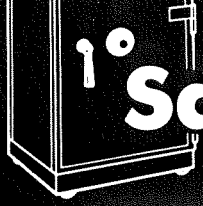

Safeman's Guide

VOLUME 2

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ART METAL SAFES

The large square strap hinge for the door as shown in Figure 1, is the predominant characteristic of the Art Metal Safe. In addition, you will find on these safes either one of two combination lock models — the Yale OC7M lock or the Sargent & Greenleaf 6730 lock.

The Art Metal Safe will function well for many years; however, as it approaches the ten or fifteen year mark of usage, two major difficulties can arise: swelling and rust deterioration. Both of these situations should be treated with care when repairs are to be made.

Swelling is a frequent occurrence on Art Metal safes, and it is very serious because, as time goes on and the swelling increases, the safe door will bind more and more. It may reach the point when the door cannot be closed at all. The cause of

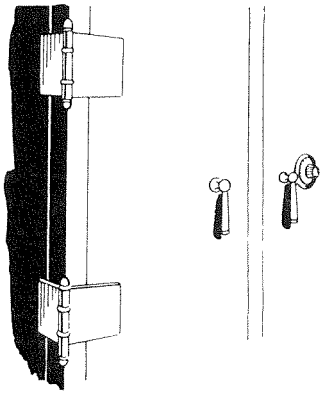


Figure 1

the swelling is something that cannot be determined but may be theorized that some sort of a chemical reaction takes place in the safe as it gets older. It might be that the safes are very damp and rust formation takes place on the steel walls facing the insulation.

There have been severe cases where rust has eaten right through entire sections of the

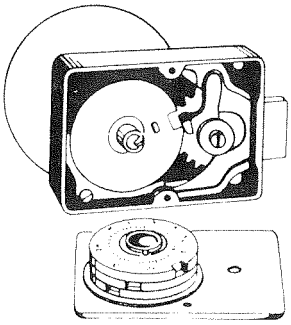


Figure 2

door jamb. Prior to this complete deterioration state, it could be assumed that the build-up of the rust on the inside of the steel wall throughout the years causes the wall to buckle outward, away from the insulation.

If Art Metal safes are encountered in this condition of severe swelling, therefore, it is not advisable to grind away the door jambs at the point of binding because you may grind away all of the metal. The steel used in these safe cabinets is 1/16" gauge. When the safe reaches this stage of severe swelling, even without visible rust deterioration, it is too far gone to perform a perfect repair job. The best advice that can be given is to use a new safe.

This, however, is something

your customer may not want — he may insist upon using the old safe and it will be necessary for you to make some type of repair. Rather than use a grinder to overcome the swelling, use a wood block and a five pound hammer to pound back the bulges and swells. There will be no difficulty in finding the bulges and swells; they'll be easily detected by the rub marks on the jambs and doors.

This method may relieve the binding somewhat, but it will not result in a permanent repair. There is not much else that can be done because of the extreme stage of deterioration. While this swelling and deterioration does occur frequently on Art Metal Safes, there are many that operate for years without any signs of swelling. Thus, your repair work will depend on the condition of the safe you encounter.

For drill points, refer to number 44 in Drill Charts.

BARNES SAFES, OLD STYLE

Although modern safes are prominant in every business today, locksmiths will find that a large number of their safe service calls will be for safes that are quite old but which are still being used today. One of the most common is the old Barnes model, which was a very popular seller during the year of 1920.

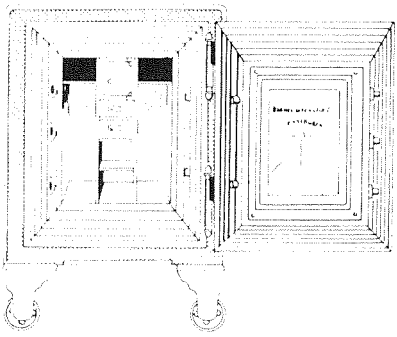


Figure 1

The Model #624 Barnes safe, shown in Figure 1, is typical of all the old style safes with heavy wall construction and the step down door and jam. Generally, these safes were not equipped with hard steel guard plates. But locksmiths know from experience that many of these old safes *do* have hard steel guard plates installed in the doors.

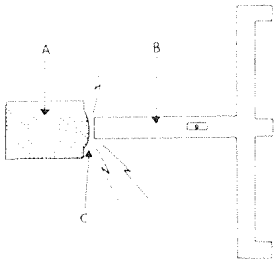


Figure 2

Since it is difficult to determine from records of serial numbers or styles which of the safes were equipped with guard plates and which were not, the only practical way of finding out is actually drilling the safe. Run a drill into the area around the combination lock. If, in your servicing of one of these old Barnes safes, you strike a hard steel guard plate, merely change to a carbide tipped drill and proceed with the operation.

These safes use a Sargent and Greenleaf 6800 series combination lock with a roller bolt. When operated to align the

wheels, the lever attached to the roller bolt drops down by gravity. Further rotation of the dial to the right drags the roller up into the lock case so that the passage is cleared for the cross bar attached to the bolt mechanism.

The point where the lever drops into the wheels is directly at 12 o'clock or above the dial ring indicator. Angle your drill down slightly to penetrate the cast iron lock case. Then, using the combination dial, line up the wheels just under the fence lever. Turn right slowly until the lever drops down and continue turning until you reach the stop point.

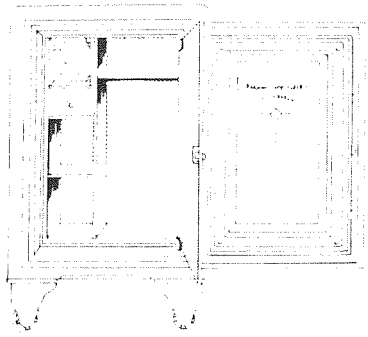


Figure 3

All Barnes safes were not of this heavy construction. Like other safe manufacturers, this company also marketed a light wall safe for moderate fire hazards. The Model #124 shown in Figure 3 was changed considerably in appearance while also employing a different combination lock. These lighter safes used the Yale OBB or OB4 combination locks, which are hand change locks.

The drop-in point on the Yale OB series combination locks is just the reverse of the S & G 6800 series lock. Thus, different servicing methods are required. However, if you are not sure which type of locking device is used on an old style Barnes safe, you can check this by applying a slight pressure to the bolt control handle. A tightening of the combination dial as pressure is applied is a good indication that the safe is equipped with a Yale OB series combination lock with the weighted lever at the bottom.

Either of two methods can be used for servicing a safe with an OB lock. Manipulation works out quite well on these. But, in the event manipulation is impractical for any reason, a small hole drilled just under the dial at 6 o'clock and slightly upwards will reveal the tip of the weighted lever. You then will be able to line up the wheels and look for the lever to drop.

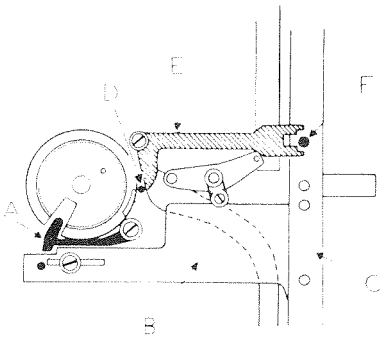
DIEBOLD SAFES

SERVICING OLD STYLE DIEBOLD SAFES

Prior to the development of Underwriters Laboratories standards for safes, the line of Diebold safes consisted of three distinct styles — the heavy wall, the medium wall and the light wall style. The identification of each was determined by their ability to resist fire exposure. The heavy wall Diebold safe was made to withstand severe fire exposure, while the medium wall style was designed for moderate fire exposure and the light wall for minor exposure to fire. Each of these old line Diebold safes, however, used a combination

lock that varied with its construction, thus requiring a separate service method for each style of safe and lock.

Distinguishing a heavy wall Diebold safe from a light wall safe, however, can be made easily by noting the type handle used. On a heavy wall Diebold safe, a "T" handle is used, while a light wall Diebold uses a drop handle. In addition, the "feel" of the combination lock will tell you if the safe is a heavy or light wall style.



The drawing above illustrates the combination lock used on the medium and light wall Diebold safes. Note that the check point of this lock is located at the lower cam "A". This cam is activated by the cross bar "B", which in turn is attached to the main bolt bar "C". When activated, the cross bar "B" moves in a horizontal plane under the lower cam "A" and lifts this cam vertically into the lock.

If the wheels of the lock are scrambled as in a locked position, the toe of the cam strikes the outer edge of the wheels, and the cam is blocked from its vertical movement. When the slots of the wheels are in alignment (by dialing the opening number sequence) over the toe of the cam, the cam can be lifted up by the cross bar, thus permitting retraction of the bolt.

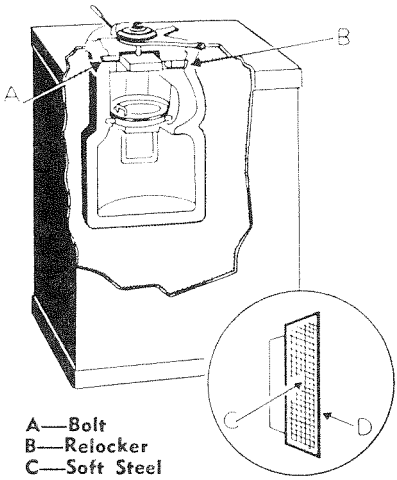
The light and medium wall Diebold safe can be identified when in the locked position by applying slight pressure on the bolt control handle while turning the combination dial. If the dial binds as the handle pressure is applied, it indicates that the cross bar is pressing up against the lower cam and that the cam, in turn, is binding up against the wheels. This symptom also is your tip-off as to your method of approach for servicing.

Because of the friction contact between the heel of the lower cam and the cross bar, a lack of lubrication at this point can cause a secondary or temporary lockout. Even if the combination wheels are in perfect alignment right over the tip of the cam lever, the lever will literally "freeze" to its pivot so that it cannot be raised. You can overcome this correction by applying heavy pressure to the handle or by tapping the handle vigorously to vibrate the cam lever into action and into the opening position. When the lockout has been overcome, be sure to apply a generous amount of lubricant to this friction point to prevent "freeze-ups" of the cam lever.

The relocking device on these style safes is held in position by a pin in the combination lock cluster. In the event the cluster is punched out in a burglary, the pin will lose its contact with the arm of the relocker, thus causing the arm to drop and to lodge itself over the relocker check point lug. In this position, the relocker will deadlock the bolt.

THE DIEBOLT CASH-GARD ROUND DOOR MONEY CHEST

One particular safe that is easily recognizable and that is in common use is the Diebold Cash-Gard round door burglar-resistive money chest. The full line includes many varied styles, but the style which is representative of the servicing procedures is the model which opens from the top. This top opening vertical model is often called the "bottle type" because the inside chamber resembles a milk bottle in its shape (See Figure 1).



A—Bolt
B—Relocker
C—Soft Steel
D—Hard Skin

Figure 1

The combination lock used on these safes is the standard 900 series combination lock used on the insulated fire-resistive type safe with just one modification. This modification occurs in the oblong - shaped locking bolt, which is 1 inch longer than the bolt used in the ordinary lock in the fire-resistive line.

The doors of the Cash-Gard line, like the doors of most quality safe lines, is case-hardened. This means that the outer skin of about 1/8" thickness is hard and resistive to ordinary drilling. However, beneath the hard skin, the steel is soft and it can be drilled.

With ordinary drills, it is impossible to penetrate the hard skin. But, with carbide drills, run at the proper speed, penetration can be made.

A quicker and easier way of penetrating the hard skin is to grind it away. Once the hard skin is by-passed, an ordinary good quality high speed drill will penetrate the inside core of the door. After passing through the soft steel however, you will again hit the hard skin, since the hardened skin shield is used on both sides of the door.

It is impractical to attempt to use a grinder in this deep so it will be necessary to change over to a carbide drill and complete the penetration. On many occasions, it is possible to punch the inside skin through and break it away; but, in doing so, it is possible that damage will be inflicted on some part of the lock that should not be damaged.

Because of the understandable difficulty in penetration through these round door chests, be very accurate with the drill dimensions and angles. If, for instance, you are seeking to penetrate for picking the lock, be exactly sure that the hole is drilled in the right place and at the right angle. This first hole can take from 30 to 60 minutes, and in some cases, even more than an hour. Thus, be right the first time!

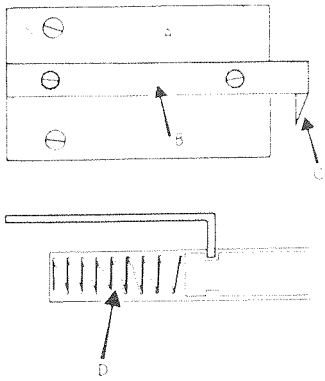
The drills should be as sharp as possible. And, a small leader

hole (about 3/16") should be started first, then gradually enlarged with progressively larger drills until the desired 1/4" or 3/8" hole is finally made.

Because of the high cost of good quality carbide drills, it is necessary to use them carefully to eliminate breakage. If the drills are kept sharp, there is less chance of breakage while going through the hard shell. It is advisable that an inexpensive grinder be part of the safeman's truck equipment. Frequent sharpening of carbide drills is necessary to reduce unnecessary work.

The problems involved in drilling a Diebold Cash-Gard round door money chest are typical of the problems you will encounter with most other round door money chests. Most of the chests used today have case-hardened skins on the doors, with the exception of a few low-priced items you may run into at times.

Your service work in handling an activated relocker on a Diebold Cash-Gard chest, however, is quite individual because of the mechanical design. The relocker bolt on the Cash-Gard is located at three o'clock, as you look at the door with the dial indicator directly on top. And, the combination locking bolt is located at 9 o'clock, directly opposite the relocker. The chamber into which the relocker rests also holds a heavy coil spring, which provides the operating power for the relocker. In its cocked or non-activated position, the relocker is held by a retainer bar, which is a flat bar, bent at a right angle. The tip of this bend hooks into a groove in the relocker bolt to hold it cocked.



A—Lock Case Cover; B—Retainer Bar; C—Right Angle Bend; D—Spring.

This retainer bar is fastened, in turn, to the lock case cover. Thus, any action which will loosen the cover (but not fall away completely) will subsequently loosen the retainer bar and will cause it to shift slightly out of the groove. While in this "half and half" position, a slight shift or sudden jar of the safe door could set off the relocker accidentally. And, this can be precisely the situation you have if the combination dials correctly and the bolt retracts *but the door won't open.*

The reason for such a condition is not mysterious, since the operation of the lock is not affected by a loose cover. The wheels or tumblers of the lock are secured *within* the lock case rather than fastened in a cluster to the inside of the lock cover as on many lock styles. The wheels are mounted on a post inside the case and there is no direct connection between the post or wheels and the cover. Thus, it is possible to dial out the combination correctly, even to retract the bolt, and not have any indication of malfunction. But, the door may not open because the relocker is holding fast.

