The Monotype Casting Machine.

The Lanston Monotype Corporation, Limited.

THE LANSTON MONOTYPE CASTING MACHINE.

THE LANSTON MONOTYPE CASTING MACHINE.

INSTRUCTIONS REGARDING ITS PROPER USE AND MAINTENANCE.

PREPARED FOR THE GUIDANCE OF OPERATORS AND LEARNERS.

MONOTYPE COMPOSITION.

THE LANSTON MONOTYPE CORPORATION, LIMITED
43 AND 43A, FETTER LANE, LONDON, E.C.

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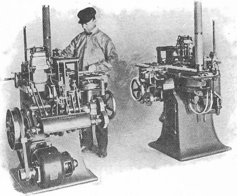


ONE OPERATOR ATTENDING TWO MONOTYPE CASTING MACHINES.

TO THE MONOTYPE OPERATOR.

Whilst this publication is not meant to be a complete instructor in the art of running the Monotype casting machine, it will be found that, if all the instructions given therein are closely followed, there will be little left which could be learnt by other means than practical experience.

The best training is that which is the result of actual daily contact with the machine, but there are many points in its working which, if properly gone into by the operator, will add greatly to his efficiency and to the durability of the machine and its accessories.

The book will be found useful for reference, enabling the operator to refresh his memory and to avoid leaving undone things which would tend to add to the production of the machine and to enhance his own reputation as an intelligent and painstaking operator. It will also bring to his notice many things which should be strenuously avoided.

It is not intended to tempt the operator to be continually tinkering with the adjustments of the machine. The machine is entrusted to him in good condition, and careful attention to cleanliness and lubrication, the maintenance of the heat of his metal and the flow of water up to the correct standards, and keen supervision in order that screws or nuts do not work loose, will constitute practically the whole of his duties.

The operator, if he would be successful, will use his common sense, and judge between that which he can effect for himself and that which his want of experience justifies him in referring to the Monotype Inspector.

He should draw the line between childishly calling on others to put him right in regard to the most trivial details and the obstinate attempt to do for himself work (whether repairs or adjustments) of which he knows perfectly well he is not capable.

The man who takes a pride in his machine is almost sure to do better than he who simply goes through the day's work with absolutely no healthy interest in his occupation.

Special articles will be found on the Care of the Mould and Matrices. Too much stress cannot be placed on the necessity to carry out most religiously the directions there given. The operator should bear in mind that a hair of the human head may measure something like $2\frac{1}{2}$ thousandths of an inch, whereas the Mould and Matrices are designed to give types to a standard measurement as close as half a tenth of a thousandth of an inch—or a fiftieth part of the previous measurement. If he will think of these figures, he will see that if he but rubs a matrix carelessly he will affect its truth, whilst to drop it on the floor or expose it to hard usage (consequent on faulty adjustment) can but damage it irretrievably.

A good and careful operator will avoid more trouble than ten men can cure after the event.

The operator should consider it a disgrace to have to admit that some part of the machine has seized for want of oil, and no self-respecting operator will have a dirty machine.

In conclusion, the operator is urged to profit by experience. When troubles arise he should not be content to correct them, perhaps intuitively, but should closely study the cause, in order that it should be removed and a recurrence of the difficulty rendered unlikely. If he makes an alteration in the adjustment of his machine, he should know and be able to explain just why he did it, and if such is not the case, he should endeavour to improve his knowledge by referring to someone having a wider experience of the machine than himself.

CONTENTS.

INTRODUCTION.

The machine having been installed, everything must naturally be left to the mercy of the attendant. On his intelligence, his care, and his industry, the output of the machine depends. The different parts of the machine perform the same evolutions day after day alike, and if the result produced to-morrow be not the same as that of to-day, either the attendant has allowed some part to become deranged or damaged by indifferent adjustment—such as a centring pin not seating in the matrix properly—or outside conditions have altered—such as the use of dirty or inferior metal. A careless attendant—one who has no consideration for the firm employing him, nor care or interest in the machine entrusted to him—is generally slovenly in making his adjustments, and never attempts to see if any screws have become loose, with the result that the machine can become a worry to him instead of being full of interest. Unfortunately the machine is not "fool-proof."

This handbook is issued with the idea of giving the attendant an opportunity of studying every motion on the machine, tracing such motions from their very starting points, *i.e.*, the driving cams, and to be a guide to him as to how such parts should be adjusted. Although it gives the method of detaching various parts, it does not follow that all those parts should be habitually or even occasionally disconnected.

The method adopted in this book of following each motion from its source should be adopted by attendants in the event of any undesired result occurring. Each cam drives a separate mechanism, quite disconnected from the neighbouring cams, and upon any part not working exactly as it should, the various parts connected with it should be examined, commencing from the cam operating such part. Later on, a few hints will be given as a guide to the method of procedure in this direction.

Ordinarily an attendant's duties are confined to the changing of the founts and to seeing that the quality of type produced is satisfactory. In doing this it is necessary that he take pains to see that all the adjustments in connection with changing a fount are scrupulously exact to the standard laid down in this book, that his metal is kept clean, and of proper quality and at the proper temperature, that his pump connections are working correctly, and metal channels are clean, and that the type is cast and delivered to the galley without hitch of any kind. After this, all he has to do is to keep his machine cleaned and oiled, and to see that no screws or nuts work loose.

A point which cannot be too strongly impressed upon attendants is the importance of keeping their tools in good condition. It is pitiable at times to see the overstrained spanners and softened and useless screwdrivers kept by some operators. On no account should a screwdriver blade be dipped into molten metal, or its handle knocked by a hammer. The end should be correctly shaped so as not to slip out of the screw-head slot as soon as pressure is put upon the screwdriver, and each screw should be removed with the correct size of screwdriver. Do not tighten up or remove the nozzle with a galley spanner. Files are very useful when required for fitting a new part, but their use should never be needed by a good attendant. In addition to the tools supplied with the machine, a hand brace and strong vice are needed, and the latter should be placed in a light position.

Although all the adjustments have been given in detail elsewhere, we give in the following chapter the main features in connection with *running* the machine, as distinct from the adjustments of those parts which seldom require attention.

THE LANSTON MONOTYPE CASTING MACHINE.

PRINCIPAL FEATURES.

The four main features of the machine are the matrix case containing the matrices, the mould, and the pump, and these are in contact with each other at the most important point of the operation of the machine, namely, that at which the type is being cast.

All the other parts of the machine are simply attributes to these three, their office being, before the type is cast, to bring the particular matrix, corresponding to the letter required to be cast, directly over the recess in the mould, and set the mould so that the type is of the required size, and after the type has been cast to remove it from the mould to the type channel.

The mould, in main, consists of a foundation plate, side blocks, mould blade, jet ejector blade, and cross block. The mould blade and side blocks rest on a plate fixed to the foundation plate, the mould blade being free to be moved between the other two; and the cross block moves at right angles to the mould blade, forming a metal-tight joint against the faces of the body blocks.

The ejector is contained in the cross block, and ejects that part of the type cast between the bottom of the fixed blocks and the foundation plate; it is operated by a cam fastened to the foundation plate.

The Mould in height, *i.e.*, the thickness of those parts presented to the matrices, corresponds to the height of type from the foot to shoulder, and the width of the mould blade to the depth of the type, the width being determined by the distance between the blade and the face of the cross block at the time the type is cast.

The Matrix Case contains the matrices—225 in number—which represent all the different characters that can be cast without change; the matrices are oblong cubes of gun metal, each containing at the lower end the female of a particular character, and at the upper end a conical hole by means of which the matrix can be centred directly over the mould ; the matrices are held in the case by means of wire running through them and into slots in the case.

The Pump performs the same work as an ordinary type machine pump, consisting as it does of a plunger and well, the well terminating in a nozzle which fits into a bell on the under side of the foundation plate of the mould, and through which the metal is forced into the mould to cast the type.

The Wedges are five in number, viz., the normal wedge, lower transfer wedge, upper transfer wedge, and the two justification wedges. The lower transfer wedge and the normal wedge slide on the bed of the machine in a passage cut in the B pin block. One vertical face of the normal wedge slides against the abutment block (the abutment block has a vertical strip on its face which forms the point of communication, and when the wedge is being moved into position it is kept clear of this strip by a spring block in the face of the abutment block which slides in a horizontal groove in the normal wedge) which forms the communication between the wedges and the mould blade.

The lower transfer wedge lies between the normal wedge and a fixed edge of a shelf, the shelf being slightly above the upper face of the transfer wedge.

The justification wedges rest on this shelf against the fixed sides of the pin block, and the upper transfer wedge lies between the outer justification wedge and the normal wedge.

The abutment block has an adjustable screw against the head of which the mould blade strikes, and by which means the set size of the type is approximately adjusted.

The stop against which either transfer wedge comes to rest on the " in " position is tapered, and by means of a screw adjustment above the bed of the machine this stop can be raised or lowered, thus regulating to a very fine degree the travel of the transfer wedges, and providing a means of adjusting the set sizes to any degree of accuracy.

The top transfer wedge has also an adjustable screw which comes in contact with the stop, and by means of which the relation between the transfer wedges may be regulated (that is to say, that the normal wedge remaining in the same position throughout, and the justification wedges being put in the position where they simply amount to a continuation of the " edge " of the shelf—or, as it is called, the position of no justification—then the difference between the size of the type cast when either wedge is in position can be made to equal any given amount).

The vertical face of the normal wedge is wide enough to engage either transfer wedge.

When a letter is being cast, the lower transfer wedge is in against the stop and the upper one out of action, so we have fixed edge of shelf, lower transfer wedge against edge of shelf, normal wedge against transfer wedge, abutment block against normal wedge, and mould blade against abutment block.

When a space is being cast, the upper transfer wedge is in against the stop, and the lower one out of action, so we have fixed side of pin block, inside justification wedge against pin block, outer justification wedge against the inner, upper transfer wedge against the outer justification wedge, normal wedge against the upper transfer wedge, abutment block against the normal wedge, and mould blade against the abutment block. By separating them in the above manner, much of the mystery of the wedges is removed.

In actual operation the justification wedges are brought into a certain position at the commencement of a line, and whenever a space is to be cast in that line, the normal wedge is brought to the position corresponding to a six-unit body (in fact, the normal wedge is always brought to this position for a space in all lines), and the top transfer wedge is brought into position ; so it can be seen that as the justification wedges remain in the same position throughout the line, the normal wedge and the upper transfer wedge both come to a fixed position each time ; therefore all the spaces in that line will be of the same thickness setwise. Further, it will be noticed that the only conditions which alter in casting spaces on different lines are the positions of the two justification wedges.

ADJUSTMENT OF MACHINE.

DRIVING.

The machine is driven by a pulley keyed to the front cam shaft, and the speed should be varied, by means of separate coned pulleys or other speed varying gear, from 130 to 160 revolutions per minute, the former speed being suitable for large type and fancy border casting, and the latter for small type. The belt travels through a shifter eye, for the purpose of bringing it, when required, on to a "loose" pulley running by the side of the "fast" pulley. The shifter eye should encircle and lead the belt as the latter approaches the pulley, and care should be taken that the belt joint or fastener does not hit the shifter eye, as in that event the shifter is likely to be broken. The belt should be $1\frac{1}{4}''$ wide, and kept fairly tight in running, otherwise the machine will run irregularly.

BELT SHIFTER OR STARTING GEAR.

The belt-shifter eye is adjusted on an extension arm by means of a set screw, and the extension arm is in turn fixed to a ring casting by means of a clamping piece and screw bolt. This arm can be adjusted to any position around the ring casting, to suit the angle of the driving belt. The ring casting carries a stud, which serves as a guide, and also, when the belt is on the loose pulley, to prevent the machine being reversed, by the end of the guide stud coming into contact with a projection on the side of the type-pusher cam. A rod, screwing into, and clamped to, the ring casting, and running along the back of the machine, carries an arm, projecting upwards, to meet a short distance rod communicating with the starting handle. The former rod has a coil spring around it, which has a constant tendency to pull the belt-shifter eye over the loose pulley. The short intermediate distance rod, between the projecting arm and starting handle, is bored down a part of its length to receive a small plunger, with a spring behind, to act as a buffer, as the rod has a shoulder to prevent it travelling too far when starting the machine by hand. The end of this distance rod is slotted to receive the end of the starting lever, which is in one piece with the starting handle. The starting handle is attached to the galley mechanism bracket by a bolt and nut, and one end of the lever has a step which, in working position, engages a projection on the long or short line automatic stopping gear. (This latter will be dealt with in the description of the galley mechanism.) Fig. 1 is a plan view of starting gear.

Adjustment.—When starting lever (32F, Fig. 1) is out of action, take projecting arm (2E) on spring rod (6E) to left till the intermediate distance rod spring box (37F) has 1-16″ play between end of projecting arm and end of starting lever. Then put starting lever in gear, and set belt-shifter eye (4E) so that belt runs in centre of fast pulley. By setting thus the fibre washer between the ring casting and cam-lever casting takes the force of the coil spring (6E2) when stopping the machine.

The only possibility of derangement with this mechanism is likely to be due to the projecting arm end (2E) getting out of alignment with the intermediate distance rod (37F) owing to the clamping screw which fixes ring casting to spring rod, or the screw at bottom of projecting arm, becoming loose.

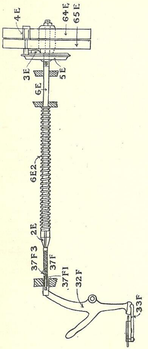


FIG. 1.

Belt-shifter mechanism with the operating lever (32F) thrown back, forcing the belt on to the driving pulley and, at the same time, compressing the belt shifter spring (6E2). The operating lever is held in this position by the latch (33F). As soon as this is released the spring forces the belt on to the loose pulley and the machine stops.

CAMS.

The machine possesses two sets of main driving cams, which actuate levers to impart the desired effect upon the various mechanical principles employed. The cams are eight in number per set, and each set is keyed to a shaft carrying on its end a toothed wheel, and the whole are supported by a bracket screwed to the machine base. The action of the cams is positive, because where one cam is convex the counter is concave, and *vice versa*. The two sets are geared together by means of an intermediate toothed wheel, and for the purpose of easily finding the correct meshing the toothed wheel on the end of back cam shaft has a tooth marked "0," while the counter wheel carries a tooth marked "1." The intermediate gear wheel is correspondingly marked "0" and "1." At a certain part of the machine's revolution the figures "0—0" and "1—1" will meet at the same time. The gear wheel attached to the front cam shaft is marked around its circumference with the degrees of a circle, twenty by twenty, fractions of twenty being ascertainable by means of the vernier plate attached to the gear cover. Nearly all the machine adjustments are correctly timed from this degree scale.

The cam-shaft bearings should be periodically lubricated through the small oil cups in the cam bracket just above the bearings, as oil cannot reach them from any other point. In practice the cams require little or no attention beyond being kept clean, but the machine may at times become stopped through a nut or screw or other article being dropped among the levers. In such a case it may be necessary to detach the cams, but this is an operation that should only be undertaken by a person well acquainted with the machine. With care, however, it may be tackled by any intelligent attendant. Usually it is only necessary to lower the set of cams nearest the cause of obstruction, and is done by removing the cam-shaft bearing brackets underneath the ends of the cam shafts. As the machine may have become wedged in such a position that it may be necessary to turn it forward to find the correct gearing when replacing the cams, care must be taken that the lever runners are kept on the face of that set of cams which have not been removed. This may be done by pressing the levers to the cams by hand, turning the machine inch by inch by the hand driving wheel, which is attached to the intermediate gear wheel, till the figures "0" and "1" on the intermediate gear wheel are in a level line at the bottom. Having got the figures "0—0" and

" 1—1 " to agree, it only remains to screw up the bearer brackets tightly, as the gearing is then bound to be correct.

In performing the above, care should be bestowed upon the type-pusher lever and the type-carrier lever, to see that the runners follow the undetached cams, but any anxiety concerning these may be avoided if the type-pusher rod be removed. Should any difficulty be experienced in getting the teeth to correctly mesh, it may be necessary to slacken the bearer brackets of the opposite cam shaft so as to give more " shake " to the intermediate gear wheel.

The bearing screws should be occasionally tested to see that they have not become loose.

Sometimes the machine becomes fixed in one position through the carrier becoming wedged. To decide this point it is only necessary to remove the pin connecting the type carrier to the type-carrier lever, and then try the machine by hand, keeping watch upon the type pusher, and removing it if possible. If the machine has become free it will be necessary only to remove the type carrier. This will be explained later.

In the event of the machine becoming wedged, no undue force should be exerted by hand to get it round, the greatest pressure permissible being just about as much as is exerted when overcoming the action of the pump, and in no case should any sudden jerk be attempted. On no account should the cams be interfered with unless it is positively known they are obstructed by some outside object, and all efforts have failed to pick out such obstruction.

On present machines the locking bars are backed by means of a separate single cam, placed on the front cam shaft between the die-centring cam and tong-worker cam, and the lever roller is kept to the face of this cam by the action of the spring on the rod in connection with the lever. See that this roller revolves as the cam goes round ; if not, a flat may wear on it and upset the locking bar releasing adjustment.

For ease of reference the cams are lettered A, B, C, D, E, F, G, H, starting from hand wheel. The type-carrier cams are A, pump-action cams B, transfer-wedge cams C, bridge cams D, tong cams E, paper-tower cams F, mould-blade cams G, type-pusher cams H, and the single cam on front shaft for backing locking bar I.

The cams on the front cam shaft (driving) have the letters A, B, C, &c., cast on them inside a circle, while the rear cams (driven) have the letters A, B, C, &c., cast inside a square indentation and so are easily identified.

CAM LEVERS.

The first three cam levers, A, B, and C, are fulcrumed on a shaft carried in the cam bracket casting on the right-hand side; the fourth and fifth, D and E, are fulcrumed in an extension bracket screwed to the machine base; the sixth, seventh, and eighth, F, G, and H, on a shaft on left-hand side of cam-bracket casting; and the "I" cam lever rocks on a pin in a boss left on the cover of the back set of cams.

The levers carry friction rollers on the cam ends, and require no attention beyond being kept clean, and lubricated on the runner pivots; for this, holes are provided on each side of the forks which carry the runners. No attempt should be made to detach the runners from the levers, owing to their special form of construction, but it should be seen that they are always revolving freely.

The levers should scarcely ever require removing, but sometimes the type-carrier lever becomes broken through neglecting, after having removed the carrier, to replace the spring abutment steel piece, attached to the type-carrier top spring rod, into the slotted projection provided for it. (This will be referred to in describing the type carrier.) This breakage would not occur if the precaution were taken of gently turning the machine by hand after having replaced a type carrier. In the event of breakage, to remove the type-carrier lever, first take off the cover over cam gear wheels, then the hand wheel bearer cap; remove hand wheel, take off right hand bearer cap of lever fulcrum shaft, and then drive shaft from left to right. The bottom end of lever E should be forward, to expose the end of shaft while driving, and for this purpose first turn machine, say, to 120 degrees. In replacing, while putting on hand wheel, see that the figure "0" on worm comes between the figures "0" on the bronze worm wheel of galley-action vertical shaft. It is also necessary to get the figures "0" and "1" on the cam gear wheels to correspond with "0" and "1" on the intermediate gear wheel as explained in the description of the cams. To get the teeth to mesh easily it may be necessary to partly lower one set of cams (back for preference) by loosening the cam shaft bearer screws. B and C cams are also removed by above methods.

To remove either of the F, G, H cam levers, take off split pin and washer on right-hand end of corresponding shaft, also the screw on top of bearer between F and G cam, then draw shaft to left.

To remove the tong spring-box cam lever (E), move the fulcrum pin to the *right*, past the transfer wedge rod link motion, and withdraw. Do not attempt to turn the machine with the fulcrum pin in this position, but, having removed the lever, replace the fulcrum pin.

