GENERAL MAINTENANCE

PART II

Assembling

LINOTYPE

"LINOTYPE LIFE EXTENSION"

GENERAL MAINTENANCE · PART II

Assembling

For more than half a century, LINOTYPE has maintained a policy of sharing the technical experience of engineers, plant machinists, and operators with Linotype users everywhere. The *Linotype Life Extension* series of booklets, of which this is one, has been compiled and distributed in the interest of maximum production with minimum waste and delay, through continuous operation.

LINOTYPE, BROOKLYN, NEW YORK
NEW YORK CITY · CHICAGO · SAN FRANCISCO · NEW ORLEANS
CANADIAN LINOTYPE, LIMITED, TORONTO, CANADA

The following helpful hints are intended to assist Linotype users in diagnosing troublesome conditions if they develop. They represent the best judgment of Linotype technical experts from here, there and everywhere although no pretense is made that in some cases there may not be other remedies. Nor are these brief comments to be considered as comprehensive discussions of the mechanics or maintenance of Linotypes. Competent Linotype machinists devote lifetimes to studying and developing newer and better methods of maintenance, frequently with consequent improvement in production, both in quantity and quality. These general topics have been taken from the book *"Linotype Machine Principles,"* the official Linotype manual ($3.50 postpaid U. S. A.).

"Carelessness does more harm than a want of knowledge."

—BENJAMIN FRANKLIN

Assembling

Failure of Matrices to Drop—The keyboard key lever may be "hard" to the touch; the lever may be bent or there may be gum on the sides where it comes in contact with the frame.

Examine the cam yoke and see if it drops down so that the cam rests on the rubber roll when the key is depressed. If it fails to function there may be gum on the sides of the cam yoke where it comes in contact with the frame just over the trigger, which would prevent the yoke from dropping down, or the stop pin may be bent.

If the cam fails to turn after it has dropped on the rubber roll, it may be dry on its pin, the pin broken, the teeth on the cam too smooth, or the rubber roll glazed. If new rubber rolls are put on and are oversize, the cam may not drop low enough to clear the stop pin. If the roll is worn, or undersize, it will not lift the keyboard key rod high enough to give full throw to the escapement lever.

If a matrix has been released by the escapement and comes only partly out of the magazine, it will usually be found that there is rust or gum on the contact points of the escapement lever and the verge plunger, creating a friction that will not allow the escapement to fully open. To correct this, polish contact points or use graphite, but do not use oil. Examine the verge spring and see that it is not too strong, but of sufficient strength to bring the escapement verge back to normal position after the matrix has been released. Also see if the spring is worn where it comes in contact with the escapement verge.

The lugs of the matrices may be bent or burred enough to make them too broad to slide freely in the magazine channel. There may be gum on the matrix lugs or in the magazine channels.

If the lugs of thin matrices are too narrow, these matrices may overlap and wedge fast side by side in the magazine channel.

The escapement pawls may have worn spots at the top and interfere with the matrix when it passes over. This would be particularly noticeable when using thin matrices.

If the lower inside lug of a matrix is sheared off, it will fall into the verge pawl opening and fail to drop. It is also possible that there may be a shortage of matrices in the magazine.

If a thin matrix should fall flat on top of the channel entrance it may cause the matrices which are being distributed to "run wild" and get into the wrong channels of the magazine.

Further information on the care of matrices is given in the Linotype Life Extension booklet, "The Care and Maintenance of Matrices."

Transpositions—Unless certain parts of the machine are in correct condition and adjustment, transpositions may occur.

The keyboard cams must have no slippage on the rubber rolls, the magazines and matrices must be clean, and there must be no interference with the assembler entrance partitions. The keyboard rolls, the assembler and matrix delivery belts must run smoothly at full speed; the escapement verge pawls must not hesitate when coming back to normal position after releasing a matrix. The assembler star wheel must not be too badly worn, and the friction spring that pulls the star wheel shaft must be of sufficient strength to carry the matrices evenly into the assembling elevator.

The assembler slide must be kept clean, and the brake spring must be strong enough to prevent the slide from moving too far away from the matrices as they are being assembled.

The assembler chute spring must be adjusted so it will not unduly retard the matrices as they enter the assembling elevator.

The improved chute spring with which all new model machines are equipped needs very little adjustment for various sizes of matrices because it guides the matrices by the lugs instead of the body; but it is very important that the older type of chute spring be correctly adjusted so as not to interfere with the free travel of the matrices.

Care must be taken that oil does not get in the magazine.

After all the foregoing causes of transpositions have been checked, be sure that the assembler entrance partitions are shaped so as not to interfere with the free travel of the matrices into the assembler. The incorrect shape of these partitions is one of the principal causes of transpositions.

Doublets—When a keyboard key is depressed, it sometimes happens that more than one matrix will drop. This is generally caused by the failure of the keyboard bar to drop back to normal position to return the trigger under the cam yoke. To correct, remove the entire section of the keyboard bars, place flatwise and remove the two cross banking bars and polish them. Also polish any of the keyboard bars that may have caused trouble and see that the key lever is not bent or gummy on the sides at the front and back end. In some plants gasoline is used on the keyboard key bars to prevent doublets, but this practice does not effect a permanent cure. A rusty hinge rod may cause a trigger to bind.

A broken keyboard cam stop pin would allow the cam to turn continuously, and all the matrices in the magazine channel controlled by the cam would be released from the magazine.

The Keyboard

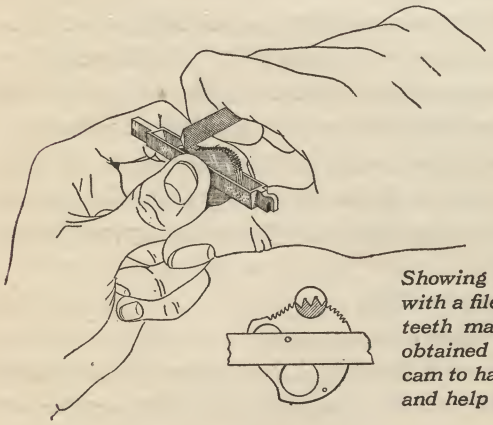
Keyboard cams should be cleaned and oiled twice a year. To do this, it is necessary to remove both front and back cam yoke frames from the keyboard.

There are three ways to clean the yokes and cams, each depending on the equipment available for doing this work.

The first way is to wash the cams with high test gasoline, after which they should dry thoroughly before oiling; also wash slots where the front end of the cam yoke extends through the cam yoke frame under key reeds.

The second method may be followed if the plant is equipped with a rotary wire brush which can be fastened on the end of a saw arbor. Clean both sides of the cam yoke at each end, and the spot that rests on the trigger; then turn the edge of the cam against the brush so that the brush will clean the teeth and edges of the cam. Also clean the slot as mentioned above.

