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 counterbalancing 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.

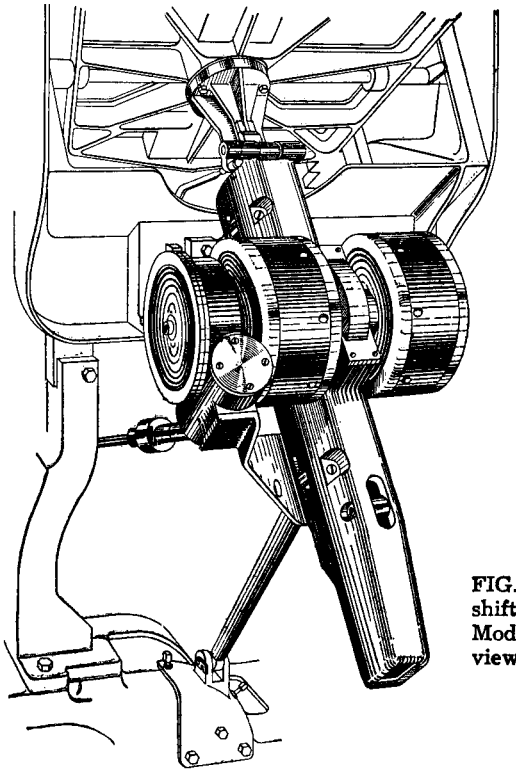
The principle employed might be illustrated by a balance scale. It takes very little effort to swing it one way or the other if there is a state of balance at any given weight.

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

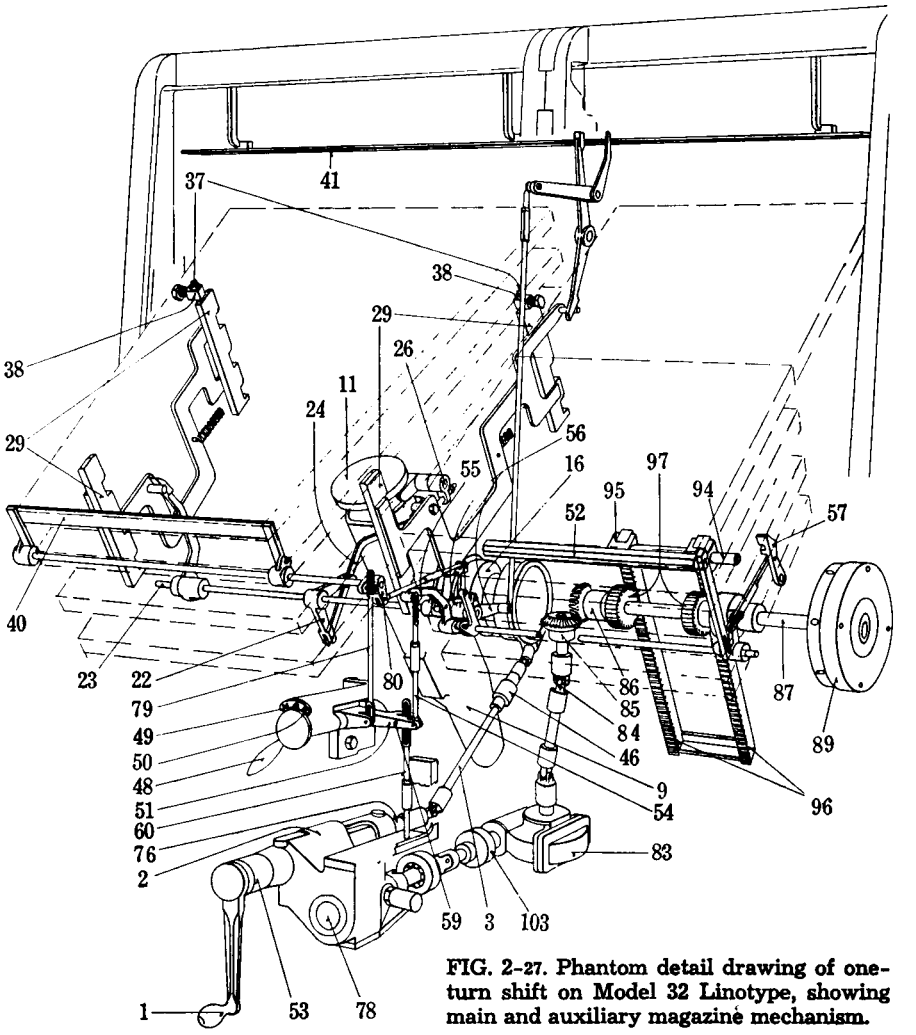


FIG. 2-27. Phantom detail drawing of one-turn shift on Model 32 Linotype, showing main and auxiliary magazine mechanism.