To remove the cam lever (I) operating the locking-bar bell cranks, remove the cam lever E, unhook the lever I from the rod 33E, and then disconnect the fulcrum bolt (35E4, Fig. 33).

TYPE CARRIER.

The type carrier (Fig. 2) is worked by the A cam lever, and its object is to carry the type from the mould to the type channel, prior to being taken to the galley.

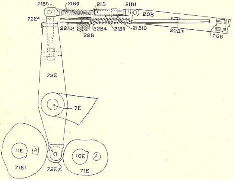


FIG. 2.

Cams, cam lever and connections for moving type carrier. Note that the spring (21B9) absorbs the movement of the cam lever to the right in case a type jams and prevents the carrier from moving.

It is adjusted to the cam lever by a connecting rod with a right and left-hand thread, and the other end connects by a link to the mould cross block. At one end (near the mould cross block) it is tunnelled out to allow the type to pass through it, and the type is gripped, while being carried, by means of a sliding clamp (26B, Fig. 3) supported by a small spiral spring. To prevent the type turning sideways there is a flat supporting spring (31B). In casting position the tunnel is presented to the type channel, and the type pusher ejects the type previously cast, the supporting spring now being pulled back (to allow free passage to the pusher) by a short rocking lever (20B3) coming into contact with the angle guide piece on the unit pin block. On completion of the casting operation, the previous type having by this time been ejected, and the cam caused the type carrier to give a slight kick back to cut the jet piece off the bottom of the type, the cam lever forces the type carrier forward till the tunnel is presented to the type in front of the mould blade, the type supporting spring in the meantime having been released, by its operating lever or catch having come away from the angle guide piece on the

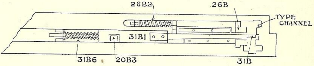


FIG. 3.

Rear view of type carrier with type clamp shoe removed, showing carrier at right end of its stroke with the type clamp (26B) withdrawn to the left, so that the mould blade can place the type in the carrier. Note that, at this end of the stroke of the carrier, the support spring (31B) is in position to prevent the type from falling forward.

unit pin block, and being now in a position to prevent the type turning as it is rapidly ejected into the tunnel. In going forward the sliding clamp (26B) is held back by a projection meeting a trip plate (28B, Fig. 4) attached to the unit pin block. Having received the type the carrier returns with it, and the sliding clamp grips it as the projection on it comes away from the trip plate on the unit pin block. Towards the end of the back stroke the type supporting spring operating lever meets the

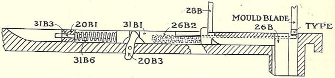


FIG. 4.

Horizontal section through the carrier at right end of its stroke just as the mould blade is moving forward and pushing the type into the carrier. As the carrier moves to the right the lug on the type clamp (26B) strikes the trip (28B), causing the clamp to open to receive the type, which is prevented from falling forward by the support spring (31B).

angle guide piece on the pin block, taking the supporting spring away to form a clear passage for the type pusher through the tunnel to the type channel.

The carrier connecting rod carries a coil spring to act as a buffer on the forward stroke, and a projecting rod underneath carries a buffer spring for the end of the back stroke. At the extreme end of the bottom of the carrier, where it connects to the mould, is a flat brass plate acting as a shield to protect the type from any possible particles of metal which might otherwise accidentally reach it during the ejecting period.

Should the machine be casting bad or hollow type through inattention either to the temperature of the metal or the quantity allowed to pass under the piston, the type-carrier tunnel is liable to become choked with broken pieces of metal, rendering the type supporting spring open to breakage. Otherwise the type carrier should require no attention beyond cleaning, excepting, perhaps, the occasional renewal of a buffer spring.

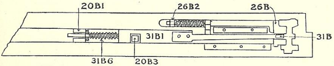


FIG. 5.

Rear view of type carrier with type-clamp shoe removed, showing carrier at left end of its stroke with the type support spring (31B) withdrawn, so that the type pusher can pass through the carrier and shove the type out of the carrier into the type channel, where it is supported by the latches.

To remove type carrier, take off mould cross block, disconnect fork end of adjusting rod from cam lever, remove the two angle guide pieces holding the carrier to pin block, and carefully lift out.

In replacing, be careful to get the projection (28B) on sliding clamp to the left of the trip plate found on end of pin block near mould, and in screwing up angle guide pieces make sure they are not wedging the carrier. To test the latter, before putting on cross block of mould or coupling up the connecting rod to the cam lever, try the carrier by hand to see that it slides freely. In screwing up the longer angle piece, the short screw should go at the end near the connecting rod. Great care should be taken to observe that the top spring abutment steel piece, through which the connecting rod passes, is dropped into the slot provided for it, otherwise the full traverse of the type carrier will be prevented, and the cam lever broken. To guard against this, a habit should be cultivated of gently turning the machine by hand after having had the carrier apart—in fact, always after having dissected any part of the machine.

In connecting up the carrier to the carrier lever always insert the connecting bolt so that the head points to the left, and the hole for the split pin is on the right. The object of this is, should the carrier become wedged in a forward position, the bolt may easily be removed, which would not be the case if the head of bolt was on the right, as in that event the die-centring lever bracket would be in the way.

Adjustments : SLIDING CLAMP (26B).—See that this slides freely, and that the end face is not above the face of the carrier, and thereby putting friction on mould wall face. Also see that the projection is not bent, and that the cover plate screws are not loose.

If this slide does not work freely type-turning will be the result, probably resulting in choking the carrier tunnel or type channel, and possibly breaking or bending the type-channel spring.

TYPE CLAMP ABUTMENT OR TRIP PLATE (28B).—See that this is not loose. A hole is provided in end of pin block behind mould for fixing this. Pass a screwdriver through, and test it occasionally. If the abutment plate be taken off, be sure when replacing that the grooved side is the same side as screw head.

TYPE SUPPORTING SPRING (31B).—The end passes along a groove in the sliding clamp, and the sides should not touch the latter. When fully forward, the end of supporting spring must not touch the inside tunnel wall of type carrier, otherwise type will turn, as the spring will be ineffective. The spring must not be too strong, nor should it be too weak, as both are at times conducive to type turning. A note should be taken of the tension as it leaves the works. It should be seen that no burrs exist on the short operating lever or catch (20B3, Fig. 4), and that it works quite freely.

TRAVERSE OF CARRIER.—Turn machine to casting position. In this position the end wall of carrier tunnel should be in exact line with the face of fixed type-channel block. As a guide to this, a line is generally left on the side of the type carrier, and one on top of the short angle guide piece. These two lines should correspond at casting period, which is also the time the pusher operates. On the forward position, the time during which the type is ejected into the carrier from the mould, the inside tunnel wall of carrier should be 1 31–64″ from end face of unit pin block. By this setting, the largest type (12 point) may be ejected without fouling the type carrier, and all smaller type will follow suit. It will be noticed that the line marked on the type carrier will have travelled forward 2 5–32″, which should be the stroke allotted to the cam lever. It is best, therefore, to first ascertain if the lever is giving this stroke, by measuring the difference in the position of the line on the type carrier during casting and mould-blade ejecting period. If the stroke is not correct, raise or lower the extension post (72E4, Fig. 2) on top of cam lever, till the right length of stroke is obtained, and lock up tight. Having got the correct length of stroke, it only remains to set the tunnel wall of carrier in a line with wall of fixed type-channel block, as previously explained, and the setting will be correct, without troubling to measure from end of pin block to tunnel wall during the forward position. This *latter* setting is obtained by lengthening or shortening the connecting rod (21B) of carrier. The main point is first to get the correct stroke from cam lever before setting the carrier.

Angle guide pieces.—See that these and their seatings are clean before screwing down. The screws must always be down tightly, but the type carrier must slide freely.

Forward buffer abutment piece (21B10, Fig. 2). —*Do not forget to place this in its slot before starting machine*, or the cam lever will be broken.

PUMP ACTION.

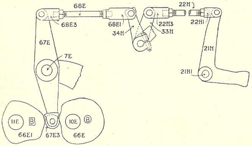


Fig. 6.

Pump cams (66E), cam lever (67E), connecting rod (68E), operating lever (34H), rocker arm (33H), connecting rod (22H) and bell crank (21H) for moving piston lever operating rod crosshead. Note that, for the sake of clearness, the pump latch for connecting the operating lever and rocker arm is omitted from this view.

The pump action initial motion is imparted to the lever (67E, Fig. 6) by the B driving cam. A rod (68E) connects the cam lever to another lever (34H) in machine base, which is fixed by a clamping screw to a shaft running the whole width of machine base. Loose upon

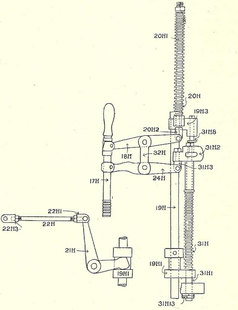


FIG. 7.

View of pump operating mechanism *after* the pump-body spring rod stop nuts (31H13) have struck their abutment, checking any further upward movement of the pump-body crosshead (31H2). The further rise of the piston crosshead (19H3) forces the piston down into the pump body, ejecting the metal from the nozzle into the mould which, by this time, has been lifted into contact with the mould.

In the lower left corner of this cut is shown a side view of the bell crank (21H) which operates the piston-lever operating rod through its crosshead (19H1).

the same shaft is the pump rocker arm, having two lever projections, one near lever 34H, and the other towards the other side of machine base, marked 33H. This latter lever is connected by a rod to a bell-crank lever (21H) in the pump-bracket casting. One end of this crank lever is forked to engage a lifting crosshead (19H1, Fig. 7) attached to a vertical rod (19H) in pump bracket, the reciprocation of which rod works the

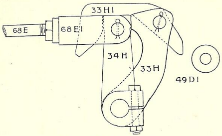


FIG. 8

Pump latch (33H1) engaging the operating lever (34H), making this lever and the rocker arm (33H) practically one piece. Pump-trip tube collar (49D1) is shown forward in position to be struck by the latch, as it moves to the right, and to disconnect it from the operating lever (34H).

pumping mechanism on the pot. This rod (19H) must only reciprocate when casting is required, and for that reason the pump rocker arm is loose on its shaft. The operating lever (34H) has a square end, and the loose

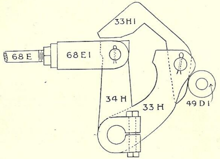


FIG. 9.

Pump latch (33H1) lifted out of contact with the operating lever (34H) by the pump-trip collar (49D1) being interposed behind it. When the latch is in this position the operating lever oscillates without producing any movement of the rocker arm (33H), consequently there is no motion of the pump.

sleeve lever near it carries a loose latch or hook for the purpose of locking the two together (see 33HI, Figs. 8, 9). When engaged, as in Fig. 8, motion is given to the rod (19H) in pump bracket (Fig. 7); but when disengaged, as in Fig. 9, the lever (34H) will reciprocate without carrying with it the arm on 33H, and the pump mechanism will be at rest. To disconnect this latch (33HI), such as at the end of a line while the justification wedges are being arranged, or when the pump is dis-

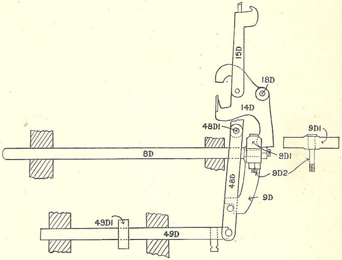


FIG. 9A.

Side view of pump-trip collar (49DI). The rise of the justification-wedge lever (14D) moves the collar behind the pump latch and locks the pump out while the wedge is being set.

connected by hand, a sliding rod, carrying a collar, is provided, and so arranged that when the rod is in its normal position the collar clears the side of the latch (33HI), but when the rod is drawn to the right (looking from back of machine) the collar is placed in the track of the latch, and disengages it from the operating lever (34H). A spring automatically returns the sliding rod, carrying the collar, as soon as metal is required. (The control of this collar will be dealt with when the galley action mechanism is explained.)

The metal pot (Fig. 10) is attached to a swing bracket, which is made to screw up and down, so that the pot may be taken back, away from its working position. Inside the pot is the pump body, sometimes called the well arm, one end of which carries a piston which forces the metal, let in through a port at the bottom of pump body, up a channel to the nozzle at the other end. These parts may be seen in section in

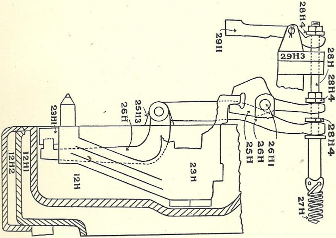


Fig. 10.

Section through the melting-pot casing and melting pot, showing the pump body (23H), the piston-end lifting lever (25H) and the nozzle-end lifting lever (26H), the operating rod (28H) which moves these levers and the operating-rod lever (29H). The upper end of this lever is released before the injection of metal occurs, so that the lifting spring can raise the pump body and seat the nozzle in the mould.

Fig. 11. By the action of the pumping mechanism the pump body rises, so that the nozzle may meet the mould bell and form a metal-tight joint whilst casting is taking place, and then recedes so as not to overheat the mould or chill the nozzle.

The action of the pump mechanism is as follows: As the bell-crank lever (21H) in the pump-bracket casting rises, taking with it the vertical rod (19H, Fig. 7), the crosshead (19H1) at the same time compresses a spring encircling another vertical rod (31H1), causing the latter to rise, by the spring pushing against a sleeve shoulder at the top end. A separate crosshead (19H3 and 31H2) is attached to the extreme tops of these two rods. A pair of linked levers (18H and 24H) is connected to these two crossheads, the latter lever terminating into

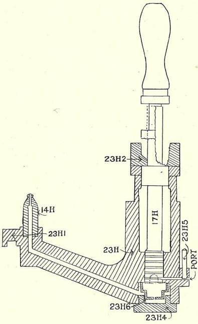


FIG. 11.

Section through pump body, showing the piston at the top of its stroke, against its stop (23H2).

a guide on the pump body, and the former into a guide on the piston (shown plainly in Fig. 12). At a given distance in the rise of the rods (19H and 31H1), the latter is checked in its motion by the nut (31H13) coming into contact with the bottom of bracket. By this time the pump body will have risen, allowing the nozzle to fit into the mould bell. Although the progress of rod (31H1) has been arrested, the rod (19H) continues its upward motion, with the result that the piston lever (18H) is rocked by the spring (20H) pulling one end upwards, causing the piston to make an attempt to descend. But as the piston lever (18H) is connected on its fulcrum by a link (32H) to the pump-body lever (24H), the upward motion of the spring rod (20H1), lifting the end of piston

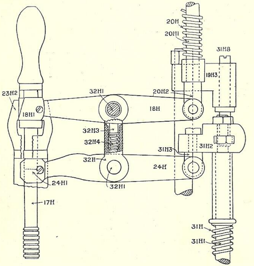


FIG. 12.

Section showing pump-lever connecting link plunger (32H3) provided to facilitate the adjustment of the crosshead stop (31H8). When the piston crosshead (19H3) comes in contact with its stop (31H8) the upward movement of the piston must just be checked by striking its stop (23H2). By having the fulcrum of the piston lever rest upon a spring a much less accurate adjustment of the stop is required.

lever (18H), has a tendency also to lift pump-body lever (24H). At the other end, the piston, in descending, is thus opposed by the pump body trying to rise ; in short, the two are working against each other. Were it not for this action existing, the nozzle on pump body would be forced away from the mould bell in the event of a tight piston becoming stuck in the pump body, as the

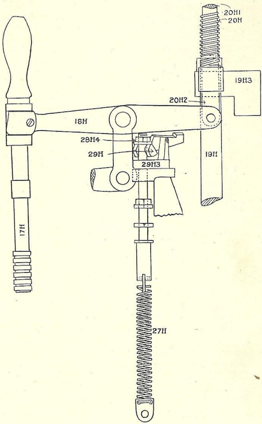


FIG. 13.

Piston being lifted to the top of its stroke by the descent of the left end of the piston lever (18H), coupled to eye (20H2). Just after the up stroke of the piston is checked by striking its stop, the piston lever comes in contact with the back end of the operating-rod lever (29H). This raises its forked end, connected to the operating rod, removing the spring tension from the pump-lifting levers and allowing the pump to fall and withdraw the nozzle from the mould.

nozzle-lifting spring (27H, Fig. 10) would not be strong enough to withstand the downward friction of piston. To continue, as soon as the mould has received the full quantity of metal to form the letter body, and the rod (19H) not having finished its stroke, the surplus motion is absorbed by the compression of the spring (20H).

The pump body rises in a perfectly vertical direction through being balanced at each end upon separate levers (25H and 26H, Fig. 10), these levers being operated by a short spring (27H), and the spring itself operated by a further lever (29H, Fig. 10) resting under the piston lever (18H, Fig. 13). As the latter rises, the lever (29H) is released, and the spring (27H) takes the pump body up till the nozzle reaches the mould bell. As the piston cross lever (18H) descends, it depresses the nozzle-operating lever (29H), causing the pump body to lower.

Adjustments.—A buffer is provided on the rocker lever (33H, Fig. 9), and when the latch is engaged on the lever (34H), this buffer should be compressed 1-32″ at the end of the forward stroke of cam lever. This is obtained by adjusting the connecting rod (68E) till the correct compression is arrived at.

The connecting rod (22H, Fig. 6) between the rock lever (33H) and crank lever (21H) should be so adjusted that the distance between the eye-bolt centres is 10¾″. When connected, see that the crank lever (21H) clears pump-bracket casting at the extreme ends of its stroke.

Setting the pump.—Screw up pot ready for casting (that is, with the lever latch engaged as in Fig. 8) and set the machine at 220°, by the indicator on cam-shaft gear cover. Slacken off nuts at bottom of pump-body spring rod (31H1, Fig. 14). Now adjust the crosshead stop stud (31H8) so that the fulcrum pin (32H1, Fig. 12) is central with the hole in piston lever, the hole being 1-32″ larger than the pin. The piston top, in coming up, will now be checked by coming in contact with the pump-body stop (23H2, Fig. 11). In this position, the pin (32H1) should be free, if tried by the fingers. Having screwed up lock nut on stud (31H8), bring up nuts on bottom of rod (31H1) till the top one just touches pump-bracket casting, and lock up. Fig. 12 shows plunger (32H3) on fulcrum pin, which assists to keep piston to top of well, making port at bottom of well arm (Fig. 11) come opposite bottom groove of piston.

With the machine still at 220°, set the nozzle-operating lever (29H, Fig. 10) 1–10″ from piston lever (18H). This setting varies slightly, as for hard metal the nozzle should be brought away earlier by reducing this distance.

The valve (23H6, Fig. 11) should be clean on its seating face, and have a needle hole in its centre. The valve is to check the return of metal from the well-arm channel, but if too much metal remains in the nozzle stop-casting is likely to be the result; hence the small hole in hat valve (23H6), which allows a small portion to return. If the hole is too large, insufficient metal will remain in the well-arm channel.

To regulate the inlet port, take back the regulating screw (23H5, Fig. 11) to insure plenty of metal getting beneath piston. Then gradually screw down till the bottom of the quads begin to get hollow. Then back slightly. This is a better plan than first shutting off all metal

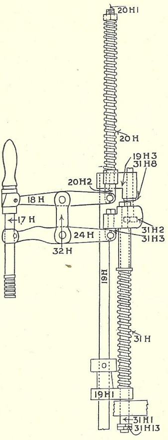


FIG. 14.

View of pump operating mechanism *before* the pump-body spring rod nuts (31H13) strike their abutment; that is, when the rear ends of piston and pump-body levers are being moved together by the rise of the piston lever operating rod crosshead (19H1), which, acting through the pump-body spring (31H), lifts the pump-body crosshead (31H2) with the piston crosshead (19H3). This moves the pump body and the piston levers together as described.

and gradually opening till the quad bottoms are solid, as the type carrier is likely to become choked with imperfect types when the port is insufficiently opened. The metal required to pass the port varies according to the fount cast.