The only solution to such a condition is to drill as explained previously. Once the hole is made, you can reach the relocker and retract the bolt. Trying to push the bolt back through this tiny hole is not easy, however, since the bolt, when extended, is quite long. One sweep of the retracting probe will not return the relocker to its cocked position. And, to further complicate this probing, the heavy coil spring behind the relocker will keep returning the bolt every time you lift the probe to wedge the bolt back for another push.

This little trick will help. First, push the bolt back as far as you can with the probe. Then, bear on the door as hard as you can; this will apply pressure on the bolt and door jam. This pressure will hold the bolt back long enough for you to move the probe and to get another bite on the bolt. Next, release the pressure and push the bolt back further again. Continue this procedure until the entire bolt is back out of the way and clear of the locking flanges of the door jam. Wedge the relocker in its cocked position with a steel punch while you revolve the door open. The wedge will prevent the relocker from springing out and lodging itself against any other obstruction.

For drill points, refer to number 58 in Drill Charts.

HALL SAFES, OLD STYLE

There are still a considerable number of old style Hall safes in use throughout the country and locksmiths may occasionally encounter them in their service work. These old Hall safes can be identified quite easily since the manufacturer's name and symbol is printed in gold letters on the face of the door. The symbol is a picture of an eagle, the body of which is partially covered by the picture of a safe on which is printed "The Hall's Safe Co." The legs of the eagle are spread and its claws clasp a draped banner marked with the words "Made in U.S.A." This same symbol is used today with the exeception that the banner is marked "Hamilton, Ohio."

Figure 1

Emblem found on safes manufactured by The Hall's Safe Company.

These old style cast iron type safes use a direct lock in which the sliding bolt locks directly against the wheels. When all the wheels are in opening alignment, the slide bolt is permitted to pass into the gateways of the wheels, thus retracting the bolts. When the wheels are scrambled, the slide bolt butts against the outer periphery of the wheels and cannot be moved.

The lock consists of a round cast iron lock that is held by three screws into a mounting plate. Both the mounting plate and the face plate of the door are soft steel; however, between them, there is a heavy hard steel

plate to prevent drilling.

The locking mechanism uses three wheels and a driver, which is notched for additional security against detecting the combination wheel gateways. The driver has a gateway like the other wheels, but because of the notched edging, detection of the gateway location is prevented. This is shown in Figure 2.

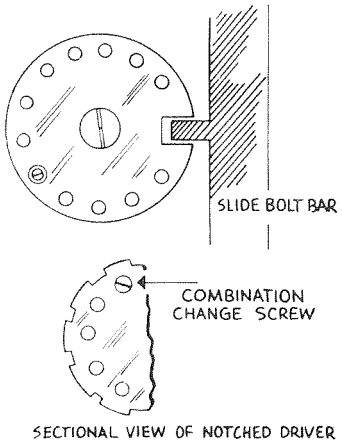


Figure 2

The wheels are mounted in a cluster fashion on the curb, which is held in place in the round lock case by three screws. The driver is positioned closest to the outside of the door of the safe.

The following method should be used for changing the combination of this lock: First, remove the cluster. Then, reach into the drive wheel and remove the combination change screw; this screw is easily visible. Place this screw in another hole. Then, replace the wheel pack and take a combination reading through the slot in the curb.

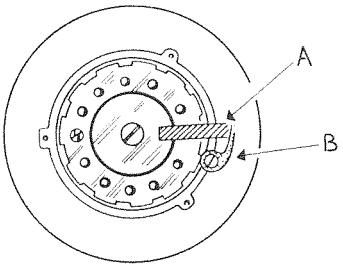


Figure 3

With cluster removed, bolt "A" and relocker arm "B" are shown.

Lockouts on this type of Hall safe occur when the screw pin in the driver loosens and falls out. When this occurs, there is no contact between the driver and the wheels; thus, the combination dial spins freely without the noticeable pick-ups or contacts that normally are obtained.

Another major cause of a lockout on this type of safe is a loosening of the screws which hold the wheel pack. The loose screws will permit the pack to move away from the driver, detected from the outside by a free spinning dial.

HERRING-HALL-MARVIN SAFES

The Hamilton Line

The Hamilton Line of fire-resistive safes produced and marketed by Herring-Hall-Marvin Safe Company about the fifties, was a popular line that included four models, ranging from 22 inches to 40 inches in height. Although their construction was sound, locksmiths may still be called upon to service them for certain mechanical difficulties.

One model in this line is shown in Figure 1. This is model No. 2115HR, measuring 28 in. high, 9½ in. wide and 20 in. deep.

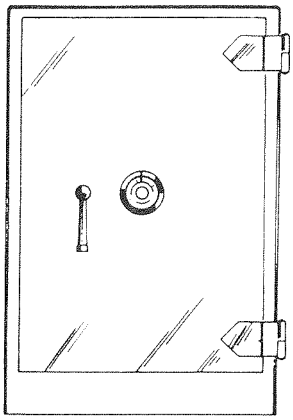


Figure 1

The combination lock used on the entire Hamilton line was the three wheel hand change type manufactured by H. H. M. However, the company, then changed over to use the Sargent and Greenleaf 6730 type lock in later years. Thus, the locksmiths servicing this safe, may encounter either of these locks.

The Hamilton safe is equipped with a hard steel guard plate to protect the lock from penetration by the use of ordinary high speed drills. This hard plate, which measures 4x7 inches, is located about 1½ inches in from the outside surface of the door.

Figure 2 shows an exposed view of the door interior, illustrating the hard plate as well as the other related mechanisms. The two vertical rods "A" and "B" are connecting rods that are attached to the round stock locking lugs or bolts. These connecting rods are attached, in turn, to the handle cam control by two lugs that protrude from the cam.

The connecting rods are not fastened or screwed into position; thus, it is possible for the rods to fall away from the cam lugs and become disconnected. When this occurs, the outside bolt control handle will move freely back and forth but the door will not open since there is no connection with the bolts.

Here, the engineering theory sets the connecting bars at sufficient strength so that they could not be bent or moved from position under the normal operation of the safe. However, experience of service calls has shown that the connecting bar "A" will bend or bow out slightly, whatever the cause. This bowing of bar "A" will cause the disconnecting of bar "B".

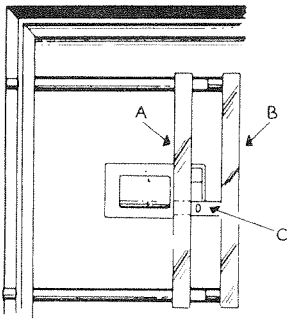


Figure 2

Why this happens is shown in Figure 2. Note the slide "C", which is a permament part of bar "B". This slide fits behind bar "A", as shown by the dotted portion in the drawing. When bar "A" is sufficiently held in place, it applies a holding pressure on slide "C" so that bar "B" is positioned firmly on the

male lug on the cam. When bar "A" bows out, the holding pressure on slide "C" is released so that bar "B" disconnects.

When encountering a lockout of this nature, characterized by the free- turning handle, tip the safe on its hinge side and pound the door with a heavy mallet. This will vibrate the bolts back out of the way to their opening position. Should this method fail, drilling can be performed to locate the connecting bars. You can drill for these bars at almost any point as long as the starting hole is at least two inches above or below the center of the dial. Within this 4x7" area, the drill will hit the hard plate. When the safe is open, note that the lock is mounted on a plate behind hard steel guard plate.

H-H-M MODEL #1313-C

Herring-Hall-Marvin has recently marketed a small inexpensive safe designed for the home market. A model of this new line, identified as Model #1313-C, will be used as the basis of this article.

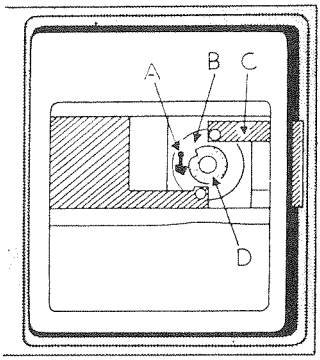


Figure 1

Internal parts of door are: A—spring lever on combination cluster; B—rotary cam; C—locking bars; D—drive wheel.

Upn examining the door of this safe, shown in Figure 1, you will note that the door is made with pressed steel jambs and that an outer face plate is attached to the jamb by bending and pressing the outside edges over the edges of the jamb. The two locking bars (diagonally lined parts within the door, "C" is the bar at the opening edge) are four inches wide. They both are made of 3/32" metal, bent over and pressed flat at the locking edge to a thickness of 6/32".

The locking arrangement used in this safe is unique and unlike conventional safe locks used in other common safes of today. The combination lock consists of three basic parts: the drive wheel "D", the rotary cam "B" and the combination cluster. The spindle and the combination dial are attached to the drive wheel while the bolt bars and the lever are attached to the rotary cam. The combination cluster serves also as a bearing and the stopper for the rotary cam. ("A" in Figure 2.)

The three wheels of the lock ("B" in Figure 2) are of the perforated type with numerical graduations. The principle by which the lock operates involves

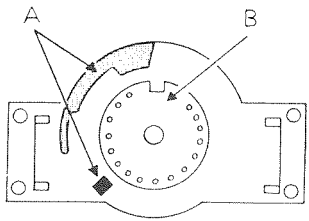


Figure 2

the dialing of the proper combination until all the wheels are in alignment at the point of contact at the tip of the lever nose. Once the lever falls into the gates of the wheels, the continued rotation of the dial in a clockwise motion will also revolve the rotary cam and retract the bolts.

The spring activated lever ("A" in Figure 1) is in a vertical position and the drop in point occurs at numbers four or five. The drop-in contact points are prominent for those working by manipulation.

Since the wheels of the combination are of the perforated type with the stationary pin contact, it is not possible to operate the combination starting either left or right with the same numbers. It is possible, however, to operate the lock either left or right using a different set of numbers. The lock normally would start to the left four times to the first number, right three times to the second number, and left two times to the third number; then, right to open.

After changing the combination on one of these locks, the numbers are not immediately known since with perforated wheels you cannot (in many cases) select a set of predetermined numbers. It will be necessary for you to peek into a slit in the back of the lock, while dialing the combination to set the gates in proper position. When the gates are lined up, you can take reading on the dial to set what the combination number is.

A lockout on this safe can be serviced by drilling.

For drill points, refer to number 55 in Drill Charts.

Herring-Hall Marvin Cast Iron Safe

In 1926, Herring-Hall-Marvin began manufacturing the modern type pressed steel cabinet safe. Prior to that time, the company had been producing an improved model of the old style cast iron safe, one which featured steel plates on the sides, top and door facing. These plates had improved the old cast iron safe by substantially reducing the thickness of the characterstically thick side walls. This change, however, was the forerunner of HHM's development of the pressed steel safe.

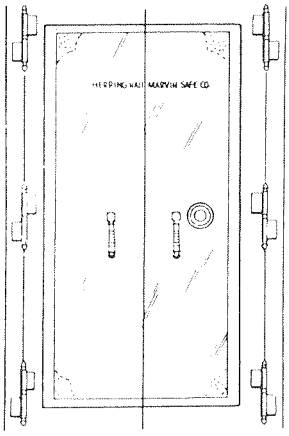


Figure 1

An illustration of one of the cast iron models produced by HHM is shown in Figure 1. While the bolt control handles on this model are larger than those found on other safes of

the same era, they were designed for sturdy and practical usage. The size and shape of

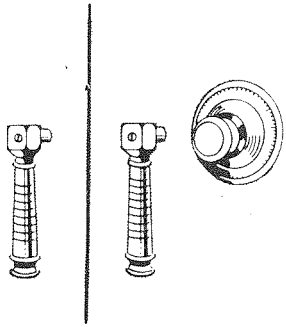


Figure 2

these handles permit a firmer grasp for ease in opening and closing the safe. Figure 2 shows this handle.

The bolt control handle can be unscrewed and removed from the outside of the safe. However, the handle shaft is anchored inside the safe; thus, the shaft cannot be removed unless it is unfastened from the inside.

The combination locks used on these safes were manufactured by Yale & Towne. All of these locks are shown in the Yale & Towne combination lock catalog and are identified as the HE series locks.

The lock consists of three wheels and a driver. The wheels are hand-change, held together in cluster fashion. Opening action brings all of the wheels into alignment at 6:00 o'clock (including the drive wheel). At this point, pressure on the bolt bar will force the lever into the wheel slots for opening. When dialing the combination, note that the last number is always 0; this number activates the drive wheel. Combinations can start from either left or right.

Guard plates, made of ¼" steel, to resist penetration by high speed drills, are found on all models of this safe made by HHM. These hard plates, however, are not bonded to the door face plate as most hard plates are; but rather, they are fastened to a swivel type rivet that permits the hard plate to pivot up or down. This does not mean that the hard plate will pivot when in its installed position. When installed, the hard plate locks into the spindle to bar penetration of the lock case by drilling and to prevent the spindle from being driven in.

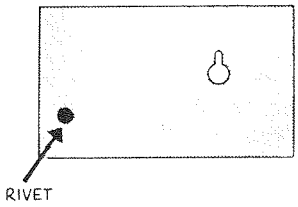


Figure 3

The hard plate is shown in Figure 3. In addition to the rivet at the lower end, the hard plate is provided with a hole shaped as shown. The circular section of the hole is large enough for the combination dial shaft to pass through.

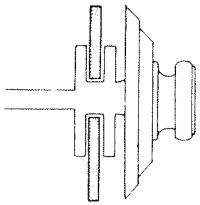


Figure 4

Before the dial shaft can be inserted into the safe, the hard plate must be raised on its pivot to align its hole with the spindle hole in the safe door. When aligned, the shaft can be inserted. Once it is in place, the hard

plate will drop over the spindle and into the slotted spindle shown in Figure 4. This slotted spindle feature of the HHM safe serves two purposes: It locks the spindle and plate securely in place and it acts as a buttress to prevent anyone from driving the spindle in.

Further anchoring of the spindle is effected by the third screw fastening the lock to the door. Three screws hold the lock case in place. The third screw, being longer than the other two, goes through the lock mounting plate and into the hole in the hard plate. Thus, this screw not only fastens the lock but it also prevents the hard plate from being raised.

ROUND DOOR MONEY CHEST — H-H-M

There are several interesting service features of the round door Herring - Hall - Marvin money chest which is shown in open view in Figure 1. Most prominant feature is the door design. Opening of the door is accomplished by rotating the outside handle, which in turn, causes the locking lugs ("A", Figure 1) of the door to revolve free of their mates in the door opening. The door "B" does not revolve; it swings open on the hinge anchored to the safe as shown in Figure 2. The hinge is attached to the door without the use of a bearing plate; since the door does not revolve, a hinge bearing plate is not necessary.

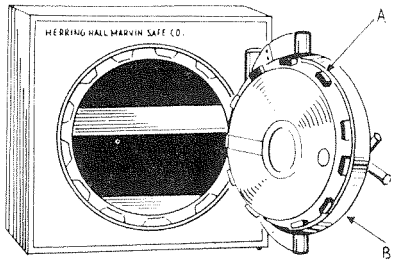


Figure 1

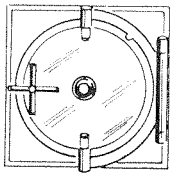


Figure 2

Another feature of this safe, which was manufactured sometime during 1926, is the tapered dial attaching screw that attaches the combination dial to the locking spindle. As the dial screw (shown by "D" in Figure 3) is tightened into the locking spindle, the expansion slots ("C" in Figure 3) in the tip of the spindle expand tightly against the inner hub dial.

