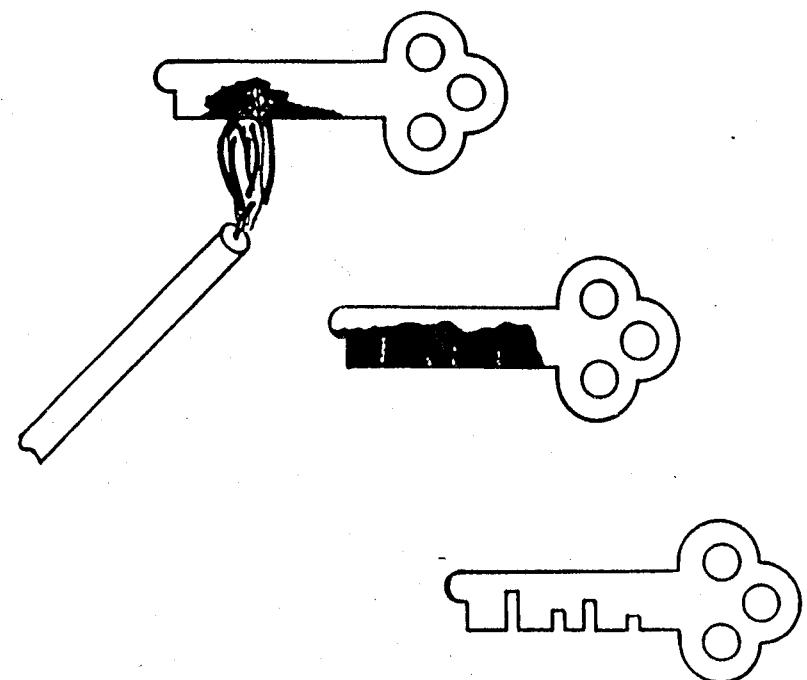


# HOW TO FIT KEYS BY IMPRESSIONING



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## WARDDED LOCKS

We will begin our study by focusing our attention on the more simple locks first. These locks fall into the general category of "warded locks". Warded locks include: bit key locks, as found in older homes and cabinets; flat and corrugated steel key locks, which can be found in cheaper padlocks, cabinets, chests, etc.

A ward is a part of the internal structure which prevents the passage of a plain key blank. A proper fitted key is required to have various areas removed or filed away in order to pass these wards. See Fig. 1 and Fig. 2.

Needless to say, fitting a key by impressioning requires the proper key blank. It is assumed that the student knows how to select the proper blank, so we won't dwell on the subject. If all keys were made of soft metal, impressioning would be easier. However, most bit, flat and corrugated key blanks are made of steel with nickel plate on them. There are several ways to prepare a blank to take impressions more easily. One way is to "smoke" the blank with a kitchen match or small candle. Another way is to coat the blade of the blank with die maker's blue, model airplane dope, or even fingernail polish. This coating will now take impressions a lot easier than the bare steel blank.

Insert your prepared blank into the keyway and turn gently but firmly. Remove and look for marks. Sometimes it is better to rock and jiggle the blank while turning. Marks made by hitting the wards should be visible. With your ward file, start making a cut or cuts where the marks appear. Go easy at first. Later you will have a better idea of just how large a cut to make.