Should the nozzle splash under the mould bell it can be tested by the squaring post provided. To test, first bring nozzle up to mould, and then measure the distance the lifting lever (26H) has risen from the bracket casting, just above the spring (27H). Now take off mould and nozzle and plunger. Screw up metal pot, and insert squaring post in nozzle hole. Regulate end of lifting lever (26H) till it measures the same as when nozzle was on. This can be done by packing it up with a few quads or pieces of type, the object being to have the pump body raised to the same height as occurs when the mould is on. Now get a square and see that the squaring post is square with the machine base occupied by the mould. If not, regulate by the nuts (28H4).

Keep the nozzle and metal channel in pump body clean. Be careful not to burr top of nozzle. See that inlet holes in bottom groove of piston are clear, and that no metal exists in well-arm guide for top of piston, otherwise piston may stick up and not come high enough to present the inlet holes to the port. Keep all parts well oiled, especially crosshead stop (31H8), bottom of spring rod (20H1), and plunger on lever (33H, Fig. 9). The pump-lever bearings in machine base should not receive neglect in regard to oiling simply because they are difficult of access. To avoid undue wear, and to assist in getting a free plunge from the piston, the bearings (18H1 and 18H2, Fig. 15) and the top guide on piston should be daily lubricated with mould oil, but any dried or burnt oil should be occasionally cleared off.

TEMPERATURE OF METAL AND MOULD.

These temperatures are variable, and no exact rule can be given that will answer in *all* cases; they alter with different sizes of type and with the speed of the machine. This most particularly applies to the mould, for the larger the type cast, or the greater the rate at which the machine is running, the more metal will be passed through it in a given time, and a greater flow of water will be necessary to keep it at the proper temperature. The mould should be kept at a heat consistent with good working—that is to say, it must not be so hot as to cause the mould blade to hang up or the cross block bind. On the other hand, the types must be sufficiently cooled before passing from the mould into the type carrier that they do not burst or swell during the transit from the mould to the type channel. Keeping in mind that the temperature of the mould is to a very great extent dependent upon the temperature of the metal, we will turn to that question. There are two limits to the temperature of the metal in the pot—the lower limit at which the machine will not cast and the higher limit at which the machine is prone to splashing, and the type likely to blister and burst—and between these limits the correct temperature lies. The proper temperature is judged from the appearance and quality of the type produced; if the type has a frosted appearance, and the corners are not well defined, the temperature is too low; if, on the other hand, the type is very bright but shows signs of blistering, it is too high. The point to be aimed at is where the corners are well defined, and the type is solid and not blown. Having obtained good type in all other respects, attention must be paid to the face, that is, the character; this must be sharp and well defined, every part of the outline showing up clear and distinct. If defective, the fault most likely lies in one of the following causes: the temperature of the metal or mould too low, the metal dirty, the nozzle not clear, or a sticky piston. Examine the latter point first, and then raise the temperature of the metal and regulate that of the mould accordingly. By strengthening the take-up spring (20H) the face of the type is often improved, but care should be taken in this connection that too much strain is not put on, which results in an undue load being put upon the machine at one particular point of its revolution, affecting its balance, and making it work in a jerky manner, besides causing excessive wear on the pump connections. It may be put down as an axiom that it should be worked with the least compression consistent with good results. In this, as in

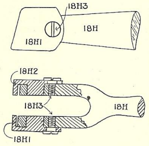


FIG. 15.

Detail of bearings on end of the piston and the pump-body levers for permitting these ends to slide slightly on the piston and the pump body.

all other cases, the main factor in obtaining good results is the temperature, and it depends above all things upon the intelligence and care of the operator, and, all other things being equal, on it will depend his success or failure; particular attention should be paid to it, and when once the point has been arrived at which gives the best results, it should be noted and maintained throughout the run. As explained before, many causes tend to alter the proper temperature, but, as a general rule, it may be taken that the best results are obtained with a temperature varying from 660° F. for pica, to 700° for nonpareil. This latter is the maximum temperature and should not be exceeded.

Care of thermometer.—The thermometer is a very delicate instrument, and should not be handled roughly. Never throw it down hastily or give it any sudden jerk, especially upon any solid body, or the mercury may become divided, rendering correct reading impossible. Remove it when leaving the machine for any considerable time, as the metal may become overheated, driving the mercury to the extreme top, which should never be allowed to happen. Do not plunge a cold thermometer bodily into the molten metal, but heat it gently by first dipping only the point.

TRANSFER WEDGES.

The whole mystery of the justification of the lines of type, to make them any given length, is wrapped up in the transfer wedges. The various thicknesses of the *letters* depends upon the distance to which the mould

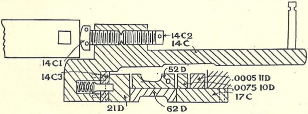


Fig. 16.

Section through the abutment slide (14C) when a character is being cast, showing the position of the wedges when the lower or type transfer wedge (62D) is in casting position. The mould blade is pulled back against the abutment screw (14C1), drawing the abutment back, so that the anvil (14C3) bears against the proper portion of the normal wedge to make the body size of the character required. If, however, a space were to be cast, the lower wedge would be out, and the upper or space transfer wedge (52D) in. The normal wedge would then abut against the justifying wedges (10D and 11D), which are backed up by the C pin block instead of the abutment (17C).

blade is pulled back, and this distance is governed by the position of the normal wedge. The various thicknesses of the *spaces* depends upon two justification wedges. Hence, when letters are being cast, the influence of the justification wedges must not exist; but when spaces are cast, and the justification wedges are being employed, the normal wedge must always be in some defined position every time alike. This defined position is when the normal wedge is in the 6-unit place. The transference of these two conditions is by means of the transfer wedges, which are two in number, placed one on the other, each being only half the depth of the normal wedge. The bottom one is brought into opera-

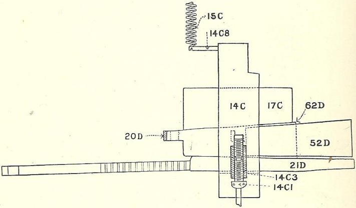


Fig. 17.

Mould blade, mould-blade abutment slide (14C), normal wedge (21D), with the type-transfer wedge (62D) in casting position; that is, bearing against its abutment on the C pin block and its movement to the left stopped by the micrometer wedge (20D). The space transfer, or upper, wedge is shown to the right out of position.

tion each time a letter is required, and the top one rests idly forward. The mould blade is brought back to an abutment piece in front of the normal wedge, and this is pressed to that part of the normal wedge decided upon by the unit pin blown up. The normal wedge is in turn pressed against the bottom transfer wedge, and this wedge against an abutment on the "position" pin block. This is shown in end section on Fig. 16, and in plan in Fig. 17, where it will be seen that the top transfer wedge and justification wedges are loose. When a *space* is wanted the bottom transfer rod goes forward, and the top one recedes, and the mould blade now gets pulled back to the abutment piece, this against the normal wedge, the normal wedge against the top transfer wedge, the top transfer wedge against the two justification wedges, and these against the abutment on " position " pin block. The normal wedge, when this takes place, is always in the 6-unit position, but the two justification wedges vary in their position according to the thickness of space required. The top transfer wedge is so adjusted that, with the justification wedges in their extreme forward position (1–1 on keyboard) the 4-unit body will be exactly .0185″ less than the 6-unit body obtained when

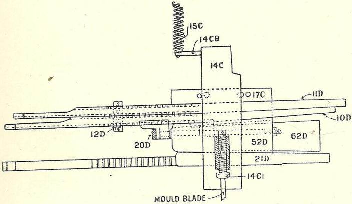


FIG. 18.

Mould blade, mould-blade abutment slide (14C), normal wedge with the space transfer wedge (52D) in casting position ; that is, bearing against the justification wedges, which are held in position by their centring tooth (12D), and which abut against the C pin block. The movement of the space wedge to the left is stopped by the micrometer wedge (20D), the same as with the type transfer wedge. The type transfer wedge (62D) is shown to the right out of position.

the bottom transfer wedge is in operation, being exactly two units of 12-set type. As this overlap of .0185″ would make the 4-unit too small on other founts, the difference is obtained by varying the " constants " or " 4-unit " justification keys on the keyboard, according to the fount in use. (This is explained in another booklet). Fig. 19 shows the top transfer wedge in operation, and by comparing this drawing with Fig. 20, it will be seen how the top transfer wedge prevents the mould blade receding so far as when the bottom one is in use by .0185″.

The transfer wedge rods are worked by cam C. Connected to the cam lever, which is provided with an adjustable post for the purpose of varying the throw if

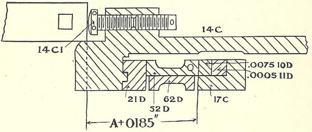


FIG. 19.

Section through mould-blade abutment slide and wedges when the mould blade is pulled back to cast the smallest justifying space. Note: The normal wedge is still in the six-unit position as in Fig. 20. Distance from end of blade to abutment is now A plus .0185″. Thus the six-unit character is .0185″ larger than the space cast with the normal wedge in the same position and with the justifying wedges set for 1–1 justification.

desired, is a very ingenious link motion, the object of which is to pull at the two transfer rods, and to withdraw the one which does not happen to be locked in a forward

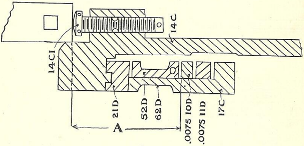


FIG. 20.

Section through mould-blade abutment slide and wedges when the mould blade is pulled back to cast a six-unit character with the type transfer wedge (62D) in. Let the distance from the end of the blade to the abutment be A.

position. As the cam lever backs out, pressure is put upon the centre link (59D4, Figs. 21 and 22), which in turn causes the bottom transfer rod (63D) to come back the long front link (59D9), with a spring box at the bottom (60D), acting as a buttress. This action repeats itself all the while letters are wanted, but when spaces are required, the bottom transfer rod becomes locked, and the action of the link alters. As the cam lever puts pressure upon the centre link (59D4), the top end of outside link (59D13) being fixed by the bottom transfer rod being locked, the bottom end moves outward, pulling with it the front link (59D9), which in turn pulls the top transfer rod back, the spring box (60D) still acting as a buttress at the opposite end. Figs. 21 and 22 show the two actions with the respective transfer rods fully withdrawn.

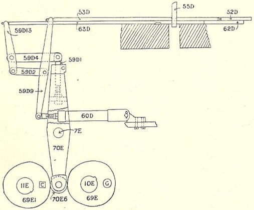


FIG. 21.

Position of the transfer tongs when the type-transfer wedge (62D) is in casting position. Since the space-transfer wedge (52D) is locked out by the shifter (55D) engaging the notch in the upper, or space, transfer rod (53D), the space-wedge lever (59D9) of the tongs remains stationary, and all movement of the cam lever is transferred through the tongs to the type-wedge lever (59D13).

The cause of transference is as follows: The "space" perforations in the paper consist of two holes—one for blowing up the 6-unit pin on the unit-pin block, and the other for blowing up the centre one of the three vertical rods on the A pin block, whose headed tops reach the side of the die-centring lever. As soon as this rod is blown into the nick (as in Fig. 23) on the die-centring lever, the lever rises, lifting it up. The bottom of this rod is attached to a lever (56D) normally kept down by a spring. Through a hole in this lever a plunger shifter is passed (55D), having a slot through part of its length near the bottom. The two transfer rods pass through this slot, and each rod has a nick, the top rod having the nick on its upper face and the bottom rod on its lower face, as seen in Figs. 21 and 22. Normally, when letters are being cast and the justification rod (57D4) is not engaged in the die-centring lever, the top transfer rod remains locked forward by the plunger shifter (55D) entering the upper rod nick by means of the downward action of the spring, thus leaving the bottom transfer

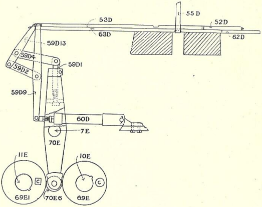


FIG. 22.

Position of transfer tongs when the space-transfer wedge (52D) is in casting position. The shifter now engages the notch in the lower, or type-transfer, rod (63D), locking the type wedge (62D) out of position. The movement of the cam lever is, therefore, transferred through the tongs to the upper, or space-wedge operating, rod (53D).

rod free to slide in and out. But when the die-centring lever lifts the justification rod (57D4), such as it does when the space perforations are in action, the shifter plunger (55D) is lifted, releasing the top transfer rod, and locking the bottom one as it reaches the end of its inward stroke.

The transfer wedges are attached loosely to the ends of the transfer rods, and the one operated upon by the link motion already described is drawn back against a vertical wedge, called the fine adjustment wedge. This fine adjustment wedge is regulated by a very fine screw, and as it is screwed down the transfer wedges are not allowed to recede so far, thus allowing the mould blade to be pulled further open than when the transfer wedges are permitted to recede further by the fine adjustment wedge being higher up. This wedge is only for very fine adjustments, and by it adjustments to the type can be made to the ten-thousandth part of an inch. Fig. 24 is an illustration of the fine adjustment or micrometer wedge.

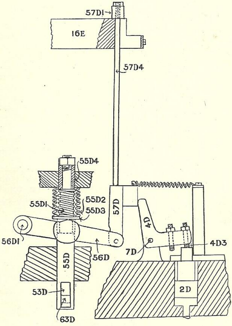


FIG. 23.

Shows the space air pin raised when a space perforation is presented to the paper tower. This throws the shifter lever-arm rod (57D4) forward, so that it is engaged and lifted by the centring-pin lever (16E), raising the shifter lever (56D) and compressing the shifter spring (55D1). When the lower, or type-transfer, rod (63D) moves so that its notch enters the shifter, as shown in the cut, the shifter spring at once lifts the shifter into this notch, locking this rod and, at the same time, releasing the upper, or space-transfer, rod (53D).

The top transfer wedge, against which spaces are cast, carries an adjusting screw for the purpose of accurately getting the difference required between a 4-unit and 6-unit body, this screw allowing the transfer wedge to get nearer to or further from the fine adjustment wedge to meet the necessities of the case. When once correctly set, this screw should never be interfered with.

Adjustments : THE SPRING BOX (60D, Figs. 21 and 22) is attached to machine base by a small bracket and two screws, reached from inside the base through the door. Adjust the nut and lock nut on the rod (60D5, Fig. 25) from spring box so that the rod is not slack in the box, which happens if the nuts are too far in or too far back. Couple up link levers to transfer-wedge rods, taking care to insert rawhide washer between end of rod and front of link connecting eye. Then set the adjustable extension post (59D1, Fig. 21) on top of cam lever till 1-16″ compression on spring in spring box is obtained when cam lever is at end of outward throw. There should also be 1-64″ compression when cam lever is at end of forward stroke. Make sure all three nuts on spring-box rod are thoroughly locked.

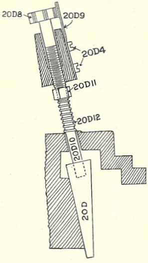


FIG. 24.

Section through locking-pin stand (15B), showing micrometer wedge (20D) and method of adjusting by rotating the adjusting screw (20D2).

To adjust lift of lever-arm rod (57D4, Fig. 23), insert head into nick on centring-pin lever, and turn machine till centring-pin lever has risen to top. Then measure top of shifter (55D) from top of casting through which it passes. Turn machine further round till bottom transfer rod has reached end of inward stroke, when the top of shifter (55D) should rise about $\frac{1}{8}''$ higher than previous measurement. If such should not be the case, adjust by the nuts on top of lever-arm rod (57D4). In ordinary working, when lever-arm rod (57D4) is inserted in die-centring lever, the shifter (55D) will jump upwards with a sharp click as the bottom transfer-wedge rod reaches end of inward traverse, and the top rod will then be quite free to slide back. If the nuts (57D1) on the lever-arm rod be set too low down, the retaining plate will strike the bottom nut each time the centring lever rises, causing unnecessary wear.

To OBTAIN CORRECT FOUR-UNIT SPACE.—To set top transfer wedge so that correct 4-unit space is obtained, bring justification wedges to extreme forward position (by blowing through justification perforations marked 1–1 on keyboard), and then insert piece of paper with normal space perforations. The type body now produced should be exactly .0185″ less than when 6-unit

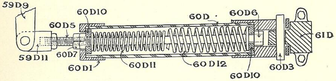


FIG. 25.

Section through transfer-wedge spring box.

letter bodies are cast. The top transfer wedge is adjusted by means of the screw running lengthwise through it. When making this adjustment, care should be taken not to move the justification wedges from the 1–1 position. To avoid this, the characters for measurement should be removed from the type channel by means of releasing the galley trip lever (45F, Fig. 61), and not by inserting the wedge lifting rods (15D3, Fig. 52) in the notch on die-centring lever.

REMOVE TRANSFER WEDGE RODS.—To remove top transfer wedge rod only, insert the rod (57D4, Fig. 23) into die-centring lever, and bring lever to the top of its stroke. Remove nuts at the end of rod, and withdraw from metal-pot side of machine, being careful not to let transfer wedge fall to the floor. To remove bottom rod it is not required to insert the rod (57D4) into die-centring lever.

INSERTING TRANSFER RODS.—After having had the transfer rods out, to get them back first insert the bottom rod (through slot in shifter, 55D) and screw it up to the operating link. Then insert lever-arm rod (57D4) into die-centring lever and turn machine till C cam lever has reached end of inward stroke, when the shifter (55D) will have engaged in nick in bottom transfer rod. Now pass top transfer rod through slot in shifter (55D), and connect up at back. Before connecting up each rod at back of machine hook the transfer wedge on. No mistake can be made in coupling these up, as the long rod goes at the bottom, the adjustable wedge at the top, and the smooth sides of wedges slide together.

Occasionally examine the nuts at the end of the transfer rods to see that they are not loose, or bad justification may ensue.

DIE-CENTRING LEVER.

The die-centring lever is worked from the D cam. Its uses are : to engage the three vertical (justification) rods when blown forward, and lift them ; to depress the normal wedge locking pin ; to take the die case to and from the mould, and to work the die-centring pin.

With the exception of the normal wedge locking pin, the adjustment of these parts will be dealt with in their respective places, when dealing with the mechanism with which they are connected.

Adjustments : NORMAL WEDGE LOCKING PIN.—To adjust the normal wedge locking pin, first see that it slides freely in its bearings, but has not the slightest "shake" sideways. In the event of the latter happening the type bodies may vary through the wedge not being locked every time in exactly the same position. Adjust this locking pin by means of the four-sided nut (14B5, Fig. 26) on top of locking-pin standard. This nut works a couple of tightening cones. If the locking pin is too tight, slack back the nut, and tap it lightly on the top with a piece of wood or lead. Never leave the nut off its seating.

To get the correct lift on the locking pin, turn machine till die-centring lever is at its highest position. Partly insert a normal wedge so that plain portion (not teeth portion) comes under locking pin. Slack back the nuts on top of locking pin till locking pin rests on normal wedge. Turn nuts down till they just meet the top of abutment piece (14B10, Fig. 26). Now give the nuts exactly one and a-half turns more, and this will bring bottom of locking pin 1-16″ from top of normal wedge. Lock up nuts and remove (or properly insert) normal wedge. The locking pin (14B) is in two pieces, the top portion screwing into the bottom. It must be seen that these are tightly screwed together, as they may be worked apart if an attempt is made to unscrew the top adjusting nut (14B1) without first unscrewing its lock nut. In unscrewing this lock nut always have a spanner on the adjusting nut (14B1). This remark applies to all nuts with lock nuts.

In locking up the nuts on top of normal wedge locking pin, it is a good plan to first remove the guide pin (14B6) to avoid the danger of breaking it off.

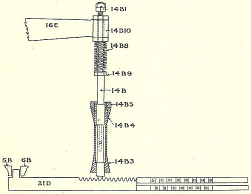


Fig. 26.

The normal wedge, after being positioned by the matrix jaws, is locked accurately in place by its locking pin. Note: In the above cut the normal wedge is marked to show the position the mould blade occupies in casting the different unit bodies.