The third way is to dry clean, provided there is no oil on the cam yokes. Use a very fine file or one that is partly worn (a Barrette file is best) and rub both sides of the cam yoke in such a manner as to remove any accumulation of gum; then scrape clean the outer edge of the cam where it comes in contact with the rubber roll. After the machine has had considerable use, the teeth on the cams are apt to be worn smooth, and to remedy this, hold the cam in the exact position as illustrated below and draw the edge of the file over the teeth in the direction indicated by the illustration, using some pressure on the file. This treatment will make a slight burr on the teeth in the right direc-



Showing treatment of worn cam teeth by scraping with a file. The lower view is a cam with two of the teeth magnified to more clearly show the result obtained by scraping. The burred teeth enable the cam to have a more positive grip on the rubber roll and help to avoid transpositions from that source.

tion to cause the cam to engage on the rubber roll. To file each tooth would be a tedious operation and it would be difficult to get the teeth even, but by scraping them the work can be done in a short time without damaging the cams. The sides of the slots over the triggers where the cam yokes operate should be scraped. If these slots are gummy the cam might hesitate to drop on the rubber roll. It is good practice to scrape the teeth on the cams no matter what method of cleaning is used.

Before the cams are put back in their frames they should be oiled, using the Linotype Keyboard Cam Oil (X-101). The oil should be applied with a thin wire, flattened at the end, using one drop on the pin on which the cam turns, and spinning the cam to be sure it works freely. All surplus oil should be wiped off before the cam is again placed in the frame.

Before the cam yoke frames are attached to the machine, the keyboard key bars or weights should be thoroughly washed with high test gasoline. They may be taken off as a unit by removing two screws, the heads of which may be seen from the front of the keyboard. When replacing the key bar unit it is necessary to lock the key levers.

Care of Rubber Rolls—Keyboard cams should be cleaned and oiled twice a year with Linotype Cam Oil. If the cams do not turn freely the rubber rolls may be damaged.

Do not use oil excessively when oiling rubber roll shaft bearings, as oil is apt to penetrate to the ends of the rubber rolls and damage them. Always wipe surplus oil from the bearings. Use *only* two drops of oil in each bearing.

The surface of rubber rolls should be kept clean and free of graphite and dust. It is advisable to wash them frequently in warm water with a mild soap, such as Ivory. This will remove the hard glaze and prevent slippage of cams.

Do not use gasoline, benzine or any other alkali that tends to cause deterioration of rubber when cleaning rubber rolls.

Be sure to lock the keyboard when the machine is not being used. If a number of keys should be pressed when the machine is not running and then the machine is started, the rubber rolls may be scored.

On machines with the adjustable feature for overthrow of cam yokes, the spring pressure should be checked occasionally as excessive pressure may cause the rubber rolls to wear or to be cut. If the pressure is not sufficient the cams may slip and cause damage to the rolls as well as not actuating the escapement.

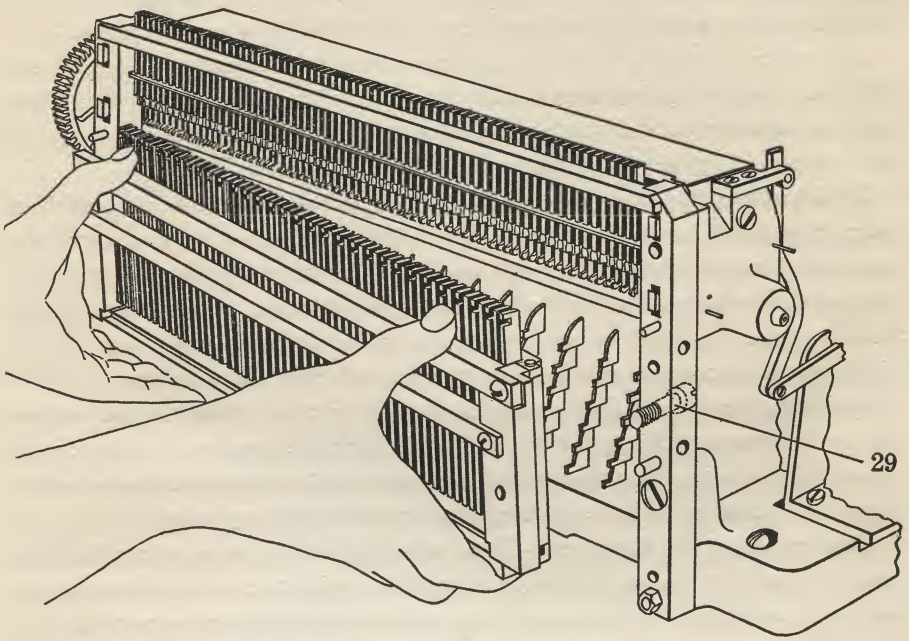
Do not roughen rubber rolls by any method.

Do not sharpen keyboard cam teeth to a sharp edge.

On machines that have been used for a long time, the tension of the rubber roll shaft pulley friction spring may weaken. If so, it should be strengthened

or a new spring applied, or else the drive will be retarded by the cam and cause the rubber roll to slip or be cut when the cam is at its high point.

Be sure that the keyboard cam covers are on the machine at all times as they prevent dirt and dust from getting into the cams and yokes. Dirt will cause sluggish action of the cams and unnecessary wear.



Showing key bars being removed from keyboard as a unit. Also key bar frame end-piece screws 29, which hold the unit in place.

When possible, remove old rubber rolls without mutilating them, as some sections can usually be saved to replace other short sections that have become worn. The lower case end of the rubber rolls usually wears out first. To conserve rubber, a short section of a new roll may be used to offset replacement of an entire new rubber roll.

On newer machines there is a knurled collar at the end of the shaft which requires about a ¼ turn to loosen. This must be removed in order to take off the rubber roll. The older machines have a different collar at the end. To remove it drive the oil ring off and take out the pin which holds the collar to the shaft. If the rubber roll sticks to the shaft, it may then be necessary to cut it through lengthwise.

Before applying the new roll, clean the shaft thoroughly, start the roll on the shaft and then place the assembling tool (H-2897), for sale by the Linotype Company, over the roll and stand in a vertical position. With a firm pressure, force the roll over the shaft and stretch the roll so it will be against the collar at each end and uniformly spread over the shaft's length.

If no special tool is available, the roll may be put on by starting one end on the shaft and filling the roll with water. Hold the hand over the top of roll and press down, allowing the water to escape as the roll goes into place.

To replace the rubber rolls into the frames after the cams have been assembled, turn the cam yoke frame upside down, and slide the roll into place. Then turn the frame right side up, and revolve the roll to bring the cams against the stop pins. Tighten the set screws that hold the bushings in place.

To Clean the Key Levers—On the right-hand end of the keyboard there is a narrow steel strip about 4¼" long which is fastened with a small screw at each end. Remove this piece and the rods will be free for removal. Polish the sides of the levers at each end where they pass through the keyboard frame. Do not use emery cloth or other abrasive material. If equipped with a wire brush, use that, or some other polishing agent which will not scratch.

While the key levers are out, clean the slots in the keyboard frame where the key levers pass through, both front and back. If there is any gum on the sides of these slots, the action of the key levers will be sluggish and possibly cause "doublets," as well as affecting the "touch" of the keyboard.

