CHAPTER 27

The One-Turn Magazine Shift Mechanism

A feature of Blue Streak Linotypes is the method of raising and lowering the magazines. Four powerful clock-form springs, actively countering-balancing the magazine load, supply the energy in elevating. The magazine load itself, in turn, counterbalances the unwinding pressure of the springs and thus provides for lowering.

The principle employed might be illustrated by a balance scale. It takes very little effort to swing it one way or the other if there is a state of balance at any given weight.

On the Linotype, perfect balance cannot be achieved at all times because of the variations in the magazine load. However, in adjusting the spring tension to counterbalance the heaviest magazine load, it is found that lightening of that load does not materially increase the manual effort in lowering. The reason for this is found in the properly proportioned worm and gear mechanism plus strategically positioned ball and roller bearings. If the magazine load is altered considerably through changes in matrices or magazines, then there is provision for adjusting spring tension, by unwinding the spring drum housings, to balance this generally lighter magazine load.

Operation is by means of the familiarly located crank handle. But, in the one-turn shift, in addition to a new ease of operation, there is a new speed of action. One turn of the handle is all that is required to bring another magazine into operating position.

As to safeties, the automatic matrix guard lever not only exercises its usual functions of checking for interference by means of matrix guard and distributor screw guard and operates the magazine frame banking blocks. It also operates a pawl which engages one of four ratchet teeth at the rear of the main elevating member to automatically lock each magazine frame when it reaches operating position. This universal magazine frame locating linkage insures the proper locating of the magazines in the delivery position regardless of weight variations in the magazine load. Thus the springs represent a controlled force. They are permitted to assume the effort of magazine shifts and yet are provided with adequate safeguards which leave the control in the hand of the operator.

The one-turn shift has also been adapted to auxiliary magazines where the one crank handle performs the double duty of operating the shifting mechanism for either main or auxiliary magazines. The action of the handle is transmitted either to the main or auxiliary sides by simply moving a shift indicator lever, conveniently located above the crank handle, to either the position marked MAIN or AUX. This lever not only transmits the motion of the crank handle, through an idler gear, from the main clutch to the auxiliary clutch, and vice versa, but also performs the same safety functions as the automatic matrix guard lever on machines equipped with only main magazines. As with the main magazine machines, this lever, having performed its functions, is released to return automatically to normal position as soon as the crank handle swings into action.
The auxiliary elevating mechanism differs from the main in these respects: the counterbalance spring is located at the side instead of at the rear; the worm and gear mechanism of the main side becomes a rack and pinion design sufficient for the lighter load of the auxiliary side.

FIG. 1-27. Perspective view of one-turn shift mechanism assembly on Blue Streak Model 8, 14, 29, 30, 31, and 32 Linotypes as viewed from the rear of the machine.

ELEVATING MECHANISM FOR MAIN MAGAZINES

Referring to Figs. 2, 3, 5, 6 and 7-27, this mechanism consists of an improved crank handle 1, journaled in a crank shaft housing 2, with a universal jointed shaft 3, leading to a worm shaft 4. One complete turn of the crank handle will turn the worm 5 through one revolution, which will rotate the worm wheel 6 through an arc of approximately one-third revolution.

A rectangular elevating slide 7 is supported on rollers 8 in a housing 9. This housing is adjustably fastened to the distributor bracket as shown at 10. The upper end of the slide is suitably flanged as at 11, to support and convey the lower magazine frame from one position to another.

The central portion of the rear surface of the slide carries a rack 12 in mesh with a toothed sector 13 which is keyed to the worm wheel shaft 14 which shaft is rotatably mounted in side bearings 15, see Fig. 5-27. At each side of the housing and concentric with the worm wheel shaft are located spring drum housings, left and right 16. The annular flanges of the drum housing 16 are on the outside provided with radially spaced holes 17, utilized for winding the proper spring tension and one of which is engaged by the upward projecting drum arresting plungers 18, Figs. 5 and 6-27, for maintaining position. Each spring housing carries two clock-form springs 19, adjustably mounted for tension control, with one end locked to the worm wheel shaft 14, as at 20, and the other end fastened to the spring drum housings as at 21.
The worm wheel shaft 14 extends beyond each side of the inner bearings 15, into and through the spring drum housings and beyond the right-hand spring drum housing to the worm wheel 6.