Still another feature is the double shouldered spindle. There are two reasons for the double-shoulder. First, the spindle cannot be driven in from the outside after the dial has been removed and second, the spindle cannot be pulled out with a drift or puller tool. The spindle will come out only after the spindle retainer plug, "B" in Figure 3, is removed.

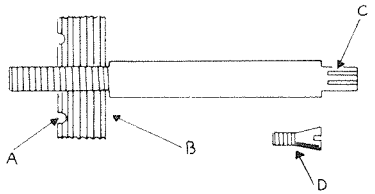


Figure 3

The spindle retainer plug is about the size of a half dollar and is about ¾" thick. It is threaded into a plug hole provided in the door and it rests snugly against the inner shoulder of the locking spindle. This plug is flush with the inner body of the door so that is cannot be seen when the combination lock is in place.

Since the combination lock rests right over the plug, it is necessary to remove the entire combination lock before the spindle can be removed. Once the lock is removed, you will be able to see the back side of the plug and the two wrench holes ("A" in Figure 3) that are used for removing the plug. These plugs are usually driven down tight so that a punch and a hammer are required for removal. Insert the punch into one of the holes and tap it with a hammer in the direction of opening (counterclockwise) until the plug is in motion. Once started, the plug will unscrew. Remember too, a shot of oil on the plug threads will help.

After the plug is out, the spindle can be withdrawn from the inside. Any of the parts mentioned above are still available from Herring-Hall-Marvin for replacement purposes. They are identified as follows: Removable dial assembly— No. S-5409; Dial Spindle—No. S-20186 and Dial spindle screw —No. S4541.

In the event of an attempted burglary on this chest, it is quite probable the extent of damage would be confined to the parts mentioned above. While the door of this chest does not revolve, the inner locking lug disc does revolve, controlled by the four-sided lug handle on the outside of the door. (This model chest also used a lay-down "T" handle.) The locking disc revolves in the opposite direction of the control handle; turning the handle to the right moves the disc to the left. The outside handle turns left to open and right to close; almost a full turn is required for each operation.

RELOCKER ON HHM

The feature of the relocker used on the modern Hall's safe and the Herring-Hall-Marvin safe is a spring-loaded pin. When activated, this pin will prevent the relocker arm from being raised to free the bolt. A view of an activated relocker arm is shown in Figure 1.

An explanation of the relocker action also can be seen in Figure 1. When the safe combination dial has been knocked off in an attempted burglary, and the lock spindle driven in, the relock cover "A" will be forced off to disengage the connecting link "B". A heavy flat spring anchored to both the relocker arm and the pivot shaft will force the relocker arm "D" over the lug "C" connected to the bolt bar. As this action occurs, the spring-loaded pin built into the pivot shaft is released to deadlock the relocker arm. A view of the non-activated relocker arm is shown by "E"; note the position of the deadlocking pin.

While this relocker has proved very effective in keeping out burglars, it also has proved quite

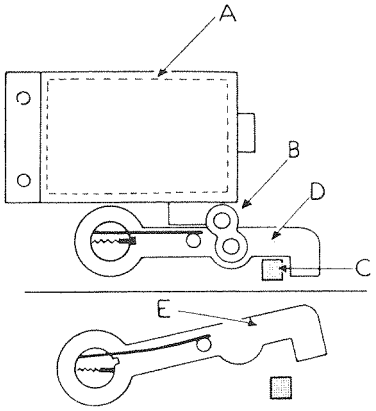


FIGURE 1

A — Relock Cover; B — Connecting Link; C — Deadlocking Lug; D — Relocker arm (activated); E — Relocker arm (not activated).

troublesome to the locksmith who is called upon to service a safe lockout or attempted burglary. To make the situation more complicated, the safe is equipped with a hard steel, drill-resistive guard plate.

In servicing a lockout on this safe, regardless of whether the relocker has or has not been activated, it is advisable to bypass the guard plate completely and concentrate on the bolt bars. A view of the bolt bar arrangement is shown in Figure 2.

Note how the short bolt bar "E" is tucked under the bolt bar "C". Actually, these two bolt bars rub against each other. The purpose of this contact is to prevent bar "A" from falling or being disconnected from the lower pin (small circle) in the handle cam "G". In bypassing the guard plate, the service method should call for disengaging the bolt bar "E" from the lower handle cam pin so that the front set of bolts can be retracted. The back bolts can remain in the locked position while the door is pulled open.

When open, you may want to check the relocker arm to see if it has been activated. If it hasn't, tie the relocker arm so that it cannot snap into a locked position. Overlooking this step may cause extra work in removing

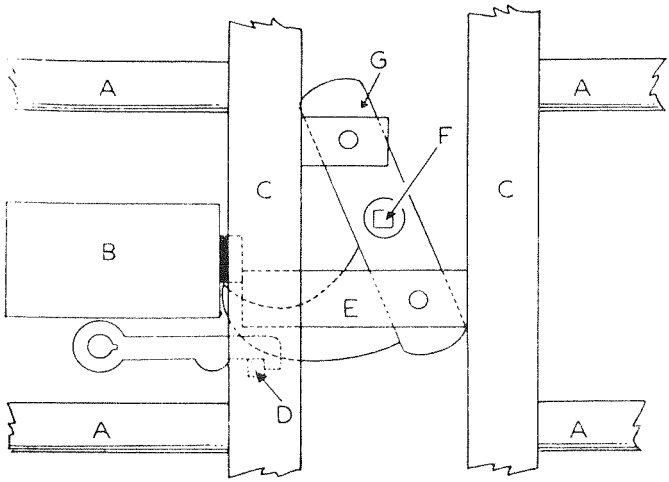


FIGURE 2

A — Bolts; B — Combination Lock; C — Vertical Bolt Bar; D — Deadlock Lug; E — Horizontal Bolt Bar; F — Handle Connecting Hole; G — Handle Cam.

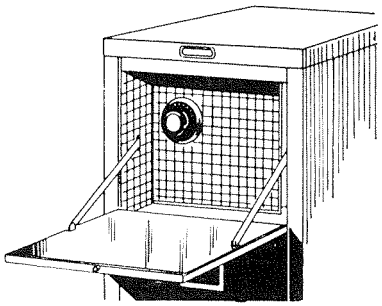
the relocker arm and in reassembling its component parts.

The combination lock on these safes is not mounted to the hard steel guard plate, but to a separate mounting plate installed behind the guard plate. The two plates are not joined; there is a space between the two for insulation. In size, the guard plate is much larger to block the entire lock mounting area. The hard plate starts about 1-1/2" in from the front of the safe.

Drilling through this hard plate can be accomplished by a carbide drill, applied with heavy steady pressure. Once by this, it is necessary to penetrate about 1/2" of insulation before striking the lock mounting plate. Ordinary high speed drills can be used for the mounting plate.

INVINCIBLE SAFE-FILE CABINET

The Invincible Metal Furniture Co., of Manitowoc, Wisconsin, has a safe-file cabinet in their line of steel office furniture and equipment. The safe compartment of the file is always located in the top section of the file and it is concealed by a false drawer panel.

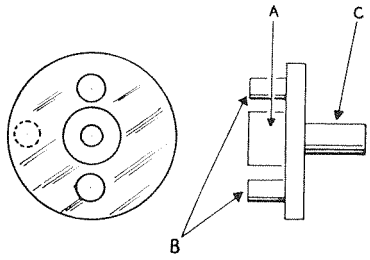


This panel, which is actually the door to the safe, is ½" solid steel. It is locked by two automatically operated vertical bolts, at the top and bottom, and by the bolt of the combination lock. The locking and unlocking action of the two vertical bolts is controlled by the safe combination dial. The bolts are *not* set in the door in the same relative position but are separated so that the top bolt lies closer to the side of the cabinet than the bottom bolt. In actual measurements, the top bolt is located one inch to the right from the left front edge of the door, while the bottom bolt is located two inches to the right from the left front edge of the door.

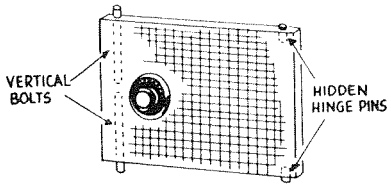
The combination locks, which control these bolts, vary in the style used according to changes and improvements in design. However, the size and operation of the lock has always remained the same. Another feature that remains the same is the factory number setting. For example, the most current Invincible safe-file cabinets use the S&G R6715 hand change lock, but the setting of these locks as they now come from the factory is the same as the setting of all previously used locks. The numbering sequence can be determined from the drill chart.

The action that results in opening the safe compartment door depends upon a rotary cam that is positioned under the combination lock (on the inside). Protruding from this cam are three pins, two facing to the rear and one facing to the front. The two pins "B" in back of the cam engage the locking bolts

while the long pin "C" in front engages the combination lock bolt. As the combination lock



bolt is extended or retracted, the rotary cam is set into a revolving motion, which shifts the top vertical bolt down to open and the bottom bolt up to open. "A" above is the hub bearing.



Servicing the safe compartment of the Invincible safe-file cabinet can be quite tricky because it is not possible to remove the safe compartment door. The entire safe is welded into the top portion of the cabinet making it impossible to reach the safe compartment door hinge pin. Thus, the first step in a service call should be the factory set combination. Work these numbers to try to open the lock.

If the combination has been changed and you are not familiar with manipulation, the next step should be drilling. On a door using the R6715 hand change combination lock, the locking lever is located just above the dial ring indicator. By drilling a small hole at this point and by tipping the drill down 10°, access will be gained to the tip of the lever, under which the gateways of the wheels should be aligned.

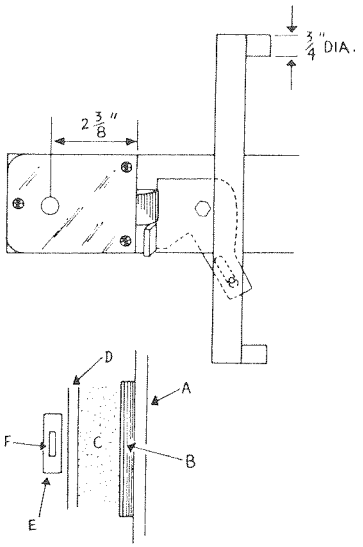
Since the styles of the combination locks used have varied, it will be necessary to drill in different locations for the lever fence, according to the lock used. Remember that regardless of the style of lock, all are of the same size and all have the bolt in the same place. The only change that a locksmith could be concerned with is the change involving the location of the lever or roller fence. Many tip in at 83 on the dial, when the dial is set at zero. All late models, however, drop in at zero when the indicator line is set at zero.

JOELI SAFES

You may have been asked many times by your customers how long it takes to learn the safe repair business. No doubt, your reply has been something like this — "There's really no end to learning, you learn something new everyday." As general as this may sound, it's as true in safe work as it is in basic locksmithing or in any other skilled craft. These words do not tell the customer, however, the difficult task that you, the professional safe man, have in keeping abreast of the new developments in safes and protective devices, not only those made in the U. S. but also those imports that find their way into

the American markets.

With both American made and foreign made safes to contend with in the field of safe servicing, the safe man must be on a constant vigil for any information that identifies or describes any type of safe. This is especially difficult with imported safes because relatively few importers give sufficient weight to the after-sales market. And when you encounter an imported safe in the field, the customer may agree with your suggestions that an American made safe would have been the best buy, but he still will expect you to service the lockout on his particular imported safe.



A—Door Shell; B—Drill Proof Plate; C—Insulation; D—Lock Mounting Plate; E—Spring Lock; F—Spring Bolt.

Such was the case recently when I encountered a Joeli safe, a Swedish import. Various models of this safe are being brought into the country in considerable quantities but the most common appears to be the Model No. 4, which measures 29¼" high. This model is equipped with a steel cylinder key-operated lock that is claimed to be pickproof in the manufacturer's literature. However, if you are called upon to service this safe, try your luck at picking this lock before proceeding further with advanced service methods.

When installed in the door of the safe, the lock is protected by a hard steel drill-resistive plate that is mounted in front of the lock but directly behind the door shell. The lock uses a spring bolt which is retracted by the key in a manner closely similar to the retraction of a night latch bolt. The lock has a 2⅜" backset.

The bolts in the Joeli safe door are round rods, ¾" in diameter, one at the top and one at the bottom. They are connected to a bolt bar and they are activated by an outside bolt control handle. The top bolt is located 6¾" down from the top of the safe and the bottom bolt is located 16½" down from the top. The bolt cam strikes the spring bolt of the key lock from the bottom (see sketch).

In the event picking attempts are exhausted, your recourse will be to drill. You can drill either through the side of the safe or through the door and, once the ¼" hole is made, a hooked probe can be inserted and your servicing continued in the usual professional manner.

You also may encounter a Junior Model of the Joeli safe and you will note that this model does not have a separate bolt control handle. The locking bolts are connected to the spring bolt

and the key retracts the bolts with the spring latch. The finish on these safes is much like the American made safes, having a wrinkle green on the outside with a smooth green interior.

For drill points, refer to number 53 in Drill Charts.

MEILINK SAFES

MODEL NO. 1X

Meilink has replaced its model #XXC safe with a new model identified as #1X. While the exterior size of the new

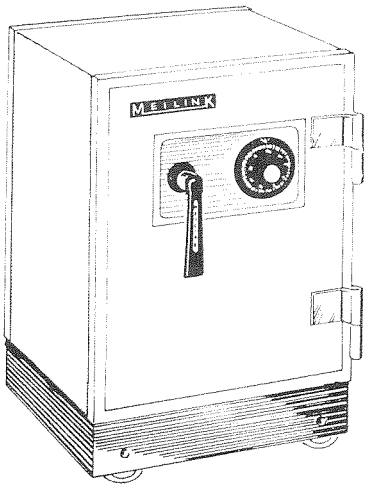


Figure 1

model, shown in Figure 1, is basically the same as the #XXC several important mechanical changes as well as a new design in the general appearance of the safe have been made. The model #1X now has an outside control handle, a better combination lock and the all-important relocking device.

The outstanding feature of this small home safe is the presence of a drill-resistive steel plate which protects the combination lock. The steel plate also protects the relocker device, which is directly connected to the lock. An exposed view of the locking mechanism and the relocker is shown in Figure 2.

The spring-loaded relocking pin is held in place by a flat steel bar attached to the cover of the combination lock case. It the combination dial is broken off and the spindle driven in, the case cover will be forced away from the case and the relocker retaining bar will release the relocking pin. This pin slides neatly into a square cut-out groove in the bolt bar cam and deadlocks the entire locking mechanism.