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.

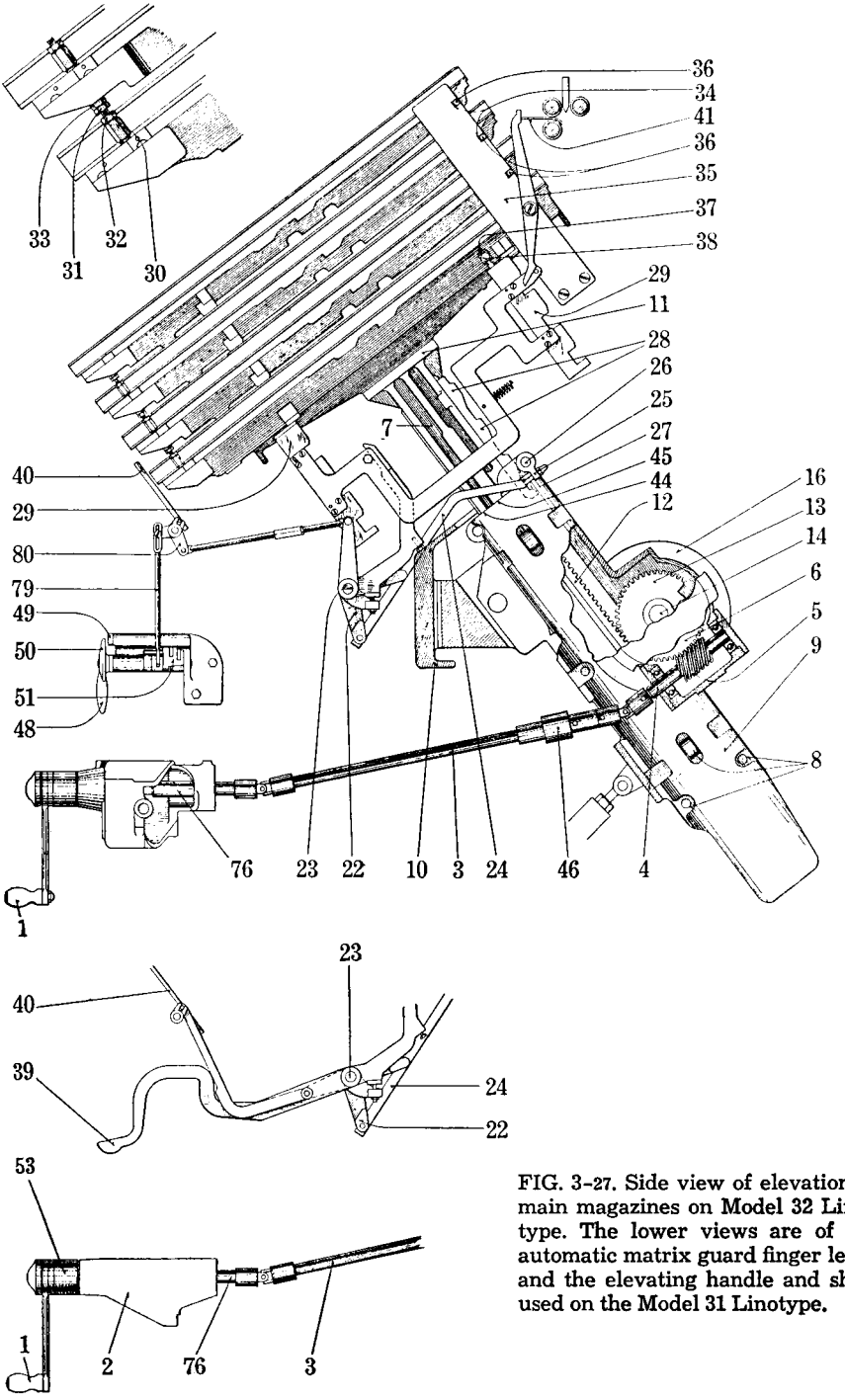


FIG. 3-27. Side view of elevation of main magazines on Model 32 Linotype. The lower views are of the automatic matrix guard finger lever and the elevating handle and shaft used on the Model 31 Linotype.