Re-assembling the Keyboard—To re-assemble the various parts of the keyboard, begin with the key levers, and it will be easier to do this before the key bar unit is attached. Start with the lower row of keys and work upward.

After the key levers are assembled, lock them in place, and then replace the key bar unit, and fasten the cam yoke frames to the keyboard, doing the back one first. See that the dowel pins enter the brackets and that all of the trigger ends are in place in the key bar slots before tightening the screws that hold the end brackets in place. After the cam yoke frames are tightened, try the rubber roll shaft and see that it spins freely, as it sometimes happens that if the set screws in the bushings are too tight, the shaft will bind. Pull out the upper locking wire, but be careful not to remove the lower one, which is the permanent wire on which the triggers fulcrum.

Escapements

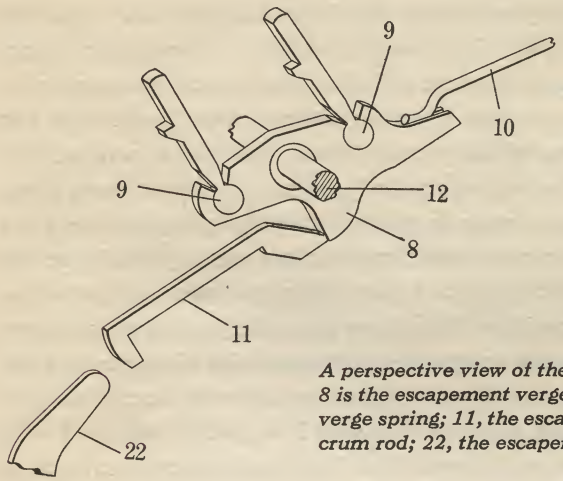
On all current models of the Linotype with the exception of the Model 9, and Super Display Models, and all auxiliary magazines, the escapements are not attached to the magazines.

The escapement mechanism is mounted on a brass frame, fastened to the

magazine frame with a screw and dowel at each end, and is easily removable from the machine for inspection or repairs.

The escapement consists of a verge fitted with two escapement pawls, an escapement plunger and a verge spring. (See the illustration below.) When the escapement pawl is at its lowest point, the top should be flush with the bottom of the magazine channel so that the matrix will pass over freely.

If the pawls become worn or develop slight indentions at the top, they should be replaced. A verge spring that is worn flat on the bottom may cause



A perspective view of the working parts of the escapement. 8 is the escapement verge; 9, the escapement pawls; 10, the verge spring; 11, the escapement verge plunger; 12, the fulcrum rod; 22, the escapement lever.

enough friction to interfere with the full movement of the verge. If the hole on which the verge fulcrums should become badly worn, there is a possibility that more than one matrix at a time will be released.

The escapements should be thoroughly cleaned once a year. Do not use oil on any part of the escapement. Graphite used sparingly will tend to reduce friction where the escapement levers come in contact with the plungers.

If the escapement has been taken off for repairs, be positive that all verge springs are in place before fastening the escapement guard. When renewing verges and pawls consult parts catalog for proper sizes.

The Principal Points of Wear Are: first, the top of the verge pawls *9* where the matrices come in contact with them. After considerable use it will be noticed that a small indention will be made at this point and if worn too much it will interfere with the free travel of the matrices. This is especially true of thin matrices such as the commas, thin spaces, and periods, as these characters are used frequently.

If there is trouble at this point, replace the pawls, and examine the matrices to see that the lugs are not too narrow. If the lugs are too thin, they are apt to get alongside the matrix that is following and wedge fast.

Another source of trouble may be due to friction at the point where plunger *11* comes in contact with the verge *8*. If a notch is worn in the verge, the plunger may bind when pushed back, and the spring *10* will not return the pawls to their normal position, or there might be too much friction to allow the pawl to be forced low enough to release the matrix. Also examine the pawl spring *10* to see that the end where it comes in contact with the verge *8* is not worn too flat to slide freely in the groove.

A simple way to temporarily overcome this friction if the wear is not too great, is to take the point of a soft lead pencil and rub it over the front edge of the verge *8* where it comes in contact with the rear end of the plunger *11*. This will give it a coating of graphite in its best form and will sometimes last for a long while. The front end of the plunger, where it comes in contact with the escapement lever, may be treated similarly, especially if rust spots show.

When the escapement levers come in contact with the plungers, there is a slight sliding motion, and to reduce the friction, place some graphite on the finger tip and rub over the points of the levers when the lower magazine has been raised to the operating position. Do not use oil on the ends of the plungers as it will eventually get into the verge rack and cause the plungers to bind.

The escapement rack is fastened to the magazine frame by a screw at each end, and is located with dowels. About once a year it should be removed from the machine in order to clean the plunger slots. The plungers are held in place by a brass strip screwed to the escapement rack. After this strip has been taken off, remove the plungers, being careful to keep them in order so that when they are replaced they will be in their original positions.

A rotary wire brush (X-1673 or X-1674) may be used to good advantage for cleaning the plunger slots, and it may also be used for cleaning the grooves on the reverse side of the escapement rack, through which the matrices pass over the escapement pawls. After the plungers have been reassembled, polish the ends that come in contact with the escapement levers.

When necessary to replace an escapement verge, have at hand a rod the exact size of the fulcrum rod *12* (shown in the illustration on page 9). When the fulcrum rod is withdrawn to release the verge, follow up with the other rod, which will hold the verges in place until the fulcrum rod is in position. Before the new verge is put in place, see that it fits freely on the fulcrum rod, and that the verge pawls do not bind in their openings.

When putting in a new verge, the spring *10* should also be replaced, as the end may be worn flat and cause it to bind in the verge groove.

The Magazine

For successful operation the magazine must be clean and free from oil or gum, and there must be no burrs in the channels.

When the magazines are removed from the machine they should be hung in a vertical position on a rack designed for that purpose, and the back cover should be closed to keep out dust or other foreign substance. Graphite should never be used as a lubricant in the magazine. It may help temporarily, but it will eventually cause gum to collect in the magazine and on the matrices.

Before a magazine is removed from the machine the locking bar must be moved to the left as far as it will go in order to lock the magazine and open the safety latch so the magazines may be raised from the escapement.

If the locking bar cannot be moved over it is likely that some of the matrices do not come all the way to the front of the magazine. If so, touch the keys to bring the matrices into position. Never try to remove the top plate of a magazine as it will be difficult to reassemble without special equipment.

When the magazine is placed on a flat surface, the escapement cover, which contains the locking bar, may be removed for cleaning by loosening a screw at each end. Unless the magazine is empty this will expose the first two matrices in each channel and they may be moved back or taken out before the cover is fastened on again.