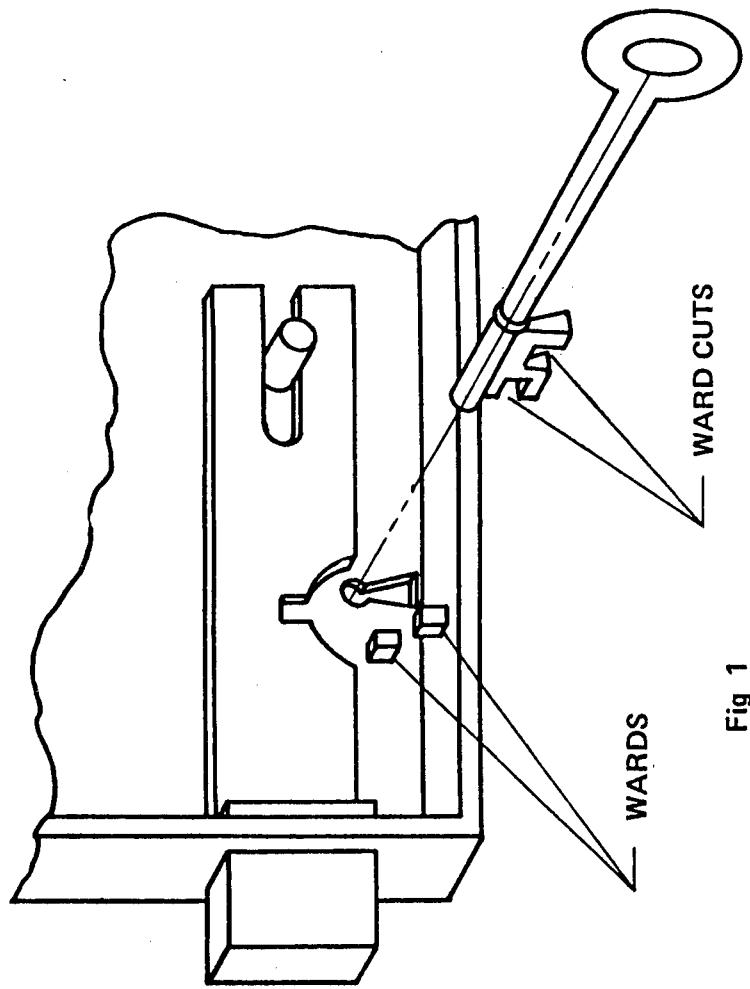


Fig 1

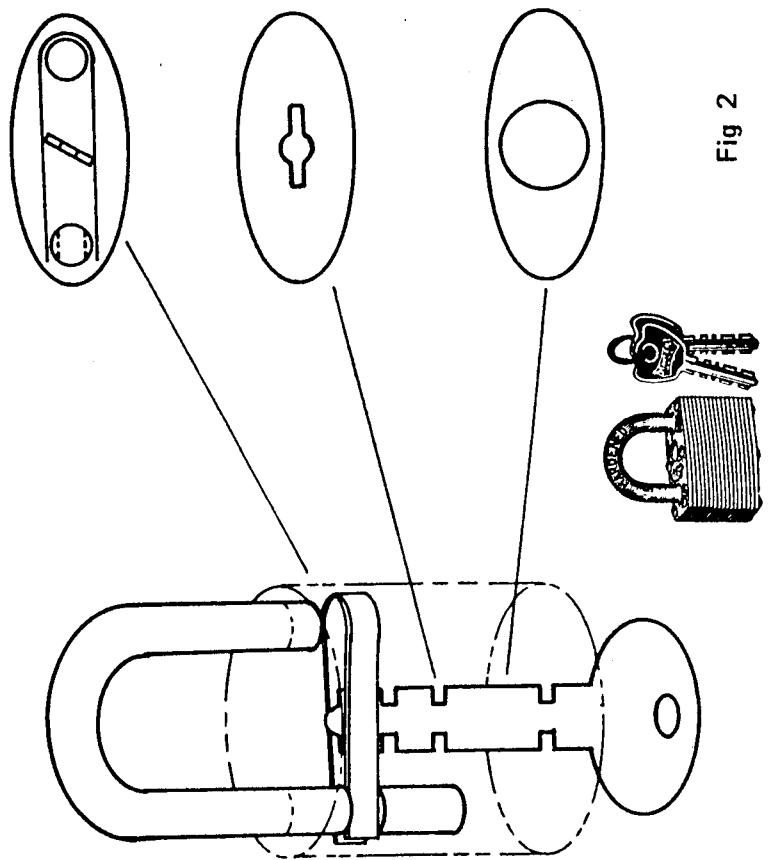


Fig 2

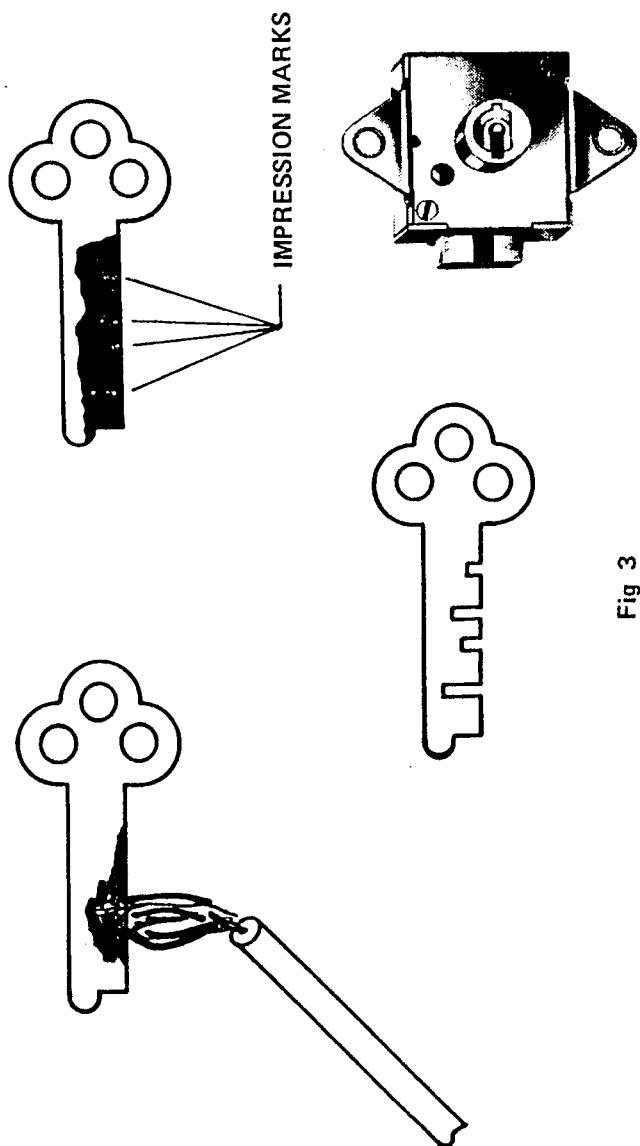


Fig 3

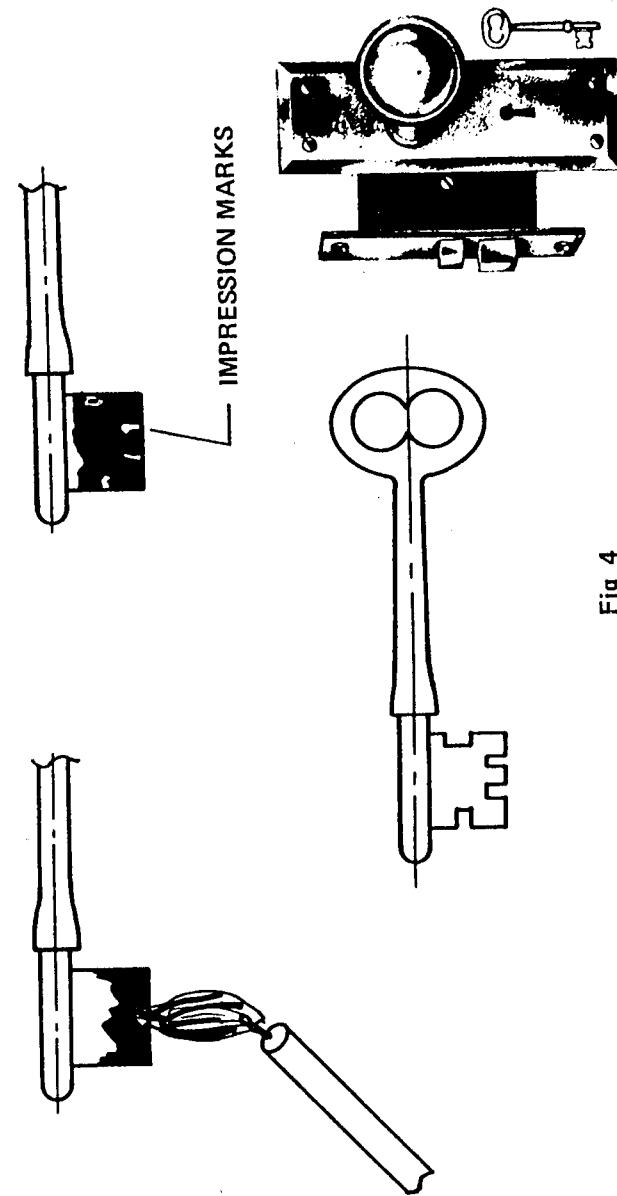


Fig 4

Resmoke, or otherwise coat, the shiny metal where you have been filing, and repeat the above step again. Keep marking and filing until the key blank freely passes the wards. The idea is to make a cut no larger than necessary to pass the ward. See Fig. 3 and Fig. 4.

In the more simple locks, once the key blank clears the wards, some portion of it (usually near the tip) will engage the latching mechanism, or in the bit key locks, it will actually engage the bolt itself. Further turning should either release the shackle of the padlock or withdraw the bolt of a bit key lock.

Skeleton keys are simply key blanks that have enough of the blade removed to clear any possible ward combination while leaving just enough to engage the latching mechanism.