Never turn the machine with the nuts on the normal wedge locking pin slacked back, because if the bottom of pin does not clear the teeth of normal wedge the latter are liable to be broken as the matrix jaws endeavour to take the normal wedge to the position of the locking rack.

Fig. 26 shows the action of locking pin on normal wedge, after the latter has been positioned by the matrix jaws, and also the various positions on the normal wedge that mould blade occupies in casting different bodies.

TONG MECHANISM.

The tong mechanism is worked from the E cam (see Fig. 27). On each side of the machine are two sets of tongs, having jaws at one end. The tongs cause the jaws to travel along the pin block to which they are connected. The pin block near the galley mechanism is called the B, or "unit," pin block, and the one near the metal pot is called the C, or "position," pin block. The cam lever, in its forward stroke, causes the upper (or pin) jaws to meet together, the position on either pin block at which they meet being decided by the pin blown up. Should more than one pin be blown up, through faulty paper

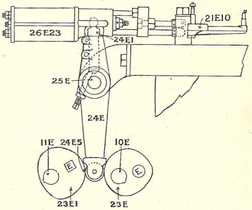


FIG. 27.

Cams, cam lever and spring box for moving jaw-tongs bell crank.

or two keys on keyboard having been struck at once, the first pin—the one nearest mould on either block—will be the position where the jaws will stop, as it is only the forward jaw which meets the pin, the hind jaw riding over the pins. These pin jaws, in meeting together, draw a rack along (12B, Fig. 28) by means of a projection from the latter. This projection will thus be brought to the position of the pin blown up. As soon as the rack is in position, it is locked by a bar, the end of which engages the teeth on the rack (see Fig. 31). The cam lever will now have completed its inward stroke, and, on returning, the pin tongs open out, and the lower (or matrix) set of tongs come together, stopping in the positions at which the rack projections have been placed by the pin tongs. In coming together, these lower tongs drag two die-case slides, one slide running *in* the other and at right angles to each other (see Fig. 48). The dies are contained in this slide, and the matrix jaws on B block drag the die case so that some particular unit row is presented to the mould, and the matrix jaws on C block drag the die case so that some particular die in that unit row shall be the letter presented to the mould orifice for casting.

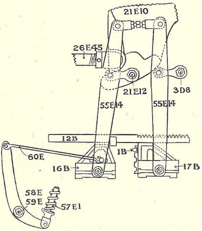


FIG. 28.

B pin jaws positioning stop rack, motion of right jaw stopped by air pin, left jaw moving rack to right as tongs close.

Each set of jaws takes fifteen positions, to correspond with the number of matrices in each row of the die case. The matrices have their centres one-fifth of an inch apart, and the centre of one pin to the centre of the next, if taken in a straight line, is consequently one-fifth of an inch. Having brought the die case into position, the matrix jaws begin to open out, and the locking bars release the racks. Another pin will now have blown up, and the cycle of movements be repeated.

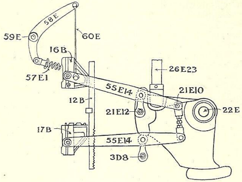


FIG. 28A.

B pin tongs closing, moving right-hand pin jaw to the left. This movement of this jaw will be stopped by its striking the air pin for the character required.

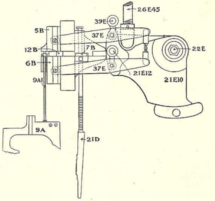


FIG. 28B.

B matrix tongs after moving sliding frame, by means of its draw rod, to the position determined by the stop rack, which previously has been set by the pin jaws.

The air is conducted by pipes inside the base of the machine from the paper tower to the pins. No movable pin is required for the zero (or end of pin block) positions, so there are fourteen movable pins to each block. The pin blocks must be an air-tight fit upon their seatings. Should they not be, through being screwed down to dirty seatings or otherwise, air is likely to escape from one pin to another, thus blowing up more than one pin and producing wrong letters, should the extra pin blown up be in front of the one desired. When not in use, the pins are held down by springs, and a top plate acts as a cover and guide. Each pin should blow up freely, and drop quickly when the air is released. There should be no suggestion of sluggishness in either direction. The pin blocks are fastened down to the machine base by screws, guided by dowel pins, but the necessity of removing them seldom arises, and they should not be unnecessarily removed.

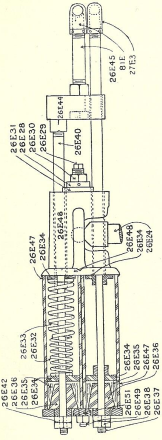


FIG. 29.

Spring box for jaw-tong bell cranks.

Adjustments.—This book is dealing with the adjustments of the later machines, which vary from the older ones mostly in connection with the tong mechanism. In older machines all four sets of tongs were driven from one bell crank, but two bell cranks—one placed over the other, and fulcrumed upon the same stud—are now employed, the upper working the B tongs and the lower the C tongs.

The top of the cam lever carries an adjusting post to vary the throw, the post having a ball head.

The spring box (Fig. 29) consists of a framework (26E48) carrying two tubes (26E47), one placed over the other. These tubes contain the springs. The ball extension adjusting post (26E24, Fig. 30) on cam lever is set into a sliding socket (26E25), and adjusted by a plug (26E29) having a dished end to correspond with the ball (26E24). When the ball is once adjusted by this screw, the screw should not afterwards be shifted during other adjustments. Two rods (26E40 and 26E37), running through the tubes (26E47), connect the spring box to the tong operating cranks—one to the top crank and the other to the lower. The lower rod runs straight through to tong bell crank, but the top rod, being above the line of connection with tong crank, is connected first to crosshead (26E44) and thence by a shorter rod (26E45) to the tong crank. The distance between the tong bell crank connection and ball head on cam lever can be regulated by a short sleeve (26E27) screwing into the spring-box frame. This sleeve is provided with a turning piece (26E28) loosely keyed into it, and provided with holes for a pin spanner. The stem of the ball-adjusting plug (26E29) passes through a clearance hole in sleeve (26E27) and sleeve turning piece (26E28), and a nut (26E30) outside the latter draws the ball socket (26E25) to the rear end of sleeve (26E27). As the position of the latter varies, so will the distance between the ball head (on 26E24) and the connection on tong crank vary.

To remove spring box take off all tongs and also nut and washer on top of tong bell crank stud. Slacken the clamp nuts on the cam lever, and turn machine so that paper-feed rod is at its highest throw. Then lift spring box and tong cranks out bodily. To replace, have machine in same position, start ball-head shank (26E24) first, and then work down slowly and simultaneously on ball-head shank and tong bell-crank stud.

Before putting spring box on machine, adjust the two ball sockets on tong bell cranks (81E and 27E3), and ball socket in spring-box frame, the latter by the square end of 26E29; then lock up the nut (26E30).

Next set the nuts (26E42 and 26E38) behind spring box lightly against the collars and lock them tightly together. Set the ball stud (26E24) so that the square portion is central in the opening in spring-box frame. This is done by slackening the nut (26E30) and turning 26E28 to right or left as required, and then locking up by nut (26E30), having taken care not to move screw (26E29). After placing spring box, see that square portion on ball stud (26E24) is so set that the rod running through it is parallel with the hole, and that the bottom of the square portion is $\frac{1}{8}''$ above top of cam lever; if not, adjust by the screw (24E7) on cam lever, working

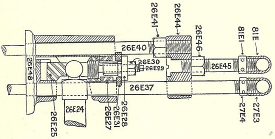


FIG. 30.

Section through spring-box cap (26E25) and crosshead (26E21). Shows adjustment of box to independently position stroke of upper and lower bell cranks. The lower spring rod (26E14) not being adjustable, the box itself is moved to regulate the lower crank which operates the rear tongs. The stroke of the upper crank, which operates the front tongs, is positioned by screwing the upper spring rod (26E17) out of, or into, the crosshead (26E21), to alter its length.

The adjustment for the lower crank is made by moving the ball socket (26E2) and the ball-socket ball plug (26E6), which is screwed in it, to the right, or left, in relation to the tube cap, turning the ball-socket plug (26E4) by rotating the ball-socket plug button (26E5), the tongue of which enters the slot in the button and acts as a screwdriver. The ball socket is prevented from rotating by the guide pin (26E3). After the socket is positioned, it is held in place, and the ball plug (26E6) locked in it, by tightening the ball-plug nut (26E7). The upper crank is then regulated by altering the length of the upper spring rod as described.

under ball stud (26E24). Now connect up all tongs and jaws. Set the lower C tongs first, getting the correct length of stroke by raising or lowering the ball stud (26E24). Now see that the lower (or matrix) C tongs just meet at 105 degrees of machine's revolution and start opening at 195 degrees; if not, adjust the lower rod (26E37) by slackening the hexagon nut (26E30) and moving the sleeve turning piece (26E28) till the above timing is arrived at. By unscrewing with 26E28 the jaws will close earlier; by screwing up, they will be later. Each time 26E28 is moved, the nut (26E30) must be tightened up, otherwise the effect of turning the adjustment will not be seen; but, as before mentioned, the plug (26E29) must not be moved, otherwise the setting of the ball stud (26E24) will be altered.

In setting the lower C tongs, take care that the upper tongs are not opening out too wide, preventing lower tongs closing correctly. Should they be doing so, bring them together slightly by adjusting their connecting link (55E15). Also take notice that the B tongs do not open too wide during the time the C tongs are being set. Next adjust the top (pin) C tongs by the adjustable coupling at the end of the tongs, seeing that they just meet firmly at the end of the forward stroke of spring box.

After adjusting the C tongs, regulate the lower B tongs by screwing up or unscrewing the rod (26E40) in the crosshead (26E44); then adjust the top B tongs by their adjustable coupling. The two sets of matrix jaws should close simultaneously at 105 degrees, and commence opening at 195 degrees. The two sets of pin jaws should also close together simultaneously; also they should not open so wide that they are tight between the ends of the jaw race.

In placing tongs on the machine do not forget to place the paper take-up spring holding piece on the rear stud of lower B tongs. The end of this spring holding piece should bear against paper tower.

In setting the spring box, the tong-tension spring (57E1, Fig. 28) should be coupled up, and the short abutment sleeve should be on the guide rods for pin jaws. The front pin jaw on either pin block should open out till there is at least ⅛″ space between first pin and the striking edge of pin jaw. Also the front matrix jaw on B block should open out so that there is at least 1-16″ space between the striking edge of jaw and the head of justification wedges when the latter are being lifted up from the 5-unit position.

Note that all the lubrication holes on spring box are in an upward position, and that the spring rods (26E37 and 26E40) are moving freely, which can be ascertained by placing the fingers on the nuts (26E38 and 26E42) at end of rods at the time the matrix jaws meet. If no movement is felt against the nuts most likely the wooden brake (26E35) is hanging up in spring box through want of lubrication, and should be attended to immediately.

Should the jaws not properly close through the wooden brake hanging up, or through the adjusting nuts being allowed to work loose, wrong letters may be the result, or the centring pin may not enter the cone of matrices, but strike on the matrix plate, causing the letters to overhang or break off, and possibly result in metal splashing between mould and die case.

LOCKING RACKS.

It has been mentioned that each pair of pin jaws carried a rack into the position of the pin blown up, and that the rack was then locked till the die case had been positioned. The bars (13B4 and 13C4) which lock the racks are worked from bell cranks, actuated in their forward direction by springs (see Figs. 31 and 32), and

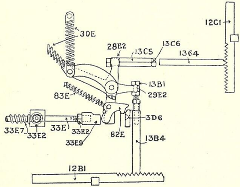


FIG. 31.

Plan of stop racks (12B and 12C) after being accurately positioned by the locking bars (13B and 13C). The locking bars cannot be jarred out of the racks, as the locking-bar bell cranks (28E and 29E) are prevented from rotating left-handed by the latches (82E).

in their backward direction by a rod (33E) connected to the cam lever operated by a cam placed on the front cam shaft between the E and F cams (see Fig. 33). As soon as the racks are positioned by the pin jaws, the cam lever releases the locking-bar bell cranks (28E and 29E), and the springs attached to them cause the bars to engage the teeth of the racks. For strengthening purposes the rack teeth are made V shaped, and the ends of the bars are made to correspond. As the bars with V shaped teeth (being held in only by the bell-crank springs) would be apt to jump out by the action of matrix jaws meeting the racks, safety latches (82E) are provided. These latches wedge the bell cranks in such a position that the locking bars cannot fail to perform their function effectively. As

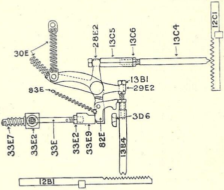


FIG. 32.

Plan of stop racks (12B and 12C) after the locking bars (13B and 13C) have been withdrawn to allow the racks to be positioned for the next character. The movement of the connecting rod (33E) to the right first withdraws the latches (82E); the bell cranks (28E and 29E) are then rotated left-handed, withdrawing the bars.

the machine proceeds to revolve, the rod operated by the cam lever first releases the safety latches and then withdraws the bars from the racks.

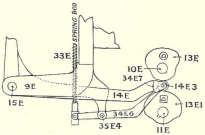


FIG. 33.

Centring-pin cam lever at right end of its stroke. The locking-bar lever (34E6) has moved the locking-bar connecting rod (33E) as far to the left as possible, permitting the locking-bar springs to seat the locking bars in the stop racks as shown in Fig. 5.

When placing this mechanism on machine, first insert the locking bar in C pin block, and then fit bottom bell crank, complete with springs and latch. Next put locking bar in B pin block, and then top bell crank, having first inserted the bar extension piece (13B1), and top latch.

Adjustments.—Set the racks in position, and let the bars enter the teeth (the middle teeth of rack for preference, being less used than the end teeth). Then adjust the bars by the bolts (13B1 and 13C5) so that the end of the projection on the latches meets the end of the bevel on the plate which guides the B pin block locking bar, as shown in Fig. 34. Should the end of latch go beyond the bevel of plate withdraw the bar from the rack, and adjust the bar by the end bolts and try again. Do not try to adjust the bar with the latches engaged on bevel, or the bell-crank lever may break off. Having adjusted both bars so that the two latches engage bevel equally, turn machine forward till the locking-bar cam lever is on its full forward throw, and adjust the rod (33E) from cam lever to bell crank so that the bars withdraw from rack teeth by 1-16″. Having slackened the nuts on the rod, if the spring be pushed up the rod slightly, a pin hole will be found for turning purposes.

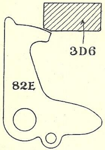


FIG. 34.

Position of locking bar bell crank latches when forward against bevel on plate (3D6).

MOULD-BLADE MOVING GEAR.

The mould-blade moving gear is actuated from the G cam (see Fig. 35), the lever from which connects to a cranked lever (41E, Fig. 36) rocking under the tong-spring equalising lever. One end of this cranked lever engages the rod (16C7) to which the mould blade is coupled, and which runs through the C pin block. The object of the rod is to operate the mould blade, either in pulling it back to the distance allowed by the normal wedge or justification wedges, or in ejecting the type into the carrier.

The mould blade is connected to the rod by a forked slide (16C5), which moves along an extension on the

C pin block, and is brought back to a screw in the abutment slide (14C, Fig. 16). This screw is for adjusting the mould blade till the correct set of letter is obtained, and it also acts as an abutment for the mould blade each time it is brought back. The anvil in abutment block (14C3, Fig. 16) in turn prevents any sharp knocking on the normal wedge. The rod carries two springs, which

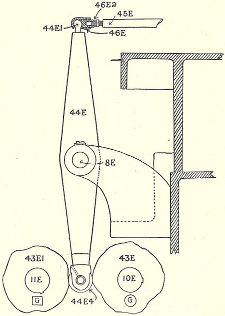


FIG. 35.

Mould-blade cams, cam lever and connecting rod.

are used for ejecting. (These two springs (16C2), together with the sleeve (16C4), act as one spring.) Behind the lever is another spring (16C10), which brings the mould blade back in sizing up to normal wedge.

Adjustment.—Put smallest set normal wedge obtainable in machine, and bring the two justification wedges to the 5-unit position. Insert on paper tower a piece of paper perforated to raise 6-unit space pin, this bringing the top transfer wedge into operation. Turn machine to 130° and adjust the connecting rod (45E) so that end of crank lever (41E) clears the abutment washer (16C13) by nearly 1-64".

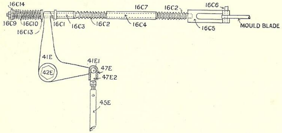


FIG. 36.

Mould blade, mould blade operating rod (16C), mould blade bell crank (41E), and mould blade connecting rod (45E). The forward movement of the mould blade is checked by its striking the mould blade stop on the back of the mould; excess forward motion of the bell crank is absorbed by the ejecting springs (16C2). The backward movement of the mould blade is checked by the wedges; excess motion of the crank compresses the sizing springs (16C10).

By this adjustment the mould blade will be brought back before the matrix seats on the mould. Should the matrix get seated before the blade was quite back, the sliding action of the blade would damage the matrix. The other consideration is that the transfer wedges get

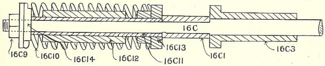


FIG. 37.

Detail of the sizing spring and its abutments, showing inside sleeve (16C11) used to clamp the rear abutment (16C14) against the shoulder on the operating rod (16C).

seated against the fine-adjustment wedge (20D) before the mould-blade adjustment takes place against them.

Fig. 37 is a section drawing showing how the sleeves and abutment washers are placed on the mould-blade operating rod.

TYPE PUSHER.

The type pusher is worked from the H cam, and is used for pushing the type through the type carrier tunnel into the type channel, prior to being taken to the galley. An adjustable rod connects the cam lever to the bell crank working the pusher. The only adjustment about the pusher is that it should push the type into the channel so that it gets just behind the spring

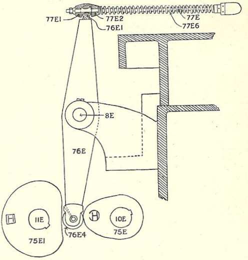


FIG. 38.

Type pusher cams, cam lever and connecting rod. Note: If the type catches and prevents the pusher moving forward, the movement of the cams is absorbed by the spring (77E6).

latches in the channel walls. A guiding lever, attached to the normal-wedge locking post, keeps the pusher steady in its line of traverse. Fig. 38 is an illustration of the type-pusher lever and connecting rod, and Fig. 39 is a plan of type pusher and bell crank.

TO REMOVE TYPE PUSHER.—The most convenient period of the machine's revolution for taking out pusher or replacing it is at 360°, when the bell-crank lever will be fully back. Should the type carrier be at any time disconnected, and allowed to remain on the machine, the pusher should be removed, and on no account should the pusher be left disconnected when turning the machine.

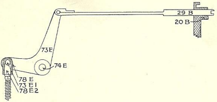


FIG. 39.

Plan view of type pusher showing bell crank and right end of connecting rod.

PAPER TOWER.

