the crossblock and the mould blade – and the depth of the matrix punching. The distance from the foot of the type to the top surface of the character is known as 'type height' or 'height to paper'.

The shrinkage allowed for in the height of a type on cooling is 0·003 in (0·076 mm): it should always be measured when cold. Casting should be carried out with as few stoppages as possible, in order to maintain a regular mould temperature and uniform type shrinkage.

Any mould which produces type which falls short of the required height by more than 0·002 in (0·051 mm) should be returned to The Monotype Corporation Ltd., for repair.

4.3 Quad and quotation height

Mould lower blades are made to produce quads and spaces to a height of 0·750 in (19·050 mm). Non-cored quotations can also be cast to this height. This permits the use of quads and quotations as base material for mounting stereos and electros machined to a thickness of 12 points, allowing 0·002 in (0·051 mm) for the thickness of the adhesive employed in attaching the plate to the base.

CHAPTER 5

Type alignment

Each fount in every type face series has a recommended standard of alignment, which during casting is controlled by checking the product against a slip gauge. The slip gauge size required for checking the alignment is notified with each type fount supplied – and this will always be correct to the nearest 0·0005 in, since the gauges provided are produced in 0·0005 in increments. The type alignment figure quoted for each fount is, unless otherwise specified, directly related to the type line of the capital H, and represents the distance from the top of the shoulder (opposite the nick) to the type line, i.e. the base line of the character, when cast on its own normal body size. If a matrix alignment figure is quoted, this indicates the type line measured from the back of the matrix. Refer to Chapter 18 which deals with matrices.

If the fount is to be cast 'off body' larger than normal, the required value of the recommended type alignment figure is obtained by adding half the difference between the normal and the larger body sizes involved. Take, for example, Series 169, 6 pt, cast on an 8 pt body: half the difference between 6 pt and 8 pt = 1 pt = 0·0138 in. Type alignment value of Series 169, 6 pt = 0·0635 in; 0·0635 in + 0·0138 in = 0·0773 in, which to the nearest 0·0005 in = 0·0775 in. When a fount is cast on a body size larger than normal, to accommodate special characters with long descenders, the type alignment remains the same as for normal casting, as is also the case when a smaller body is chosen to suit special characters with short descenders.

The alignment of cast type is checked and adjusted with the aid of the appropriate slip gauge and the type-alignment gauge shown here. Two alignment gauges are available, one for sizes up to 36 pt and one for larger sizes up to 72 pt. The procedure is as follows: select the recommended slip gauge (3) specified for the fount in use and cast a series of the appropriate alignment character (usually the capital H), until the mould is warm. When the mould has reached its normal working temperature, take the last two cast H's and assemble them on the alignment gauge on either side of the slip gauge, in the manner indicated in the illustration. When the leading edge of the sighting plate (1) is advanced over the characters and brought into alignment with the step on the slip gauge, it should also be level with the base line of both capital H's, if the alignment is correct.

The exact amount of any alignment error can be speedily checked by moving the sighting plate (1) so that it aligns with the base line of the characters, and noting the degree of movement on the graduated micrometer knob (2) on the handle of the gauge. Each graduation represents a 0·001-inch movement of the sighting plate.

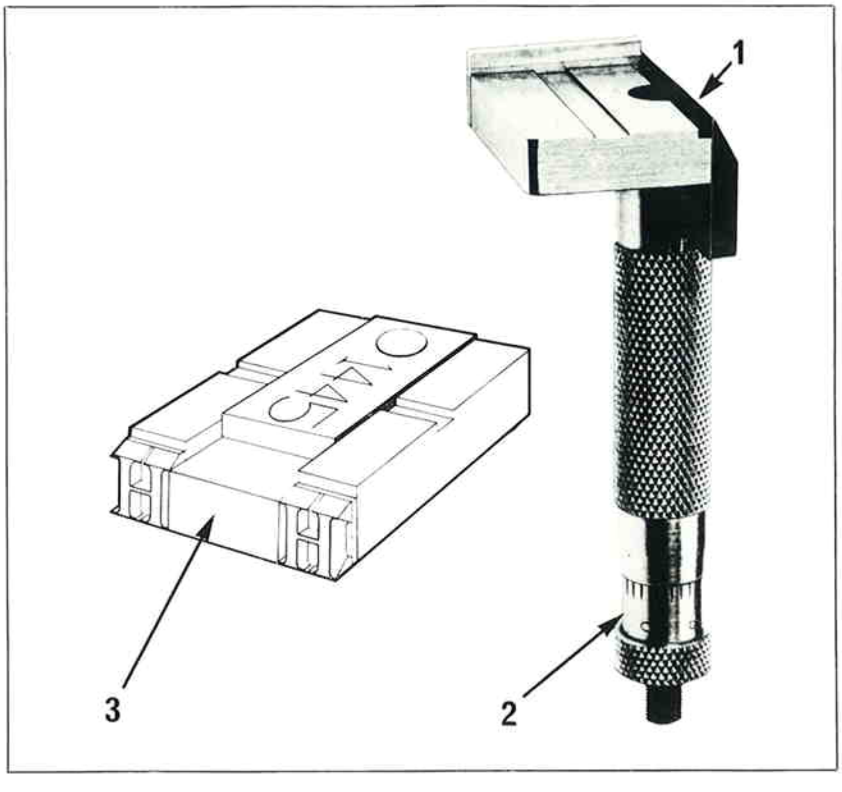
Note: If the base line of the capital H is not perfectly horizontal, the lowest part of the shape should be aligned with the slip.

