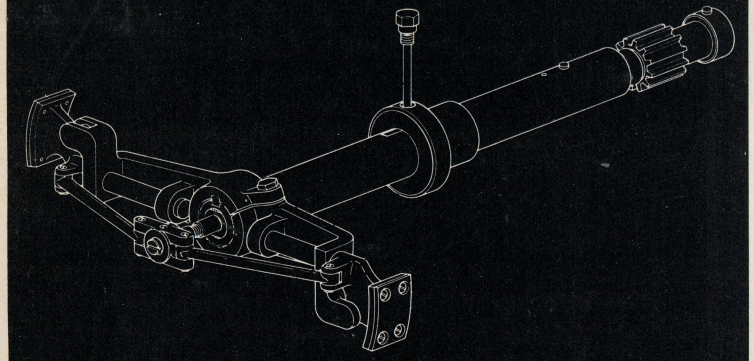
SHOP TALK

VOLUME 8. NO. 1

The Drive Pinion



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Address all Communications to:
Alfred Archer, Editor
Star Parts Company
2 South Main Street
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WHAT DID GUTENBERG INVENT?

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The quick answer to this question is "Printing". In the same sense that Marconi "invented" the radio and Fulton "invented" the steamboat, Gutenberg invented printing.

However, Fulton invented neither the boat nor the steam engine, but rather took two previously unrelated technologies and successfully combined them. The same is true of Marconi. Many of the principles involved in radio transmission were already known to scientists of the time.

Gutenberg is correctly known as the father of modern printing because he combined several well-known crafts, and added some of his own genius to establish the art of printing from moveable type.

Although we know very little of the techniques which were used in Gutenberg's printing establishment around 1440, we do have a good knowledge of the state of the art of printing at that time.

Woodblock printing, especially of religious pictures, had existed for many years. Woodcuts, similar in principle to present linecuts, still exist from the year 1340. These blocks were used for the handprinting of designs on cloth.

Because reproductions from these blocks were almost certainly hand-rubbed impressions, the ink had to be far more fluid than printing ink today. Consequently it soaked through, making an impression on the opposite side impossible.

Many of the religious pictures in woodblock form had hand-carved captions. The idea of cutting apart these letters so they could be reused surely occurred to Gutenberg and some of his contemporaries. However, there were no precision cutting tools in those days and experiments along these lines must have produced type which was almost impossible to lock up. (Modern printers can appreciate this problem when a column of slugs only a few thousandths out of parallel are locked up together.)

Gutenberg had considerable skill as a goldsmith, and therefore understood the properties and malleability of metals. It is possible that he discovered the key to successful moveable-type printing by engraving or punching the first matrix into soft copper, and then moving one step further by constructing a one-character mold with parallel sides. When the matrix was fixed to one end of the mold and an alloy of lead and tin poured into the opposite end, the first type could be cast.

After the problem of type paral-

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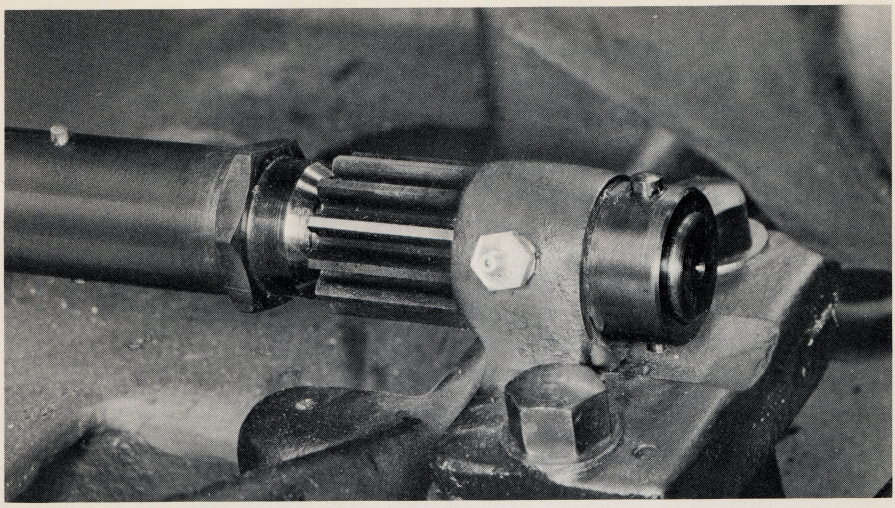