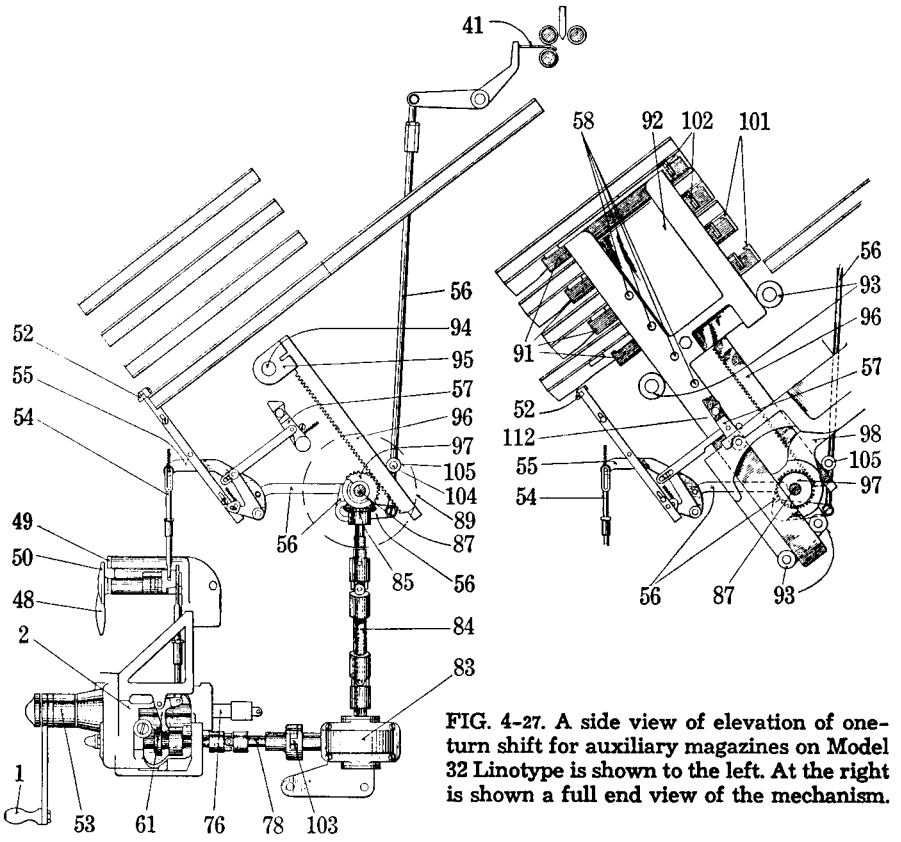


FIG. 4-27. A side view of elevation of one-turn shift for auxiliary magazines on Model 32 Linotype is shown to the left. At the right is shown a full end view of the mechanism.