This consists of a box containing pipes (thirty-one in number), which communicate between the paper perforations and the air pins in the three pin blocks. A line of thirty-one holes in a crossgirt at the top of paper tower leads to the pipes, and the paper passes over this line of holes, being fed by spur wheels engaging the side perforations in the paper ribbon. Hinged by a shaft on top of the tower is a clamping piece, with a narrow leather pad, called an air bar (see 2G, Fig. 41), which covers the line of holes. A pipe by the side of the tower conducts air to the hollow end of the air-bar shaft, and then down one of the air-bar arms, to beneath a small valve (see Fig. 42). At a given time the air bar is clamped to the cylinder and the air valve is depressed, allowing the air first to rise and then descend and travel along a groove in the leather pad of air bar, and thence through any perforation in the paper. The feeding of the paper over the crossgirt, and the clamping of air bar whilst air is blown through, is done by the sixth (or F) cam lever, which has a connecting rod (54E, Fig. 43) to a lever (19G) fulcrumed on the right-hand side of paper tower. This lever reciprocates two rods, one (17G5, Fig. 43) in connection with a spring box operating an escapement motion for turning a ratchet wheel one tooth for each revolution of the machine, and the other (4G, Fig. 41) depressing the air bar and valve. As the paper is passed over the crossgirt it is wound on to a spool. The spool is attached at one end to a short shaft carrying a ratchet wheel (23G, Fig. 44). A finger projection piece (23G3), screwed to top of paper feed operating rod lifts a pawl (23G1) on the upward stroke, and this pawl, by means of a tension spring (24G),

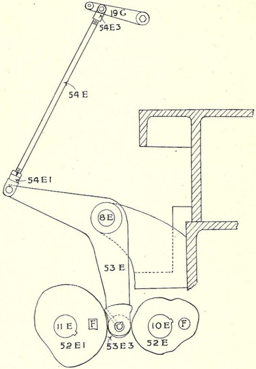


FIG. 40.
Paper feed cams (52E), cam lever (53E), operating rod (54E), and paper tower lever (19G).

revolves the ratchet on the downward stroke of connecting rod, thus keeping the paper taut.

Adjustments.—Adjust the cam-lever connecting rod so that the spring (17G4, Fig. 43) has ⅛″ compression at the end of down stroke and 1–16″ on the upward stroke. This can be told by having the locking lever (12G) up, and seeing how far the rod (17G5) enters or leaves the spring box (17G) at the end of the strokes. Care must be taken that the stud running in the slot of connecting link (4G3, Fig. 41) does not reach the top of slot at the extreme upward stroke, or the lever may get broken. Next adjust the screws (1G20, Fig. 43) so that

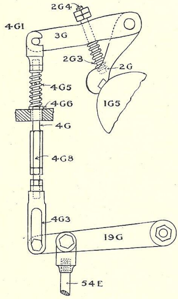


FIG. 41.

Paper-tower lever at the bottom end of its stroke, having clamped the air bar to the crossgirt.

the spurs on wheels for feeding paper come in line with the line of holes in crossgirt both on the down and up strokes. In adjusting this, see that the tooth on end of locking pawl (13G) and feeding pawl (13G5) both enter the ratchet (20G4) centrally between the teeth without moving the ratchet wheel; and also that as the pawl-ring lug just touches the right-hand screw (1G20) the air bar on crossgirt has not clamped the paper. (These parts seen also on Fig. 45.) To set this, put a piece of spool paper between the lug on pawl ring (14G) and right hand screw (1G20); turn machine gradually till the paper is lightly gripped. Then put two thicknesses of paper under air bar and adjust by the nuts on the stud (2G4, Fig. 41) at each end of air bar so that the two pieces of paper can be drawn through by pulling very lightly. Further compression will be given, as the machine continues, by the springs (2G3) on air bar compressing. The next adjustment is to see, whilst the paper is feeding, that the air bar rises 1–64″. To test this, bring the stud in paper-tower lever (19G) to the centre of slot in connecting link (4G3), and adjust the sleeve nut (4G8) on connecting rod (4G) and lock by nut below so that four

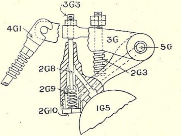


FIG. 42.

Section through air bar at valve. Shows the bar in the position of clamping paper and the valve opened to admit air to the crossgirt through the paper perforation.

thicknesses of spool paper can be lightly drawn between air-bar pad and crossgirt. Next adjust valve operating screw (3G3) so that valve gets depressed 1–16″.

These adjustments should not be unnecessarily interfered with by caster attendants, as they are rather confusing to the inexperienced. But the following are the points to bear in mind: The stud in paper-tower lever (19G) should not reach top of slot in air-bar connecting link (4G3) on the end of up stroke. The paper-feed spurs must come in line with holes in crossgirt at end of up stroke and down stroke of connecting rod (54E), and tooth on locking pawl (13G) and tooth on feeding pawl (13G5) must bottom the teeth on ratchet without moving the ratchet wheel. The lug on pawl ring (14G) must reach right-hand screw (1G20) in lug on paper-tower casting before the paper is clamped on crossgirt. The air bar must lift from paper 1–64″, and the spring (17G4) must have ⅛″ and 1–16″ compression on the up and down stroke respectively. If these conditions are fulfilled, the setting will be correct.

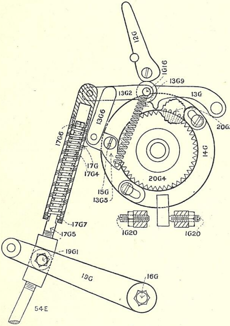


FIG. 43.

The paper-tower lever at the end of its down stroke. The feeding pawl (13G5) has rotated the ratchet (20G4) until the further movement of the pawl has been stopped by the lug on the pawl ring (14G) striking the right stop screw (1G20). After this occurs the further downward movement of the lever is absorbed by the spring box.

PAPER TAKE-UP SPOOL.—A section of this is shown in Fig. 46. It is pivoted on one end by the plunger (25G1), and on the other by the end of shaft (21G5). A pin (21G8) engages the driving disc (22G) when the button (25G2) is bedded into its V seating, and the turning motion is imported by the ratchet (23G). When the button (25G2) is withdrawn so that the V projection rests on the end of the paper-tower casting, the disc pin

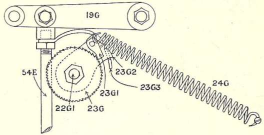


FIG. 44.

Paper-tower lever at the upper end of its stroke, having raised the winding pawl (23G1) into position to rotate the winding ratchet (23G) as soon as the lever descends and permits the operating spring (24G) to act.

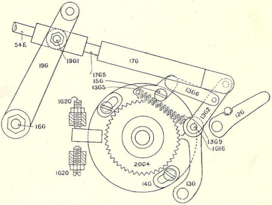


FIG. 45.

The paper-tower lever at the end of its up stroke. The locking pawl (13G) having been seated in the ratchet (20G4) to prevent its rotating, the feeding pawl (13G5) and pawl ring (14G) are moved back into position to feed against When the movement of the pawl ring is checked by its lug striking the left stop screw (1G20), the further upward movement of the paper-tower lever is absorbed by the spring box (17G).

(21G8) withdraws from the driving disc (22G), and the spool is free to revolve in either direction. A further withdrawal of the button (25G2) leaves nothing for the spool to pivot upon, as the shaft will recede by the action of spring (21G10), and the spool can be taken off. When the shaft (27G5) is pushed to the right by the button (25G2) entering its V seating, the disc pin (21G8) should

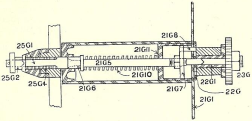


FIG. 46.

Section through winding spool showing plunger button (25G2) turned so that the plunger spring (25G4) forces the plunger (25G1) into the spool. This forms the left bearing for the spool and, at the same time, forces the shaft (21G5) into disc shaft (22G1), for the right bearing, and enters the pin (21G8) in the driving disc (22C).

project the thickness of the driving disc (22G). This is regulated by screwing off the left end of spool, when the shaft (21G5) will come out. The disc (21G7) can then be adjusted as desired, first loosening the lock nut behind it.

Care should be taken that the flange (21G1) is not bent, or the paper will wind unevenly.

BRIDGE.

The bridge spans the mould, and contains the die case. In the middle portion is attached a plunger, with a tapered end, called the die-centring pin, which is worked by the forked end of the die-centring lever, operated by the D cam (see Fig. 47). Connected to two posts, running through the bridge casting, is a slide-carrying frame, along which the slide containing the die case moves. The die case is made to move in this slide at right angles to the slide itself (see Fig. 48). Being thus free to slide in either direction, any die in the case may be presented to the mould. The two carrying-frame posts are coupled at the top by a cross beam, and made to move up and down by a connecting link attached to the die-centring lever. The matrix jaws drag the die case to the position decided by the blown-up pins, and the die-centring lever causes the die case then to approach the mould. The centring pin then enters the matrix to clamp it to the mould surface (see Fig. 49). In each fount the dies are all punched in a fixed relation to the cone hole, the centring pin, therefore, causing all the letters to have the same alignment. A draw rod leads from the slide to the lower jaws on B pin block, and a hook on the die case engages a shoe in a slide worked by a draw rod from the lower jaws on C block.

The stand through which the centring pin runs is screwed to the bridge casting, and may be adjusted in

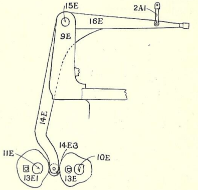


Fig. 47.

Centring-pin cam and cam lever when the matrix case is in casting position; that is, at the bottom of its stroke.

two directions at right angles to each other. The use of these adjustments will be explained below.

Adjustments.—Put bridge on machine, seeing that all three feet are clean, and no pieces of metal adhering to them. Also see that machine base, where bridge feet go, is perfectly clean.

See that the fulcrum rod (2A2, Fig. 50) measures 4 15-16″ from top face of bridge casting to centre of fulcrum stud (2A5).

Descent of Matrices.—Do not insert link pin (3A), but with the machine in the position where the type

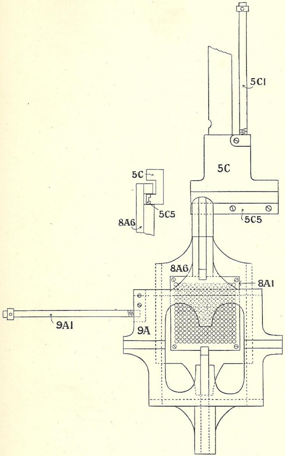


Fig. 48.

Plan view of sliding frame with matrix case in place. Shows means by which matrix case can move in two directions, at right angles, and the draw rods through which the matrix jaws produce these two movements of the case.

carrier has just reached the end of its back stroke (the end of die-centring lever having slightly dropped here), place a piece of spool paper between the die case and mould, and depress the bridge lever (2A) by hand. The paper should draw out without seizing.

In the event of imperfect setting, slack back the lock nuts (4A10) and stop nuts (4A2), and put one thickness of spool paper between mould and die case, as above. Depress lever (2A), and bring down one stop nut (4A10) till the paper will draw without tearing if lightly pulled. Then turn the lock nut back one complete turn, which will make the paper tight again. Now bring down the

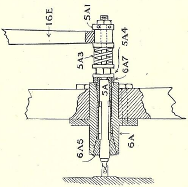


FIG. 49.

Centring pin in casting position, seating the matrix firmly on the mould. The seating occurs after the cone of the pin has entered the cone hole of the matrix and accurately positioned it to make the alignment correct.

other stop nut (4A2) till the paper draws correctly. Having got the paper right by the second stop nut, bring the first stop nut *down* the one complete turn, and lock both up. By this method it is guaranteed that the stop nuts will come down equally on both guide rod bushes (1A6), and not on one only. It may be found that after screwing up the lock nuts (4A10) the paper will be too slack under the dies on account of the nuts being slack in the threads. If so, loosen the lock nuts without disturbing the stop nuts (4A2), then slightly back both stop nuts (4A2) equally ; tighten lock nuts and test again.

By this adjustment, as the stop nuts strike the bushes, the matrix will rest on the mould, and the wire running through it will be in centre of the matrix hole, as shown in the illustration (Fig. 50). Should the matrix carrying frame descend too far, the bottom of matrix hole will be forced against the matrix wire, but should the carrying frame not go low enough down the top of matrix hole will be forced on the wire when the centring pin enters the matrix cone—probably causing splashing through the matrix not being firmly seated on the mould surface.

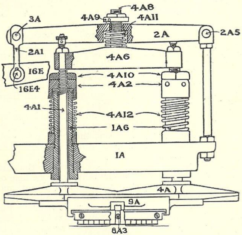


FIG. 50.

Carrying frame in casting position, showing matrix resting on mould. Note that the downward movement of the carrying frame is, at this point, checked by the stop nuts striking the tops of the bushings.

ASCENT OF MATRICES.—Next turn machine round till the centring lever is at its highest position. Insert fibre plate, and then see that the hole in bridge lever (2A) is slightly higher than the hole in connecting link (2A1). If not, back the adjusting nut (4A9) on top of bridge lever till it is. Now couple up with the link pin (3A), and the fibre plate should be free to move. Should the hole in the bridge lever be lower than the hole in link pin before coupling up, the fibre plate will be tightly clamped, after coupling, when the centring lever rises to its top position, and the bridge lever (2A) may get broken.

In casting position, there should be 1-64″ clearance between the adjusting nut (4A9) and bridge lever (2A).

The matrix centring pin should slide freely in its bushing, but should not have the slightest side shake. In the event of the latter, adjust by the square nut (6A7, Fig. 49). Should the pin be too tight, slacken the nut, and then tap it downwards with a piece of wood or lead. If too tight, the spring (5A3) will not overcome it when it is required to centre the matrix, and splashing will be the result; if too easy in sliding, the alignment will be affected.

TIMING THE CENTRING PIN. — To correctly time the centring pin, first take down the adjusting nut (5A1, Fig. 49) so that the centring pin does not seat in cone of matrix when depressed by the lever (16E). Then place two thicknesses of spool paper between the die case and mould, and turn machine till they are lightly gripped. Now take adjusting nut (5A1) back till there is 1-64″ clearance between bottom of nut and top of abutment (5A5) in centring-lever fork. By this setting there will be about ⅛″ spring depression at the end of down stroke of centring lever, and the centring pin will have squared the matrix without dragging it along the face of the mould.

Set the draw rods from the lower jaws so that the centring pin enters *exactly* in the centre of cone hole of matrices, and see that the draw rods are not bent, and that they never touch the jaws as the latter are moving.

ALIGNING.—The centring-pin stand is fixed to the bridge by two hexagon-headed screws. Should the letter faces not come centrally on the body setwise, the pin stand (6A)—and with it the centring pin—may be adjusted by first loosening the hexagon-headed screws, and then moving the pin stand sideways by means of the two set screws, one on each side of the stand, which point in a direction parallel with the C pin block. For aligning purposes, two other screws are provided, these pointing in a direction parallel with the B pin block. Should the letter faces not be square upon their bodies, but lean to right or left, they may be squared by manipulating the two screws which work on the die case guide post (4A1, Fig. 50) near the pump. In making the latter adjustment, first slightly loosen the two-sided nut beneath guide-post spring, but not the hexagon-headed screws for centring-pin stand, as the centring pin is not affected by this adjustment.

Having centred the letter face on the body (preferably by a "star" matrix, or em dash), again look to see that the centring pin enters matrix correctly, as aligning up may have affected this. If so, adjust again by the draw rods from lower jaws. Before centring the type face on body the mould blade should always be correctly adjusted to quad size. In removing the die case, be careful not to knock the matrix cone plate on the bottom of the centring pin, and in replacing see that the two screws holding the wire-end cover on are not loose.

REMOVING BRIDGE.—The bridge is taken off with the matrix jaws fully opened and the centring lever on the top throw, but should the machine get stuck so that the bridge cannot be taken off on account of the matrix jaws not being fully opened, disconnect the draw rod in the sliding frame (9A), and the bridge can then be easily removed, and the type carrier also, if desired.

In replacing the bridge, always see that the alignment has not been affected by the removal, which may be the case should dirt get on the bridge feet and not be cleaned off. It is always a good plan to keep a small stock of capital H's or M's of the founts first cast from the machine, and always align up to them. This insures that any corrections likely to be made by hand from older type will always be in perfect alignment.

Do not leave any screws or nuts loose on the bridge. This remark applies to the whole machine.

GALLEY MECHANISM STARTING ACTION AND JUSTIFICATION WEDGES.

On the completion of every line two things are required—the taking of the completed line into the galley and the placing of the two justification wedges so that every space in the line next to be cast will be of sufficient thickness to make the line the required width. These two actions take place simultaneously, and their mechanisms are connected.

At the end of each line the paper receives two sets of perforations, each set containing two holes. One hole in each set leads to the A pin block in the centre of the machine top, and the other leads to the B or "unit" pin block. The air running to the A pin block blows up a piston (1D, Fig. 51), which causes a headed rod to engage a slot in the side of the die-centring lever, whilst the latter is at the end of the down stroke. As the centring lever rises it lifts the headed rod. This rod is connected to a lever (14D), which projects under the justification wedge, and consequently the wedge also

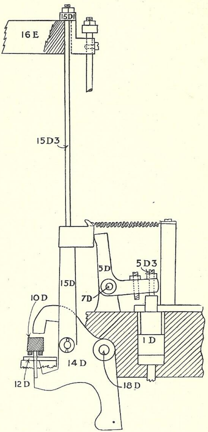


Fig. 51.

End view of mechanism for setting justifying wedges before starting line. Justifying air pin is blown up, causing the justifying-wedge lever-arm rod (15D3) to be engaged by the centring-pin lever. This raises the wedge clear of the centring tooth (12D), so that it may be moved by the matrix jaws.

rises. A projection on the end of the justification wedge is now placed in the track of the matrix-jaw ends (see Fig. 52). In the meantime, the other perforation in the paper has led to some pin in the B pin block, and this pin decides the position in which the justification wedge shall be placed. As there are fifteen positions on the B pin block, so can the justification wedges assume fifteen positions each, the first position being when the wedges are fully forward. One wedge has a taper increasing .0075″ ($7\frac{1}{2}$ thousandths) from shift to shift, and the other wedge a finer taper, only increasing .0005″ (half a thousandth) per shift. The smallest space will be that cast when the wedges are in the extreme forward (1—1) position, and this can be gradually increased by moving the finely-tapered wedge shift by shift up to the fifteenth position. It can then be brought back to the first position, and the coarse wedge shifted to the next position, when .0075″ will have been added. By moving down the fine wedge again, and at the end of each fifteenth position moving the coarse wedge one shift, a wide range of space thicknesses may be obtained ($15 \times 15 = 225$).

As the positioning of these wedges takes place after the completion of the previous line, and also whilst they are being positioned no letters are required, two things must happen: Firstly, the completed line must be removed to make room for the line to come, and secondly, the pump mechanism of the metal pot must be stopped. These requirements are fulfilled simultaneously, and by mechanism in connection with the justification - wedge lifters. A continuation on the wedge-lifting lever, each time the latter is acted upon by its rod engaging the die-centring lever, presses against a rock lever (9D1, Fig. 53) connected to a rod (8D) which leads to a galley-action trip lever (45F) at the front of the machine. Screwed to this rod is a projection (9D), the end of which operates the rod (49D) containing the collar governing the metal pot action, referred to in the chapter on the pump. Thus each time the wedge lever (14D) lifts the justification wedges, it also sends the galley-trip rod (8D) forward to start the galley action, and the pump-trip rod (49D) forward to stop the pump. As the wedge-lifting rod disconnects itself from the die-centring lever, the wedge drops on the fixed tooth (12D, Fig. 52) in the position found for it, and the two rods (8D and 49D) are returned by the action of the spring (50D) attached to the pump-trip rod (49D).

Each time the rock lever (9D1) is operated upon by one wedge lever, the galley-trip rod (8D) goes forward 3–16″, but when both wedge levers are lifted the galley-trip rod goes forward double that distance. *The screw* (45FI) *in galley-action trip lever* (45F, Fig. 53) *can be taken back so that when the galley-trip rod* (8D) *goes forward only 3–16″, it will not start the galley action.* In this case it will be necessary to blow up both justification rods (15D3, Fig. 52) at once to knock out the galley trip lever. Tabular matter, with any number of columns, may be set upon the machine, and each column will be correctly justified as a separate line, but not taken to the galley till the last column has been set, when a double perforation in the paper causes the galley-trip rod to operate.

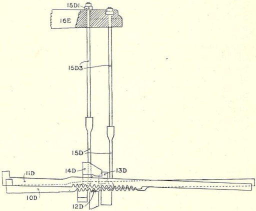


FIG. 52.

Front view of mechanism for setting justifying wedges before starting line. The front wedge is lifted to clear the centring tooth (12D), to allow the lug at its left end to be engaged by the matrix jaws and moved to its position for the next line.