REPLACING THE DRIVE PINION

By James Adamo *Ass't. Service Manager*

We believe there is no one part on the typesetting machine that is more important than the drive pinion (C-230, S-21) for smooth, quiet operation. The work horse of the mechanical drive linkage, it operates on an 11 to 1 ratio to the machine cycle. The ease of replacing the drive pinion and its low cost in contrast to its important function dictates its replacement on a regular maintetenance schedule, rather than on an open "its had it" basis. The following steps outline basic procedures, and if replaced with the Star improved "easy out" pinion, the possibility of difficult removal in future will be quite remote. (In the event a drive pinion and drive shaft are difficult to separate and remove from the machine, you will find some helpful hints in Section II of this article.)

Step 1—Place machine in normal position and turn off motor. Remove rear step.

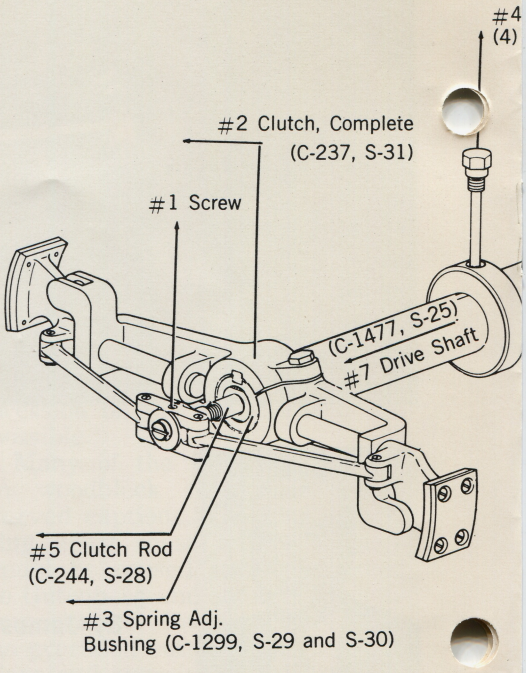
Step 2—Refer to Figure 1. Remove screw (1) and complete clutch (2). Next remove the spring adjusting bushing (3) and at the same time this will remove tension on the clutch spring (C-4 or W-117, not illustrated). Temporarily replace clutch (2) and turn shaft so as to place screw (4) in an accessible position for removal of same. Once this screw is removed the clutch rod (5) will slip out.

Step 3—Once again, rotate the shaft slightly to place pin (6) in proper line-up to be driven out. Using the proper size punch or drift, knock out the pin. Slide the main drive shaft (7) to the left, keeping the main drive wheel in place if possible. (If pinion (10) is tight or frozen to shaft (7) refer to Section II before proceeding.) If the main drive shaft has dirt and gum on it, it will be necessary to clean this off so it will move easily to the left, through the clutch collar, bearing and the main drive wheel.

Step 4—If the main cams have not moved, the pin (8) for the main drive pinion collar (9) will also be in the proper position for removal at this time. After driving out pin, remove collar and slide pinion out to the left for complete removal from the machine.

Step 5—Clean and lubricate as necessary the various parts pertaining to the pinion and also take this opportunity to force out any old or dry grease that may be in the fitting or pipe, (Point A, Figure 2) that holds a grease fitting.

Step 6—Install the new pinion, reversing the above procedure. Leave collar (9) off until timing is complete. A liberal amount of grease or heavy oil should be used when assembling the pinion to the shaft. In the case of the Star improved drive shaft pinion, the threads act as a catch or holding agent for the grease or oil to be carried into the drive shaft opening.