One revolution of the crank handle turns the worm wheel 6 one-third revolution, also the toothed sector 13 which is so proportioned as to move the rack 12 and slide 7 the correct distance to bring a magazine to its operative position. The four springs are thereby either wound or unwound, according to direction of travel and serve to counterbalance the magazine load.

Ball and roller bearings are strategically positioned throughout, with adjustable counterbalance control to minimize the magazine lifting effort. The properly proportioned worm and gear mechanism, together with the above, provides an elevating system whereby a force of one pound applied to and moved through

FIG. 2-27. Phantom detail drawing of one-turn shift on Model 32 Linotype, showing main and auxiliary magazine mechanism.
one revolution of the crank handle will elevate a load of sixty pounds two and one-half inches, the distance between magazines.

In connection with the foregoing accomplishment, it became necessary to contend with certain variable factors which are inherent to practical conditions, due to some magazines being made of light material, such as Linolite, and others of heavier material such as brass, together with the different sizes and number of matrices which go to make up the various fonts.

The counterbalancing mechanism being properly adjusted to a load of heavy magazines with heavy matrices, does not have the same balancing effect on a load of light magazines with light matrices, and vice versa.

To overcome these variations and avoid separate counterbalance spring adjustment for the various conditions, there has been devised a universal magazine frame locating linkage which automatically locates each magazine frame and magazine, when it reaches operating position. The mechanism to do this consists of a bell crank lever 22 pinned to magazine locating block support lever shaft 23.

The lower end of a connecting link 24 is connected to one arm of the bell crank lever 22, and the upper end is adjustably attached to an arm 25 keyed to a rock shaft 26. A pawl 27, located on the rock shaft 26, extends downward and engages one of four ratchet teeth in the steel block 28, which is fastened to the elevating member 7.

It can be seen that when the pawl 27 is in engagement with a ratchet tooth of the steel block 28, it will be impossible for any over-balancing tension of the clock-form springs 19 to lift the magazine frames and magazines; and as the distance between the ratchet teeth of the steel block 28 is exactly the same as the distance between the magazines, the magazines are automatically located in operating position.

If, on the other hand, the magazine frames are heavily loaded, sufficient to slightly overcome the tension of the clock-form springs 19, the magazine frames will rest on the finished surfaces 29 when in delivery position, which are supported in the usual manner by the magazine locating blocks.

When the frames rest on the finished surfaces 29, they will be in the same practical mathematical relationship to operative position as they would be if any overbalance of the clock-form springs 19 should force the ratchet tooth of the steel block 28 upward against the pawl 27. The lower magazine frame and magazine are accurately located and the upper magazine frames are correctly positioned by spacing studs consisting of a stud body 30 fixed to the escapement bar of the lower magazine. A set screw 31 located by a lock nut 32 in the stud body 30 banks against a screw 33 fastened to the lower face of the magazine frame above.

To maintain a parallel position of magazines, the locating recess 34 of the side brackets 35 have been closely fitted to the magazine frame studs 36. Two set screws 37 in lugs 38 of the channel entrance bracket, maintain the position of the banking blocks 29.

The automatic matrix guard finger lever 39 when depressed will check for interference by means of matrix guard 40 and distributor screw guard 41, and if no obstruction at either point prevents the withdrawal of the magazine banking blocks 29, the change of magazines can take place. In case of an interference at these points and the accidental turning of the crank handle 1, the slip collar 53 would prevent damage.

The slip collar has two spring-pressed plungers 43 which are identical. One of these is shown in Fig. 7-27. They also provide means to shift the crank handle 1 to an upward position so as to secure clearance when the keyboard has to be swung out of position.
FIG. 3-27. Side view of elevation of main magazines on Model 32 Linotype. The lower views are of the automatic matrix guard finger lever and the elevating handle and shaft used on the Model 31 Linotype.
For accurate timing of the elevating and lowering device, a setting line 44 has been placed on the elevating slide 7. When the lower first tooth of the rack 12 just engages the gear sector 13, this marker 44 should be flush with the upper surface 45 of the housing 9. In this position, the crank handle 1 should be in a vertical downward position to be finally adjusted in relation to the line setting by adjustable union 46, which in construction is similar to the adjusting clutch 47 as illustrated in Fig. 9-27.

ELEVATING MECHANISM FOR AUXILIARY MAGAZINES

To conform to the easy and quick elevating mechanism explained in the foregoing description for the main magazines, there has also been designed an improved system for elevating the auxiliary magazines which is controlled from the operator's seat by the same crank handle 1 used for controlling the main magazines.