Any deviation from the common alignment thus revealed is corrected by means of the knurled adjusting micrometer screw on the right-hand side of the matrix lifter when using the composition matrix head, and by means of the adjusting screw of the adjusting pad of the display matrix bridge when using the display matrix head. The adjusting screw must be turned clockwise to raise the character on its body (away from the nick), and anti-clockwise to lower it, and this applies in both cases, although the nick is positioned on the opposite side on the display mould. One complete turn of the screw moves the character 0·010 in, and one division of the knurled head produces a difference of 0·0002 in.

The other knurled adjusting screw on the composition matrix head (the one facing the front of the machine) effects a similar change in the set-wise direction, enabling the character to be positioned centrally on the body; a clockwise turn moving the matrix to the rear, in the direction of the mould blade sizing mechanism. This set-wise adjustment, in the case of the display matrix, is similarly achieved by the knurled head screw provided in the matrix holder, which adjusts the position of the matrix locator as required.

Finally, a word of warning regarding the practice of checking alignment adjustments against the em rule. This is a thoroughly unreliable method, since by no means all founts include an em rule designed to lay across the true centre of the body, and reliance upon this system as an alternative to the recommended procedure could well result in much trouble and confusion. You should always use the capital H unless another character is recommended for the purpose.

Furthermore, you should always bear in mind that if you are not extremely careful, slip gauges can very easily find their way into the melting pot, along with any unwanted type from the galley, especially when you are cleaning up. Type-alignment slips are precision gauges and should be treated with care and always returned to their correct position on the slip-gauge board immediately after use.



CHAPTER 6

Basic unit and set

Before setting out to learn how to operate a Super caster, it is essential that you first gain some understanding of the principles implicit in two essential typographical terms, and their application in connection with the correct casting of type from the composition moulds in the 5–24pt range. The terms are 'basic unit' and 'set', and they are both fundamentally involved in all type design, and constitute the means whereby the width of all type in the composition series is both measured and described.

Whereas, in connection with the Super caster, we perhaps have no need to concern ourselves in too much detail with the theoretical basic unit of set, the term 'set' itself, and likewise 'units of set', are each expressions with the practical application of which we are concerned, as they are vital factors related to the width of all type. It is therefore necessary for us to fully understand what they imply, as we are called upon to exert a very fine degree of control over the width or 'set' of the type body when casting.

6.1 Theory

To the beginner, the theory of basic unit and set, and the expression of set in points, can tend to be a little confusing at first. This measurement of type body width based on points is generally described as 'set-points' or 'set-width', or just 'set'. This is not to be confused with the 'point size' of the body of the type, which describes its measurement from the front to the back of the type body. The point size of the type body is controlled for us by the mould, there being a separate mould or mould inset for each point size in the range.

Briefly, the theoretical or imaginary basic unit of set is derived from the 12-point, 12-set quad, each side of which measures 0·166in, whereby the width of an equally imaginary 1-point, 1-set quad measuring 0·01383in is divided into 18 equal parts. The unit which comprises one-eighteenth of the width of this imaginary 1-point, 1-set quad, is our theoretical basic unit of set. You need not concern yourself overmuch regarding this, but purely as a matter of interest, it measures 0·0007685in (less than one ten-thousandth part of an inch).

A unit of set, as distinct from the theoretical basic unit of set, therefore becomes a variable measure, since you can similarly have 1 unit, or one-eighteenth of a quad in any point size, in any type fount. Furthermore, the quad set-width will be dictated by the type design and it will therefore not always constitute a square, as is the case with the 12-point, 12-set quad from which the imaginary basic unit is derived.