The outside handle is made of a plastic-like material that is strong enough to move the bolt mechanism. However, in an attempted burglary, the handle will break before any forcing pressure can be placed on the inner lock. As an added preventive against forcing the bolt control handle, a built-in shear

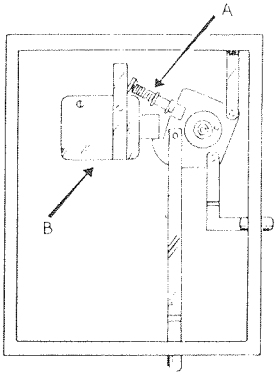


Figure 2

screw will break before the bars can be forced back.

Should it become necessary for you to solve a lockout on one of these safes when the relocker device has been activated, you can reach the tip of the relocking pin by drilling.

The combination lock bolt is located two inches right of the center of the bolt control handle. Because of the drill-resistive hard steel plate, drilling the model #1X is much more difficult. In experimenting with ordinary carbide masonry drills it has been found that these inexpensive drills will do a fair job in most cases, especially with the 1/4" and 3/8" sizes. Smaller size masonry drills cannot take the extreme pressure and the high speed. It is suggested that you have on hand a supply of Chicago-Latrobe carbide tipped drills. While these drills are more expensive, they are more durable and longer lasting. By drilling a small leader hole with one of these drills, and following with an inexpensive 3/8" masonry drill, you will be able to drill the hole in an economical way.

Once the hole has been drilled, insert a steel probe to force back the relocking pin and, at the same time, apply slight pressure to the control handle until it moves to opening.

For drill points, refer to number 52 in Drill Charts.

MEILINK SAFES

The improvements and differences in mechanical design on the latest Meilink safes represent interesting knowledge for the locksmith. These innovations now are appearing on Meilink 500 series A label models, 400 series B label models and on all C label models.

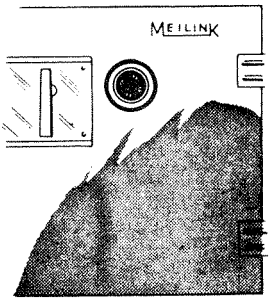


Figure 1

Most obvious to the eye is a newly designed front door panel which features a S&G counterspy dial combination lock and a modern bolt control handle mounted on a stainless steel panel.

Not so obvious, but more important, is a new interior mechanism which has a patented "Bolt-O-Matic-Dor-Gard" to prevent the locking of the combination or bolts when the door is open. Because of this new feature the door must be completely shut in order to lock it. Thus the Bolt-O-Matic prevents damaging collision of an extended bolt and the door jamb as the door is shut. As a result, the hazard of broken or bent bolts, which could bind in operation, is eliminated.

The "Bolt-O-Matic-Dor-Gard" mechanism is illustrated in Figure 2. Note that as latch A is depressed as the door is closed, counterpart trigger B is forced downward, allowing rotary cam

C to be moved into position.

The combination lock has a drill-resistive hard plate protecting it. In the event the lock is subjected to an explosive or

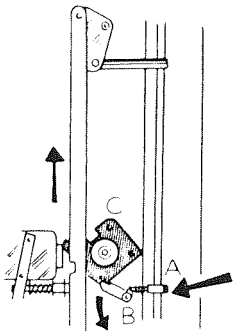


Figure 2

A—Dor-Gard Latch; B—Trigger; C—Rotary Cam.

mechanical attack, there is a re-locking device which, when released, dead-locks the safe.

The mechanical operation of the re-locker is shown in Figure 3. The re-locker plunger is attached to the combination lock cover; if the cover is disturbed in any way, the heavy spring in the re-locker bar will activate it and force it down into the corresponding notch in the rotary cam. (See Figure 2).

The handle is equipped with a shear screw and cam attachment which prevents any undue pressure being placed on the combination lock. The shear screw will break off before damage can be done to the combination lock itself in an attempted burglary.

In the event that the re-locker pin is activated and the combination dial knocked off, the locksmith must drill to service the lockout.

If the combination dial is knocked off and the re-locker is activated, it will be necessary to release *both* the re-locking device obstruction and the combination bolt obstruction.

Attach the combination dial back onto the broken spindle and dial the combination out in the normal manner to open the combination lock. (This procedure has been outlined in previous chapters.)

If the locksmith is faced with a badly mangled spindle which cannot be reattached, then the combination lock bolt will have to be knocked in. Or, the combination lock bolt will have to be pushed aside (from the inside) along with the re-locker pin.

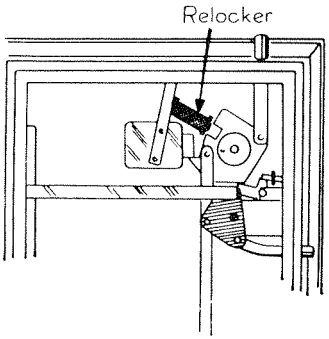


Figure 3

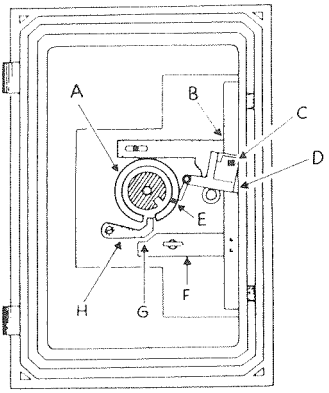
It is also possible to open the safe from the side by drilling only one hole. Insert a punch into this hole and knock out the combination lock bolt. Then, use the same punch probe to push back the re-locker pin and open the door.

For drill points, refer to number 60 in Drill Charts.

MOSLER CAST IRON SAFES

Since locksmiths may still encounter the old style cast iron safe, they may come across any of several different models that were produced by Mosler. One of the models is shown in the accompanying illustration. Main feature of this safe, however, is the style of the locking mechanism used, since this employs a gravity drop relocker device.

Notice in the illustration that the slide bar "F" is fastened directly to the bolt bar "B". Notice also that the lever "H" is activated by the movement of the slide bar. Thus, when the wheels are not in alignment, the



lever will not move with the action of the slide bar and the safe remains in the locked position.

The point of contact "G" between the lever and the slide bar is important in the servicing of this safe. It should be lubricated often to enable the lever to move upward freely. Extreme dryness at this point, coupled with a slight film of rust, will cause a bind. In some cases, this bind will be so strong that the lever will not move. Result — a temporary lockout!

From the outside of the safe, you may be fooled into thinking that the wheels are not in alignment when dialing the combination. Actually, they are. The trouble is that the lever will not release, even though the combination is dialed correctly and the wheels are in perfect alignment. Before proceeding further when encountering such a situation, strike the bolt control handle with a few rapid taps of a mallet in the direction of opening — this should quickly jump the lever into its opening position.

In studying the sketch further, you will notice the gravity drop relocker device "D". The relocker is held up by a pin "E" on the wheel curb "A". In the event the curb is removed as in the case of a burglary, the pin will slide from under the relocker, permitting it to drop down and to lodge itself behind the lug "C" in the bolt bar, preventing the bolt retraction.

The relocker, which is hinged (directly above point "E"), is not controlled by a spring but drops by gravity when the curb pin is removed. Because there is no spring, the relocker can be raised easily using a probe.

To locate the relocker for drilling purposes, measure 2½" to the left of dial center and up 1". At this point, insert a steel probe and lift up the relocker until the bolt can be retracted.

To open the safe under ordin-

ary conditions, drill a small hole directly under the dial ring, angling the drill up to 10° to locate the tip of the lever. You then will be able to line up the wheels through this hole.

It is possible to determine the style of combination lock used on this safe when working from the outside. Apply gentle force against the bolt control handle and rotate the dial. If the dial tightens up, the tip of the lever is being forced up into the drive wheel causing a bind. This will be your indication that the lock you are working on is the one described above.

McCASKEY & NATIONAL SAFES

OLD STYLE NATIONAL AND McCASKEY SAFES

Identifying the old style National Safe can be done easily by observing the position of the dial to the combination lock. On this safe, the dial is located directly above the bolt control handle as shown in Figure 1. This arrangement of dial over handle was an exclusive National design for many years but, recently, it has shown up in several modern safes.

Some of the current models which use this arrangement are York, Diebold and Protectall. However, you should have no difficulty in identifying the National Safe as against these others since National safes, which are at least thirty-five to forty years old, are made of heavy steel and cast iron, a feature readily distinguishable as old style safe construction.

On the other hand, one could mistake the old style National safe for an old McCaskey safe, which also used a dial over handle arrangement. This is as far as the similarity went, however, the locks used on these safes are completely different.

For example, the National

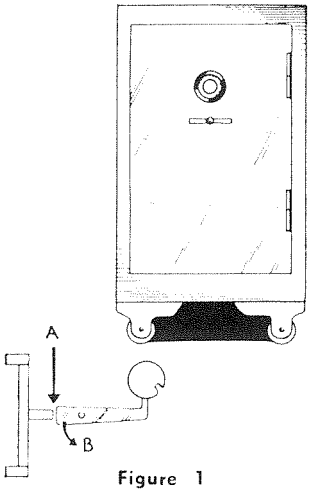


Figure 1

safe uses the Yale OB drop lever combination lock and, since there is no hard plate in this safe, it can be serviced for a lockout by drilling. Procedure for this is the same as that used for servicing a lockout in the Syracuse safe, which also uses the Yale OB drop lever type safe combination lock.

The action of the Yale OB lock is shown in Figure 1. As the back end "B" of the lever drops when its front end slides into the gates, bolt bar "A" is free to pass over the lever so that the door can be opened.

The old McCaskey safe also

used a Yale lock but this was the 026 series combination lock employing a roller bolt. A view of this locking action is shown in Figure 2. "A" illustrates the manner in which the roller bolt blocks the passage of the bolt bar. When the roller bolt is unlocked, it will roll within the case and permit the bolt bar to move backward. "B" in Figure 2 represents the bolt guide while "C" is the handle shaft connecting rod.

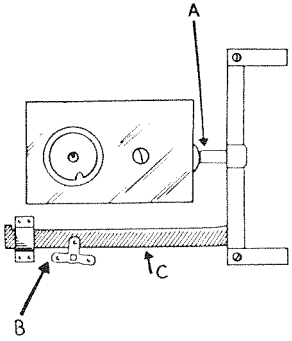


Figure 2

One important fact should be remembered about these two safes — they are serviced for a lockout in the same manner as any other safe which has the dial and handle placed ***side by side.*** The fact that the National and McCaskey safes have an arrangment which places the dial over the handle may confuse the location of the vital obstruction point. This should not be confused, however, since the obstruction point is in the ***same relative position.*** Always work from the dial and disregard the handle. Remember that the handle could be a foot below the dail but the obstruction point is relative to the position of the combination dial.

There is one common technical fault with the drop lever type lock used on the National safe (and also Syracuse and a few others). If the bolt bar is pressing against the drop lever, the lever will ***not*** be free to move! Even if the combination wheels are in perfect alignment, the lever will ***not*** drop into opening position.

Any person who locks up his safe almost always jiggles the handle back and forth to make sure that the safe is locked.If the last movement of the handle bears pressure against the drop lever, the person who is dialing the combination the next time will not open the safe on the first try unless he takes the handle to relieve this binding pressure against the lever.

In case you encounter a safe with an OB lock, you may also come across a condition of abnormally tight fitting bolts. In the event these tight fitting bolts freeze the handle so that the bolt bar is forced against the drop lever, it will be necessary for you to force the handle back away from the drop lever before the safe will open. Correct any condition of binding bolts; they should work freely and smoothly at all times.

National Safe

A National Safe can be identified easily by its lock-handle relationship — all models have the the combination lock dial placed above the handle, as illustrated in Figure 4. The combination lock used on these safes is a standard Yale OB series lock, using a weighted lever that

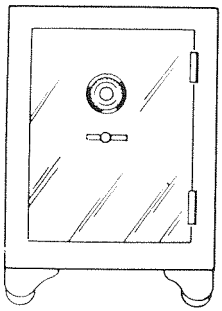


Figure 4

drops into the wheels when they are aligned. As the lever drops, the bolt bar is permitted to pass to its opening position. An exposed view of this lock is shown in Figure 5. To service a lockout on this safe, drill according to the instructions given in Step No. 48 on your Drill Chart. There is no hard plate.

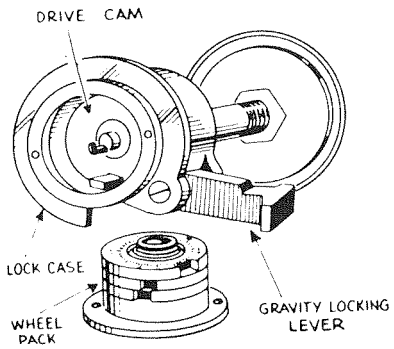


Figure 5

For drill points, refer to number 48 in Drill Charts.

PROTECTALL SAFES

Protectall manufactures a safe model that also has the combination dial located above the bolt control handle. The lock used in these particular models is a standard type combination lock with the retractable bolt operating within a lock case. However, when this lock "C" as in Figure 6, is installed, it is in an inverted position with the bolt "D" facing downward to bind against the handle cam "E". Figure 6 also shows the hard plate "A" that protects the lock from drilling.

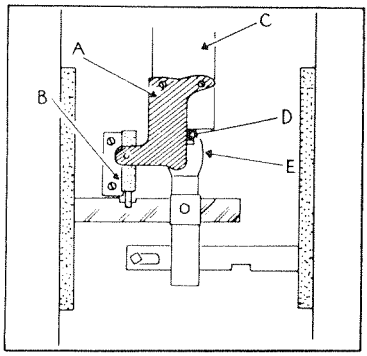


Figure 6

This safe also is equipped with a relocking device, illustrated by arrow "B" in Figure 6. When it is activated, the relocker shoots downward to bind into the bolt.

For drill points, refer to number 49 in Drill Charts.

PITTSBURGH SAFES

Safes manufactured by the Pittsburgh Safe Company can be identified easily by the firm name stamped on the combination lock dial. A Pittsburgh safe uses a locking mechanism in which the operating action presses a lever up into the com-

bination wheels. When all the gateways are in alignment, the lever is pressed up far enough to permit the bolt bar to slide under the wheels into an open position. In the event a safe of this type is jammed, you will find in your checking out procedure that pressure applied to the bolt control handle will cause the combination to bind and turn hard. Even without knowing what make of safe this is, the characteristic feel of a binding combination should indicate to you where to drill.

For drill points, refer to number 50 in Drill Charts.

REMINGTON RAND SAFE CABINETS

This style Remington Rand safe cabinet is identified by a prominent characteristic — the combination dial and bolt control handle is fashioned in one compact unit (See Figure 7). Generally speaking, this particular safe cabinet is very difficult to open for normal lockout servicing because of the variety of locking mechanisms used.

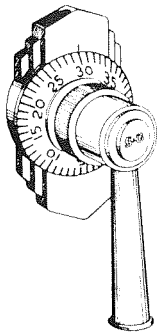


Figure 7

There have been two types of combination locks used on these cabinets — Sargent and Greenleaf or Yale. The predominance of one lock over the other, of course is something that cannot be determined, but it appears that most of these cabinets now are using Yale locks.