Fig. 54 shows the action of the justification-wedge levers (13D) upon the rock lever (9D1). The first shows the wedge levers at rest. The second shows justification-wedge lever (14D) in operation, lifting the fine justification wedge and pushing galley-trip rod forward 3–16″. The third represents the other justification wedge lever (13D) in operation, lifting the coarse justification wedge, and pushing galley-trip rod forward 3–16″. The fourth shows both wedge levers lifting together, lifting both wedges and sending galley-trip rod forward 3-8″. The double perforation will have been obtained by the keyboard operator depressing a key on both justification rows at the same time, the keys touched being indicated by the bottom figures in the drum squares. Thus, if the square read 3—5, he would touch 3 on the top row and 5 on the top and bottom rows

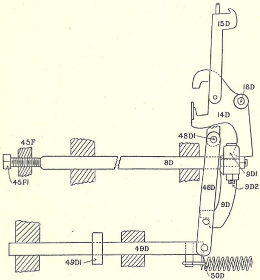


FIG. 53.

The lower end of the justification wedge lever (14D) bears against the rock lever (9D1), which is fulcrumed upon the trip rod arm (9D), attached to the trip rod (8D). Thus, when the wedge lever is lifted, the trip rod is moved forward (to the left in this view) tripping the galley. The justification perforations, at the end of the line, therefore, do two things: *First* set the wedges for the next line to be cast; *second*, trip the galley for the line just cast.

Note: This view shows also the pump trip collar for locking the pump out of action, when the wedges are being set and the galley tripped. The pump trip spring serves also to restore the galley-trip rod when the wedge lever fails.

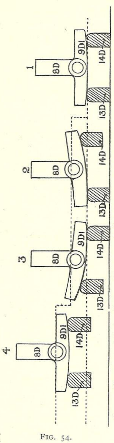
together. In passing the paper through the caster (it going through backwards) the double " 5 " perforations will cause both wedges to be drawn to the fifth pin position, and the " 3 " perforation will then cause the coarse wedge to assume the third pin position.

F

The justification wedges may be removed by first taking off the square block found near the rear stud on which the B matrix tongs rock, and then raising the lifting rods (15D3, Fig. 52). In replacing, remember that the wedge going nearest the transfer wedge is the one possessing most taper (.0075″).

When it is desired to turn the machine without casting type, the handle (35H7, Fig. 55) must be pulled back and hooked in the catch plate (36H). This is connected by a spring box to a rod (35H1) carrying a plate with a cranked top (35H4). When drawn to the left, this crank plate pushes the trip tube (49H), causing the collar to disconnect the pump latch from pump operating lever. The trip-rod spring returns this rod when disconnected from the catch plate.

To remove this hand-trip rod, if desired, take off the crank plate (35H4), and also the split pin at the extreme end of the rod on the pulley side of machine, and draw through from the galley side.



1. Plan view of rock lever (9D1) and galley trip rod (8D) when both justification lever (13D and 14D) are down. The portions of the justification levers that come in contact with the rock lever are shown in section.

2. Same as No. 1, except that the justification lever (14D) is shown lifted. Distance from end of trip rod to line A B is now A+3-16″. Thus lifting *one* lever moves the trip rod forward 3-16″.

3. Same as No. 2, except that 13D lever is in action.

4. Same as No. 1, except that both justification levers are shown lifted. Distance from end of trip rod to line A B is now A+3-8″. Thus lifting *both* levers moves the trip rod forward 3-8″.

FIG. 54.

Adjustments: LIFT OF JUSTIFICATION WEDGES.—The justification wedges have teeth on their under side, and a groove running lengthwise. As the lever (14D, Fig. 24) rises, a thin plate attached to it fits in the groove, and the wedge (10D), when lifted, can be freely drawn along the thin plate. When the wedge has been drawn to the desired position it is dropped, and the teeth engage a fixed tooth on the A pin block. The points to watch are—the wedges must be raised so that their teeth are above the fixed tooth, and will not drag on it; the projection on the end of the wedges must be high enough for the matrix-jaw arms to properly engage them; the wedges must not be raised so high that they are forced on the top against the locking bar or C pin-block casting. Put wedges in, and bring them to the extreme forward position (5-unit). Put one of the rods (15D3, Fig. 24) in

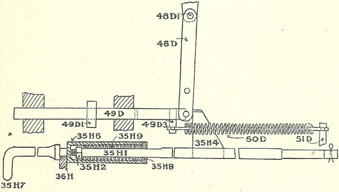


FIG. 55.

Same view of pump-trip collar as Fig. 9A. Also shows spring (50D) for moving the collar back from behind the latch, as soon as the justification-wedge lifting lever descends and releases the trip tube (49D).
This view shows the pump locked out by the hand trip, which has moved the collar forward behind the latch. The hand trip is latched upon the catch plate (36H) to hold the pump out of action.

slot of centring lever, and turn machine till centring lever reaches its highest position. Then press tightly against the rock lever (9D1), when the nut (15D1) on rod (15D3) should clear top of centring lever by 1–64″. Then treat the rod for other wedge in similar manner. In testing thus, the hand pump trip should be disengaged from its latch, to put weight on the levers (13D and 14D). Adjust the bell crank (5D) by the screw nearest fulcrum. To do this, insert rod in centring lever, and turn machine to the point where rod will drop out by itself. In doing so it should fall lightly against the retaining plate on centring lever. Turn machine so that centring lever goes to bottom, when the rods should clear the plate by about 1–32″. This applies to all three rods.

The stop screw (5D3) in bell crank should be so adjusted that it clears the piston 1-64″, so as to give the piston an opportunity of commencing its ascent without any load upon it.

Care should be taken not to burr or bend the justification wedges, or the justification will be rendered indifferent.

Inserting rock lever.—Should the rock lever (9DI, Fig. 53) become disengaged, let the pump-connecting latch (33HI) be taken away from the operating collar (49DI) by turning the machine round with the latch engaged on lever, as in Fig. 8; then take off the pump-trip spring (50D, Fig. 55), and hook up the handle (35H7) on catch plate (36H). The rock lever can now be easily replaced. Should the rock lever become disengaged the lines will not be taken to the galley.

Removing pump-trip collar.—To take out the collar rod (49D), first take pump-rocker arm latch away from collar by turning machine with latch engaged, as in Fig. 8. Take off the spring (50D), disengage rock lever, to allow link (48D) to swing back, and then slacken set screw in collar (49DI). The rod can now be withdrawn from pulley side of machine, the collar dropping off.

In the case of the roller having moved along the tube, follow the above instructions except removing the rod. The roller can be reached by putting the hand through the door. Adjust so that, with the hand trip disconnected from the catch plate (36H, Fig. 55) and the spring (50D) connected up, the roller will lay 1-32″ to the side of the pump rocker arm latch (33HI). The set screw in the roller should be pointing downwards after the spring (50D) is connected up, and it should be felt to see that it does not strike any of the air pipes as the collar moves along to cut off the metal supply. A sign that the roller has slipped to the *left* is the obtaining of letters at the end of each line whilst the justification wedges are being set. If the roller be set too far to the *right* the pump will not work, as the pump rocker-arm latch will be constantly disengaged.

In the above instructions it has been mentioned that the pump rocker-arm latch (33HI) should be taken back, that is, away from the trip collar. When this cannot be done, the collar being behind the latch, turn the machine till the pump rocker arm has partly started on the back stroke—the machine being at 170° or 175°—and then prise the pump bell-crank lever in pump bracket backwards with a screwdriver, when the latch will readily drop in, and the machine may then be turned further by hand. Or the arm (33H, Fig. 6) may be pulled forward by hand, by reaching it through the opening between B and C cam levers at back of machine, having the machine at the above position.

REMOVING GALLEY-TRIP ROD.—To take out galley-trip rod (8D, Fig. 53), unscrew rock-lever arm from end of rod, and push through to galley side of machine, first removing the galley-trip lever and column-pusher spring box.

LINE SHIFTING AND GALLEY MECHANISM.

The type is guided by the pusher into a channel near the galley. One side of the channel is a fixed wall, whilst the other side is movable, being kept forward by

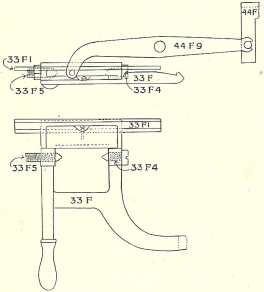


FIG. 56.

Plan and side view of operating-lever latch (33F).

a spring, and so set that the channel is slightly less in width than the body of the type to be cast. The type will thus be supported by being gripped between the

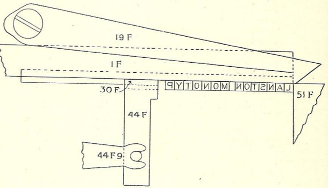


Fig. 57.

Short line; the line support is, therefore, not pushed far enough forward, consequently it catches between the column pusher and the stop slide and throws the operating-lever latch. The end and side views of the line support show that it pushes the stop slide back because it is not far enough forward for its prongs to enter the grooves in the slide.

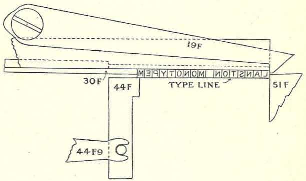


Fig. 58.

Long line caught between the column pusher (1F) and stop slide (44F). When the pusher moves to the right the stop slide is, therefore, pushed back with it, and the operating-lever latch released, stopping the machine.

channel walls. Each wall carries a spring hook to prevent the type falling back as the pusher retires. Upon the completion of a line a couple of hooks catch it, and the line is dragged along the channel to the galley, passing a cutter on the way for cleaning off any burrs left in casting. When the line has reached a position opposite the galley mouth, a gate rises and the line is pushed into the galley. The gate then drops, and the line hook returns to a position of rest, ready for the next line.

One side of the galley mouth has a sliding wall, which connects to a lever operating on the starting-lever latch (see Fig. 56). As the line of type is being withdrawn to the galley, the forward end is supported by a

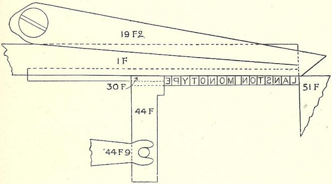


FIG. 59.

Line of correct length, pushed in between the fixed channel block and stop slide. The line-support prongs pass into the grooves in the stop slide, as shown in the end view, because it has been pushed far enough forward by the line for the plate of the support to clear the slide.

slide. This slide has a keyway at one end to correspond with a key on the galley-wall slide (44F). Should the line be shorter than the galley mouth, the type support slide key will not enter the keyway on the galley-wall slide, but will push it, causing the starting lever to disengage the latch, with the result that the belt shifter brings the belt on to the loose pulley. This is shown in Fig. 57, where the line support slide (30F) has not come out far enough to engage the keyway on galley-wall stop slide (44F), and as the column pusher (1F) comes forward, the slide will operate the lever (44F9) working on

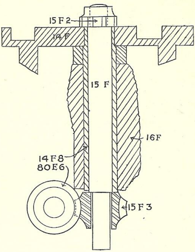


FIG. 60.

Section through galley cam (14F), galley-cam sleeve (14F8), and galley-cam stand (16F). Shows that the ratchet (15F2) is driven continuously from the cam-shaft worm (80E6), through the worm wheel (15F3) and shaft (15F), while the galley cam remains at rest, unless connected to the ratchet.

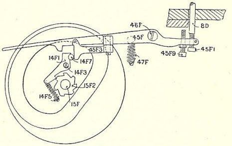


FIG. 61.

Top view of galley cam just as the driving pawl (14F1) has been released by the forward movement of the trip rod (8D), which pushes to the left end of the trip lever (45F) to the rear, releasing the pawl. Note: The pawl is shown resting upon the top of the ratchet tooth, and, as the ratchet rotates, will engage the next tooth. The cam will then rotate with the ratchet.

the starting-lever latch. Should the line be too long, the end letter or quad will push the slide (44F) forward, thereby causing the machine to stop. This is shown in Fig. 58. Fig. 59 shows a line of correct length entering the galley mouth.

The following is the action of the galley movement: A vertical shaft (15F, Fig. 60), worked by a worm upon the hand-wheel shaft, constantly revolves, taking with

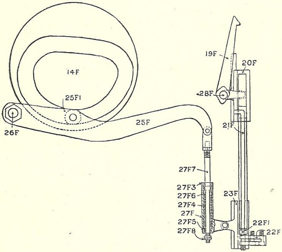


FIG. 62.

Plan of line-hook operating mechanism. Shows line hook (19F) at the forward end of its stroke, just as it has placed the line in front of the galley. At this point the forward movement of the line-hook carriage (20F) is stopped by the operating bar (21F) striking the adjusting screw (22F1).

Note that the stroke of the operating slide is 7″, in order to restore the line support after a 42 pica line has been pulled forward in front of the galley. The stroke of the line hook carriage is the difference between the stroke of the slide and the clearance of the bar.

For the sake of clearness the operating bar has been drawn turned on its side.

it a ratchet (15F2) fixed upon its top end. A flat cam (14F), through the centre of which the vertical shaft passes, remains idle, hooked up to a trip lever (45F) by a loose pawl (14F1, Fig. 61). As soon as the trip lever releases the pawl, as shown in Fig. 61, the latter engages the revolving teeth (15F2) of the vertical shaft, and the cam is carried round. In going round, the cam groove on top of cam plate operates a lever (25F, Fig. 62) which connects to a slide bar (21F) carrying the line hook (19F), and this removes the line to the galley. A cam surface on the underside of cam plate operates a lever (40F, Fig. 63) to raise the gate (or rule) at the mouth of galley,

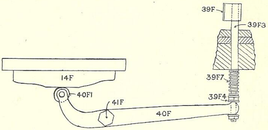


FIG. 63.

Rule operating mechanism: Shows rule cam, on the bottom of the galley cam (14F), lever for raising rule (40F), and springs (39F7) for seating it after a line has been pushed under it.

and a cam surface around the cam plate operates a lever (5F, Figs. 64 and 65), which pushes the line into the galley. On the completion of the cam's revolution, it is again hooked up, and remains idle till the next line is ready. One revolution of the *cam* occupies seven

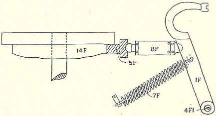


FIG. 64.

Side view of column-pusher cam on the under side of the galley cam (14F). The column-pusher lever (5F) is shown in section, with the spring box (8F) in place against it, for moving the pusher to the right to place a line on the galley. Shows also the spring (7F) for restoring the pusher to its position of rest at the left of its stroke.

revolutions of the machine, during which time other letters are being cast. The shortest properly-justified line which can be set upon the machine must contain at least six type bodies.

Adjustments: TIMING GALLEY-ACTION DRIVING PAWL. —If the hand-wheel shaft (acting as an intermediate gear for cam shafts) be removed, in replacing see that the figuring on the worm (80E6) corresponds with the figuring on gear wheel (15F3, Fig. 60). To test, when properly coupled up (see chapter on cams), put a justification-wedge lifting rod into the notch in die-centring lever, and turn machine slowly till the galley-trip lever (45F) has released the pawl (14F1). The machine should then make a complete revolution before the cam starts to revolve. This gives the last letter of a line time to

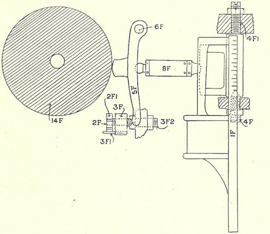


FIG. 65.

Plan view of column pusher and operating mechanism. Shows the method of adjusting the pusher for different points, by regulating the pusher adjusting screw (2F).

get into the type channel, and the pusher time to recede, before the line hook goes forward. If the ratchet on the vertical shaft engages the pawl too soon, the last letter will be left behind. The worm gear (15F3) will then want moving one tooth to the right or left. Fig. 61 shows the position on the ratchet that the pawl (14F1) should fall when tripped by the rod (8D).

As the galley-action cam carries a long sleeve (14F8, Fig. 60), through which the vertical shaft (15F) runs, do not forget to occasionally lubricate through the hole in centre of the shaft top end, also through the hole in cam near the ratchet teeth, as this is often overlooked.

Adjust the trip lever by the end screw (45F1, Fig. 61) so that it leaves the pawl (14F1) about $\frac{1}{4}''$ when one wedge-lifting rod has been engaged by die-centring lever and the lever raised to top position. Adjust the stop screw (45F9) so that the other screw (45F1), when the galley cam is revolving, just clears end of trip rod (8D), and the end of pawl (14F1) seats fully into trip-lever hook without scraping side of lever.

TRAVERSE OF LINE TO GALLEY MOUTH.—Adjust the screw (22F1, Fig. 62) at end of galley frame so that the line hook (19F) brings the end letter in a line level with fixed galley wall. Then see that the connecting rod (27F7) gives about $\frac{1}{8}''$ compression in spring box at end of both forward and back stroke. To do this, bring the nut (27F8) lightly against the end abutment (27F5), when the galley cam is at the end of its revolution, and

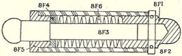


FIG. 66.

Section through column-pusher spring box.

obtain the desired compression at end of stroke by adjusting the rod (27F7) on the eye connection.

COLUMN PUSHER.—Adjust the column pusher (1F, Fig. 64) sdeways, by the screw (4F1) centres upon which it pivots, so that it moves freely, has no side shake, and enters the galley mouth with a clearance from the fixed galley wall equal to the thickness of a piece of spool paper.

The column-pusher spring box (8F, Fig. 65) should be adjusted, by the adjustable ball end, so that the line is pushed into the galley mouth 1-64″ beyond the galley gate.

COLUMN-PUSHER ADJUSTING SCREW.—Next turn the column-pusher adjusting screw (2F1, Fig. 65) to the figure 12, then put a pica em quad in type channel, and set the column pusher, by means of the adjusting screw (3F2), so that the pica line can be drawn along without fouling the column pusher. All other founts will then work correctly.

GALLEY GATE.—The galley gate or rule should be so set that it clears the column pusher 1-64″ just before the column pusher recedes. This is obtained from the nut (39F4, Fig. 63) on the lifting rod of gate. This gate should drop freely; if not, clean the guide rod (39F3) and see that the short guide pin at other end is not bent.

BURR TRIMMER.—To set the trimmer on the moving wall of type channel, put a quad partly in channel (not against the nick ridge) and bring knife lightly up to quad and screw up. As the head of the trimmer screw is out of proportion to the screw itself, do not put too much pressure on with the screwdriver, or it will break the screw head off.

REMOVING LINE HOOK.—To remove line hook, disconnect lever (25F, Fig. 62) from rod (27F7), and remove the screw (28F), which is held by nut at bottom. Now take off the stop piece (22F) at end of galley casting, and remove the slide piece (23F). The line hook can now be easily withdrawn through arch in column pusher without straining it.

REPLACING LINE HOOK MECHANISM.—In replacing the line-hook mechanism (Fig. 62), first insert the slide (20F), taking care not to lose the two spring plungers. Then insert the narrow rod (21F). In placing this, the end carrying the projection goes in first, and the projection points to the back of machine. There is also a spring plunger on the top of this rod. Should the line hook (19F) have been removed, this must next be inserted, the projection on it being placed in the slot on the bottom of the rod (21F). The end slide (23F) may now be placed on, and coupled up to the lever (25F). Then place on the end stop piece (22F).

TYPE-CHANNEL SPRINGS.—These should be examined from time to time to see that the shank of the spring does not protrude at any part of its length above the level of the channel block. If such a condition exists, as the type accumulates it will cause the hook to recede and become inoperative, and allow the type to turn. The hook itself should always come well forward of the face of channel block.

CHANGING FOUNTS.

Turn the machine to the most useful position for changing, which will be at 360°, or when the pin jaws have just commenced to open. In this position the die case may be removed, the normal wedge changed, and the mould cross-block connecting link removed.

The mould-blade coarse adjusting screw is also easily accessible in this position.