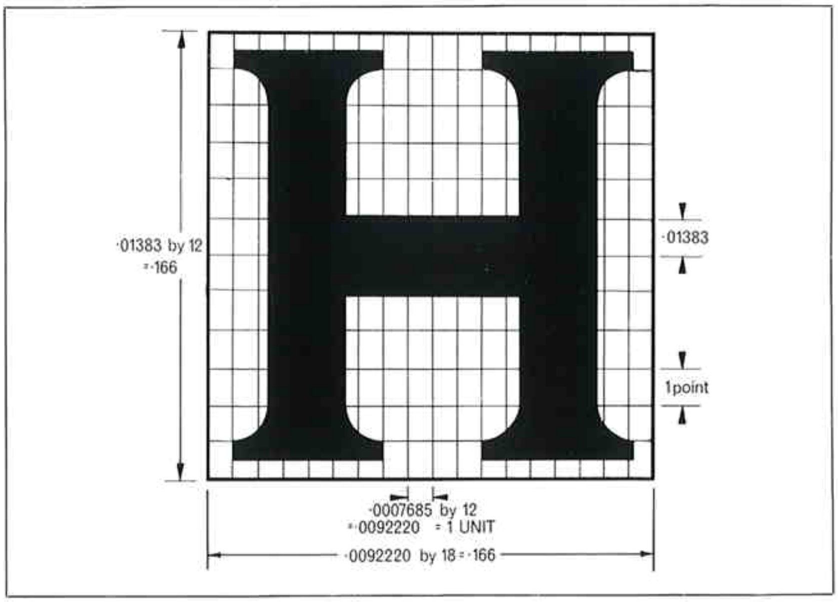
Thus, by dividing the width of a quad, that is, any quad of any point size of any type fount, into 18 equal parts, a convenient range (expressed in five-eighteenths, seven-eighteenths, etc.) can be obtained to classify, in appropriate groups, all the characters of any fount. Thus (for example) 'i' and 'l' would, generally speaking, conveniently come in the five-eighteenths group, 'r' and 's' in the seven-eighteenths group, and 'T', 'L' and 'w' in the twelve-eighteenths group, and so on; the exact group for any particular character in any particular fount being determined by the design of the characters themselves.

In consequence of this, every fount of type in the composition type range is designated by a specific set-width or set-size, which is automatically determined by the design of the type face, there being some founts in which the characters are expanded or wide, and some in which they are narrow or condensed. Because of this, and since each of the eighteen units of the quad is made up of a number of basic units, a wide or expanded type face would have more basic units per unit of set than would a narrow or condensed design, and it is the number of basic units per unit of set that determines the set-size by which the fount is known.

The letter 'M', which is usually regarded as one of the widest letters in the type fount, generally occupies a greater or wider set-wise area on the type body than most other characters in the fount. The type body on which the letter 'M' is cast is therefore generally understood to be one of the largest in the fount, and usually occupies the full 18 units of the set-width of the fount. Because of this, the 18-unit quad is known always as the 'em-quad'.

You will therefore appreciate that there is, generally speaking, an 'em-quad', or 18-unit quad, for every point size of every variation of every typeface, and that they are all consequently of different dimensions, both point-wise in relation to the body size of the type face, and set-wise in relation to its width. Thus you can have type founts 10 point, 10 set, where the em-quad would be exactly square, and the characters of the typeface of normally accepted average proportions. Similarly, with a 10-point, $12\frac{3}{4}$-set fount, the em-quad would no longer be square, the set-width being greater than the point-size of the body, and the characters in consequence being expanded or wider than normal. Likewise, a 10-point, $8\frac{1}{4}$-set fount would have an em-quad the set of which would be less than the point-size of the body, whilst the characters would therefore be condensed or narrower than normal.

It is therefore not difficult to appreciate that, where the 18-unit em-quad is either wider or narrower than the point-size of the type body, as indicated by the 'set' of the fount, so the various characters in the fount which fall into groups of, say, five-, seven- or twelve-eighteenths, etc. of an em are likewise similarly affected.



The practical application of the foregoing, in respect of set-width and units of set, as far as you need concern yourself in relation to the Super caster, is that, when setting up to cast from the composition moulds, you must obtain the correct setting figures for the mould blade sizing mechanism from the 'Table of Micrometer Head Settings', which covers all composition matrices. You therefore need to know both the set-width (number of basic units per unit of set) of the typeface series in the point-size you are using, and the unit-value of each individual character in the fount, in order to do so. (The 'Tables of Micrometer Head Settings' are reproduced at the end of the book, and they are also available in card form for use on the machine.)