The early Remington Rand safes used the complicated Yale lock shown in Figure 8. In this lock, the principle of operation is similar to that of the older type locks in which a lever is pressed up into the combination wheels to permit the bolt bar to pass. However similar this principle is, the old style Yale lock was more complicated.

The component parts of this lock, shown in Figure 8, are as follows: A - combination wheels B - intermediate gear; C - drive gear; D - locking lever; E - locking block; F—control linkage.

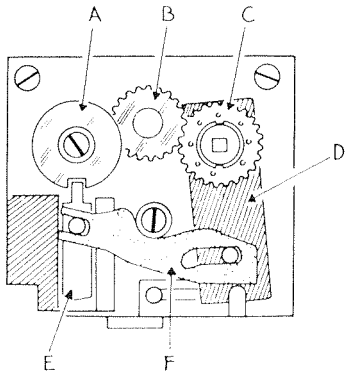


Figure 8

On the other hand, the Sargent & Greenleaf lock used on the early Remington Rand safes is shown in Figure 9. A gear arrangement also is used in this lock, but its operating function is more direct. Yale locks used on the more modern Remington

Rand safes operate somewhat on this refined principle.

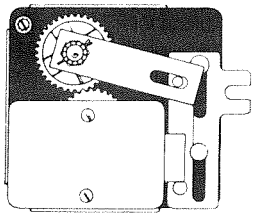


Figure 9

One of the features of a Remington Rand safe is its spring controlled bolt mechanism. The result of this mechanism action is quite simple — as the door is closed, the bolt mechanism locks itself. Examine Figure 10 closely. At the left, you will see the hold back hook "A". As the bolts are opened, the hook "A", which is controlled by a spring, drops down over a plug mounted on the bolt "D" to hold the bolts in an open position. When the door is closed, the plunger "B" rams against the door jam, releasing the hook so that the bolt bar can spring back to lock.

It is reasonable to assume that the safe will not lock by itself if the bolts lose their alignment with their receiving holes since the control spring is not strong enough to compensate for such abnormal conditions. However, the mechanism can be operated manually if the automatic locking mechanism does not function according to its own design.

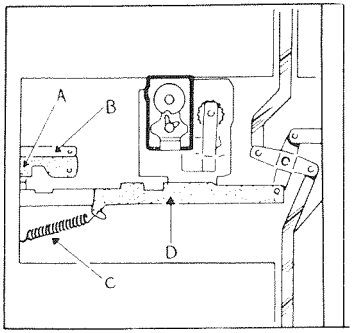


Figure 10

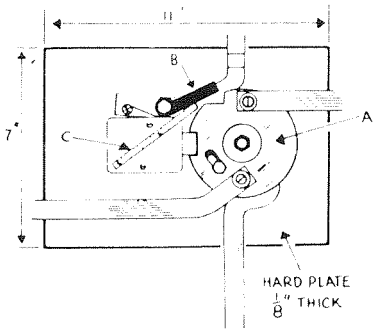
A hard steel guard plate is used to protect the combination mechanism used on these safes so that several different methods of servicing lockouts can be used, depending on the style of lock.

For drill points, refer to number 51 in Drill Charts.

SCHWAB SAFES

MODEL #1316C

The locking mechanism on the Schwab Model #1316C safe is compact and rugged in construction. There are four 3/4" locking bolts which control the locking of the door. This number of bolts on a small safe such as the #1316C gives added protection since every side of the door is checked by a bolt, when closed.



Additional protection is given by the use of an oversized drill-resistive hard plate which measures 11 inches long and 7 inches wide. This oversized plate completely blocks any attempt at

reaching the vital parts of the locking mechanism.

The safe is equipped with a standard S & G combination lock using a No-Spy dial. For extra protection against burglary attempts, the safe lock is equipped with an Underwriters approved relocking device. The illustration (Page 33) shows the position of the relocking device. The relocker finger "B", which is placed above the combination lock, is under heavy spring pressure and it is held by a bar "C" attached to the lock lever.

In the event the lock dial is knocked off and the spindle punched in, the back cover of the lock will be forced off, taking with it the relocker retainer bar. As the retainer bar moves away from the relocker finger, the heavy spring will force the finger down into the recess of the rotary cam. Thus, the finger will prevent the rotation of the cam and the retraction of the bolts.

When servicing one of these safes on which the relocker has been triggered, the locksmith will have two recourses for drilling: first, to drill to reach the relocker and to retract it; second, to drill for the combination lock bolt.

There are two points in which to drill to reach a triggered relocker, one to by-pass the hard plate and the other to penetrate the hard plate. Once the hole is drilled through either points, insert a steel hook probe into the hole and engage the relocker finger. Maneuver the probe to raise the relocker finger and, at the same time, turn the bolt control handle to retract the bolts.

In the event the combination lock bolt is still checking the rotation of the cam with this method of approach, drill straight through the bolt and knock it off. You needn't worry about triggering the relocker since it will already have been set off.

For drill points, refer to number 54 in Drill Charts.

TOWER SAFES

A name on a safe very often can be misleading in attempting to identify the safe for the proper servicing procedure. Regardless of whether the safe is new or used, it could carry a name plate that simply denotes a brand or a company signature.

For example, there are many safe dealers throughout the country who perform remarkable jobs in refinishing safes and in making them ready for resale. Almost invariably, these dealers will either print their name or attach their nameplate to the safe. Thus, a locksmith could encounter safes with names such as Ace, Wolverine Safe Company or Boston Safe Company.

These are only hypothetical names, of course, but they do illustrate this important point —there are many different safes in the field today with many different names BUT the names do not necessarily indicate the manufacturer.

This is a common situation in the used safe field but the same does occur in the new safe field

as well. There are some manufacturers who do not produce a full line, such as money chests and vault doors, but their catalogs show a full line. It is obvious to those who know safes that the safe models shown in office equipment catalogs, for example, are actually manufactured by one of our leading safe companies with a brand name attached.

This is the situation regarding the Tower safe. Like the Tower file cabinet and the Tower adding machine, the Tower safe is sold by Sears-Roebuck. Sears does not manufacture these items but they place on them their brand name.

If you are called upon to service a Tower safe you must look beyond the name and attempt to recognize the safe for what it really is—a Mosler, Schwab, Sentry, Herring-Hall-Marvin, Protectall, etc.

One of the most popular Tower models is the Sentry safe in the wood cabinet. You may have a job on one of these some day and if you do not or cannot recognize the safe because of the Tower label, all you have to do is measure the safe.

The size of the Sentry Standard model is 24½" high, 17½" wide and 17½" deep. This safe, with recent modifications and improvements, is basically the same safe that was produced twenty years ago.

In this safe, the combination lock consists of two brass wheels and a driver. The driver is positioned at the rear

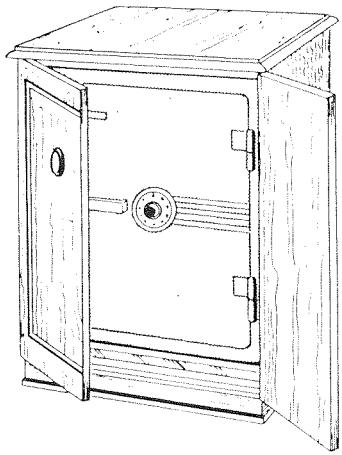


Figure 1

of the two wheel cluster so that any attempt to spindle the lock will prove futile. A straight tail piece connected to the bolt control handle butts into the three wheel lock and, when all the wheels are in

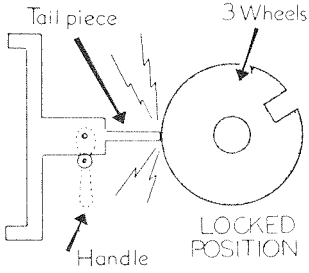


Figure 2

alignment, the tail piece can pass through freely, retracting the two steel bolts. On recent production models, the two steel bolts have been replaced by a single piece 4" steel bar.

A lockout on this safe can be serviced by drilling.

For drill points, refer to number 57 in Drill Charts.

URBAN & MC NEIL SAFES

Although McNiel and Urban safes are no longer manufactured, there are enough of them scattered throughout the country to warrant the safeman's attention on the locking mechanism. The standard locking device, as shown in Figure 1, was described in the August, 1962 Locksmith Ledger.

Briefly, the standard lock uses dials with A to Z graduations, rather than 0 to 100, as conventional dials. The last letter of the combination always ends in K since the driver always carries this letter and is part of the sequence.. The other three wheels making up this lock may carry any combination of lettering. When the wheels are aligned to bring the lever at the drop-in-point, a continual clockwise turning of the dial draws back the slide and bolt, which allows the rotary cam to operate for opening the safe.

Another type of locking device which the McNiel and Urban safes have is not so common but is encountered from time to time. There isn't too much known about this rather old lock. The best way to describe it is that it resmbles an inverted Yale O B drop lever locking device. Figure 2 shows the safe mechanism. There is a large

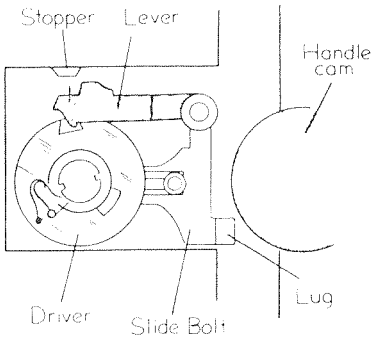


Figure 1

heavy lever located at the top. When the wheels are lined up the lever falls into the drop-in-point while the butt end of the lever rises in counter action and allows the handle cam to rotate. The drive wheel, unlike the

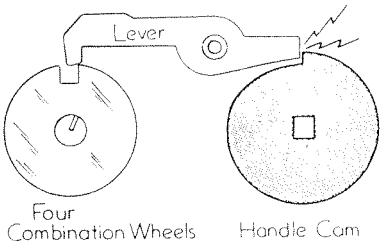


Figure 2

standard model, is nearest the front of the safe and is not a part of the sequence of numbers; therefore, the combinations need not end in K.

For drill points, refer to number 59 in Drill Charts.

SERVICING THE URBAN AND McNEIL SAFES

Servicing safe lockouts is not an easy task, even for the experienced locksmith who is familar with the construction and characteristics of the safe on which he is working. But, when he happens to come across a lockout on a safe that he is not familiar with, his problems

mount. Usually, he must guess or resort to trial and error, both of which are expensive in terms of time and effort. Or, he can hit the other extreme and try to locate information about the safe.

One safe which seems to run the "seek information" gamut quite frequently is the old McNeil and Urban safe. These models are out of production now but they pop up every now and then and cause the locksmith who hasn't seen them before some consternation. These safes are easily identified by the combination dial, which is lettered from A to Z, as shown in Figure 1.

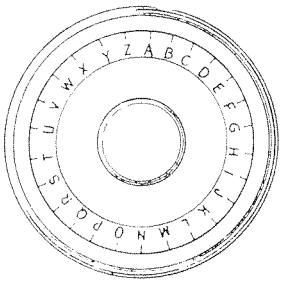


Figure 1

The combination is very often a common four letter word, but of course, it can also be any grouping of four letters. On the standard fire-proof type model, however, the last letter in either case will always be "K". Typical combinations of these safes can be "TALK, WALK, ROCK, SOCK."

When you are faced with servicing a lockout on a McNeil and Urban safe, your first effort should be the use of trial combinations. The chances of opening the safe on one of these combinations is favorable. But, in the event none of these trial combinations work, you have only one recourse, drilling.

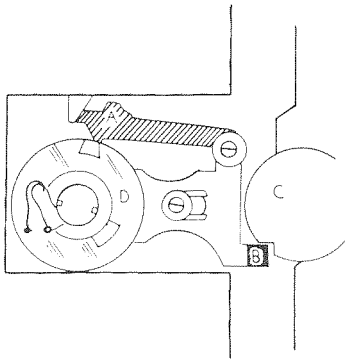


Figure 2

It is quite possible that the safe on which you may be working has a hard steel guard plate. But, on the other hand, there are certain models that do NOT have hard plates. Too, the location of the hard plate is not definite. They have been found up front, just under the face plate of the door and also way in deep, just behind the combination lock. However, the location of the plate is of little consequence today in the presence of carbide drills.

The combination lock used on the McNeil and Urban safe is shown in Figure 2. This is a view from the inside of the safe, with the back cover removed. The lock has three wheels and a pair of drivers.

In Figure 2, the lever "A" is shown in the locked position. When all the wheels are in alignment, the lever "A" will drop by gravity. A continual clockwise turning of the combination dial draws back the slide and

bolt "B", which allows the rotary cam "C" to operate for the unlocking of the safe.

The drop-in point of Lever A is not at true center. It is off approximately 10 numbers.

In your drilling operation, you will need long drills because the insulation is very thick. It is best to drill a small test hole to find out if there is a hard steel plate in your path. If you do not encounter a hard plate, continue to drill through the insulation and into the cast iron lock mounting plate. If you do strike a hard plate, change drills to a ¼" carbide drill for penetration of the hard plate.

Once through the cast iron, you should be at a point where you can see all of the wheels revolving as you turn the combination dial. Line up the wheels through this hole and take a reading. Then, transpose your numbers to the combination.

For drill points, refer to number 56 in Drill Charts.

VICTOR SAFES

Victor 500 Pressed Steel Safe

Back in 1927, the Victor Safe Company of Marietta, Ohio, introduced a light weight steel cabinet type safe, which almost immediately became quite popular. There are many of these safes still in use at the present time -- years later. Feature of the safe during its introduction was its construction of pressed steel. The door of this safe also was made of pressed steel and it was fashioned into a tongue and groove design for extra protection at the joints.

Figure 1 shows the various tongue and groove designs used on the 1927 Victor safe. The top illustration shows the door used on the filing safes, while the second illustration shows the door construction of the entire 500 lines. The tongue and groove design of the hinge side of the door on all models is shown in the bottom illustration. It should be pointed out that all doors on the 1927 Victor pressed steel safe are one-half inch thicker than the walls.

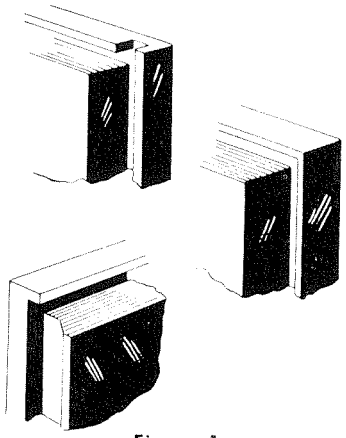


Figure 1

A standard Yale OC5M combination lock was used on all models of the 1927 Victor safe. The bolt handle design, however, is somewhat different; the handle is a hollow tube which is fastened to the handle hub by a long screw that fits up through the hollow handle grip. The handle is positioned next to the dial as shown in Figure 2.