An automatic matrix guard lever link operating handle 48 is conveniently located above the crank handle 1. An indicator plate 49 serves to guide the selection of magazines which are to be moved, by the position of a pointer 50, on the operating handle 48. By moving the handle 48 slightly downward, the pointer 50
will register with the word MAIN on the indicator plate 49 which indicates that the main magazines will be moved upward or downward by turning the crank handle 1. If the handle 48 is moved slightly upward, the pointer 50 will register with the word AUX. on the indicator plate 49, indicating that the auxiliary magazines will be moved by turning the crank handle 1.

The operating handle 48 is connected on a shaft to a rocking arm 51, the left-hand end of which is linked to connections that operate the automatic matrix guard 40 at the delivery point of the main magazines and the distributor screw guard 41. The right-hand end of the rocking arm 51 is linked to connections which operate the automatic matrix guard 52 at the delivery point of the auxiliary magazines, and the distributor screw guard 41.

If the automatic matrix guards at the delivery points of the main or auxiliary magazines, or the distributor screw guards at the upper end, meet with any obstruction such as a matrix protruding from the magazine, or a matrix on the distributor bar, the operating handle 48 cannot be moved, and no action will result from turning the crank handle 1, other than slipping of the friction collar 53. If the automatic guards meet with no obstruction, the operating handle 48 is free to move in either direction.

When the operating handle 48 is moved slightly upward, the right-hand end of the rocking arm 51 moves downward, pulling the link 54 in the same direction. This action of the link 54 pulls the lever 55 downward, which in turn actuates the

FIG. 5-27. Section of counterbalancing springs, worm wheel and related mechanism of the one-turn shift.
connections 56, to operate the distributor screw guard 41, also the auxiliary magazine locating arms 57 (right- and left-hand), and the automatic auxiliary matrix guard 52.

During this downward movement of the right-hand end of the rocking arm 51 and shortly after the auxiliary magazine locating arms 57 have been moved out of the path of the locating studs 58, the shoulder stud 59 (Fig. 2-27) contacts with the bottom of a slot in the link 60, and pushes the link downward.

The lower end of the link 60 is connected to one end of a bell-crank 61 (Figs. 7 and 8-27), the other arm of which engages an annular groove 62 of a slidable member 63 of the auxiliary clutch 64. The downward movement of the link 60, through the bell-crank 61, moves the slidable clutch 63 into engagement with the auxiliary clutch 64, the latter being integral with a gear 65.

The gear 65 is connected through an idler gear 66 to the elevating handle gear 67, the movement of which is controlled by the crank handle 1, through the friction collar 53 and the shaft 68, which is formed on the elevating handle gear 67.

The slidable clutch 63 is made with an additional annular groove 69, which engages a roller 70, attached to the right-hand end of a horizontal shifter lever 71.

The left-hand end of the shifter lever 71 also carries a roll 72, which enters an annular groove 73 of the sliding member 74 of the main tooth clutch 75, keyed to the main magazine elevating shaft 76. The shifter lever 71 is fulcrumed on a stud 77, located midway between the main magazine elevating shaft 76 and the auxiliary magazine elevating shaft 78, consequently when the slidable member 63 is in mesh with the auxiliary clutch 64, the other slidable member 74, will be free of the elevating handle gear 67 and the motion of the crank handle 1 will be transmitted through the idler gear 66 to the auxiliary clutch 64, to the magazine elevating shaft 78.

The slot in the link 60 allows the shoulder stud 59, on the right-hand end of the rocking arm 51, to move upward and return the handle to its normal position.
while the slidable member 63 remains in engagement with the auxiliary clutch 64. The slidable member 63 will remain engaged with the auxiliary clutch 64 after the auxiliary magazines have been elevated or lowered, and will not become disengaged until the operating handle 48 is moved downward.

When the operating handle 48 is moved downward, preparatory to shifting the main magazine, the left-hand end of the rocking arm 51 moves upward, pushing the link 79 and the front end of the automatic matrix guard lever 80 in the same direction, actuating the matrix guard 40, the distributor screw guard 41, the magazine locating blocks 29 and the bell-crank lever 22, which through the link 24 operates the rock shaft 26 to release the pawl 27 from engagement with a ratchet tooth in the steel block 28, on the elevating member 7.

It is unnecessary to continue holding the operating handle 48 when the magazines are being raised or lowered, as the spring action on the magazine locating block support levers will cause the pawl 27 and the magazine locating blocks 29 to automatically drop into position for locating the magazines.