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## LEVER TUMBLER LOCKS

The most complicated type of warded lock that you may encounter will be the lever tumbler type of cabinet locks. Some bit key type house locks also have lever tumblers. This type of lock may have from one to several tumblers. The bolt has a protrusion called a "stop". The edge of the tumbler is called a "fence". Along this edge you will find a slot, or "gate" as it is properly labeled. These gates must all line up and allow the stop to enter in order for the bolt to retract. As these gates can be at various positions along the fence, the tumblers must be raised to various heights in order for the gates to line up. A properly fitted key will have various height cuts or lands that will raise the lever tumblers to their proper heights to line up the gate or gates with the bolt stop. While the tumbler portion of the key blade is doing this, another portion is engaging the bolt and retracting it with the bolt stop traveling into the aligned gates. See Fig. 5 and 6.

Once you understand how the lever tumbler mechanism works, little trouble will be encountered in impressioning a key for this type of lock. You will notice than an uncut key blank will begin to lift the tumblers with its edge. A better impressioning surface can be had by filing this sharp edge to a slight bevel, thereby creating a wider surface to take the impression marks. See Fig. 7. The blank should be smoked or coated as before along this edge.

When the prepared blank is inserted and turned, one of two things can happen:

- A. The bolt will be drawn back, the stop will engage the fences at points other than the gates thereby preventing the tumblers from freely traveling upward.
- B. The tumblers will all be raised to their upmost travel limits with the gates all above the stop. The bolt will not have traveled rearward enough for the stop to engage the fence.