You are, of course, similarly concerned when duly sizing the cast product, using the micrometer caliper gauge, as explained in detail in Chapter 7.

The mould blade sizing mechanism, which is fully dealt with in Chapter 9, controls the width of the casting cavity and determines the set-width of the type, whilst the wedge screw scales provided to exert this control permit extremely fine adjustments of the blade (and consequently the width of the type) to a ten-thousandth part of an inch.

6.2 How it works in practice

The numerous settings given in the 'Tables of Micrometer Head Settings' range from as low as 3 units of 5 set, for the very small type sizes, up to as high as 21 units of $23\frac{3}{4}$ set, and 26 units of $19\frac{1}{2}$ set, for large-composition type. The settings given in the tables, in every case, give you the choice of either a four-place decimal fraction of an inch, or an alternative expressed as points and fractions of a point, either of which can be set on the wedge screw scales of the mould blade sizing mechanism, as best suits your convenience.

Before you can refer to the tables, however, you need to know both the set of the fount in which you are working, and the unit-value of each character in the fount, as already explained. This information you can generally obtain from one of two possible sources, depending on your particular operating circumstances. First, if your establishment operates a 'Monotype' composition caster, you will naturally be using the matrices belonging to it, and you can easily obtain the details you require from the printed layout charts of matrix-case arrangements which composition caster operatives use as a guide when setting up for casting. These layout charts give you both set- and unit-value and you then need only to refer to the 'Super caster Tables of Micrometer Head Settings' for details of the relevant wedge screw handwheel scale adjustments. Alternatively, in the absence of a composition caster and the non-availability of its convenient layout charts, you are referred to the very simple 'Type Series Charts' illustrated here, which give you decimal settings relative to unit-values in every point-size in the complete typeface series covered by the list – in this particular case 'Monotype' Baskerville (169), 6–14pt. With these charts, you are not given an alternative points setting, but other than this you have all you need, and although the chart may not quote the set of the fount series, it is of no consequence since you are not required to refer to the Super caster tables at all.

These 'Type Series Charts' are supplied automatically with every fount of composition type matrices included in an installation order; that is, when the Super caster is initially supplied and installed. Should you require this type of chart for any subsequent composition type founts you may order in due course, you should clearly specify this at the time, as they are only included with matrix founts when specially requested. In this respect, you should bear in mind that you would be unable to cast from matrices if you had the matrix fount, but no chart to guide you as to the set, the character unit-values and the relevant wedge screw handwheel scale settings. To attempt to do so by mere guesswork or by using the unit-values of another perhaps similar fount series could prove disastrous for any one of several reasons, and could result in severe damage to both the matrices and the mould.

In conclusion, it is perhaps necessary to briefly touch on the necessity for absolute accuracy in the production of type bodies, and the basic reasoning implicit in the type design and the allocation of unit-values to each character, which can vary considerably with every fount or type series as already explained.

The set-width of the type body allocated to every character in every fount of every typeface series is so apportioned as to ultimately provide printed words of maximum clarity wherein each and every letter is evenly spaced with its neighbour on either side, due regard being taken of the varying shapes of the letters or characters in the alphabet concerned.

The foregoing should suffice to impress upon you the need for a sympathetic understanding of the theory of basic unit and set, and its subsequent faithful and painstaking application when casting type of any kind.

'MONOTYPE' BASKERVILLE SERIES No. 169 — UA 43

NOTE FOR LARGE COMPOSITION SEE SEPARATE CHART

					Units	POINT SIZE 6	8	9	9½	10	11	12	14
	fijt.,'':;!		ijlt;'	I	5	0259	0317	0346	0365	0384	0413	0461	0500
	st-(		ce/rs	Js	6	0311	0380	0415	0438	0461	0496	0553	0599
	r?()[§' '	/	[illegible]		7	0363	0444	0484	0511	0538	0578	0646	0699
IJ	cez	fS	abdghknpqu xz fiflro	I	8	0415	0507	0553	0584	0615	0661	0738	0799
S	agkovxy''' 1o,,-	S	æff'''',,	BCELPTZ	9	0467	0571	0622	0657	0692	0744	0830	0899
SB	bdhnpqu *fiflij†‡		ij	ADGKNO QRUVXY	10	0519	0634	0692	0730	0769	0826	0922	0999
BFP	æff	CFJLP		HM	11	0571	0697	0761	0803	0845	0909	1014	1099
ELZ		ABEG RVYZ	mœffiffl		12	0622	0761	0830	0876	0922	0991	1107	1199
ACTY£	w	KOQX		Æ	13	0674	0824	0899	0949	0999	1074	1199	1299
DGNRV	œ	DHNTU		WŒ	14	0726	0888	0968	1022	1076	1157	1291	1399
HKOQ UX&	mffiffl				15	0778	0951	1037	1095	1153	1239	1383	1499
ÆŒ		ÆŒ&			17	0882	1078	1176	1241	1306	1404	1568	1698
MW	… —	MW			18	0934	1141	1245	1314	1383	1487	1660	1798