There should be no difficulty in recognizing the 500 line Victor safe; merely examine

the reinforced steel wheel housing shown in Figure 3. In the event every other means of identification fails to authenticate the safe as a Victor 500 line, turn your attention to the wheels and wheel housing. This is a feature that will give clear and positive identification.

The outside appearance of the Victor 500 line pressed steel safe is shown in Figure 4. Notice there is no Underwriters' Label

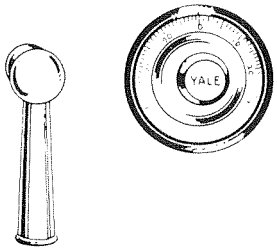


Figure 2

but, in its place, there is a metal plate attached to the center of the top architrave. This plate bears the manufacturer's name and the word "Certified."

All Victor pressed steel safes left the factory with the same combination. For security purposes, this combination cannot be disclosed here, but it can be determined in the Master Drill Chart. This pre-set combination may prove quite valuable, even today, more than thirty years after the safes left the factory. Many will be found that are still set on the factory combo.

This fact may be startling, but it's true! And, it emphasizes how infrequently combinations are changed, even though the safes change ownerships. For security purposes, safe combinations should be changed regularly and the locksmith is the man who can and should sell

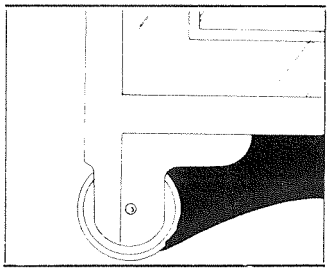


Figure 3

this service to safe owners, regardless of the age of the safe.

In the event the combination has been changed, and you find it necessary to service a lockout on the Victor 500 safe by other means, follow the directions given in the Master Drill Chart for safes equipped with the OC5M Yale lock.

In servicing this safe, you may find also that the Yale OC6M combination lock was used. Both the OC5M and the OC6M are identical in size and dimensions; the difference between the two is in the wheels.

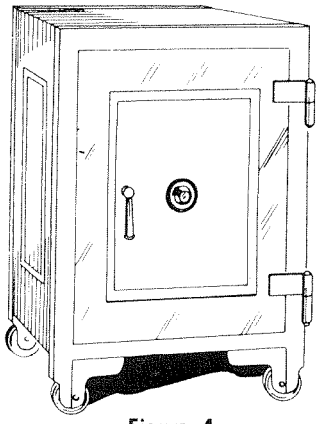


Figure 4

The OC5M lock has hand change automatic selector wheels with shifting flys. The OC6M has wheels which are the perforated type without shifting flys.

Another difference is the direction of dail rotation. Even though the combination has been set at the same number, the direction of turns differ for the two locks. On the OC6M lock (with perforated wheels) the combination is always started to the left, or counterclockwise, as follows: Left four times to 40; right three times to 15, left two times to 50, right one time to 0; left to stop. (Note that the combination here is coded.)

On the OC5M lock, the combination is always started to the right, or clockwise, as follows: Right four times to 40, left three times to 15; right two times to 50; left to stop. One fact should be remembered: the OC5M lock is capable of one million combinations while the OC6M lock is capable of only 11,000 combinations.

VICTOR OLD STYLE

The old style Victor safe does not have a separate bolt control handle; it uses a single dial only. The function of the dial is to not only set the proper opening number but also to retract the bolts. When the proper opening number for the Victor combination lock is dialed, the fence drops into the gateways, and as the rotation of the dial is continued to the right, the bolts are retracted. The dial on certain models in the old Victor safe line has a lug inserted across the diameter of the dial hub, as shown in Figure 1.

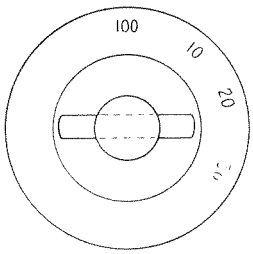


Figure 1

The most frequently occuring service problem on the old line of Victor safes results from wear of the hinges. As the hinges wear, the door loses its alignment with the safe body so that the locking bolts cannot be extended to lock the safe without a maximum of effort. This can be a difficult operation because the dial does not permit an easy application of sufficient leverage.

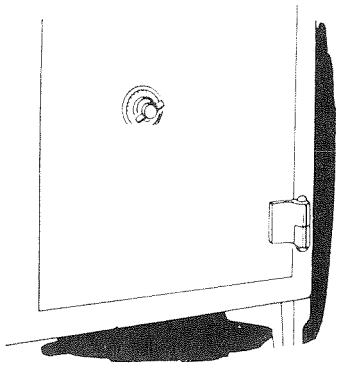


Figure 2

Figure 2 illustrates a model of the old line of Victor safes with the single dial control. In this safe, the bolts always must enter their receiving holes freely for ease of operation. If the door hinges are worn, the door should be removed so that the hinges can be built up with a thin washer to act as a shim and to compensate for the wear. In the event the door is too heavy to be removed, the bolt receiving holes can be ground suffi-

ciently to permit the bolts to slide in and out freely. The grinding of the bolt receiving holes also can be performed if it is impractical to build up the hinges for any reason.

An interior view of the locking arrangement found on the old style Victor safe with a single control knob is shown in Figure 3. This illustrates the manner in which the lever (or fence) drops into the wheels as they are moved in opening se-

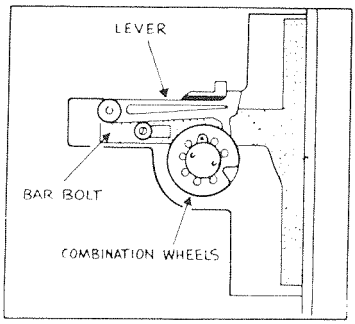


Figure 3

quence. As the lever drops into the wheels fully, the bolts are drawn back to open the safe with the continued rotation of the wheels and dial.

Newer lines of Victor safes (Figure 4) have a separate bolt control handle, a vast improvement over the old style arrangement in which the dial activates the bolt mechanism. Models of the new line are finished in a green color, with the Victor name being neatly lettered on the face of the door.

An inside view of the combination lock used on the new

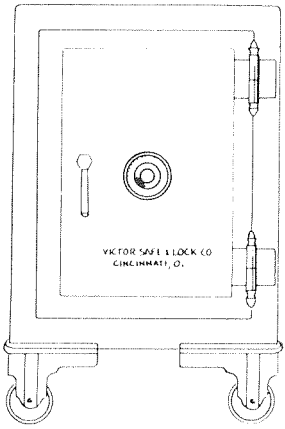


Figure 4

Victor line (Figure 5) illustrates another important change — the lock is housed in a case. In addition, the bolt is built into the lock case. With the exception of these changes, the combination lock on both the old and the new line of Victor safes are the same.

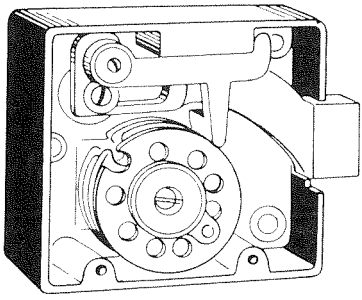


Figure 5

Try out combinations for opening the Victor safe line were presented in the June, 1958 issue of the Locksmith Ledger. If these combinations do not work, drill at point #43 on the drill chart.

JAMMED LEVERS ON VICTOR SAFES

Even though it has been many years since old line Victor safes were made, locksmiths undoubtedly will encounter these safes frequently in the field since many are still in use. Identifying these safes is quite easy because of the prominant characteristic of the old line Victor safe — the single dial control on the door.

This dial has two lugs or pins protruding from the dial hub and for good reason. Because the dial operates not only the combination mechanism but also controls the action of the bolt, the lugs on the dial give added leverage to retract the bolts.

The amount of pressure (or leverage) needed to retract the bolts of an old Victor safe depends largely upon how well the bar bolts fit into the corresponding holes in the safe body jambs. If there has been no misalignment of the bolts with their holes, the bolt action will be smooth and the leverage needed for retraction will be slight.

However, because of the age of these safes, it is possible that the doors will sag and thus lose the alignment with the body jambs. When this occurs, the bolts also will lose their alignment with the bolt holes. Bolts like this, which are under undue pressure as they slide in and out during locking and unlocking of the safe, will require heavy pressure or leverage to be placed upon the dial control.

To illustrate the mechanical results of misaligned bolts, study Figure 1, which is an inside view of the lock as you would see it from the inside mounted

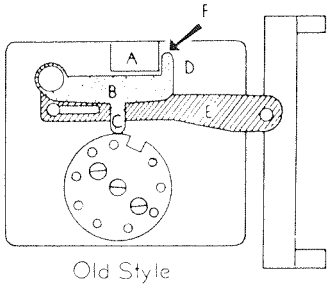


Figure 1

A—Stop Lug; B—Lever; C—Toe of lever; D—Heel of Lever; E—Bolt; F—Point where heel of lever jams with stop lug when bolts are out of alignment.

on the door. This view shows the lock in a normal operating position. Note the position of the lever, the toe of the lever and the heel of the lever. Note also that the lock bolt is attached to the bar bolts.

Upon dialing the proper combination, this is the action that results with a normally functioning lock: when the gates of the four wheels in this lock line up at opening, the lever drops by gravity with the toe of the lever falling into the gates. The heel of the lever also drops and clears the stop lug mounted in the lock case. Then, as the dial control is turned further, the lever slides back with the lock bolt and the bar bolts.

The lever moves into two separate directions: down and back to open and forward and up to lock. All of these motions are controlled by the rotation of the single dial control. The pressure (or leverage) needed to make this rotation will not be great if the bar bolts are in proper alignment.

In the event the bar bolts begin to function under pressure

(caused by misalignment and door sag), more pressure is needed to open the bolts. Another result of misalignment will be jamming of the heel of the lever. Since misaligned bolts actually are forced into their holes and thus do not move far enough to give the heel the necessary clearance to by-pass the stop lug, the heel jams with the stop. This results in a minor

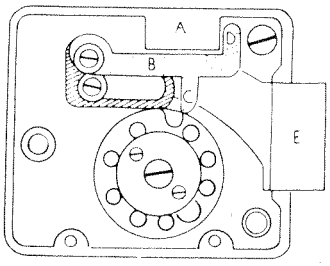


Figure 2

lockout since the lever does not drop when the proper combination is dialed.

The tendency of this type of lockout, caused by the bolts eventually losing their alignment, prompted a change in the lock mechanism. The improved style lock, designed to correct this type of lockout, is shown in Figure 2. Basically, the lock is the same with two important differences — the improved bolt is square and it is *not* attached

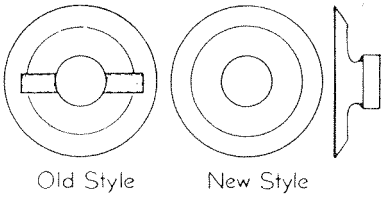


Figure 3

to the bar bolts. The same action of the lock occurs with both styles of locks but, with the improved style, the bar bolts are *not* retracted by the dial.

Victor safes equipped with the improved style of lock DO have a separate bolt control handle. You can readily distinguish safes with the old style lock from the improved style by comparing the dials, as shown in Figure 3.

Drilling both styles of locks for picking is done at exactly the same place — at the point where the toe of the lever rests on the periphery of the wheels.

YORK SAFES

The York safe of today has the same styling features of the Diebold safe, an understandable similarity since Diebold, Inc., has taken over the York line. Prior to this, York had built its own distinctive safe, shown in Figure 1. Although this safe is not manufactured, it still is in use throughout the country since it is a well-made model.

Some of these safes are equipped with a set of heavy relocking pins that are activated

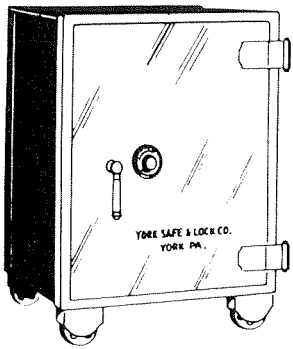


Figure 1

when the combination lock is punched in during an unauthorized entry. An exposed view of the door interior, illustrating these relocker pins, is shown in Figure 2. Note that there are four bolts in the door — the two center bolts are the relockers, while the top and bottom bolts are the active locking bolts controlled by the outside handle.

the relocker pins prevent the door from being opened!

If you are called upon to service a burglarized safe of this type, and you note that the handle can be operated but the door cannot be opened, you will know immediately that the relocker has been released. It then

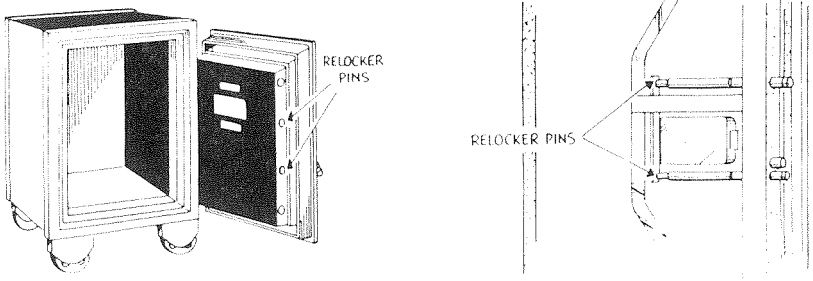


Figure 2

The relocker pins are held in place by the back cover of the door; thus, if the combination lock is punched and the back cover disturbed, the relocker will shoot out to relock the door. Unlike other relocking devices, that is those that freeze the control handle when activated, the relocking mechanism shown here for the York safe. permits the handle to be operated. *However,* is necessary to drill for these pins. Drilling instructions are given in Step No. 45 of your Drill Chart.

To service this type safe under normal conditions follow instructions given under Step No. 46 in your Drill Chart. In this operation, you must use extreme caution not to do any unnecessary punching or probing or you will set off the relocker.

Modern York Safes

The York safe of 1960 can be easily identified. Although it looks exactly like a present day Diebold safe, an understandable similarity since Diebold manufactures the York safe, there are several other features to identify the York safe. Of course, the small oval shaped "York" name plate permits identification but, even without this nameplate, an unusual handle and dial arrangement is a tell-tale mark.

This arrangement is illustrated in Figure 1. The dial is located directly above the bolt control handle. Size of the dial is another feature; being 4⅜" in diameter, it is larger than most standard dials. In addition, the dial is made of a plastic like material and it has numbers that are exceptionally large and easy to read.

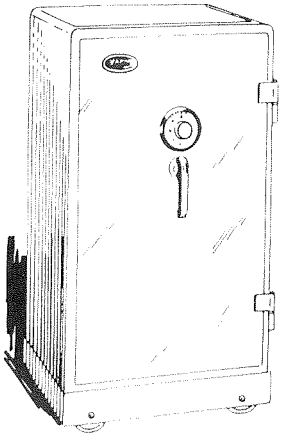


Figure 1

A view exposing the locking mechanism on the 1960 York safe is shown in Figure 2. The combination lock used on this safe (and the current Diebold safes) is the standard 900 (key change) lock, which is similar in size and construction to the locks used most frequently on present day safes — the Yale OC5M and the S & G R6720.