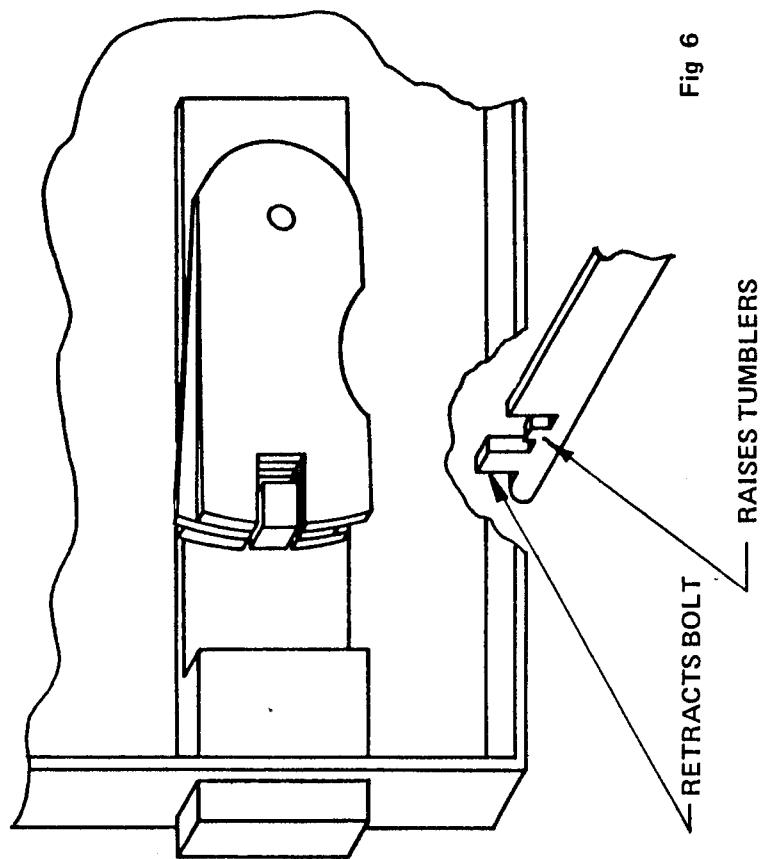


Fig 6

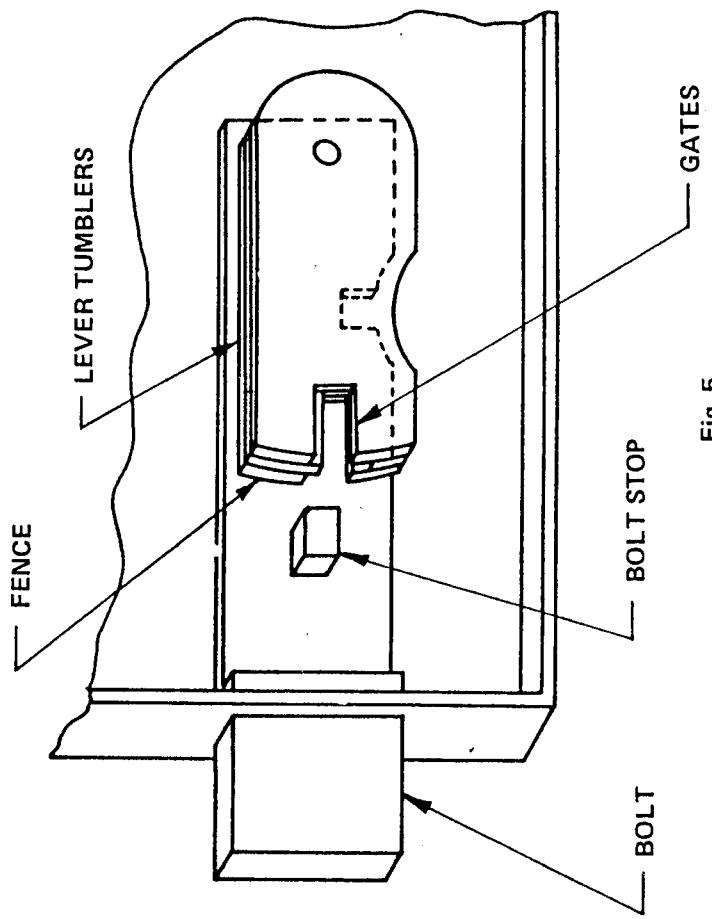


Fig 5

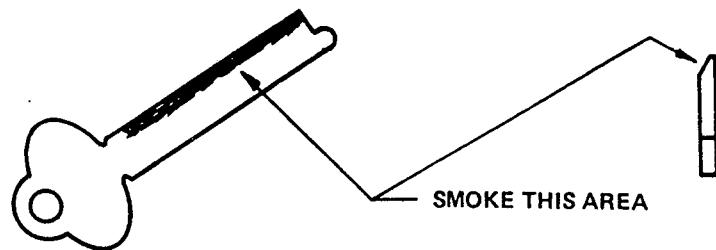


Fig 7

In either case, the tumblers will impart a heavy mark on the blank key. The blank is now filed at these marks, re-smoked or coated, and impressioned again. As before, go easy at first on filing. Your cuts should not only be to the proper height, but also to the right width, so as to engage the correct tumbler.

When properly cut, the blank will raise the tumblers until the stop and the gates are in alignment. Since the stop is no longer binding against the fence, the tumbler will not impart a heavy impression as before, and no further filing should be done at this cut or land.

A word of caution --- since the tumbler lever is spring loaded in the downward direction, this force may mark the blank but not nearly as heavy a mark as when it was binding against the bolt stop.