THE MONOTYPE CORPORATION LIMITED

CHAPTER 7

Measuring the cast with the micrometer gauge

All type, quads and spaces, etc. cast from any type mould on the Super caster must be cast to a specific set-width, and this set-width must be carefully checked or 'sized' with the aid of a micrometer caliper gauge, a precision instrument designed for measuring to limits of one ten-thousandth of an inch. We shall from hereon refer to the gauge as the 'Micrometer', the name by which it is generally known.

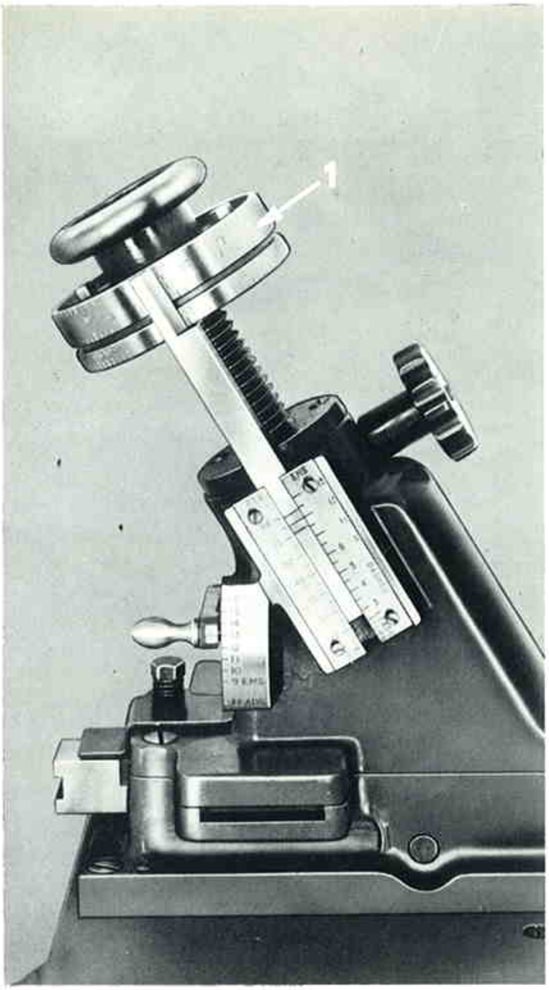
With type cast from the composition moulds in the 5–24pt range, the set-width is determined by the unit-value of each character in relation to the set of the type fount, the detailed settings for which are obtained from the relevant tables mentioned in Chapter 6 concerning 'Basic unit and set', which you should read and assimilate first. With display type in the 14–72pt range, the set-width of each character is marked in points and fractions of a point on the side of each individual matrix. Reference to the tables which cover micrometer head settings for display matrices will give you the equivalent set-width expressed as a decimal fraction of an inch.

The very fact that in all type sizes, the set-wise dimension is given to four decimal places indicates the extreme accuracy required, and proper measurement cannot therefore be conveniently effected except by the competent use of a micrometer. The set-width of the cast product is dependent upon the extent to which the mould blade is withdrawn, and this in turn by the setting and adjustment of the wedge screw scales of the mould blade sizing mechanism, as dealt with in Chapter 9.

With the composition moulds especially, it is preferable, whenever possible, when casting a wide range of characters or 'sorts', to commence with the larger set sizes of the fount and work down to the very small ones in a reasonably planned casting sequence. It is in consequence, therefore, a good idea to commence with an 18-unit character or 'em-quad' of the particular fount being used.

We will assume, for example, that you are about to cast, using a fount which is 8 set, and from the tables you will have ascertained that the set width of the 18-unit quad of 8 set measures 0·1107in. Having duly completed all preparations for casting, the setting 0·1107in must be put on the upper edge of the upper handwheel 'type' scale (1) in order to correctly position the mould blade. You can, if you so wish, set to the points equivalent of 0·1107in, as given in the 'Tables of Micrometer Head Settings', which is 8 points. To do this, you read off the points figures on the lower edge of the upper handwheel 'type' scale (1), and this is, in this case, more convenient to do than to try to estimate to seven-tenths of a division on the upper edge of the scale for the seven-tenths of one-thousandth of an inch involved in the equivalent decimal setting.