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

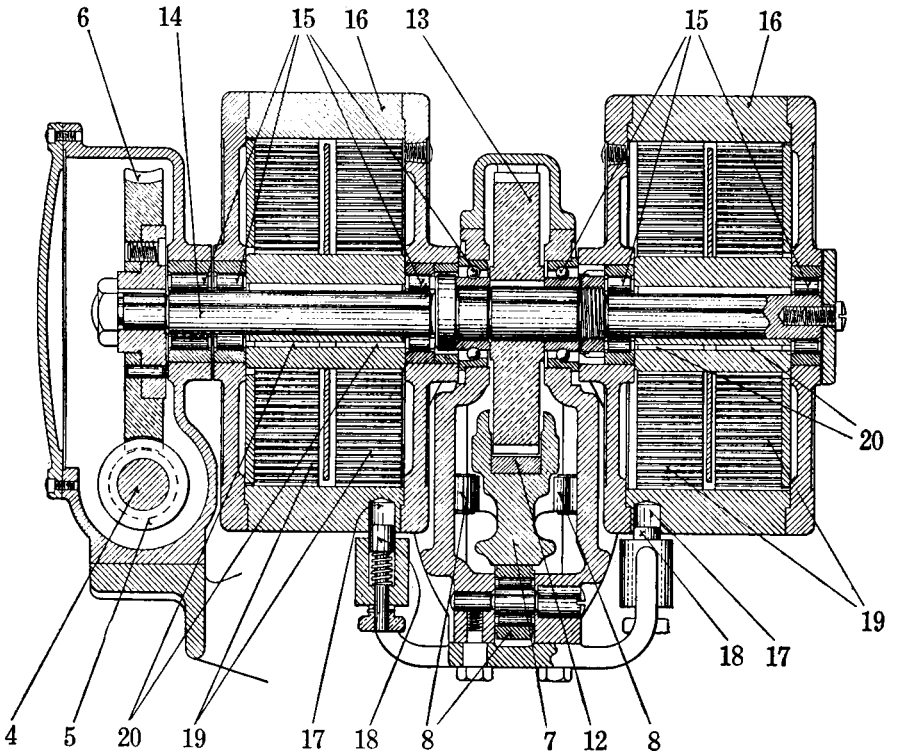


FIG. 5-27. Section of counterbalancing springs, worm wheel and related mechanism of the one-turn shift.

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

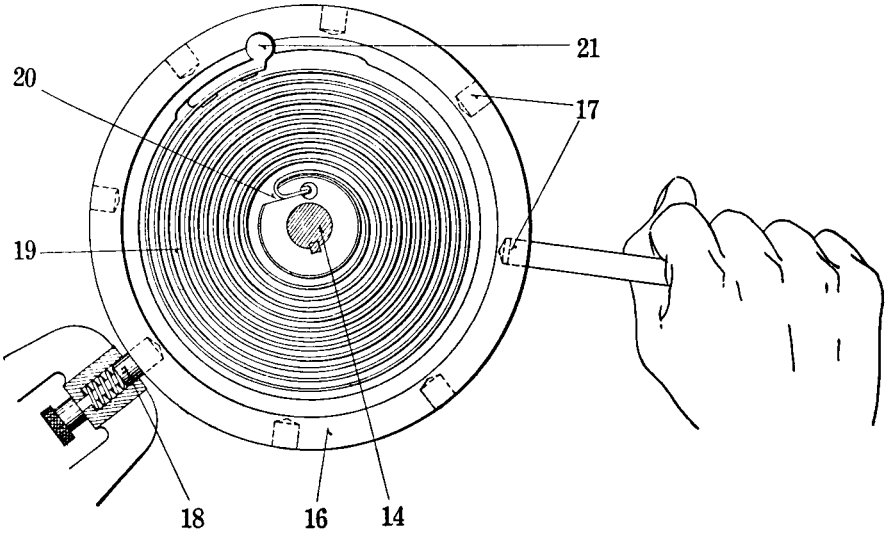


FIG. 6-27. View showing the adjustment of spring tension for proper counterbalancing of the magazine load. The spring tension is increased by moving the handle rod downward or decreased by moving upward.

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,

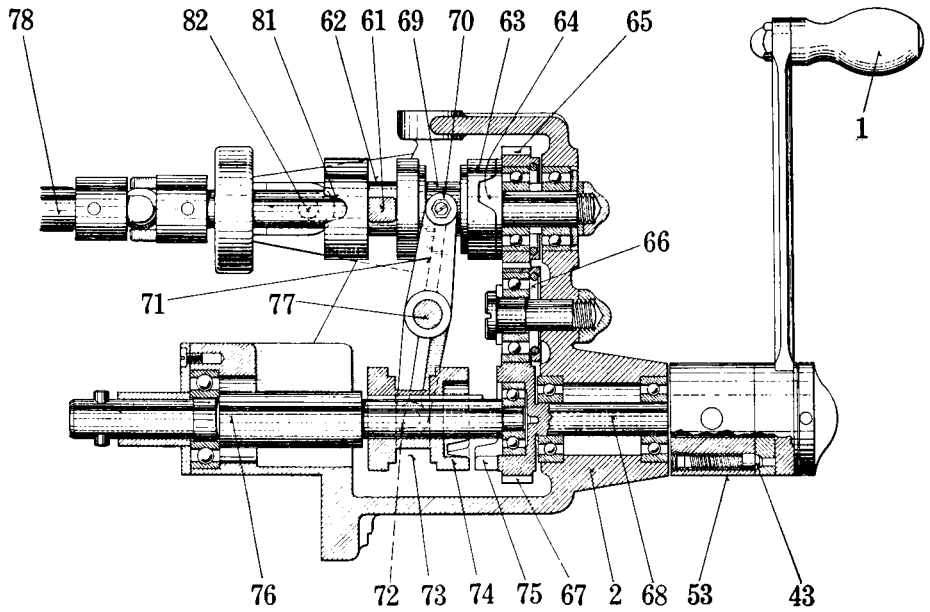


FIG. 7-27. Detail of shift handle, showing link to auxiliary mechanism, ball-bearings and related mechanism.