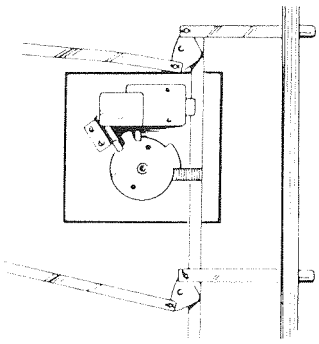


Figure 2

In studying Figure 2, note that the bolt handle cam is some distance away from the combination lock bolts, a variation from standard locking arrangements. This variation is due to the raised dial. The cam on this safe, therefore, functions to activate the main vertical bolt bar, which is connected to the locking bolts. When the combination lock bolt is extended to its locked position, it will block the movement of the main vertical bolt bar by binding against a steel lug welded to this bar. However, when the combination lock bolt is retracted to its unlocked position, the main vertical bolt bar is free to retract the locking bolts as the bolt handle cam moves the bar.

The modern York safe is equipped with the hard steel guard plate indicated by the heavy black lines in Figure 2. This plate affords considerable protection to the vital parts of the locking mechanism. It is almost impossible to by-pass this plate at any point where it would do any good in a lockout service procedure.

In addition to this, your lockout servicing will be hampered by a well-designed relocking device, which is held intact by a pin in a plate fastened to the cover of the combination lock. If the combination lock is punched in, the plate and pin free the spring loaded relocker bolt so that it lodges behind a wing in the handle cam, preventing handle rotation.

The relocker bolt can be raised by drilling, if it has been activated in a lockout. The tip of the relocker bolt (when activated) is located at a point 12" down from the top of the door and 8½" from the hinge side. Your drilling operation should take you through the front face plate, and through the insulation to hit the hard steel guard plate. Change then

to a carbide tipped drill and drill through the guard plate. A steel probe then can be inserted into the safe to lift the relocker bolt until the handle turns.

It is not likely that the relocking device will let go unless the safe has been burglarized. However, it ***can*** let go if the back cover of the combination lock ***loosens*** up and you will have a relocker lockout without the safe being burglarized. It is essential that all screws in the combination lock be tightened thoroughly. This can be a point of regular maintenance of the combination lock.

YORK OLD STYLE

The old style York safe, heavy wall cast iron jam construction is shown in Fig. 1. This safe

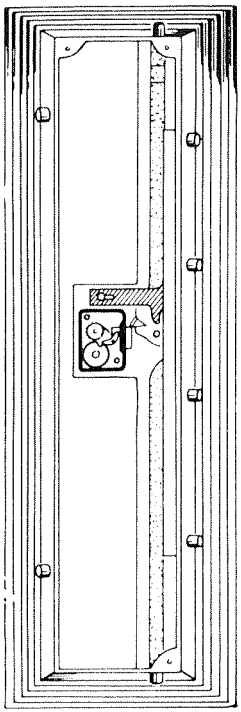


Figure 1

uses the Yale 063½ series, indirect - drive combination lock. This lock is shown in Fig. 2. The safe is equipped with a heavy hard steel guard plate just under the face plate on the outside of the door. In this position, it is fairly easy to penetrate with a hard steel drill, or you may prefer a small grinder.

The combination lock consists of four wheels and a driver. It is a gear driven lock which raises the dial spindle *above* the combination cluster thus thwarting any attempt to knock out the wheel pack. This model York is not equipped with a re-locking device. To open, drill at #42 (note alternative on the chart).

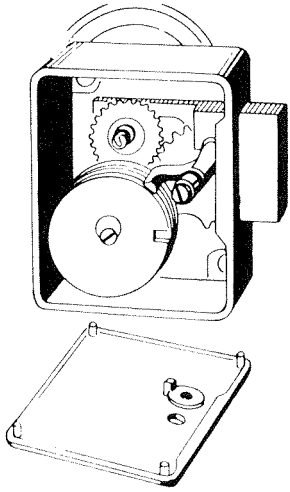


Figure 2

There is nothing about these old safes that can be truly classified as "troublesome". However, they should not be trusted to resist the heat of a hot fire. Like

all old safes, the insulation has long since dried out and the moisture that generates steam to check the rise in temperature within the interior is no longer present.

For drill points, refer to number 42 in Drill Charts.

York Round Door Depository Chest

The door of the early model York round door chest is not hinged and does not pull out away from the door jam as the doors on most chests of this type. This style door rotates 180° to its opened or closed position. When the rotating action takes place, a half circle cutout in the door is lined up with a half circle cutout in the chest to permit access into the interior. Thus, when the chest door is closed, the hole cutout which is provided in the side of the chest, is covered as shown by the dotted lines in Figure 1.

The major service problem on this style of chest is to determine the manner in which to remove the door for repair or combination changing. This can be done by using the following method: Rotate the door to its half-open position and reach behind the door to locate the bolt "C" shown in Figure 1. This bolt is attached to the inner side of the door and serves as a stop to control the door rotation. It is held in place by a

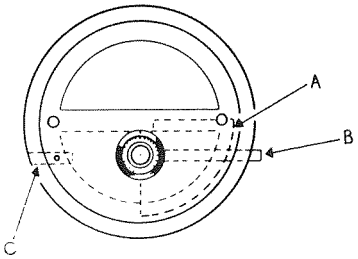


Figure 1

stiff spring; there also is a pin inserted through the bolt at a right angle. You will feel this as you reach behind the door; draw this pin back and the entire door will pull away.

The combination locking bolt, "B" in Figure 1, on this style chest is located to the right of the door as you face the chest. A quarter round hard plate is provided to protect the locking bolt area (See "A" in Figure 1). A variation of this occurs with chests that open from the top — on these models, the guide and stop bolt is on the right side and the combination locking bolt is on the upper left side.

For drill points, refer to number 47 in Drill Charts.

Section Two

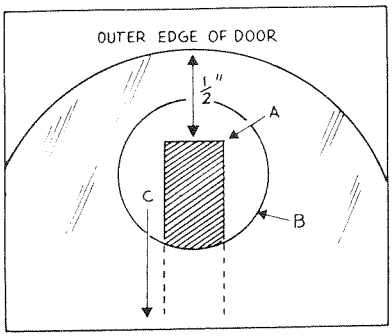
Servicing Special Safe Functions

ROUND DOOR MONEY CHESTS

Servicing round door money chests is often difficult work, and it becomes much more difficult after a burglary has been attempted. Although there are scattered cases where burglaries have been done by persons who were quite expert, the average burglary of a round door money chest is truly a bungled mess.

Invariably, the burglar will break off everything in sight, such as smashing the hinge casting, the hinge bracket, the bearing plate, the dial and the handle. He even may attempt to smash in the dial spindle which is almost a physical impossibility on most round door money chests. After all this damage, the safe is usually worthless.

When called upon to service a chest that has been burglarized in this manner, check first for any signs of explosives that may not have been discharged. Usually the door is sealed with a putty like substance if a liquid explosive was used. If there is no putty like substance present,



you should be able to detect nitro by its acid odor.

When you are sure no attempt was made to blow the safe, proceed in the usual manner. The locking bolt on most round door chests is usually located at 9:00 o'clock. The tip of the bolt can be determined by measuring ½" in from the edge of the door. In order to penetrate the case hardened chest, use a carbon tipped drill. On the other hand, a grinder can be used to grind away the surface of the hard skin. After grinding away about ⅛", you will be able to drill until you reach the tip of the

bolt. Use a sturdy probe to force the bolt back while revolving the door to the right.

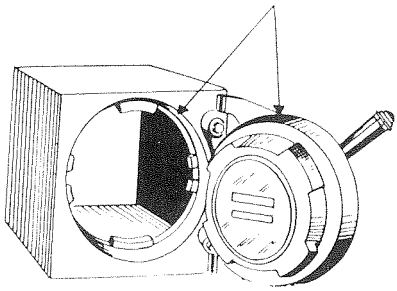
In order to repair the door so that it will resist drilling without hardening the whole door again, use a welding rod called Studite with an electric welding outfit. Any hole welded with Studite will be drill proof. After filling the hole, grind the excess with a disc grinder such as those used in auto body finishing shops.

In the event the locking bolt has been retracted and the door will not open, there is a strong possibility that the relocker device has been set off. Since the relocker is usually at 3:00 o'clock, the same procedure can be used to locate the relocker for retraction.

Servicing Revolving Round Door Chests

The true professionalism of a locksmith is indicated not only by the visible results of his safe repair or lockout services, but also by the effort he devotes to "preventive maintenance." "Preventive maintenance" is both the searching out of the causes of malfunctions and correcting them, and the identification and correction of possible trouble spots that might cause serious malfunctions if left unserviced. The extra moments taken to insure proper lubrication and absolute freedom from rust and grime will earn a locksmith the gratitude and loyalty of his customers.

Preventive maintenance is especially important when servicing revolving round door, burglar-resistive style chests. Periodic preventive servicing is necessary to keep the doors moving smoothly and efficiently. Since the tolerance between the revolving round door and the door jamb usually is ten-thousanths of an inch (approximately the thickness of a thin sheet of paper), the door will not revolve if there is even a slight bit of grit lodged between the two surfaces.



Dirt on both the jamb and door edge will cause binding action.

The fine tolerance of the doors serves a definite purpose by making it difficult for criminals to inject liquid explosives between the door and jamb. However, this fine tolerance also increases the chances of binding, sticking and even eventual breakage of other parts of the safe. The accumulation of rust and dust film on the surfaces of the door jamb should be avoided by periodic cleaning and polishing. Neglect of this will cause the build-up of this accumulation until the door begins to bind. Since this build-up is so gradual, the owner of the chest is likely not to notice it until, one day, the operating handle or combination dial breaks from the increased pressure that has become needed to operate them.

The locksmith called to service such breakage should do more

than just repair the handle or dial. He should search in true professional manner for the cause of the breakage. For the perfect job, it is necessary to make all necessary adjustments to prevent the handle or dial from breaking again.

Often, the only necessary step will be careful removal of the rust and dirt film on the door and jamb. For this, a fine grade of emery cloth should be used. Rough grades of abrasive materials should not be used since they tend to scratch the polished surfaces. (Never use a grinder as it will remove the metal as well as the rust and dirt.) Care should be taken to polish the metal to a fine, smooth luster which is free from microscopic crevices where dirt might accumulate.

After the job is finished, the locksmith should explain to the customer exactly what has been done and what caused the original difficulty. The suggestion of periodic inspection and cleaning of the chest to prevent future malfunctions usually will be accepted with whole-hearted approval, and the locksmith will gain a satisfied and loyal customer who regards him as a dependable professional.

Lockouts On Round Door Chests

Quite frequently, you will encounter lockouts on round door burglar - resistive type chests. While there are many reasons for lock-outs on these chests, the most frequent are: a broken fly; a loose spline key or a gummed-up accumulation of dirt. Each of these causes can be determined by dialing the combination so your first step in any lockout on round door chests should be a check of the dial rotation.

In the normal dialing of any combination lock, you can feel the tiny clicks that result from the wheels being picked up and from engaging each other. It is normal for a combination lock to turn hard at the beginning of the sequence and gradually decrease in resistance towards the end of the sequence. There is a definite reason for this apparent change of tightness on the dial — at the beginning of the combination, all of the wheels are being turned; at the end of the combination, only one wheel is being turned. Thus, degrees of tightness and looseness in dial rotation are normal.

When you check the "feel" of a dial on a safe that is locked out, you can tell immediately if there is a broken fly and in many cases you can tell on what wheel the fly is broken. Of course, it could be also that the combination cluster of wheels has loosened up and backed away from the driver since this condition will give you the same "feel" as a broken fly.

You can check this out somewhat, but not to any great degree of accuracy, by striking the safe or by tilting the safe. Rapid sturdy blows around the area of the combination dial sometimes vibrate a loosened cluster back into position where the drive wheel can pick up the wheels again. If the safe is movable and not too heavy, you can try to reposition the loosened cluster by tipping the safe forward so that the door is angled toward the floor. This, in conjunction with

the rapping, might get the cluster back into temporary position so that the safe can be dialed out.

In the case of a broken fly, no amount of rapping or tilting the safe will do any good and no amount of twirling the dial will help either. Waste no time; proceed to drill.

A loose spline key can cause a lockout by permitting the combination wheels to move out of alignment. A loose spline key can be detected by the degree of shake or play on the dial as you exert pressure on the bolt handle in the case of the straight bolt locks. Try to determine the degree of play (1, 2 or 3 numbers) and allow for this play in dialing out the combination.

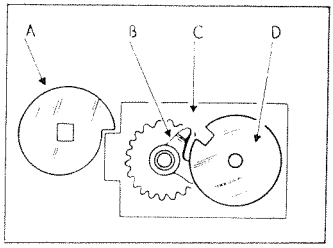
For instance, assume we have a hypothetical number of 50 and the degree of play is 3. In turning the dial to the right, the wheel would line up at 47. In turning the dial to the left, the true reading would be 53. A good rule to remember in dialing out a safe in which you suspect a loose spline key is to go beyond the given number by 3.

Gummed up accumulations of dirt and oil will tend to cause wheels to drag one another before the actual contact. This is especially true in the area between the number three wheel (wheel closest to the drive wheel) and the drive wheel. If, by chance, the dial has a slight in and out shake, pull the dial towards you as you work the combination. This will tend to increase the distance between the driver and the Number 3 wheel enough perhaps to allow you to dial open the safe.

SAFE CABINETS

The safe cabinet, or pressed steel type safe which is in common use today, varies widely in construction, wall thickness and quality. Certain models are well made with poured type or wet fill insulation while other models are merely lined with asbestos. Still other cabinets bear the label of the Underwriter's Laboratories but there are many without certification. These types offer slightly more protection than an ordinary file cabinet.

The one thing that the majority of the current safe cabinets have in common is the combination lock used to lock its door. Whether the lock is manufactured by Yale, Sargent and Greenleaf, Eagle or the others, the locks have the same general shape and size as the OC-5 that Yale produces or the model 6720 that is furnished by Sargent & Greenleaf.



"A"—Lock Cam; "B"—Angle Bar Lever; "C"—Combination Lock; "D"—Drive Wheel.

Viewing these lock installations from the outside (and looking in), the position of the combination bolt lies 2½" to

the left of the dial center. In its extended position, the bolt locks the door by preventing the passage of the locking cam, which can be in a number of shapes or sizes. Blocking the passage of the cam prevents the retraction of the safe door locking lugs so that the door remains locked until the combination is dialed out and the bolt retracted. This locking action is shown in the accompanying illustration.

The position of the fence (or dog) also varies to some degree but not too greatly. The fence is almost always found between number 85 and 90 when the dial is set at zero. In some cases, however, the fence is located at its drop-in point above zero.

The method to be used for servicing a lockout on a safe cabinet will depend upon the make of lock used. On models with an S & G lock, your plan should call for drilling directly above the dial ring and slightly to the right. The drilling path should be angled down 10 degrees so that it passes directly through the insulation of the safe and into the lock case. Once the hole is complete, you should be able to see the tip of the fence at its drop-in point.