On starting up the machine, it is best to cast for about half a minute to give the mould time to work up to casting temperature, whereupon you should measure the last piece cast, after allowing it to cool, and compare it with the



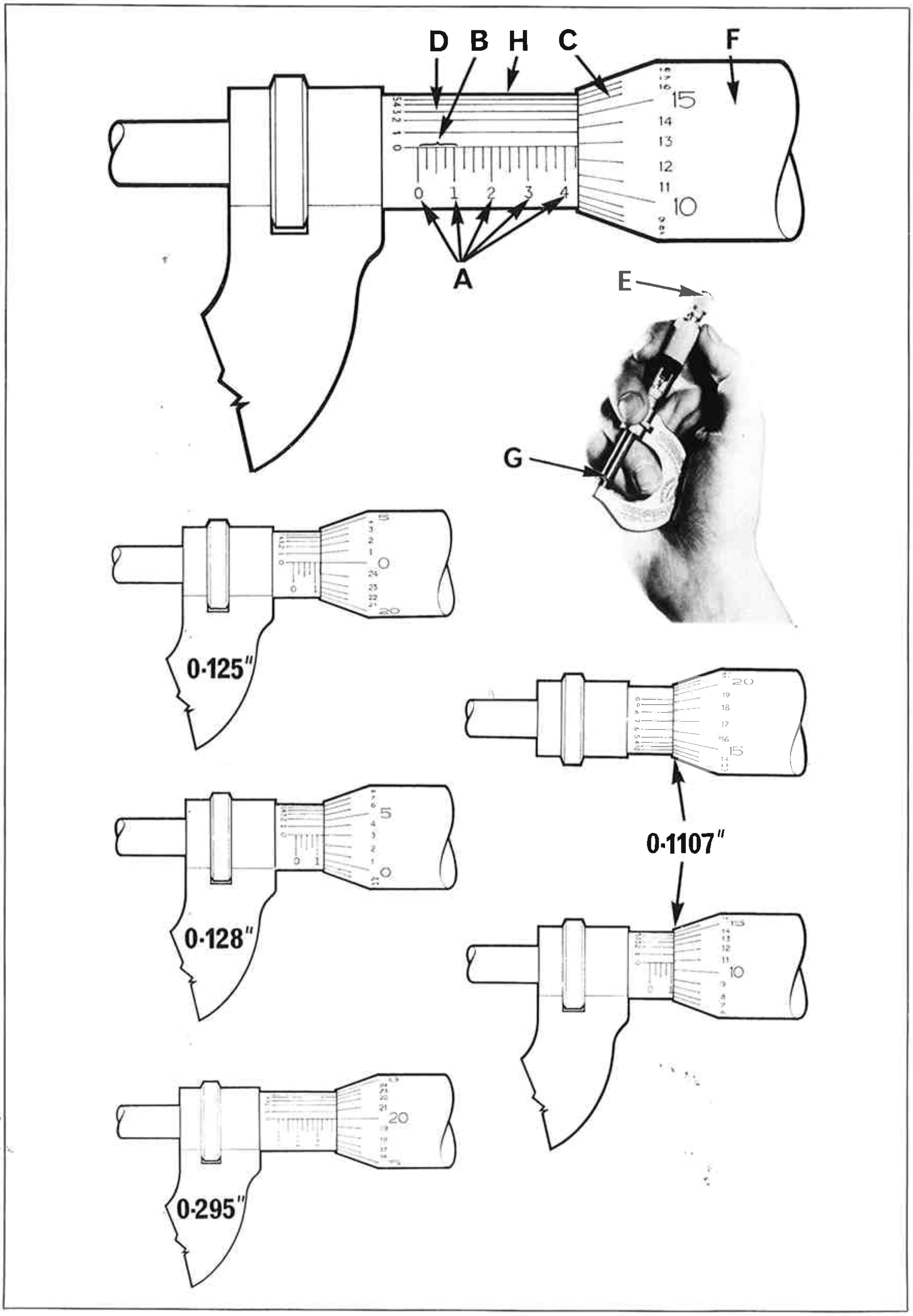
required set-wise dimension, which in our example is 0·1107in – and you do this by means of the micrometer.

Use of the micrometer in checking the cast product will guide you in making subsequent adjustments on the wedge screw handwheel scale in order to correct the set-width as necessary, to ensure the casting of correctly sized type bodies, since your first castings will almost invariably prove to be fractionally incorrect each time you adjust the handwheel scale settings.