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*.

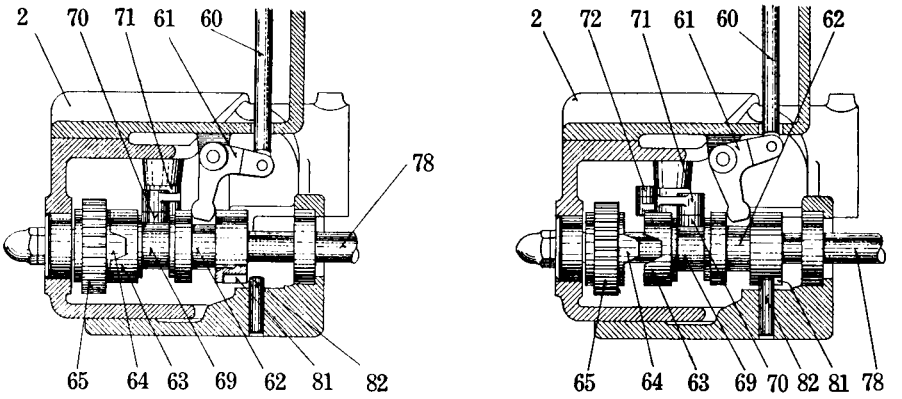


FIG. 8-27. The left-hand view shows the auxiliary drive engaged. The right-hand view shows the main drive engaged and the auxiliary drive locked—normal position.

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.

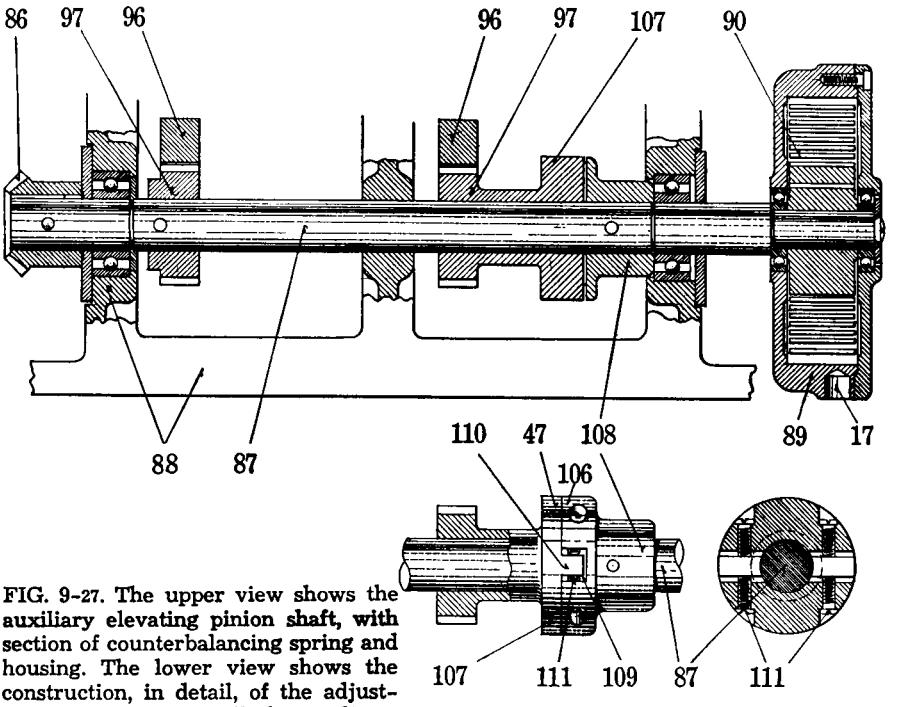


FIG. 9-27. The upper view shows the auxiliary elevating pinion shaft, with section of counterbalancing spring and housing. The lower view shows the construction, in detail, of the adjustment coupling *106*. All three adjustment couplings *46*, *103* and *106* are similar in construction. (Note that *106*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