PART II

NOTE: Care should be exercised that the holes in the drive shaft and drive pinion line up properly (taper) *before* driving in pins. Separation of these two parts is virtually impossible if a pin is mistakenly driven in the small end of the tapered hole. If this happens, the drive pinion shaft is expanded within the drive shaft making them virtually impossible to separate. So, double check that the tapers are lined up properly between shaft and pinion and also collar and pinion before driving the taper pins to a tight fit. Before replacing the collar (9) check

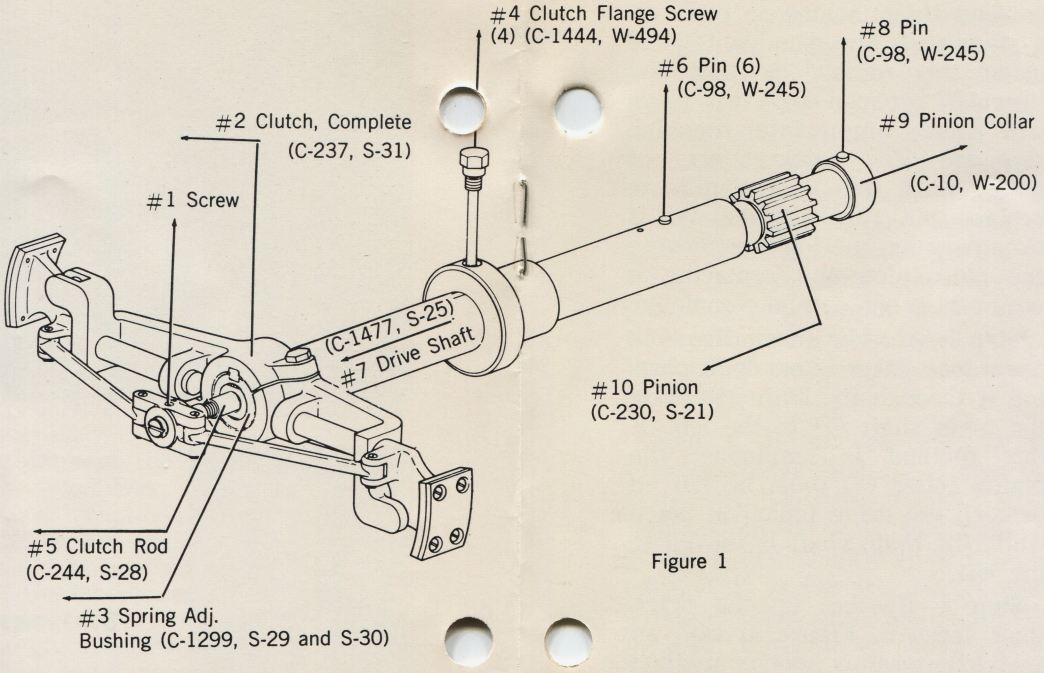


Figure 1

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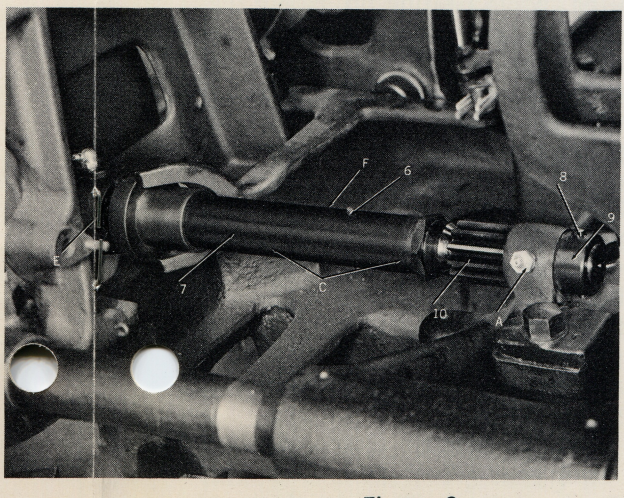

Figure 2.