## PIN TUMBLER LOCKS

A whole new set of principles applies to impressioning keys for a pin tumbler lock. First of all, the key blank is not prepared in the same manner as with warded locks. The blank should not be smoked as this soot material will rub off just inserting the blank into the keyway. This would also apply to all applied material to the key blank. The only additional thing that you might wish to do to the blank is to anneal it.

The impression marks are actually small indentations into the surface of the metal on the edge of the key blade. The softer the key, the easier it will take an impression. During the manufacturing of the key, the brass becomes "work hardened".

The annealing is accomplished by heating the key blank over a flame until it is red and then quenching it in cold water. You might wish to wire brush any oxidation scale from it after quenching.

With the key blank inserted into the lock, you know that all the pins are raised past the shear line. The only exception would be in a lock where the first tumbler cut was .000. Most locks have a first cut of about .015 to .020. When the bottom pins are raised past the shear line, you can understand how any turning force on the plug will lock these pins at the shear line between the plug and shell. See Fig. 8. With this accomplished, any up and down, or back and forth motion of the key blank will cause the locked pins to mark the edge of the key blank blade. See Fig. 9.

The blank is now withdrawn and filed at these marks with a No. 4 Swiss 6" round file. When first learning this technique, limit your filing cuts to about .003 or .004. As you progress with practice, you may wish to file more each time. As most locks have their tumbler cuts close to .015 increments, it doesn't take long to reach a tumbler height.