While the link 79 is moving upward, the right-hand end of the rocking arm 51 moves upward and the stud 59 contacts with the top of the slot in link 60 and pulls the link upward, which in turn actuates the bell-crank 61 and disengages the member 63 from the clutch 64. At the same time, the shifting lever 71 moves the member 74 of the main tooth clutch 75 into engagement with the elevating handle gear 67.

When the member 63 leaves the auxiliary clutch 64, a slot 81 in the member 63 engages a pin 82 which prevents the auxiliary magazine elevating shaft 78 from being turned, accidentally or otherwise, to dislocate the operative setting of the auxiliary magazine.

The auxiliary magazine elevating shaft 78 is connected through a helical pinion
and gear drive 83 to an upright universal-jointed shaft 84, which carries a bevel gear 85 at the upper end, in engagement with a bevel pinion 86 on a horizontal elevating pinion shaft 87, mounted on bearings in the auxiliary magazine frame supporting frame 88, Fig. 9-27.

The right-hand end of the elevating pinion shaft 87, carries a spring casing 89, containing a single clock-form counterbalance spring 90, held in adjustable tension, following the same principle as used for the main magazines. Four auxiliary magazine frames 91 are mounted and held as a unit between side frames 92, which ride between roller bearings 93, attached to brackets on the supporting frame.

A spacing shaft 94 is counterbored into and held rigidly between the side frames 92 and carries a bracket 95, to which are fastened two racks 96 extending downward and meshing with elevating pinions 97, pinned to elevating pinion shaft 87.

FIG. 8-27. The left-hand view shows the auxiliary drive engaged. The right-hand view shows the main drive engaged and the auxiliary drive locked—normal position.

When the bevel pinion 86, located at the left-hand end of the elevating pinion shaft 87, is turned in either direction, the pinions 97, meshing with the racks 96, will elevate or lower the auxiliary magazine frames and the magazines thereon, according to the direction in which the crank handle 1 is turned. The gear ratios are proportioned so that one complete turn of the crank handle 1 will elevate or lower an auxiliary magazine into the next operative position.

The two lower rollers 93 on either side are suspended by the two auxiliary brackets 98.

An additional safety for the auxiliary magazines has been created by the appliance of the magazine auxiliary upper stop 101 to all magazines. Means have been provided consisting of individual spring pressed latches 102 to prevent lifting of the auxiliary magazines from their upper position when a lower one is removed.

**MAINTENANCE**

For accurate timing of the auxiliary side, the procedure is as follows:

In initiating the timing of the auxiliary elevating and lowering device of the machine, the locking levers 57 need first to be engaged with any of the four positioning rollers 58. (Fig. 4-27.)

After disconnecting the timing coupling 103 (similar to 46 on the main side) the
shaft 104, pivoting the contact rollers 105, is withdrawn and the rollers removed. This allows the racks 96, pivotally connected at 95 to the spacing shaft 94 of the auxiliary magazine frame assembly to be swung out of engagement with the pinions 97, both of which are adjusted previously to perfect synchronism by means of the adjusting coupling 106 shown in Fig. 9-27. This coupling consists of a male member 107, integral with the right-hand pinion 97, and the female partner 108 having a wide receiving slot 109 to provide clearance for the relative adjustment with projecting wings 110 of the male member 107 by the set screws 111.

In proceeding with the timing, the idle pinion shaft 87 is turned until the two mates of the timing coupling 103 line up, the handle 1 being in its vertical downward position.

The final accurate adjustment is accomplished by means of set screws of the timing coupling 103. Obviously the racks 96 have to be again swung into engagement with the pinions and the contact rollers and their shaft reassembled.

If the “drop-off” from the delivery point of the magazine to the stationary front entrance is not the same at both sides of the magazine, the adjusting coupling 106 can be utilized to correct this condition by retarding or advancing the right-hand pinion 97.

To position the auxiliary magazine assembly properly for the removal of the lower magazine, a stud 112 is secured in alignment with the four positioning rollers 58. See Fig. 4-27, illustrating the removal of the lower magazine.

![Diagram](image-url)

FIG. 9-27. The upper view shows the auxiliary elevating pinion shaft, with section of counterbalancing spring and housing. The lower view shows the construction, in detail, of the adjustment coupling 106. All three adjustment couplings 46, 103 and 106 are similar in construction. (Note that 106 designates as a unit the coupling composed of 107, 108, 109, 110 and 111.)