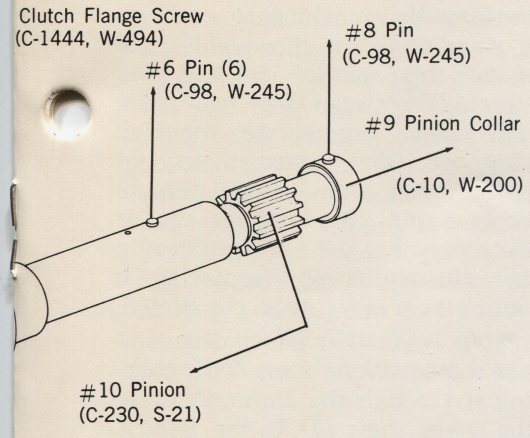

Figure 1

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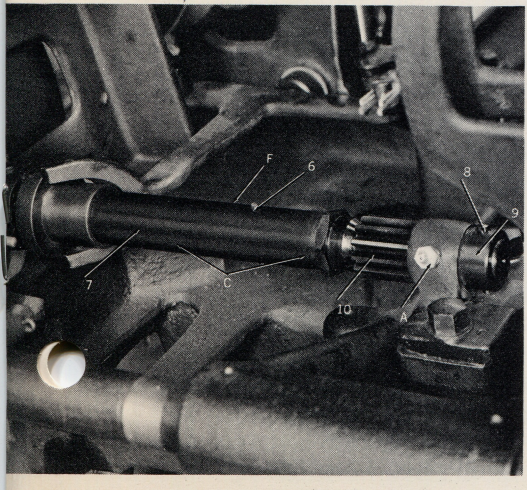

Figure 2.

the cams. Using the clock face system and referring to Figure 3, the correct position for the clutch is a 9 to 3 o'clock position or as nearly horizontal as possible. If a perfect horizontal position is unobtainable, then cock the left hand leather slightly down, possibly on 8:30 to 2:30 position. When timing the pinion, be certain to allow for a possible back-lash or roll-back of the cams which will be more prominent on older machines. If this is the case, then the pinion will have to be advanced one tooth to take up the back-lash and still have the clutch leathers stop at a 9 to 3 o'clock position when the machine is at normal or at rest. With the collar (9) left off as suggested, the above "timing" can be accomplished easily by slipping the drive shaft and pinion out of mesh with the main drive cam and advance or retard one tooth at a time. At the completion of the timing, the large end of the two taper pins and the screw heads for the clutch and clutch collar should be in "up" position when the machine is at normal.

Unless the Star improved Drive Pinion and Nut (C-23A, S-21A) is to be removed, the separation of the driving pinion from the main drive shaft may be a difficult job. If the Star improved part is used it is a simple matter to loosen the two parts by turning the large nut on the left of the driving pinion teeth.

Assuming the Star pinion is not used and the older style pinion is frozen within the drive shaft, the following procedure will prove helpful.

Step 1—Locate the breather hole in the drive shaft (left of taper pin 6) and open up two or three sizes larger so as to facilitate pouring in a solvent or a fluid with a cutting agent into the hole. ("Liquid Wrench", a commercial solvent is preferred by many machinists.) Keeping the hole in an upright position will allow the solvent to soak in between the pinion and drive shaft. On a real stubborn pinion, it may be necessary to repeat several times, prob-

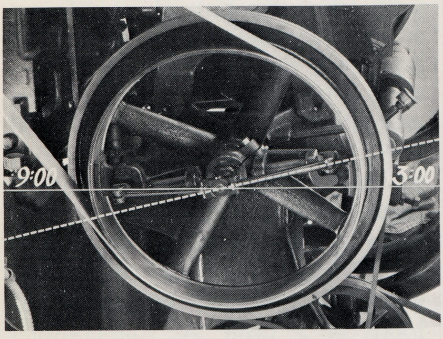

Figure 3.

ably leaving the solvent or fluid overnight. Using an oil can or squirt-type oil can put some of the solvent at the point where the drive pinion enters the drive shaft. Because this is normally a tight ream fit the chance of the solvent getting all the way through between the two surfaces is almost zero. However, on a frozen pinion every little bit will help.