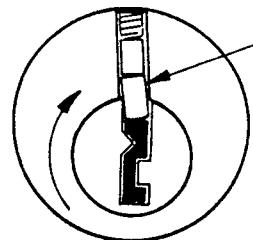


Fig 8

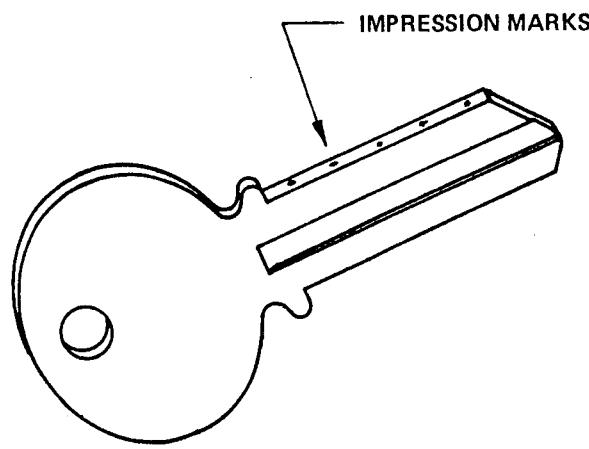


Fig 9

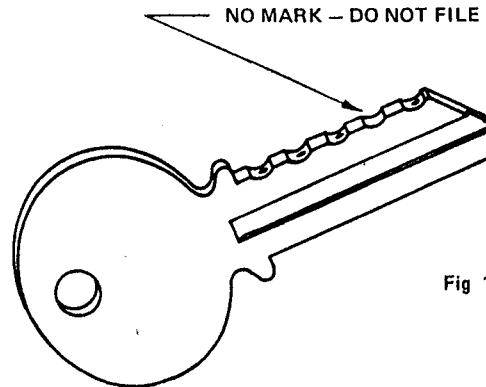


Fig 10

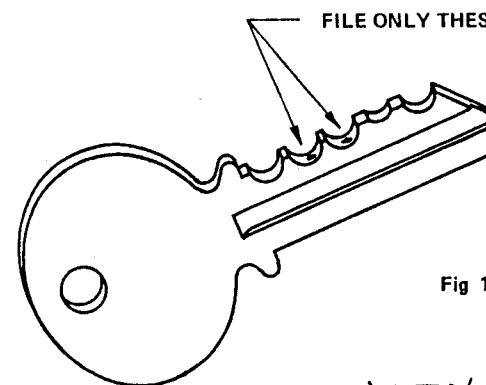


Fig 11

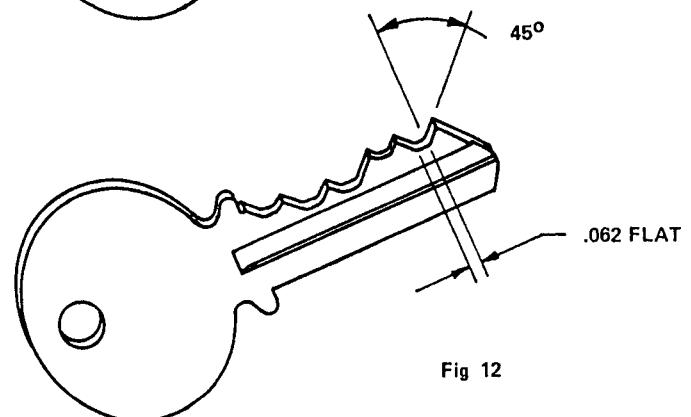


Fig 12

After filing your original cuts, insert the key blank back into the lock and repeat the impressioning motions. Remove and file again. Keep doing this until one of the tumblers no longer marks the key blank. See Fig. 10. Do not file this cut any more, but continue on marking and filing the remaining ones, stopping on each one when they no longer show a mark. See Fig. 11. When the last cut reaches the shear line, the lock will open. The tumblers, reaching the shear line, are no longer locked and cease to mark the blank. Finish the key as shown in Fig. 12.

You will want to try both the rocking up and down motion, and also the back and forth movement in order to obtain the best impressioning technique for yourself. Many locksmiths hold the key blank in their fingers and others use a special impressioning tool that can be purchased at a locksmith supply house. This tool holds the key blank and produces a back and forth motion by squeezing the handle. See Fig. 15. A simple technique is to hold the blank with a good pair of vise grip pliers or a hand vise. See Fig. 14. By placing your thumb against the lock, you can produce both a turning force and also a back and forth motion by using your thumb. See Fig. 13.

If you experience trouble seeing the impression marks, try using a small magnifying glass or eye loop. You should also have a good light source and may have to look at the blank at various angles for the reflection of light to illuminate the marks just right.

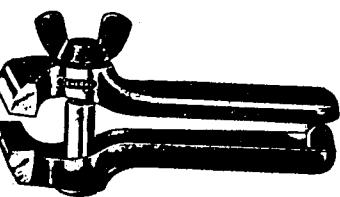
Caution should be exercised to avoid twisting the blank off by applying too much turning force. The lock should be clean. If not, use some lighter fluid or other dry cleaning fluid to clean. Blow until dry before proceeding.



Fig 13



Fig 14



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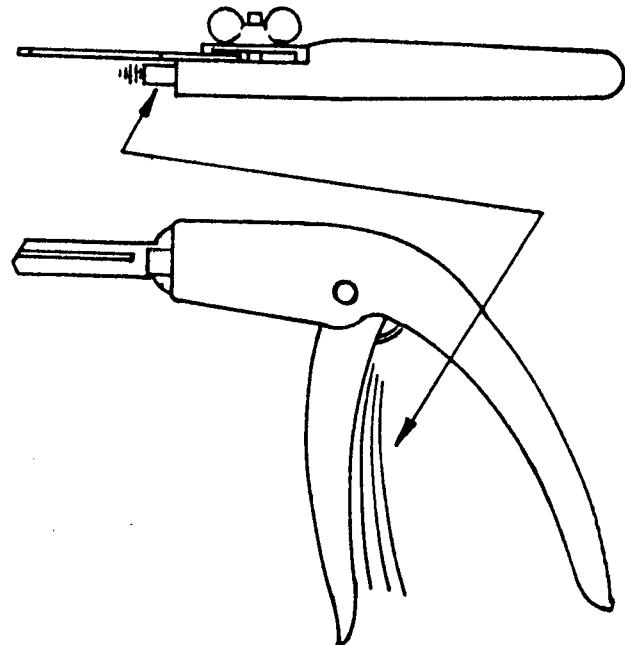