On each side plate of the magazine there is a ¼″ hole, located about three and three-quarters inches from the front end. If for any reason the magazine does not seat properly on the escapement, and if it is filled with matrices, it may be examined by first inserting a rod through these holes in the sides of the magazine. This rod will hold the matrices back in the magazine with the exception of the first three matrices in each channel, which may be run out; after which the escapement cover can be removed, as before mentioned. This will provide a clear view and make it easy to locate the trouble. If an old magazine is put on a new machine, it is possible that the magazine partitions do not fit in the grooves of the escapement bar casting.

When a magazine is being put on the machine, use care in sliding it back on the frame. If it is slammed back too hard, the matrices are apt to jar back so that the lugs drop through the openings in the bottom of the magazine. This prevents the magazine from seating properly on the escapement.

Before the magazine is lowered to the frame it is well to rub the tips of the fingers across the slots to see that all matrices are in place. If the magazine is not properly seated the matrices are likely to spill on the floor.

While the machine and matrices are new it will be found necessary to brush the magazines quite often, using the regular magazine brush (I-158), until all oil and grit have been removed. The cleaning will then have to be

done less frequently, as by continual use, the magazine channels and matrices will polish themselves unless an excessive amount of oil is used on the machine where it might come in contact with the matrices.

If oil should get in the magazine, wash with alcohol and brush thoroughly, and allow to dry before running the matrices in; but do not wash unless absolutely necessary. Do not use graphite in the magazine or on the matrices, for if they are kept clean it will not be necessary.

Spacebands

The spacebands should be cleaned after every eight hours of operation, using graphite sparingly and by rubbing them on a soft white pine board. If metal is allowed to accumulate on the spaceband sleeves it will cause hairlines.

When replacing the spacebands in their box, see that the sleeves face the right, and also make sure that the bottom of the first spaceband is held by the retaining plate; otherwise the spacebands will either drop too slowly or clog in the spaceband box.

If the spacebands fail to respond properly, the teeth on the spaceband cam may be too smooth or the rubber roll worn, glazed or cut. The spring on the spaceband key rod may not be strong enough to lift the spaceband box pawls to their full height. The pawls may be worn so as to engage more than one spaceband at a time, or they may be blunt on the ends or bind in their grooves (see illustration on page 14). The sleeve on the spaceband may bind near the top, if the band has been bent or burred, and the bottom of the band would not be held by the retaining plate. The retaining plate may be too high to allow the bottom of the band to swing out when lifted by the pawls.

Care should be taken to see that the escapement of the spaceband is operating properly—that the points which separate and lift the spaceband shoulders over the vertically projecting shoulders on the spaceband box are sharp and of equal length, square and not worn, and finally that the lost motion is just enough to give the preceding matrix the proper advantage in the time of its travel to the assembling elevator. This adjustment is particularly important in the rapid operation of the Linotype.

The Spaceband Box—Remove it from the machine and examine the pawls *7* for wear. If they are badly worn, they should be replaced with new ones. To obtain a clear view of the pawls, swing the spaceband chute hinge plate *9* out of the way and remove the pawls by loosening the two screws in the pawl spring *2*. Both the spring and the long screw extend through the front casting and are connected with the pawl at *14* and *15*. Look for wear on the end of the long screw.

If the pawls are in fair condition it may be possible to adjust them back

into shape by following the same course as when fitting new ones, but it might be necessary to use an oilstone on the points to bring them to a sharp edge. If new pawls are to be fitted they should be polished on the sides and must be perfectly straight. The slots where they fit must be clean, and as the pawl levers *1* operate by gravity only, it is plain that there must be no friction.

The pawl springs *2* should have just enough tension to bring them into position when a spaceband is to be used. Too much tension will interfere with the dropping of the pawl levers.

After the new pawls have been connected, see that both points are even when raised to the top, and if there should be a slight difference, examine the pins that hold the levers *1* to the shaft *8*, and see that they are tight. The most important detail is to get the pawls fitted so they will be in the correct position when they lift the spaceband. The top points of the pawls shown at *12*, should be as far to the left under the spaceband ears as possible, but must not touch the ears of the second band when the first one is lifted. If the points go too far in, they can be brought out by peening the left-hand side near the top of the pawl as shown at *13*, to bring it to the proper distance. If the pawl has been spread too much, dress it down with an oilstone or fine file. After the box has been reassembled, raise the lever *1* by hand and see that the pawls drop freely without the slightest friction. The box should then be placed back on the machine and tested.

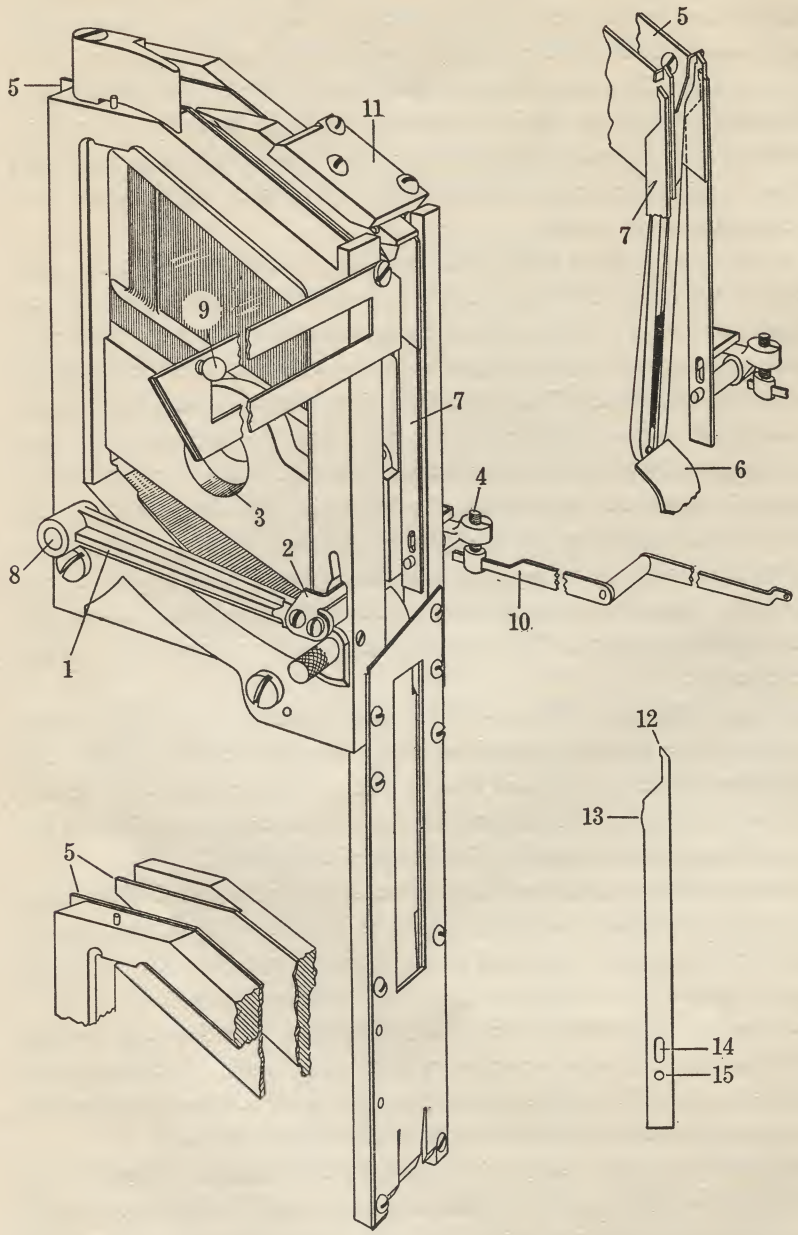
Here Are Some Points to Check—If the spaceband box pawls are known to be correct, and the spacebands fail to work properly, make a simple test in this way: Press down on the pawl lever *1* and allow it to raise very slowly, then see if the bottom of the spaceband clears the detaining plate *6* when the top of the band has been released by the action of the pawls *7*.