Step 2—Remove the pin (6) that locks the pinion and drive shaft together. It's possible to operate the machine in this condition for several days, depending on how tightly the parts are frozen together. As a rule, after operating for a few days the parts will break loose and cause the drive shaft to spin around the drive pinion, causing the machine to come to a stand-still. The disadvantage of using this method is that the "break" between the two parts will cause immediate machine stoppage. The quickest way of geting back into operation is to replace pin (6) immediately. If time permits, the job of removing the old pinion and replacing it with a new one can be completed.

Step 3—Another alternative is to use a long, large brass drift, passing it through the cams, to drive the main shaft (7) to the left. If this method is employed, the pinion collar (9) must be left on to keep the drive pinion in place while the main shaft is moved to the left.

Step 4—Heating up the drive shaft (area C, Figure 2) with an acetylene torch is another method of breaking loose these two parts. If a regular acetylene torch is not available one of the local hardware-type propane torches can be used. While heating up, rotate the shaft to heat evenly, at the same time tapping with a hammer. The trick is to expand the shaft slightly without having excessive heat penetrate right through to the pinion shaft, since expansion of both parts would defeat the purpose. There is no exact point at which heating should be stopped, but the best procedure is to heat the drive shaft efficiently to expand slightly before an excessive amount of heat transfers to the pinion shaft.

Step 5—Remove clutch (2), and main gear wheel and collar (9). Replace clutch (2) and tighten on

a permanent basis. Grasping the clutch with both hands, pull out until the gear portion (teeth) of the driving pinion strike the right side of the clutch flange, which in turn will bear against the cam hanger and bushing (Point E). This action will usually separate the driving pinion from the drive shaft, unless they are unusually tight. Care and good judgment must be exercised, as extreme pounding could break or fracture the casting (E). This "wheel pulling" effect may also be employed with step 4.

Step 6—If all of the listed "tricks," and perhaps some of your own, fail to dislodge the pinion from the shaft, then cutting of the pinion shaft will be necessary. This is the last resort and a replacement drive shaft (C-1477 or S-25) must be on hand, since removal of the shaft from the machine is no assurance that the remaining, sawed off stub within the shaft will come out. A hack saw with a new blade (24 teeth per inch) is probably the best tool for the job. Elbow grease and patience will help. Because of the inaccessible position of the drive pinion, full leverage cannot be applied to the hack saw for sufficient cutting, so having one or two extra hack saw blades before starting is important. Once the shaft is removed we can again attempt steps 1 through 4 (Section II) for removal. If not successful, a machine shop could possibly bore or drill out the remaining stub, but at this point, considering the cost of machine shop service and down time, a new shaft is probably the most economical way out.

(continued from page 2)

lelism was solved, and a tackier ink developed to permit printing on both sides of the same sheet, information was readily available to help solve the other problems of printing.

The press was already well-known although possibly not used for printing. The screw-type press, which we have all seen in old woodcuts, was used both as a wine press and as a means of pressing clothing and bed linens amongst the wealthy. (The iron had not yet been invented.)

Gutenberg lived in the city of Mainz, a medieval center of commerce and culture where magnificent illustrated Bibles and other religious material were hand-produced. Size and design of alphabet characters had been developed to a high level by expert calligraphers in their manuscripts over the centuries. The esthetics of page size, length of line, margins and other matters pertaining to book format also were well established and information regarding them readily available. As an artisan in gold, Gutenberg would have been familiar with these matters, and it is obvious that he adapted them to the new art of printing.

So printing has its patron saint, who was the first to struggle with some of the problems still facing printers today. However, like many inventors, he may not have been wholly practical, since he lost all his equipment to his creditors not long after creating his own monument—the great Gutenberg Bible.

Alfred Archer