First remove the centring-lever connecting pin and withdraw fibre plate. Unhook the die case from the slide connected to the draw rod on C pin block, and bring the die case to the centre of its carrying frame. Now withdraw, slightly depressing the bridge lever to prevent the centring pin dragging on the top of the die case. Turn off the water supply, remove the bridge, and then the mould. When replacing new mould, very slightly oil the mould base and slide it up to its position. Very lightly screw the clamps up to put the mould properly against the pin blocks, and then screw the mould to base. See that the jet piece in cross block is clean and working freely and then connect the cross block to carrier. Replace the bridge and insert die case in exactly the reverse manner of taking it off. Now change the normal wedge and adjust the movable type-channel wall to suit the body of type to be cast, also the column pusher. Bring the quad to correct size, and then align up ; alter galley measure. This latter alteration should be carried out whilst the machine is running and type being cast.

Upon taking off the mould, blow out all water and put the mould away clean, with the base slightly oiled to prevent rusting. In replacing new mould and bridge, see that all the surfaces of contact are scrupulously clean. Examine the cross block to see that the jet piece is clean and working freely, and, in replacing, take care the jet piece does not fall out. Oil the link connecting the cross block to carrier. In replacing the bridge be sure not to knock the centring pin on the mould, or the latter may become seriously damaged if the blade or blade walls be struck. Always insert the lubricators into the mould before placing the mould on machine. Never bend the transfer wedge cover to insert the lubricator, as in time it will break by such treatment. Regulate the water before it enters the mould, and not as it leaves it. This is done by the large water tap on the machine. Do not let the water exhaust be throttled, or the water may work into parts of the mould where it should not be.

CENTRING, SIZING, AND ALIGNING.

Upon changing a fount, after having made the alterations described above, it remains to "centre" the letters upon their bodies. This is effected by first making the quad exact to size, according to the "set."

After this the "star" matrix should be adjusted so that it comes exactly in the centre, which is obtained by manipulating the screws in bridge working upon the centring-pin post. A few capital "M's" or "H's" should then be cast, and these should be compared with those already in use to see that their alignment is exactly the same. If not, make them both similar, otherwise any corrections made from the old type will be out of alignment. The importance of this cannot be too strongly impressed upon attendants. In the case of a machine being installed no type should be cast for the case until the correctness of the alignment has been thoroughly proved, as all future founts must be made up to that standard. It must not overhang either top or bottom in the slightest degree. Although the "star" matrix is the recognised one from which to obtain the alignment, and has been made for that purpose, an alternative method is to first make the quad exactly to size, and then cast some dashes ("—"). First centre these setwise so that they do not overhang either side, and then centre them bodywise so that, if three types be laid on a flat surface, with the centre one having the nick reversed, the dashes will present a straight and unbroken line. By this method one need never fear of having different alignments.

Never commence a job without seeing that the centring pin is entering the matrix correctly, both as to time and position. If the bridge setting be correct, as described in the article on that subject, the timing need not be considered, but it is imperative that the pin be tested for entering centrally each time a new die case is inserted. This is probably the most important point in connection with the alignment of the output. Should the pin enter the cone slightly to one side, it will wear the cone on that side where it strikes, and in time the alignment will be affected. It should be examined before commencing work after each meal, and the clamp screws on the die-case draw rods should be tested to see that they have not become loose.

Do not let the matrices bang on the mould, but let the guide-post bushes take the force of the descent. The matrix wires should never be pressing on the bottom of matrix holes, or the matrix face will become hammered, which will result in the letter heads pulling off.

Should the mould be over lubricated, wipe the matrices and mould top with a clean piece of rag, or metal will gradually adhere, causing the type to be cast with a burr. Keep the matrices clean, especially in the cone holes. Should dirt or metal accumulate in the cone holes, the centring pin will be unable to seat properly, and bad alignment will be the result. In storing matrices, keep the cone holes downwards to prevent dirt getting into them.

The mould blade must be drawn fully back before the centring pin is seated, or it will cause the matrices to wear out.

Each morning test the screws holding the matrix wire shoe in position, as it is possible they may work loose. Also test the screw in mould cross-block link.

Periodically examine the centring pin to see that it is not loose in its bearing. It must not have the slightest shake, although it must move up and down freely.

Follow the measurements for the type as formulated by the Monotype Corporation, and do not reduce or enlarge according to whims of those who may not understand the Monotype system. If a narrower or wider measure is desired, get the keyboard operator to deduct or add a few units. Should the type be small in measurement the quad lines will all be too long ; should the type be larger than the specified measurements, the quad lines will be too short. The explanation is that if the quad, for example, be left one-thousandth (.001″) too large, all the letters will each be that amount too large. A quad line may have, say, 40 pieces of type in the line, while the solid line may have 70. In the result such quad line would be .040″ too large, whilst the letter line would be .070″ too large, making the quad line .030″ relatively short. It will be understood how the reverse is the case when type is under size. Through not understanding this point, bad justification is very often obtained, as the difference in the length of such lines depends upon the difference of the number of types in each line.

JUSTIFICATION.

Provided the keyboard operator has done his work properly, bad justification is impossible if the following conditions exist. The wedges must not be damaged but kept clean, the type must be true to size, and the normal-wedge lock pin a proper fit in its guide. The transfer wedge rods must be drawn fully back before the mould blade is operated, and the nuts at the end of the transfer rods must not be loose. Also the 4-unit space must be correct. In addition to this, see that the justification wedges are being properly drawn to their correct positions. The slightest sticking of the mould blade will cause bad justification and indifferent type sizes.

THE PRODUCTION OF GOOD TYPE.

To be considered perfect, a type must possess the following attributes :—

1. It must be quite solid, have the corners sharp, a solid flat foot, the face sharp and well defined, and must be of the right consistency, *i.e.*, neither too soft nor too brittle.

2. It must be square in all directions, exact to size pointwise and setwise, and must be correct height, *i.e.*, from the foot to the face of the character.

Of first importance in governing the quality of the type produced is the adjustment of the pump connections; after that everything depends upon the attendant and the metal he is working with. The pump adjustments being correct, as given under the heading on the pump, it remains solely a question of metal, which must be influenced by some outside condition.

In the case of bad type, make sure of the following points: that a suitable quantity of metal enters the port; that the port is not choked with dross; also see that no dross exists in or on the plunger inlet holes, plunger bottom hole, hat-valve pin hole, hat-valve face and seating, pump-body hole or nozzle hole. The pump body should be cleaned every three or four weeks, and a drill run up the main channel till it can be seen at the other end. The nozzle should be drilled every week whether it appears to require it or not. If dross is allowed to accumulate till the hole is almost closed up, it will be very difficult to drill, as the dross is very hard.

The pump connections should all be free and kept well oiled. The piston should be a free fit in pump body, but should never be filed. No metal should exist on the top shoulder to prevent it coming to the top of its stroke. It should be removed during meal times and when not in use. Before replacing the piston, warm it, and see that it is clean. If the piston is hard to turn, and on being withdrawn from the pump-body is covered with dust, it is a sign of dirty metal, and it will be difficult to obtain good type.

The metal should be occasionally cleaned and run into small ingots. The dross on the top of the pot consists of antimony (being lighter than lead), oxidised metal and dirt. Do not throw it away *en bloc*, but remove the dirt and preserve the metal. In cases where a stereotyper is employed, he should be able to treat the metal properly, but where there is no stereotyper, the operator must exercise his own intelligence. A good plan is to heat the metal well and then put a little resin or pure Russian tallow on the top, stirring well. Then press the substance floating on the top well against the side of the pot, to squeeze the metal from the dirt. Remove the dirt with a perforated spoon, and scrape the side of the pot where the dirt was squeezed against. Afterwards puddle the metal well and skim again. If these skimmings are dirt only, when cold it will be possible to crumble them into dust. If they contain metal they will be quite solid. Be careful of any new nostrums for cleaning metal. If they contain acids or salts, the hat valve may become eaten away, and the small hole in it become very large. The main point is to keep the antimony well mixed with the lead. Being lighter, it has a tendency to rise and oxidise. Occasional puddling preserves the mixture, and gives the dirt in the metal an opportunity of rising to the top. The practice of dipping the piston in vaseline is rather overdone. It is impossible that the vaseline used can be absolutely pure; it must contain some mineral matter. After the oils in it have evaporated in the well arm and been carried to the types, there remains the mineral matters. These adhere to the bottom of the piston and to the pump body channel, in time causing the latter to become choked. It is far better to slightly wipe the piston with an oily rag or brush it with plumbago, taking care to shake off any surplus plumbago. In entering the piston skim away any dross above the pump body, so that the piston may enter clean metal and not take down dirt with it.

Regulate the metal passing through the port so that the type is solid, and too much metal does not remain in nozzle. In the latter event, stop-casting will be the result. For small type the piston should have a short, sharp stroke, but a little longer one for large type. Theoretically, the port must be wider open for large type than small, but in practice it is often found necessary to reduce the port opening for large type to prevent stop-casting. As it is impossible to see the metal entering beneath the piston the action must be based on theory, and the question of metal, therefore, gives the attendant scope for reflection and discretion.

Occasionally remove the port screw, clean it and oil it to prevent it becoming corroded in.

Never run the pot up without making sure that the nozzle end of pump body is upon its seat, or the nozzle will become damaged against the mould. The nozzle should be a perfect fit in mould bell to prevent splashing. The dross on the top of the metal near the nozzle should be kept away so as to allow the jet pieces from the mould to melt quickly. In the case of the nozzle splashing or the jets not being melted, they may accumulate so that it is impossible to eject any more, and the cross block will become wedged. In this event do not force the machine round, but run the pot down and clear away all the jet pieces from the opening through which they fall.

The height of the type depends upon the height of the mould blade and the depth of the matrix. These are fixed quantities, and will only alter through wear, which should be very small if proper care and attention is given to the adjustment of the matrix case.

The standard height for type from the foot of the type to the face of the character is .918.

Further information in connection with the question of good type will be found in the article dealing with the pump adjustments.

CARE OF MATRICES.

Properly treated these will last a very long time, and the unavoidable wear is of the minutest character

Of first importance in securing the long life of a set of matrices is to take care that the lengths of the matrix-case governing rods are adjusted so that the matrix case is brought exactly into position for the engaging of the centring pin in a particular matrix, and further that the timing of the centring pin for seating in the matrix is correct—in short, particular attention must be paid to the setting of the bridge adjustments and all connected with the movement of the matrix case. Having done this, the parts concerned should be examined each day in case any of them tend to loosen, as any slackness is sure to give bad results.

When putting the matrix case into position, make sure that the bridge arm is in the "up" position, and the fibre stop plate out of the carrying frame, and depress the top lever arm, taking care that the matrices are not drawn across the end of the centring pin.

Carefully test the correctness of the adjustments of the matrix case before letting the machine make one single revolution by power, trying matrices at opposite ends of the matrix case. When doing this in the 5-unit position it is necessary to place a piece of paper on the paper tower perforated with a 5-unit combination. This blows up the 5-unit pin, and so prevents the matrix case from going back to its normal—the quad—position. Turn the machine slowly and watch very closely that the centring pin is exactly central when it enters the matrix in each position.

Most careful attention should be paid by the operator to the matrix-tong jaws and pin-tong jaws which should always meet, and the draw rods which should always be central with cone holes, or a set of matrices can be rendered useless for good work after a very short run.

It is evident that to enable the centring pin to do its work properly it must be seated in the matrix *before* the matrix is depressed sufficiently to touch the mould. If otherwise, not only bad work but damage to both mould and matrices is the inevitable result. Undue pressure on the mould bruises the faces of the matrices in time, and causes the heads of the types to pull off, resulting in " splashes."

The matrices should be thoroughly brushed before being inserted in the machine, and cleansed every morning when in continual use, otherwise the grit which may accumulate between and in them will cause excessive wear, making them slack in the case. Carefully examine the cone holes to see that no metal or other foreign matter is deposited there—the slightest speck will affect the alignment.

The best method of cleansing them is to wash them in benzine—taking care that the benzine is perfectly clean—and then blow out from the cone holes and faces the loosened dirt by means of compressed air (which can be obtained by detaching the air pipe from one of the keyboards) and the careful use of a soft brush to remove the small particles.

Oil should be kept from the faces as much as possible while the machine is running, as it causes burrs on the type.

If by chance a character pulls off in the matrix, care should be taken in melting it out not to injure the matrix, which should be held in a pair of tweezers, cone hole upwards, and after dipping in oil the lower end should be smartly dipped into the metal pot, about 1–16″ deep, and as quickly withdrawn, seeing that it never goes in sufficiently far to let metal into the cone hole. This operation should be repeated quickly until the offending metal drops out.

On no account should the matrix be hit against anything hard, as this must cause injury.

Should a matrix become damaged in any manner likely to impair its truth it should be at once discarded and replaced.

When not in use the matrices should be carefully wrapped in a clean rag so that no dust or dirt may settle on them, and they should always be placed face upwards to protect the cone holes.

Don't grow careless in handling a set of matrices as soon as the sheen of newness has worn off; remember that they have more bearing on the appearance of the final product than any part of the machine, not excepting the mould.

With regard to the matrix case, before inserting in the machine—

(*a*) Try the matrix-case screws to see they are tight, and re-examine them from time to time.

(*b*) Make sure there are no burrs on the side of the matrix case.

(*c*) See that it enters the bridge quite easily.

When the bridge has been off, wipe the centring pin before replacing in position.

When oiling the centring pin and bushings on the bridge which must be done when the bridge is off the machine, care must be taken that the oil does not overflow and run into the cone holes of the matrices, or bad faces and indifferent alignment will be the result.

SYSTEM OF LOCATING DERANGEMENTS.

As before mentioned, a derangement should be traced to its source. For instance, should an attendant be getting wrong characters, he must consider all the conditions likely to cause such an occurrence. First make sure that the keyboard operator has performed his work properly, *i.e.*, that he has perforated correctly, and that his paper has not been fed on the twist. Being satisfied on this point, place the paper on the crossgirt, as in working position, with the pawl-ring lug against the stop screw (1G20, Fig. 48), and see that the holes in crossgirt are fully uncovered and not partly blinded. If blinded, see if the paper letter perforations are in correct line with the side-guide perforations. These conditions being correct, depress the air bar and see that the air pins ascend and descend quickly. See that the pin jaws (in the case of the first pin failing) do not commence closing before the pin has blown up, and also ascertain if all the pins have dropped fully down. Next examine the jaws to see that they close correctly and are not hanging up, either in their spring box or through any nuts having become loose. Also see that the matrix draw rods have not become loose. By such a system of search all derangements can quickly be located.

THE FOLLOWING HINTS WILL BE FOUND USEFUL WHEN TROUBLES ARISE.

Reasons for escape of metal between the face of matrix and top of mould :—

- Metal too hot or insufficient water running through the mould.
- Allowing metal or oil to adhere to the faces of matrices.
- General accumulation of dirt on top of mould.
- The bridge or centring pin set incorrectly, or centring pin set too tight in bushing.
- Matrix-case rods loose and centring pin not centring true in matrices.
- The carrying-frame raising spring (4A12) failing to lift carrying frame.
- Surface of mould and face of matrices not true with each other.
- Should the piston spring rod (20H1) be allowed to seize in the piston-lever operating-rod cross-head (19H3), the pressure of metal will overcome the springs on centring pin (5A3) and spring on carrying-frame guide-rod cross-beam stud (4A11).

If any metal should fix itself to the matrices, great care must be taken that in removing it the faces of the matrices are not damaged by screwdriver, etc. To avert this, when it is absolutely necessary to use a screwdriver, place a thin brass rule closely under the screwdriver to protect the matrices from damage. It is preferable, where possible, to use a sharp knife rather than a screwdriver or other heavy implement.

If trouble should arise from the heads of characters pulling off it may be attributed to one of the following reasons :—

- Bad metal. Bad bodies. Metal too hot.
- The matrix case not being free in sliding frame or being tight on the cross-slide plate (bearing for matrix case) (C5), or the screws of the cross slide plate being loose.
- The matrix case fouling the piston guide on pump body (if new pump has been placed in machine).
- Incorrect setting of bridge and centring pin with relation to matrix-tong jaws.
- The piston not working freely and not being a good fit, or the nozzle and pump body not being perfectly cleaned.
- The characters being " off set," or there being a slight rising of mould blade.

Incorrect setting of matrix case rods, *i.e.*, not centring correctly in matrices or binding between matrix jaws.

The type carrier not working freely in its position when the screws holding the shoes are tightened, or the coupling up piece for cross block being too tight.

THE MOULD.

Figures I. and II. are perspective views of the top of the mould, with the cross slide removed, from the front and back respectively. Figure III. is a perspective view of the cross slide with the jet blade attached. Figure IV. is a longitudinal section of the mould. Figure V. is a cross section of the mould. Figure VI. shows the blade, side blocks and adjacent parts dis-assembled, but in their relative positions.

The mould parts are numbered as follows :—

1. Base.
2. Gib.
3. Cam.
4. Cross block.
5. Angle gate block.
6. Fixed gate block.
7. Jet blade.
8. Back plate.
9. Back plate plug.
10. Back plate spring.
11. Connecting piece.
12. Screw block.
13. Screw side block.
14. Spring block.
15. Spring side block.
16. Cover spring.
17. Cover spring.
18. Blade.
19. Distance piece.
20. Shoe.
21. Nick pin.
22. Blade spring.
23. Blade spring adjusting screw.
24. Blade spring check nut.
25. Blade spring set screw.
26. Spring.
27. Spring adjusting screw.
28. Spring check nut.
29. Intermediate plate.
30. Taper eccentric dowel.
31. Dowel set screws.
32. Blade stop.
33. Cross slide lubricator.
34. Aligning screws.
35. Alignment set screw.
36. Gib screw.
37. Screw block screws.
38. Spring block screws.
39. Blade stop screws.
40. Blade stop screws.
41. Cover screws.
42. Blade stop screws.
43. Gate block adjusting screw.

PLACING MOULD ON CASTING MACHINE.

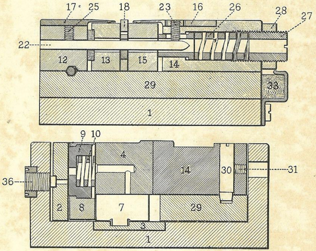
1. Withdraw the cross slide and wipe the mould thoroughly with a clean cloth, fill the oil hole at the back of the cross slide and the spring screw, No. 27, with warm oil. Oil the cross slide and replace. Note carefully when doing so that the jet blade, No. 7, is in position, and that it does not project below the bottom surface of the gate blocks.

2. Attach the two oil tubes and fill with warm oil.

3. Clean the bed and side walls of the mould seat on the casting machine, and, after oiling the bed, slide the mould into position and tighten the clamps and screws.

4. The connecting piece for connecting the cross slide with the type carrier must fit into place easily, and will do so providing the parts are all clean. This piece must be frequently and thoroughly oiled.

In starting the mould at the beginning of a run the cross slide should be uncoupled from the carrier and



Figs. IV. and V.
Longitudinal and Cross Sections of Mould.

withdrawn until the oil hole at the back is uncovered. This hole should be filled with warm oil, and the oil cup which feeds this oil hole should be filled. The oil cup which feeds through the spring screw should be half filled. A few drops of oil should be added to this cup from time to time as required.

The felt in the cross slide lubricator should be thoroughly saturated with oil.

If the blade is loose type will be cast large at the bottom setwise. This can be remedied by adjusting the blade-spring screw, 23. First release the check nut, then adjust the screw and again tighten the check nut. The blade should be quite free, but without shake.