It may be that some of the bands have worn ears, which would allow them to extend too far down past the detaining plate so that while the spaceband pawls might lift the top, the bottom of the band might not clear the detaining plate enough to allow it to swing outward when the band is lifted.

It is also possible that the detaining plate has been bent forward too far. If this condition is true it may be necessary to grind off a slight amount at the top. This piece is made of hardened steel; use care when bending it to prevent breakage. A new spaceband should be used when making this test.

Another source of trouble might be caused by the spaceband itself if the sleeve should bind at the top of the band, and not go quite all the way to the end; it would be too short to rest against the detaining plate, and would cause the other bands to clog up the chute.

The keyboard rubber roll should be examined for undue wear. If badly worn it would be too small to give enough throw to the spaceband pawls. The



Showing the spaceband box assembled; also separate views of a spaceband resting in normal position; front and back top rails; and a single pawl in detail.

spring on the spaceband rod at the right-hand side of the keyboard should be of sufficient strength to raise the pawls to their full height.

It may be necessary to adjust the stroke of the spaceband pawl levers *1* and a test should be made before starting.

To make this test, remove the keyboard belt, then turn the roll until the cam has moved the front end of the spaceband key lever *10* to its lowest point and see if it allows the pawls to come low enough to engage under the ears of the spacebands on its upward stroke. If this setting is correct, turn the keyboard roll until the spaceband key lever *10* has raised the pawls to their full height. At this point, the pawl lever *1* should be all the way up so that no lost motion can be detected. The key lever adjusting screw *4* must be used to get this proper setting of the stroke of the spaceband pawl levers *1*.

The center plate *11* should be removed occasionally to polish the sides of the upper rails *5* where the spacebands come in contact with them.

The spaceband chute box has an extension not supported on the sides. The function of this extension is to guide the spaceband toward the star wheel. It should be bent in as far as possible, but the opening must be wide enough to allow the bottom of the spaceband to pass through without binding.

Do not use oil on any part of the spaceband box. If the shaft which connects the pawl levers becomes sluggish, take apart and wipe dry; and when replacing, a small amount of graphite may be used in the bearing.

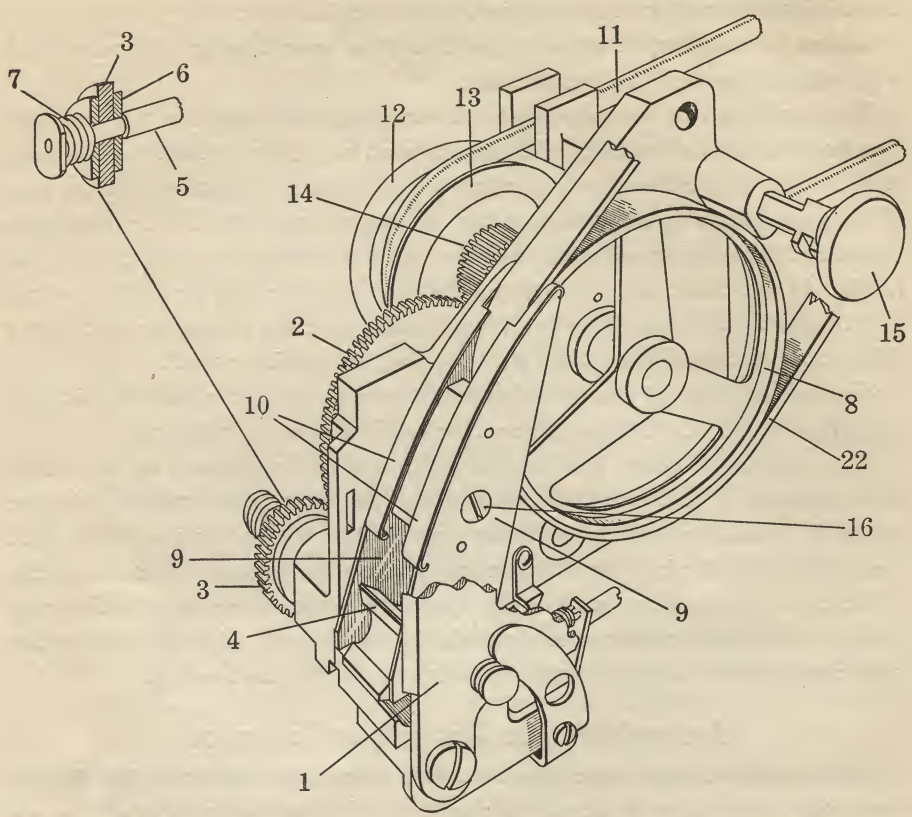
Assembler and Assembler Entrance

Most transpositions take place at the assembler entrance, but before explaining the causes, it should be made certain that the matrices have not been delayed in their travel up to this point.

The keyboard cams must function properly, the magazine and matrices be clean and the matrices have no burrs on their sides which might make them too broad to pass freely through the magazine channels.

The escapement verges and pawls must not be too badly worn, should be free from gum, and the escapement verge plunger should be straight and should not bind. The partitions or guides should be correctly positioned. If a matrix should strike against the partition at the top, the entire front may be moved either to right or left by loosening two screws at the right end of the upper inclined section of the assembler entrance, and two at the left, one of which holds the assembler entrance cover support. When making this adjustment, it is best to make a mark at the end, so that it can be moved back to its original position if the matrices strike when using another magazine.

The revolving front on the "Two-in-One" machines, is fastened to its shaft with a friction clamp, and if it has been forced out of position, it may be



View showing details of the assembler block. The driving pulley shaft has mounted on it at its rear end, an idler pulley 12 and the tight pulley 13, and also the gear 14. The belt 11 may be shifted from the loose to the tight pulley by pulling the knob 15 forward, and vice versa. 2 is an intermediate gear which drives the small gear 3 which is mounted on the shaft upon which the star wheel 4 is mounted. Gear 3 is not tight on the shaft 5, but is held against a friction disk 6 by a spring 7. The friction disk is fastened in the shaft 5. If anything such as a clog of the matrices occurs which stops the action of the star wheel, the shaft 5 stops, while the gear 3 continues to revolve. The slipping action of the gear 3 against the friction disk 6 is to prevent breakage or bending of matrices in such cases. 8 is the large pulley which drives the assembler belt, indicated at 22. 9-9 are the assembler chute rails. 10-10 are the spring rails which are fastened to the fixed rails 9-9. These rails are of such a shape as to direct the matrix directly upon the star wheel. A broken section of the assembler cover is shown at 1.