Fig 15

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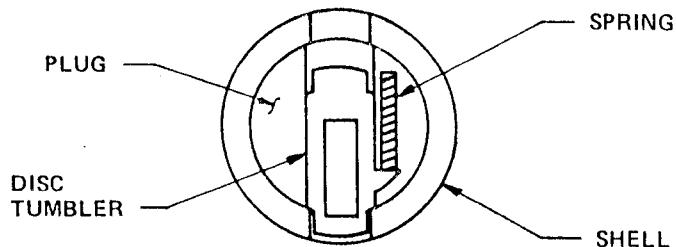


Fig. 16

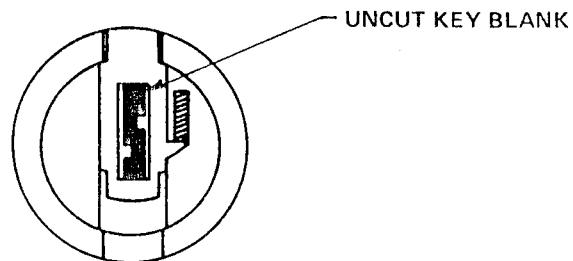


Fig. 17

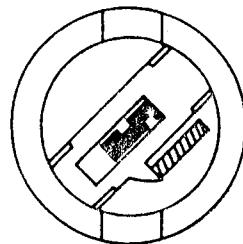


Fig. 18

## DISC TUMBLER LOCKS

A disc tumbler lock, as its name implies, has tumblers made from flat material. They have a rectangular opening through which the key passes. The position of this opening determines how deep the tumbler cut in the key must be in order to raise the disc or tumbler to the shear line. See Fig. 16. When an uncut key blank is inserted into this lock, the discs are forced out beyond their shear line. When a turning force is applied, they, like the pin tumblers mentioned earlier, are locked at the shear line and will impart a mark or impression on the edge of the blank. See Fig. 17. When reaching the shear line, they are no longer locked and will not mark the blank. See Fig. 18. Therefore, this lock is impressioned in much the same manner as a pin tumbler lock.

The one exception in disc tumbler locks is the side-bar lock used in General Motors automobiles. In this lock, the disc tumblers do not engage a shear line, but instead, when correctly raised, provide the clearance for a side bar that engages the shear line. Therefore, this type of lock does not lend itself to regular impressioning techniques.

Figure 19 demonstrates yet another impressioning technique. The key blank is inserted into the keyway and a five to six inch length of .125 diameter rod is passed through the hole in the bow, making a lever with which to impart a turning force on the key blank.

While exerting a reasonable amount of turning force, gently tap the key blank on both the top and bottom of the bow with a small plastic-faced hammer. This will cause the pins to impart a small dent to the key blank. Using these small dents as a guide, file and re-impression just as you did using the other impressioning techniques. Use care so as not to bend the key blank with too much turning force.

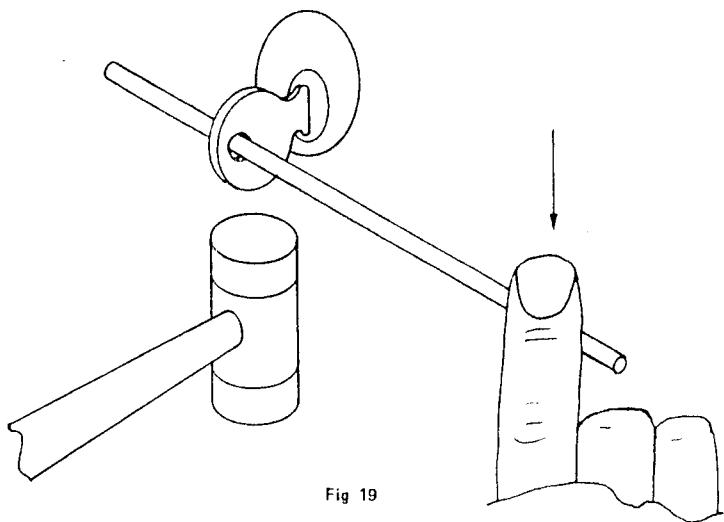


Fig 19

The illustration above demonstrates yet another impressioning technique. The key blank is inserted into the keyway and a 5 to 6 inch length of .125 diameter rod is passed through the hole in the bow making a lever with which to impart a turning force on the key blank.

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