If the metal is allowed to become too hot, or not enough water is run through the mould, or the cross slide

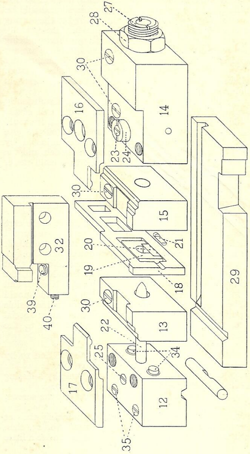


FIG. VI.
Mould dis-assembled with parts in position.

is insufficiently lubricated, the hot type metal has a tendency to adhere to the intermediate plate and gate blocks. If this metal is allowed to accumulate the gate blocks will be forced away from the intermediate plate, and the type will be cast big at the bottom setwise, and if much metal is allowed to accumulate fins will be cast at the edges. To remedy this the cross slide should be removed, and the metal which has adhered to the bearing surfaces of gate blocks and intermediate plate carefully scraped off with a sharp penknife, great care being observed that the edges of the blocks and blade are not damaged. On no account use any grinding material for this operation, nor must the gib screws, 36, be adjusted. Failure to observe this caution will probably result in ruining the mould.

See to it that the mould is at all times sufficiently lubricated; the block of felt on the outer end of the mould should be kept saturated with oil, and it should also be seen that it projects far enough to oil the gate block. If it becomes worn, it can be adjusted by inserting a piece of cardboard between the felt and the holder. Do not allow the metal pot to remain under the mould when not running.

TAKING THE MOULD APART FOR CLEANING.

CAUTION.—In taking the mould apart great care should be observed that only those screws are turned which are specified in the following instructions. If the screws 36, the slotted taper dowel pins No. 30, their set screws No. 31, the aligning screws No. 34, their set screws No. 35, the screw block screws No. 37, the spring block screws No. 38, or the screws, Nos. 39 and 40, in the blade stop, are turned in the least, the mould will be thrown out of adjustment, and, it being impossible to put it into working order without the aid of special tools, the mould must therefore be returned to the makers.

1. Remove the cross slide and gib.
2. Take off the two cover springs, Nos. 16 and 17, by removing the four cover screws, No. 41.
3. Remove all pressure from the spring, by releasing the check nut, No. 28, and the screw, No. 27.
4. Remove the blade stop by taking out the screws, No. 42.
5. Release the blade spring by loosening the set screw, No. 25, and the adjusting screw, No. 23, then push the spring out, by inserting a piece of wire a little

smaller than the spring, through the spring screw, No. 27.

6. Remove the blade by pulling it straight out from the back. The importance of handling this piece with the utmost care cannot be too strongly impressed upon the operator. This, as well as the other mould parts, is made as hard as glass, and the sharp edges are as easily nicked.

7. Insert two or three thicknesses of paper in the place of the blade, between the two blocks. Press the spring side block carefully towards the screw side block, using no greater force than necessary. Lift the block out of the mould. As the nick pin is loose in this block, care must be taken that it is not lost or broken. Lift out the screw side block.

This is as far as the mould need be taken apart for cleaning.

8. Wash all parts with naphtha using a jeweller's brush and wipe with a clean cloth. Particles of metal that cannot be wiped off remove with a sharp penknife. Place upon a clean piece of paper for assembling.

ASSEMBLING THE MOULD.

1. Place the screw side block into position. Note that the felt washer clears the aligning screw, 34. Great care should be observed in replacing the side blocks, for if either the taper pins or the slots in which they fit are in the least nicked or distorted the mould will be out of adjustment, and must be returned to the makers.

2. Replace the blade. Place the shoe, No. 20, which fits within the blade, with the oil grooves down. The distance piece, No. 19, with its narrow end towards the nick pin groove. Care must be taken to see that it is pressed down on the shoe, otherwise the oil will not feed through the mould.

3. Replace the spring side block, first inserting the nick pin, which has previously been carefully cleaned of all adhering metal, a little lower in the slot than its normal position, so that it shall enter the nick of the blade as the block is seated.

4. Screw the spring adjusting screw, No. 27, until it touches the spring. Then push the blade forward to its furthermost point, which, if the distance piece has been inserted correctly, will be about $\frac{1}{8}''$ in advance of the side blocks. This is done to get the distance piece into position to receive the blade spring, No. 22.

5. Insert the blade spring until it is flush with the back of the mould ; set by tightening screw No. 25.

6. Replace the spring covers and observe that they are screwed down solidly.

7. Put tension on the spring by giving the spring screw, No. 27, two complete turns, then tighten the check nut.

8. Replace the blade stop.

9. Adjust the pressure on blade by the screw and check nut, No. 23 and 24. The blade should work freely but without shake.

10. Oil thoroughly and replace the cross slide.

If through the carelessness of the operator the machine is started with the jet blade not in the mould the cross slide will have to be taken apart to clean the metal away from the spring, No. 10, in the back plate. In re-assembling great care must be taken that the parts are perfectly clean. The only adjustment is the screw, No. 43, and this should be set so that the bottom of the jet blade does not shake nor project below the bottom surfaces of the gate blocks.

When the mould is taken off the casting machine the water should be blown out of the water holes, and the mould thoroughly oiled to prevent rust, and put into its correct box, and kept in a clean, dry place.

TABLE OF JUSTIFICATION FIGURES FOR STANDARD SPACES.

SET.	Constant.	Thin.	Middle.	Thick.
6	2.5	2.2	2.9	3.8
6¼	2.4	1.15	2.9	3.8
6½	2.3	1.14	2.8	3.8
6¾	2.2	1.13	2.7	3.8
7	2.1	1.12	2.7	3.8
7¼	2.1	1.11	2.6	3.8
7½	1.15	1.10	2.6	3.8
7¾	1.14	1.9	2.5	3.8
8	1.13	1.9	2.5	3.8
8¼	1.13	1.8	2.4	3.8
8½	1.12	1.7	2.3	3.8
8¾	1.11	1.5	2.3	3.8
9	1.10	1.4	2.2	3.8
9¼	1.9	1.3	2.2	3.8
9½	1.9	1.3	2.1	3.8
9¾	1.8	1.2	1.15	3.8
10	1.7	1.1	1.15	3.8
10¼	1.6	1.1	1.14	3.8
10½	1.6	—	1.14	3.8
10¾	1.5	—	1.13	3.8
11	1.4	—	1.13	3.8
11¼	1.3	—	1.12	3.8
11½	1.3	—	1.11	3.8
11¾	1.2	—	1.11	3.8
12	1.1	—	1.10	3.8

These figures show the Justification (red) Keys which must be used for the perforation of paper from which to cast these spaces.

The above produces spaces equal to three, four and five to the em quad of the set being cast. The "en" space is produced from the ordinary "en" space perforation.

TABLE OF TYPE SIZES.

SET	Unit	4	5	6	7	8	9	10	11	12	13	14	15	18	SET
5½	.004244	.0170	.0212	.0255	.0297	.0340	.0382	.0424	.0467	.0509	.0552	.0594	.0637	.0764	5½
5¾	.004437	.0177	.0222	.0266	.0311	.0355	.0399	.0444	.0488	.0532	.0577	.0621	.0666	.0799	5¾
6	.004630	.0185	.0232	.0278	.0324	.0370	.0417	.0463	.0509	.0556	.0602	.0648	.0695	.0833	6
6¼	.004823	.0193	.0241	.0289	.0338	.0386	.0434	.0482	.0531	.0579	.0627	.0675	.0723	.0868	6¼
6½	.005015	.0201	.0251	.0301	.0351	.0401	.0451	.0502	.0552	.0602	.0652	.0702	.0752	.0903	6½
6¾	.005208	.0208	.0260	.0312	.0365	.0417	.0469	.0521	.0573	.0625	.0677	.0729	.0781	.0937	6¾
7	.005401	.0216	.0270	.0324	.0378	.0432	.0486	.0540	.0594	.0648	.0702	.0756	.0810	.0972	7
7¼	.005594	.0224	.0280	.0336	.0392	.0448	.0503	.0559	.0615	.0671	.0727	.0783	.0839	.1007	7¼
7½	.005787	.0231	.0289	.0347	.0405	.0463	.0521	.0579	.0637	.0694	.0752	.0810	.0868	.1042	7½
7¾	.005980	.0239	.0299	.0359	.0419	.0478	.0538	.0598	.0658	.0718	.0777	.0837	.0897	.1076	7¾
8	.006173	.0247	.0309	.0370	.0432	.0494	.0556	.0617	.0679	.0741	.0802	.0864	.0926	.1111	8
8¼	.006366	.0255	.0318	.0382	.0446	.0509	.0573	.0637	.0700	.0764	.0828	.0891	.0955	.1146	8¼
8½	.006559	.0262	.0328	.0394	.0459	.0525	.0590	.0656	.0721	.0787	.0853	.0918	.0984	.1181	8½
8¾	.006752	.0270	.0338	.0405	.0473	.0540	.0608	.0675	.0743	.0810	.0878	.0945	.1013	.1215	8¾
9	.006944	.0278	.0347	.0417	.0486	.0556	.0625	.0694	.0764	.0833	.0903	.0972	.1042	.1250	9
9¼	.007137	.0285	.0357	.0428	.0500	.0571	.0642	.0714	.0785	.0856	.0928	.0999	.1071	.1285	9¼
9½	.007330	.0293	.0367	.0440	.0513	.0586	.0660	.0733	.0806	.0880	.0953	.1026	.1100	.1319	9½
9¾	.007523	.0301	.0376	.0451	.0527	.0602	.0677	.0752	.0828	.0903	.0978	.1053	.1128	.1354	9¾
10	.007716	.0309	.0386	.0463	.0540	.0617	.0694	.0772	.0849	.0926	.1003	.1080	.1157	.1389	10
10¼	.007909	.0316	.0395	.0475	.0554	.0633	.0712	.0791	.0870	.0949	.1028	.1107	.1186	.1424	10¼
10½	.008102	.0324	.0405	.0486	.0567	.0648	.0729	.0810	.0891	.0972	.1053	.1134	.1215	.1458	10½
10¾	.008295	.0332	.0415	.0498	.0581	.0664	.0747	.0830	.0912	.0995	.1078	.1161	.1244	.1493	10¾
11	.008488	.0340	.0424	.0509	.0594	.0679	.0764	.0849	.0934	.1019	.1103	.1188	.1273	.1528	11
11¼	.008681	.0347	.0434	.0521	.0608	.0694	.0781	.0868	.0955	.1042	.1129	.1215	.1302	.1563	11¼
11½	.008873	.0354	.0443	.0532	.0621	.0709	.0798	.0887	.0976	.1064	.1153	.1242	.1331	.1597	11½
11¾	.009066	.0362	.0453	.0543	.0634	.0725	.0815	.0906	.0997	.1087	.1178	.1269	.1359	.1631	11¾
12	.009259	.0370	.0463	.0556	.0648	.0741	.0833	.0926	.1018	.1111	.1204	.1296	.1389	.1667	12

The unit is .0007716 in. This multiplied by any "set" number gives the unit of that set, and the answer obtained multiplied by 18 gives the quad (18 unit) size. Thus one unit of 10 set=.0007716 × 10=.007716, and this multiplied by 18=.1389.

PERFORATION TABLE.

5	•	,	■	,	l	i	’	!	:		;	.	,	l	i	17 (1)
6	I·	:	’	;	j	f	t	]	[	)	(	–	j	f		18 (2)
7	’	;	!	-	-	:	!	I	r	s	’	‘	r	t	s	19 (3)
8	Z·	J·	S·	ç	é	?	?	z	c	e	?	I	z	c	e	20 (4)
	9	7	5	3	1:	0:	o	a	.	9	7	5	3	1:	0:	21 (5)
9	8	6	4	2	*	J	S	g	–	£	8	6	4	2		22 (6)
	P·	T·	L·	F·	C·	x	q	v	b	p	y	d	g	a	o	23 (7)
10	Q·	B·	O·	E·	k	u	n	J	S	x	q	b	y	u	n	24 (8)
	V·	G·	R·	A·	fl	fi	h	C	fl	fi	k	v	p	h	d	25 (9)
11	Y·	X·	U·	K·	N·	H·	D·	ff	P	F	L	T	Z	C	ff	26 (10)
12	M·	Z	Q	V	Y	B	G	N	O	E	æ	P	L	F	T	27 (11)
13	X	U	R	D	A	w	&	Q	V	B	G	O	E	A	w	28 (12)
14	Œ·	Æ·	W·	œ	æ	&	K	H	£	œ	Y	U	R	N	D	29 (13)
15				ffl	ffi	M	m	℔	ffl	ffi	X	K	M	H	m	30 (14)
18	✦	a/c	%	℔	@	...	Œ	Æ	W	Œ	Æ	..	—	W		31 (15) .0005
	16 (1)	15 (2)	14 (3)	12 (4)	11 (5)	9 (6)	8 (7)	7 (8)	6 (9)	5 (10)	4 (11)	3 (12)	2 (13)	1 (14)	(15)	

13 .0075   10 Space Transfer

By means of the figures at the bottom and right of the above table any letter may be obtained from the holes in paper tower. Thus, the "star" will be number 16 hole, and "J" numbers 7 and 24. Number 10 hole leads to the justification rod, operating the transfer wedge rods, and in conjunction with number 18 produces the variable space. Numbers 13 and 31 lead to the rods operating the coarse (·0075 in.) and fine (·0005 in.) justification wedges respectively. The holes on paper tower read from left to right. The small figures on right-hand side indicate the number of pin that will be in operation on unit pin-block, and those on the bottom the number of pin on "position" pin-block.

COMPRESSOR.

The air compressor should be regularly cleaned and the lubrication attended to daily. The lubricators should be so adjusted that the oil neither runs away so quickly as to over lubricate nor so slowly as to render the pistons liable to seize. The minimum speed should be such as to ensure a slight escape of air at the exhaust valve on air tank when the full plant of keyboards and casters are all working. Periodically it should be tested to see that the crank is not loose in its bearing, and if any difficulty is experienced in getting the full pressure, when starting, the valves should be cleaned, as dirt between the valves and their seatings allows the air to return to the cylinders as the pistons recede. These may be examined by removing the end nut with the square key provided.

AIR TANK.

This requires daily attention. See that no water is allowed to accumulate in the tank, but blow it off two or three times per day by the cock provided. Note frequently through the day that the water in the outside tank is not warm; if so, allow more cold water to circulate through. Carelessness on this point may do much damage to the keyboards, as, unless the moisture is extracted from the air by being condensed in the tank-tubing (and thence blown out), it will be precipitated in the cold interior of the keyboards, and the resultant rust will not only clog the movement of the parts rusted but the dry rust flaking will be blown through the air channels to such an extent that the keyboard will sooner or later become unworkable. The pressure should be maintained at 14 lbs. or 15 lbs., and the exhaust valve and its seating occasionally cleaned to prevent the valve sticking down. The pipes leading from the air tank to the keyboards should not be too small, or the speed of the air in passing through them will be impeded. For three keyboards a pipe of $\frac{3}{4}''$ inside diameter will be sufficient; for more than three keyboards 1″ inside diameter is recommended.

An air tank very close to the compressor will require a greater circulation of water than when the two are further apart.

LIST OF ILLUSTRATIONS.

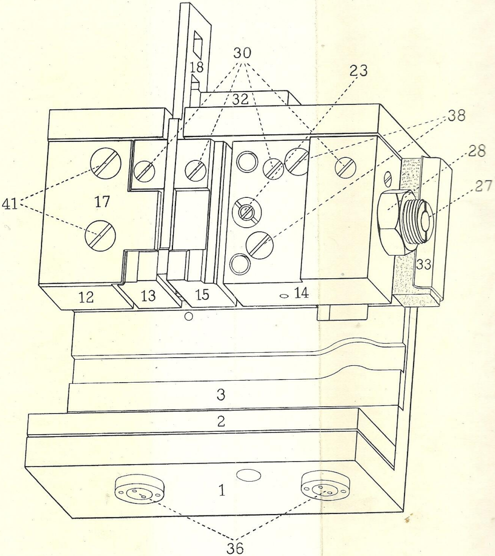


FIG. 1.

Perspective View of Top of Mould from Front.

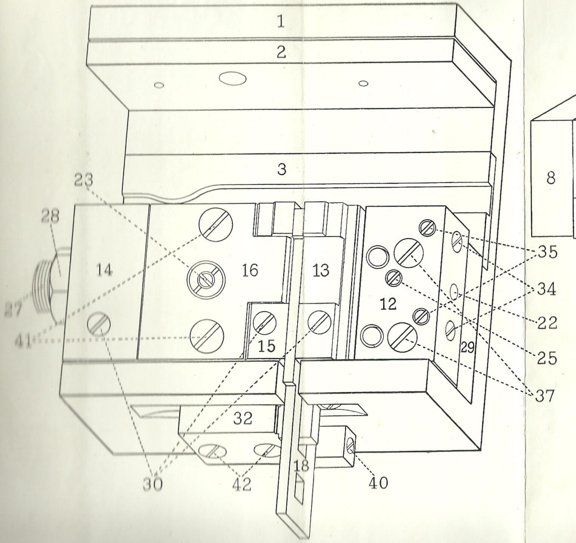


FIG. 2.

Perspective View of Top of Mould from Back.

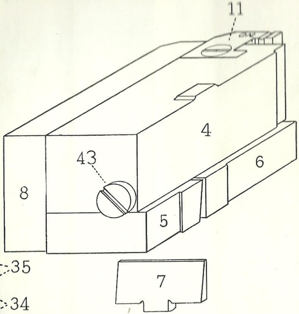


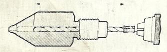
FIG. 3.

Cross Slide.

NOZZLES AND DRILLS

A few years ago we printed *(in Technical Bulletin No. 51)* a table of pump-nozzle cleaning-drill data which we understand has proved useful over the years. We have now brought this table up to date and present it on this page. May we now repeat the cautionary note, given in *Bulletin No. 51*, for the benefit of younger readers and older ones who may not have saved that number?

When cleaning nozzles having two-stage bores, the drill for the lower, larger-diameter hole, if allowed to penetrate too far, will break through the tip of the nozzle. Therefore always be sure that the measurement between the tip of the drill and the depth stop is exactly that given in the right-hand column of the table.



Pump nozzles and drill data

Nozzle no.	*Comp. caster symbol*	*Super caster symbol*	*Lower hole drill dia. ins.*	*Upper hole drill dia. ins.*	*Lower hole length ins.*	*Lower hole length mm*
1	14H	12SH	.120	.062	$2\frac{3}{16}$	55.56
2	a14H2	12SH1	.120	.120	—	—
3	—	12SH6	.152	.062	$2\frac{5}{64}$	52.78
4	—	12SH2	.213	.213	—	—
5	—	12SH3	.302	.213	$2\frac{1}{8}$	53.97
6	—	12SH4	.120	.120	—	—
7	—	12SH7	.120	.120	—	—
8	—	12SH5	.120	.120	—	—
9	14H7	12SH14	.120	.029	$2\frac{5}{16}$	58.74
10	—	12SH11	.180	.062	$2\frac{17}{64}$	57.55
11	—	12SH13	.152	.082	$2\frac{5}{64}$	52.78
12	b14H	b12SH	.120	.062	$2\frac{3}{16}$	55.56
13	c14H2	a12SH1	.120	.120	—	—
14	a14H4	—	.120	.062	$2\frac{5}{64}$	52.78
15	14H32	—	.120	.062	—	—
16	c14H	c12SH	.093	.062	$2\frac{3}{16}$	55.56
17	d14H	d12SH	.093	.062	$2\frac{3}{16}$	55.56
23	a14H7	a12SH14	.120	.029	$2\frac{5}{16}$	58.74

Symbols for ordering drills

Dia. ins.	*Dia. mm*	*Comp. caster*	*Super caster*
.029	.73	4CT6	16ST8
.062	1.75	4CT3	16ST1
.082	2.08	—	16ST9
.093	2.36	a4CT2	16ST11
.120	3.05	b4CT2	16ST10
.152	3.86	—	16ST5
.180	4.75	—	16ST6
.213	5.40	—	16ST4
.302	7.67	—	16ST7