The front rail is easily detached, for quick change of the star wheel, by removing the screw 16. The back rail and the block, which separates the rails, are both held permanently in place by another screw, back of the screw 16.

turned into place without loosening the clamp screw. If necessary to move to the right or left, two set screws at the right-hand end must be loosened.

See that the assembler chute rail spring *10*, is down tight against the rail *9* (as shown in the illustration on page 16). The top part of the rail spring is cut away to clear the assembler belt. Then the spring widens out and the projection covers the belt. At this point see that the ends are as close as possible to the belt without causing it to bind. This will prevent thin matrices from being caught. Solder the rail springs at the ends if they are replaced.

If the star wheel *4*, becomes worn so that the ears of the matrices are not carried well inside the pawls of the assembling elevator it should be changed. Star wheels are inexpensive, so it is better to change them often rather than adjust the stop screw on the assembler slide to avoid "oversetting."

A small gear *3* is held to the star wheel shaft with a brass friction disk and a strong friction spring *7*. If either of these become too badly worn, there will not be sufficient pull on the star wheel to move the assembler slide evenly. This condition can be overcome by replacing or stretching the spring.

The matrix delivery belt is adjusted for tension by moving the shaft of the idler pulley in the slot. The belt should not be too tight otherwise it will interfere with the free running of the assembler and idler pulley.

The assembler driving belt *11*, should be just tight enough to run the assembler evenly. A jumpy action of the assembler will cause transpositions.

Most of the transpositions take place when the matrices are used from the first few channels of the magazine. So it is important that the shape of the assembler entrance partitions at the lower end be correct. The bottom ends of the first three partitions should be well curved to the left so that when the matrix strikes the assembler belt it will do so at the correct angle.

The adjustment of the chute spring is an important factor in assembling matrices without transpositions, and as the old ones are of various types, they must be adjusted so as not to retard the matrices as they enter the assembling elevator. On all new model machines the chute spring guides the matrices by coming in contact with only the lugs and needs very little adjustment.

Use oil sparingly in each of the oil holes at the back of the assembler belt pulley. There is an oil hole for the star wheel shaft which can be reached when the assembling elevator is raised to expose it. Do not use too much oil. The friction spring at the back end of the star wheel shaft needs some lubrication as well as the loose pulley at the end of the driving shaft. On later models oilite bearings have been used at some points eliminating necessity for manual oiling.

Assembler Slide

To have the assembler slide function properly, the following items should be given careful attention: the brake with the blocks, the brake spring, the return spring, and the brake releasing lever; also check for wear on the assembler slide proper, particularly on its sides where the brake blocks act.

The two brake blocks should have the corners sharp and square where they come in contact with the assembler slide to prevent it from slipping back when the line is being assembled. It must grip tightly enough to overcome the pull of the return spring; otherwise the slide will "chatter." The blocks are made so that when one corner is worn they may be taken off and turned to bring any one of the edges into operating position.

The tension on the brake spring should be just enough to keep the brake blocks against the slide, but not so tight as to interfere with the free assembling of the line. This spring must have tension enough to return the slide when the assembling elevator is raised to its full height, but not strong enough to interfere with the free travel of the matrices as they assemble.

The brake releasing lever has a flat friction spring on the back. This spring should be just strong enough to overcome the pull of the brake spring, so that when a line has been sent in, the blocks remain open until the assembling elevator has seated on the end of the lever. This will allow ample time for the slide to be returned.

If the tension on the brake releasing lever is too strong, it will be harder to trip when the elevator is raised to send in a line, and it will not seat as readily when lowered to the assembling position. It is possible when replacing the friction spring on the releasing lever to give it so much tension that it will force the brake releasing lever so far out it will bind against the assembler slide and interfere with its return.

The adjustment for the return of the assembler slide is made with a screw which banks against the under side of the brake releasing lever, and the distance between should be very slight, to insure the return of the slide.

If the machine has been in use for a long time, the slide may be worn with high and low spots. After the adjustment is made it should be tested. Move the slide slowly the entire length of 30 picas to see if the brake blocks grip at every point of its travel. If there is any slippage, adjust accordingly.

The spaceband buffer should be replaced when badly worn, and the left-hand end of the buffer should be slightly above level rather than too low.

The assembler slide should be cleaned with a dry rag, and no lubricant of any kind should be used. The only part to oil is the shaft of the roll which is under the assembling elevator, and the screw on which the slide return lever moves on some of the older model Linotype machines.

Assembling Elevator

There are two ways to remove the assembling elevator from the machine when making certain repairs.

The first is to disconnect the link from the assembling elevator lever, then remove the delivery channel by taking out the two screws which hold it, and remove the left-hand gib. The other is to disconnect the link as above, remove the assembler slide, also assembler slide brake operating lever, and the roll bracket. This allows the elevator to be dropped down. By using this method, it will be found when replacing that the elevator will fit exactly as before, because the gibs have not been disturbed from their original position.

If necessary to adjust the releasing pin *10* (see illustration on page 20), it is done with the screw underneath, and to see this screw, it is best to remove the front plate *1* from the elevator.

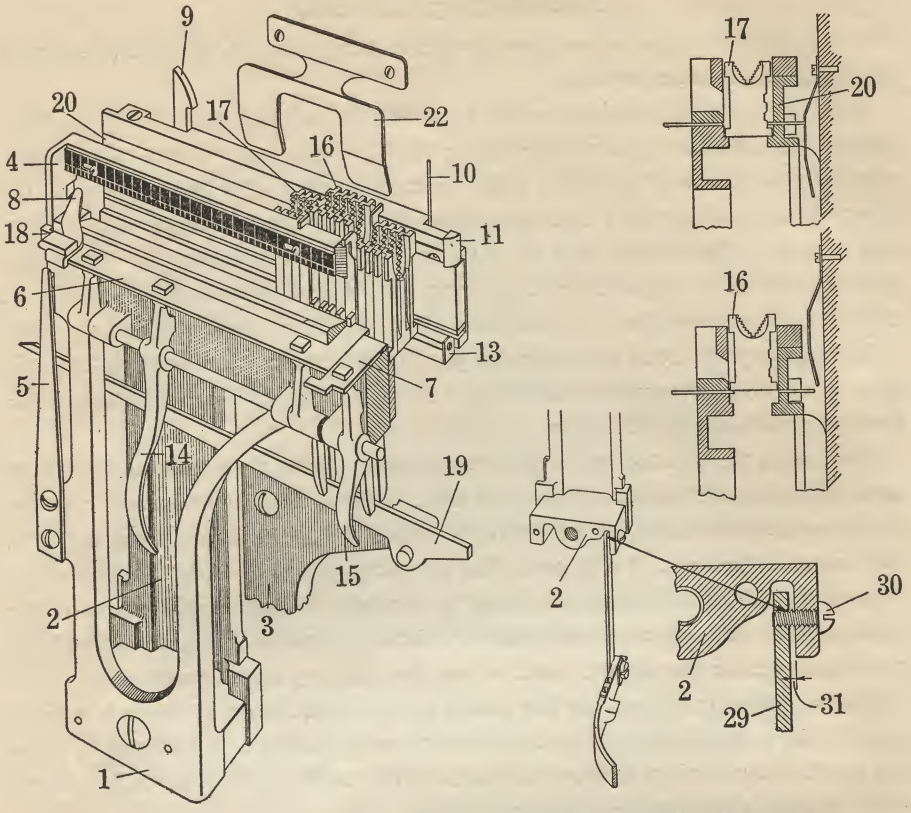
Start with the pin too low to trip the delivery slide, then raise the elevator until the back rail banks against the stop. Hold in that position and turn up on screw until the delivery slide starts across. With the adjustment made in this manner the latch *9* will be in the proper position to hold the line when transferring. The releasing pin must be straight so that it will come in the center of the starting pin of the delivery slide; otherwise it might not hold the pawl out to clear the second notch when the delivery slide goes across.