7.1 How to use the micrometer

The remainder of this chapter, which deals with the micrometer and its use in relation to our needs on the Super caster, is addressed primarily to students and others who are not yet familiar with this precision measuring instrument.

With a micrometer it is possible to measure directly to accuracies of 0·0001in (one ten-thousandth part of an inch). It is therefore, of necessity, an extremely sensitive instrument, and as such it must be treated with the utmost care and respect if its accuracy is to be preserved. It goes without saying that a damaged, dirty or badly maintained micrometer would be worse than useless. Furthermore, it must always be used and handled gently, and never screwed up tightly on the object being measured. In this respect you will in due course


D
B
H
C
F
A
E
G
0·125"
0·128"
0·295"
0·1107"

acquire an experienced 'touch' with the instrument, but until such time as you do, it is best to always use the ratchet stop (E) at the end of the thimble (F) (if one is fitted) rather than the thimble itself, when making adjustments; as the stop has a ratchet 'freewheeling' device which prevents overtightening the instant both the spindle and anvil faces (G) are brought into contact with the type body being measured.

The micrometer can tend to prove a little confusing to the uninitiated, but you will find that it is really quite easy to use and understand, provided that the following simple explanation is carefully followed, absorbed and comprehended. The rest comes with practice.

The micrometer has four sets of calibrations or graduations, the larger or coarsest graduations each being equal to 0·10in (one-tenth part of an inch), whilst the finest graduations, termed the 'vernier' scale, are calibrated in divisions of 0·0001 in (one ten-thousandth part of an inch). In between these two extremes we have graduations which measure one-fortieth part of an inch (0·025in) and one-thousandth part of an inch (0·001 in).

The coarsest graduations are those on the micrometer sleeve, marked (A); these are equal to 0·10in or one-tenth of an inch as stated. That is to say, when the edge of the thimble (F) is accurately aligned with the line marked '1' on the (A) scale, the space between the spindle and anvil faces (G) will measure 0·10in, exactly one-tenth of an inch. Similarly, when aligned with the line marked '2', the micrometer will be set at 0·20in, being two-tenths of an inch, and so on throughout the scale. Each of these (A) graduations is subdivided into four (B) graduations, each measuring a quarter of one-tenth of an inch, i.e. 0·025in (one-fortieth of an inch).

If you run your eye along both the (A) and (B) graduations on the micrometer sleeve, starting from zero or '0', the sequence of readings would be 0·025in; 0·050in; 0·075in; 0·10in (the first A division); 0·125in, 0·150in, 0·175in, 0·20in (the second A division), etc. Thus far we are able to check readings up to three decimal places, but only when the distance being measured coincides exactly with one of the (B) graduations. Therefore in order to progress to a three-place decimal reading which includes any subdivision of a (B) graduation, we need some means of positively subdividing the (B) scale calibrations, and it is precisely for this purpose that the (C) scale graduations on the thimble (F) are intended.

The instrument is so designed that one complete revolution of the thimble will advance the thimble from one (B) graduation mark to the next, a distance which we know measures 0·025in (twenty-five thousandths of an inch), and it therefore follows that since the thimble scale (C) is itself subdivided into twenty-five equal parts, each of these will represent 0·001 in (one-thousandth of an inch). The thimble scale (C) is accordingly marked from 0 to 25 and it will be appreciated that the example (A) and (B) scale settings quoted in the preceding paragraph are exact only when the (C) scale itself is correctly set at zero.

In the accompanying illustrations, the first setting shown is 0·125in (one A division plus one B division); the second, 0·128in being the same (A) and (B) settings, plus three (C) divisions. The third illustration is 0·295in. Set this on your micrometer and then wind back the thimble five (C) divisions; the 0·295in setting is thus enlarged to 0·30in and if you now wind the thimble forwards again to bring it back to 0·295in, it will be seen that a glance at the (B) scale, whilst screwing the thimble down to the measuring point can prove extremely useful, in that the final dimension can be established more easily by simple subtraction such as this. As the edge of the thimble (F) approaches the measuring point of 0·295 in, observe that it passes the 0·30 in mark (C zero line aligned with the 3 A line) and, still reducing, passes in all a total of five divisions of the (C) scale. Subtract the sum total of these five (C) divisions from 0·30 in (A) scale, and the result is 0·295 in.

This system of working by subtraction, where you set the micrometer beyond the required size to the nearest round figure on either the (A) or (B) scale as convenient, and then work down to the required measuring point, you will find to be more advantageous in general practice when checking a measurement than using addition and working the other way up towards the total reading. In the early stages, a little practice with objects of previously established size will help you to gain understanding of the micrometer and ultimately render precise measurement, and consequent correct sizing of cast type bodies by this means, a relatively simple matter.