On the right-hand end, on the inside of the front plate *1*, there is a fiber matrix buffer which should be replaced quite frequently. If allowed to wear too much, the matrices will strike the back rail buffer, which is made of steel and will result in damage to the inside lugs.

When replacing the front buffer it is sometimes necessary to file the face of the fiber at its lower end so that spacebands will pass freely as they are assembled. Also see that the outer edge of the fiber does not interfere with the front end of the assembler block when the elevator is lowered.

On the left-hand end of the duplex rail is the operating finger *8*, which moves the aligning piece. See that the point of the finger comes under the projection of the aligning piece on the delivery channel when the duplex rail is pushed in, and it must raise the aligning piece exactly the right height to allow the matrices in the raised position to transfer smoothly. The finger may be bent to bring it to the right position. The distance between the points may be changed by loosening the operating finger and swinging it right or left.

When the machine is new, the distance between the gate and the back rail is right, and a matrix will go between them with a sliding fit; but when the machine has been used for some time the gate and stop pin will gradually wear and allow the gate to go too far in and bind the matrices on the side when the line is being assembled.



View of assembling elevator, having a portion of it cut away so as to show the matrices at two different positions in the matter of alignment. The long auxiliary rail may be shifted in or out of use by the lever 14, and the short rail, by the lever 15. It will be noted that the short rail cannot be shifted into use without carrying the long rail in with it; but it can be withdrawn without moving the long rail and can be shifted in or out as desired. Also, the long rail cannot be withdrawn without carrying the short rail out of action with it.

At the lower right is shown the clearance space 31, when the link 29 is connected to the assembling elevator.

The gate rests against a stop pin, and if either or both of these points is peened out it will usually correct the trouble, unless other parts are worn. On the later model machines there will be found a set screw at each end of the gate which may be adjusted to give the right clearance.

At the left-hand end of the gate there is a roll which moves on a pin, and a spring presses against the roll to keep the gate closed.

The pin in the roll should be changed occasionally, for if worn too much, the gate will not close against the stop pin. There is very little wear on the roll, as it is hardened.

When the ends of the rod, on which the gate fulcrums show wear, the rod should be replaced before the holes in the gate become oblong. This rod is fastened with a set screw underneath the right-hand end.

When replacing the lower retaining pawl *13*, the screw should force it tight against the upper edge. This will prevent the screw from working loose. The upper retaining pawls *11*, seldom need attention.

When replacing the assembling elevator link allow clearance at *31*, between the link *29* and the side of the casting of the elevator. The screw *30* runs through a thread in the casting. The hole in the link *29* is also threaded. When connecting, let the screw go about one thread beyond the elevator casting before it enters the link. This distance can best be seen if the front plate of the elevator is removed when the link is connected at the top. On later models, the link *29* is held on the outside of the casting with a shoulder screw.

The weight of the assembling elevator is counterbalanced by a spring which is fastened at the right of the keyboard. One end is connected to the assembling elevator elevating handle, and the other end is fastened to an adjustable hook on the keyboard frame.

A slight amount of oil may be used occasionally on the rod at the end of the gate and on the roll pin.

Do not use oil where the elevator slides in the gibs. These parts should be wiped clean frequently, using a dry rag placed on the end of a screwdriver.

Line Delivery Slide

To operate smoothly, the grooves in which the line delivery slide travels must be kept clean, the air chamber must have the correct adjustment, the friction on the long finger must cause the long finger to "take up" when a short line is sent in. The adjustment of the travel to the right of the line delivery slide is made with the line delivery cam lever split hub on the rear end of the line delivery shaft, and should be adjusted so the short finger of the delivery slide comes just beyond the delivery pawl. The line delivery slide delivery pawl is tripped by a thin steel wire fastened to the assembling elevator. This wire raises the delivery pawl and is adjustable for height with a small set screw underneath the wire bushing.

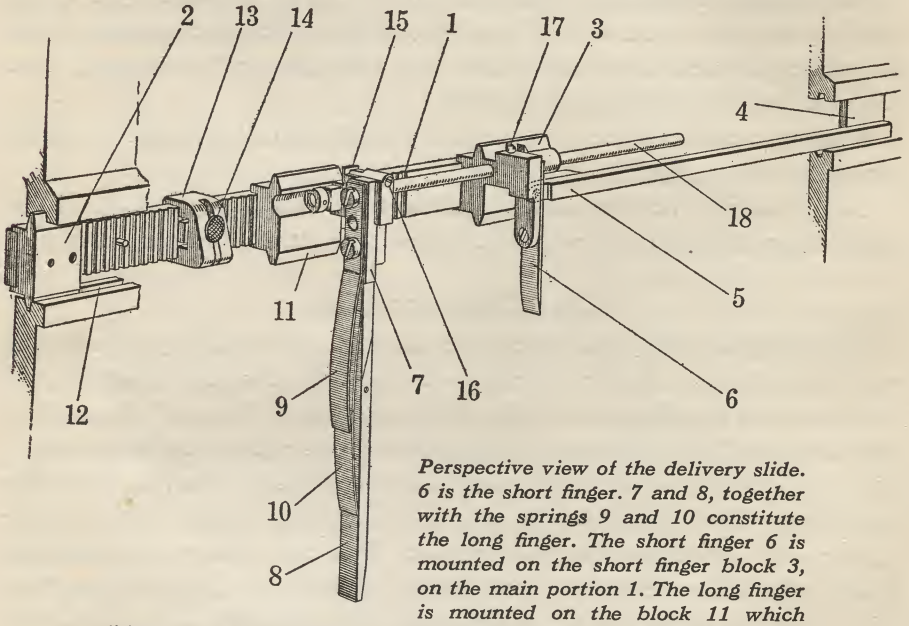
When the delivery slide moves to the left there is an adjusting screw which should be set so the short finger of the delivery slide will carry the last matrix in a line just inside the first elevator jaw retaining pawls.

If a line of matrices does not enter smoothly into the first elevator jaws, the elevator slide may be too high or too low to register with the delivery channel. The first elevator slide may be gummy and will not settle to its normal position. If so, clean and oil slightly. Also examine the matrix retain-

ing pawls to see that they are in good condition. If a line of matrices in the raised position binds as it enters the first elevator jaw, it may be that one of the matrix retaining pawls is worn; if so, replace both pawls, making sure that the tension is even.

If the movement of the delivery slide is sluggish, rub a small amount of oil, placed on the finger tip, on the face above the grooves where the friction plate of the long finger rests against the face plate.

If the delivery slide travels too far in its return, it will press too hard against the spaceband chute. If a line is sent to the waiting position while another line is being cast, it may not go far enough into the delivery channel to allow the trailer of the delivery slide to trip the latch on the assembling elevator. It will be necessary to wait until the machine is nearly in the normal position before the assembling elevator can be lowered to start the next line.



Perspective view of the delivery slide. 6 is the short finger. 7 and 8, together with the springs 9 and 10 constitute the long finger. The short finger 6 is mounted on the short finger block 3, on the main portion 1. The long finger is mounted on the block 11 which slides on the main portion 1 and is held in place by a spring pressure shoe 15. The block 11 banks against a clamp block 13 which is slidable along 1 and held from movement thereon by a small clamp 14 which fits into notches cut one em apart in the main portion 1. The block 11 has fastened to it, a rod 18 which bears in the short finger block 3 to hold block 11 and the long finger in alignment, aided by spring pressure shoe noted above. The slide block 2 is fixed at the left end of the notched portion 1 and at the right end is the assembling elevator releasing bar, or "trail." This trail, consisting of the bar 5 and the slide 4 to guide it, serves to release the assembling elevator latch at the proper time and also to prevent the latch from hooking up assembling elevator when there is a waiting line in delivery channel.

Before making the adjustment on the delivery slide, make sure the set-screw which holds the delivery cam to the main shaft is tight. If this set-screw has worked loose it may make a difference in the setting if the cam has shifted slightly; also, if not kept tight, it will cause wear on the key which holds the delivery cam to the main shaft, and if a 30-em line is sent in, the long finger may not be drawn back quickly enough to clear the spacebands on the right-hand side, as the wear on the key would make a slight difference in the timing of the delivery cam.

The adjusting screw which forms the stop for the delivery slide at the left side should be set to allow the short finger to travel $\frac{1}{32}''$ into the elevator jaws, as mentioned before in this chapter. If not convenient to measure the distance, be sure the short finger carries the last matrix inside the retaining pawls.

When a line has been sent in, and the delivery slide rests against the set-screw on the left-hand side, the delivery lever roll should move the starting pawl just far enough to clear the stopping lever.

If a line is sent in, and the travel of the delivery slide is sluggish as it enters the first elevator jaws, and the starting pawl is moved too far, the machine will start before the last matrix has been caught by the retaining pawls, and the end matrices will fall off.

The long finger on the slide is held in position by a movable block fitted with a ratchet to hold in the grooves of the slide, and when changing to different length lines, the long finger should be brought as close as possible without binding the matrices when the line is delivered. If too much space is allowed, there is a possibility that the matrices may become twisted or badly jumbled if a loose line is sent in.

The long finger must be absolutely straight. It can be tested easily by allowing the slide to go over to the right-hand end of the intermediate channel and using that as a square.

A small brass friction plate rests against the face plate, just above the delivery slide groove. It is held by a coil spring and is adjustable for tension by a screw on the outer end. The purpose of this friction plate is to hold the long finger against the line of matrices as it is delivered to the elevator jaws. If a comparatively short line is sent in, the friction must cause the long finger to remain stationary until the line of matrices has carried over and pressed against it, remaining so until the line is completely delivered.

If wear shows on the friction plate and it needs to be replaced, remove the screw which holds the spring, and, with a small screwdriver remove the screw from the plate. This work will be easier if the delivery slide is removed from the machine.

The delivery air cushion cylinder carries a piston, on the top of which is a

leather washer. The top of the cylinder has a vent which can be adjusted to control the speed with which the slide travels.

If the machine is casting a line, and the slide is sent over to the waiting position, the action of the air cushion must be smooth, so as not to jar the long finger away from the matrices.

The air cushion should be cleaned occasionally in order to insure its continued proper action. Wash the inside of the cylinder and the outside of the piston with gasoline. Dampen the edges of the leather washer with a light oil and set the air vent so the delivery slide will travel without jarring.

Other Points to Watch Are These—The guiding rod which is fastened to the long finger block and extends through the short finger block should be kept free from gum, so it will slide freely to allow the long finger to take up the slack when delivering the line.

On the back of the delivery slide bar is a screw, by which the delivery lever link is connected to the slide. To keep it from working loose, there is a small pin that goes all the way through the slide and the end of the screw. When replacing, drive out the pin before attempting to remove the screw. It will be necessary to drill a hole in the screw (from top and bottom of slide for proper alignment of hole) for a new pin after the screw has been tightened.

Examine the stud at the other end of the link where it is attached to the delivery lever, and if worn, replace it with a new one.

The blocks which hold the long and short fingers to the delivery slide may show signs of wear, especially the long finger block, due to the pressure of the friction spring. If allowed to wear too much, the bottom of the long finger will lean so far in it will strike the bottom rail of the assembling elevator when a line is sent away. It is good practice when the blocks are worn to replace both. This will give a better fit to the guiding rod. If the long finger block alone is replaced, the rod must slide freely through the hole in the short finger block, so the long finger can "take up" as mentioned before.

The starting pin should be kept clean so it will immediately drop into position as the delivery slide starts across.

If the movement of the slide is sluggish it can usually be overcome by rubbing a small amount of oil, placed on the finger tip, on the face above the grooves, where the friction plate slides over.

Do not use oil in the grooves where the delivery slide blocks travel. The oil may eventually gum up the channels. Keep channels clean and use a small amount of graphite if necessary.

The Official Linotype Manual

An up-to-date manual which has been prepared for general use of machinists, operators and students. It contains the essential technical data on the Linotype, arranged in the sequence of the basic mechanisms, parts and functions of the machine.

An ancient philosopher said: "My life has been full of troubles, most of which never happened." So that the troubles enumerated in *Linotype Machine Principles* may never happen under careful operation and maintenance, the cause, effect and remedy are given in full detail.

This 487-page book (X-1752) mailed postpaid to any part of the United States for $3.50. Remit to your Linotype Agency with your order.

TRADE LINOTYPE MARK

BROOKLYN • NEW YORK CITY • CHICAGO • SAN FRANCISCO • NEW ORLEANS
CANADIAN LINOTYPE, LIMITED, TORONTO, CANADA

Linotype Memphis Family and Bookman. 610.26-C-U-23X