We have thus far covered measurements up to three decimal places only. Since we need to measure to four decimal places, that is to a tenth-of-a-thousandth of an inch, we need the (D) scale, or vernier calibrations which are marked on the sleeve (H) immediately above the (A) and (B) scales. The (D) scale graduations are a means of subdividing the (C) scale graduations of one-thousandth of an inch, into ten equal parts, each of one ten-thousandth of an inch. The (D) scale is therefore a means of subdividing the (C) scale by ten, just as the (D) scale itself subdivides the (B) scale by twenty-five. The vernier calibrations of the (D) scale therefore indicate the number of tenths of a thousandth-of-an-inch over and above the last thousandth-of-an-inch indicated on the (C) scale, and thereby give us our required fourth decimal place figure.

To read the (D) scale, determine the dimension being checked to the nearest thousandth of an inch as already described, that is, to three decimal places; and then find a line on the (D) scale which aligns exactly with a line on the (C) scale. The (D) scale lines are numbered, and the number of the line which exactly coincides with one of the (C) scale lines signifies how many ten-thousandths of an inch are to be added to the previously established measurement determined to three decimal places.

We now have our reading to the required four decimal places, as in the illustration, which displays a reading of 0·1107 in which is the set-width of 18 units of 8 set. You will observe that this is made up of one (A) division, ten (C) divisions (ten twenty-fifths of a (B) division), plus seven (D) divisions, as indicated by the alignment of 7 on the (D) scale with a calibration on the (C) scale on the thimble.

It will therefore be appreciated that, as with the examples of the (A) and (B) divisions quoted earlier, which, as stated, would not be exact unless confirmed by a zero setting on the (C) scale, so equally, the (C) scale setting would likewise, in the cases quoted, not be correct unless confirmed in like manner by a correct alignment confirmation on the vernier scale (D).

To sum up, it is generally advisable to read off your first three decimal places by the method involving subtraction already described, and then to add on the fourth decimal place after reference to the correctly aligned vernier calibration on the (D) scale.

In conclusion, as already pointed out, you can, from the 'Tables of Micrometer Head Settings', obtain settings expressed either in points, or as a decimal fraction, and you will of course use the alternative which is most convenient when adjusting the mould blade sizing mechanism. When sizing the cast product with the micrometer, however, a setting made in points must obviously be checked against the equivalent decimal setting as given in the tables.

7.2 Care and maintenance of the micrometer

A micrometer caliper is, as already emphasised, a delicately balanced instrument, and, as such, should always be handled with care. For instance, you should never hold a micrometer in your hand for any longer than is necessary, and it should likewise never be left lying about on the machine or on the workbench when not in use, where it could so easily be knocked on to the floor. Similarly it is inadvisable to carry it around in any of your pockets, unless it is in its case, as it will inevitably come into contact with pieces of fluff, coins or perhaps other tools you might be carrying, all of which could foul up the mechanism, render it inaccurate and perhaps cause irreparable damage.

A micrometer is supplied with a case to protect it and you should make certain it is always in the case when not in use, and kept in a safe place when not required, so that you will know where it is when you need it.

When taking a measurement, keep the measuring faces of the micrometer square with the type, and never use undue force when bringing the contacting surfaces together, otherwise serious damage to the measuring faces and screw thread may result. Use the ratchet stop, if one is fitted, as this will ensure uniform pressure on the body being measured at all times, with resultant consistent readings.

Always keep the measuring faces of both the spindle and the anvil perfectly clean, as the merest trace of dirt or oil can result in an incorrect reading. Open the anvil and spindle faces slightly and insert a piece of paper between them. Close the faces together so that the paper is lightly gripped, then slide the paper out to remove any dirt or grease that may be present.

When returning the micrometer to its case after use you should always lock the spindle in the open position – just a fraction, that is all – as serious damage can result from leaving it closed under pressure, with the measuring faces in contact. If you do not anticipate using it again for some time, you should wipe it carefully and apply a thin coat of good quality non-corrosive oil on the measuring faces and all the bright metal parts. It is not usually necessary to lubricate the screw, as the thread is generally designed to provide for both oil retention and the exclusion of dirt and grit.

A micrometer of the type illustrated is usually supplied with a special adjusting spanner. Any looseness in the screw can be taken up by a slight turn of the adjusting nut, which is readily accessible when the spindle has been unscrewed.

Finally, it is a good idea to check the instrument for accuracy by sizing up a known body size, subsequent to making any adjustment with the spanner.