By dialing the combination from the outside, you will be able to line up the gateways of each of the three wheels under the fence. The last dial rotation should be right to stop. In the event the lever drops, you will know that your alignment has been accurate.

The drop-in point on a safe cabinet using a Yale lock is not the same — when the dial is set on zero, the drop-in point lies at number 82. Thus, the drill point should be just outside the dial ring at 82, with the drill path angled downward 10 degrees and slightly to the right. When the drill path enters the case, proceed slowly so as not to mash the gears in the drive wheel and the angle bar. When the path is complete, rotate the dial to bring the wheels into aligning position with the fence.

If, for some reason, it is not possible to service the lockout in the above manner, the alternative lies in drilling off the cam or bolt. Drill for the bolt 2½" left of dial center in order to locate the tip of the cam which strikes the bolt. You then can either drill off the tip of the cam to permit it to by-pass the bolt or drill away the bolt to free the cam passage.

SAFE DEPOSIT BOXES

There are several methods that can be used to service lockouts on safe deposit boxes. Since some banks will not want the door of the box drilled, it will be necessary to gain entrance through the nose of the lock. A nose extractor tool is available through locksmith supply houses for this purpose, and it permits you to perform the work without disfiguring the face of the door.

In essence, the tool is used as follows: a small hole is drilled into the nose of the lock and this hole is tapped and threaded. A coupling then is placed over

the nose so that a turn nut can be screwed into this hole. A pulling pressure then is created to extract the nose from the lock.

Once the nose is out, you can perform either of two operations. First, pull the door with a door puller tool. This method ruins the lock but it saves the door. Second, on some locks, you can reach into the lock with a probe and slide the bolt back to open the door. Since safe deposit box locks are always dual controlled, it is necessary to set up the lock with the guard key before attempting to draw back the bolt with the probe.

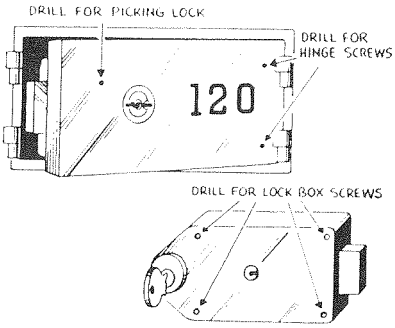


Figure 11

Another popular method of servicing lockouts on safe deposit boxes is to drill into the door to remove the hinge screws. This method is quick and time-saving, but it cannot be used in every circumstance since some banks will not want the door to be drilled. If you do not know where to drill for the hinge screws, open a similar box and measure the necessary distances. Then, transfer the measurements to the locked box and prepare for the drilling operation.

Before drilling however, examine the hinge on the open box to see if the box can be opened in this manner. Some hinges are screwed in from the back or narrow side of the door so that drilling out the front screws will not help. In these cases, you can drill out the screws holding the lock to the door. The necessary dimensions must be measured from the open box so that a template can be made to properly indicate the screw positions for drilling.

Some of the older type safe deposit locks contain only four or five levers and, although they are dual controlled locks, they can be picked after the lock is set up by the guard key. It is unwise to perform this, however, in front of a customer, since it is imperative that he retain full confidence in the security of his box. Bank officials usually object to this practice since they do not want customer confidence shattered.

SERVICING SAFE DEPOSIT BOXES

One of the subjects that seems to be discussed more and more frequently among gatherings of locksmiths is work on safe deposit boxes, covering lockouts, drilling methods and repairs. This is an understandable trend because there is little available information on techniques. As a result, many a skilled locksmith unintentionally mars a comparatively easy safe deposit box job, not because of his lack of mechanical skill but because of his lack of knowledge on drilling methods.

Normally, a locksmith does not attempt any job without sufficient knowledge. But, in an effort to gain new bank cus-

tomers and to enter this specialized field of safe deposit box work, a locksmith may accept the job from a bank rather than refuse it and lose an opportunity. In accepting the job, which becomes a challenge if his knowledge of safe deposit box repair is low, the locksmith then will try to bluff his way through the job.

Bluffing becomes just as disadvantageous as refusing the job for ignorance in safe deposit box work will stand out like a shining light, unless, of course, the locksmith is a proficient actor. Bank officials usually regard unfamiliar locksmiths with a scruitinous eye and they insist upon meticulous workmanship. Any doubt shown by a locksmith will be instantly recognizable.

Because of this "six of one and half a dozen of another" dilemma, it's difficult for the ambitious locksmith to get into this field of safe deposit box repair. Experience is one factor that is necessary in handling this work; yet, how is one to get experience unless he sets his hand into it at one time or another?

Thus, it's a good idea to learn as much as you can about safe deposit box work from fellow locksmiths who may be willing to part with bits of tips and procedures. Compile all these bits of information and make sure you understand them thoroughly. With this information as your background, you may be able to work your way into a bank and do a decent job without arousing too much suspicion.

Here are some other observations for those who may be seeking to add to their knowledge of safe deposit work.

Keep in mind that a bank will call you to service a box for two reasons: the box renter may have lost his keys and he wants to get in, or the box renter has his keys but the box will not open. In a number of cases, a stubborn lock can be opened if something inside the lock has not broken. Before you attempt any work, it is desirable to determine which function of the lock is not operating — the bank guard section or the customer key section. If this can be determined, no lost time will be involved since you can go right to work on the defective section.

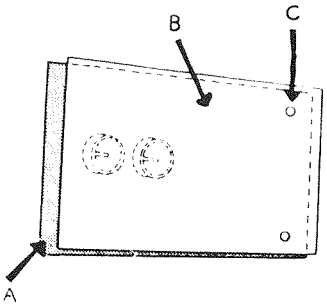
Try these actions first: rap the door with a plastic soft faced mallett; this often will shake loose any jammed levers and may cause them to fall back in place. If this doesn't work, insert a rake pick into the lock and work it in and out, then up and down. This also will loosen up any lever or levers that may be binding. Then, try the keys again. Work the keys very slowly and wiggle them back and forth with pliers; you may be surprised when the box pops open.

If these preliminary actions don't work, your only alternative is to drill. There are several methods of drilling safe deposit boxes but this section will cover the hinge drilling method. Other methods will be covered in future sections.

The door of a safe deposit box is held in place on a hinge with two screws (usually 10/32 size screws) which are screwed

into place from the back or inside of the door. Removing these screws will allow you to pry the door open from the hinge side. The problem is to find the location of the screws from the ***outside.***

You can determine the measurements of the screw positions by checking a safe deposit box of the ***same size.*** Make a template of the hinge screw locations. Using this template, mark and prick-punch the spot



A — Safe Deposit Box; B — Template; C — Screw Holes.

to be drilled. Insert a 5/32" drill into your electric drill and proceed to drill through the door. Drill slowly — and peer into the hole regularly to try to sight the end of the screw. If your template was made accurately, the hole will be centered right with the end of the screw. Continue to drill on through until all of the screw is removed.

Once the connection between the door and hinge is free, the door can be worked out and opened from the hinge side.

NOTE! The hinge drilling method is not infallible and the next section will cover the items to be looked for before drilling the hinge screws.

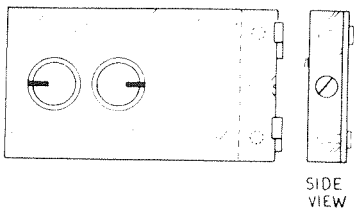


Figure 1

In most cases, the hinge drilling method will enable you to service a safe deposit box lockout. However, there are some boxes on which this method cannot be used. On boxes of this second type, the hinges are held in place not only by the two regular screws but also by an auxiliary back screw (See Figure 1).

From the above illustration, it is obvious that drilling out the two regular screws holding the hinge on the inside will not let you remove the door because of the presence of the auxiliary back screw. This back screw is completely hidden and it cannot be removed; thus, the hinge drilling method cannot be used on a safe deposit box door with a back screw.

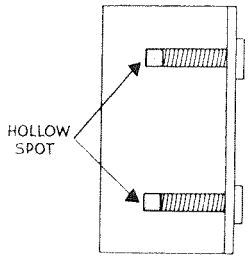


Figure 2

Here again, it's necessary for you to check on similar sized boxes to find out if the box you are working on has this back screw. Check two or three other boxes (be sure they have the

same sized doors) that are open and unrented. You will find that nests of boxes are usually consistent and, if you come across one or two that do not have a back screw, you can be fairly sure that the locked box also does not have a back screw. If this is the case, you can assume that drilling out the hinge screws from the outside will permit you to solve the lockout.

For drilling, use a 5/32" size drill bit. This size drill is slightly smaller in diameter than the 10/32" screws holding the hinges. And, it is large enough to drill out the core of the screw but not large enough to damage the threads in the steel door.

Accuracy in drilling is extremely important. If your template is made with precise measurements, in all probability, the hole will be drilled accurately. As the hole is being drilled through the steel door, you will find that the bit will not immediately strike the tip of the screw, because of a hollow spot in the hole just before the tip of the screw. This hollow results from the extra depth of the hole beyond the length of the screw.

Even with an accurately made template, it is impossible to tell how your drilled hole will line up with this hollow spot in the screw chamber. If the hole is slightly off, the drill bit will chew off part of the chamber and it will follow the line of least resistance, which is the chamber itself, thus causing the drill to bend as it follows the chamber. This will eventually result in the drill bit breaking off in the door.

To avoid breaking the drill bit, drill the hole with caution until you see that the bit is about to enter the chamber. Look into the hole with a light. If you are not exactly centered with the chamber, angle your drill in the proper direction to enter the chamber on center. The flutes of the drill will chew the outside as you draw the bit over to straighten out the hole. Thus, the hole in the face of the door will become elongated but this won't matter as long as the final hole through the screw itself is centered.

VAULT DOORS

MODERN DIEBOLD VAULT DOORS

The modern, fire-resistive Diebold vault door is rated from the ½ hour file storage room type door to the six hour severe fire exposure record storage vault. However, in spite of this variation of rating, the type of combination lock used on these doors is the same, with the only exception being the length of the dial spindle. The difference in length is needed to compensate for the varying thickness of the vault doors.

The combination lock dial is a large plastic dial, numbered in white from 0 to 99. The handle is a drop type, also made of plastic. Both the dial and the handle on the Diebold vault door are shown in Figure 1. From this illustration, you

will note that York vault doors appear similar to Diebold doors.

A common service area on the Diebold vault door is the handle. Its plastic composition makes this handle very brittle

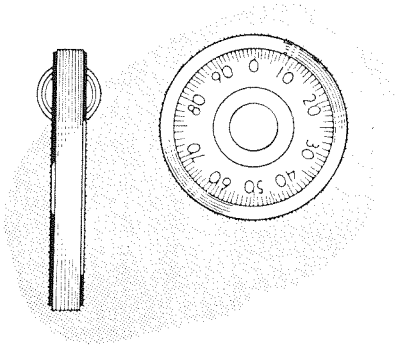


Figure 1

and susceptible to cracking when put under heavy pressure. Pressure of this nature could result from the settlement of the building since this action would force the doors to lose their proper alignment. When this occurs, closing as well as opening of the door, becomes difficult. Thus, when abnormal pressure is applied to the handle on a difficult closing or opening door, the handle will crack and break.

Recent improvements, however, have eliminated this breaking tendency. A new handle is being used with a backing of steel that adds greatly to the handle strength. The handle design has not changed but its ability to withstand pressures has.

In order to replace a broken handle, it is necessary to first remove the inner escape portion of the handle, which is attached to the inside of the handle shaft. It also is necessary to remove the large cover plate on the inside of the door. When all of the attached parts are removed from the inside of the handle shaft, it will be apparent that the handle is still anchored and it still cannot be extracted. The reason is a secondary retainer washer, which fits into a groove in the handle shaft. The groove is placed close to the back lock mounting plate. Most of the time this washer is not easily visible because of the grease packed around the shaft at this point. However, before the handle shaft can be removed, the ***retainer washer must be removed.***

Handle shafts vary in length depending on the thickness of the door. The six hour vault door uses the handle with the longest shaft while the others reduce in length according to the label attached to the vault door. When ordering vault handles, remember to specify the rating that is applied to the door so that you will receive a replacement handle of the proper length.

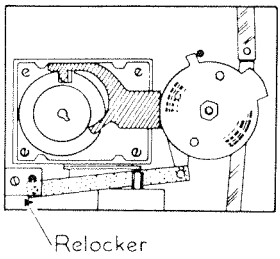


Figure 2

Diebolt vault doors are equipped with hard steel guard plates on which the combination lock box is mounted. A relocker device also is mounted

to this plate. This relocker, shown in Figure 2, is held checked by a bar and a pin attached to the lock cover plate. If the combination dial is broken and the spindle driven in, the relocker becomes activated.

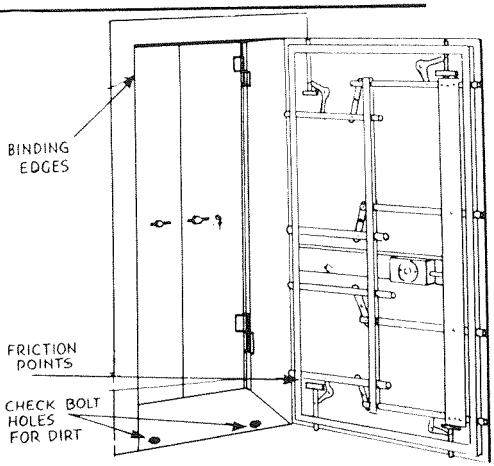
Old Type Vault Doors

Old steel plate vault doors present a variety of servicing requirements. Because of their age and the lack of necessary maintenance on a regular basis, this type of vault door is always in the need for service.

One of the most common defects on old vault doors is the door alignment with the door jamb. Most of the time, the door does not fit properly in the jamb. This may seem to be a rather unusual condition, because a vault door that has been operated successfully for many years can develop a bind or a twist so that the door doesn't close. Since steel does not warp by itself or expand to any degree like wood, the cause obviously is not in the installation of the vault door but rather in the ***settlement of the building.***

Over a period of years, the settling action of a building will cause a slight misalignment in the walls, partitions, floors and jambs, which in turn, will cause a misalignment of the door. Although the settling takes place gradually, it does occur constantly. By the time its effect on the alignment of the vault door is noticed, the settling action has usually caused a severe bind or twist of the door installation.

Your first step in correcting a severe bind of an old steel



LIGHT STEEL VAULT DOOR

plate vault door is to locate the point of binding. This is not difficult since the telltale marks of a bind should be clearly visible—look for the friction rub marks on the edge of the door and the door jamb. Once located, the bind can be removed by grinding down both the door and the jamb.

The type of grinder that is used for this step is optional although experimentation with the various types of grinders for removing metal reveals that the commerical disc grinder used by auto body shops is aptly suited for this job.

Difficulty in closing the vault door also can be caused by the locking bolts. In these doors, heavy ¾" to 1" bolts are used and these usually rust with age. When they do, excessive friction is created as the bolts move in and out of their bearing holes. Many a broken bolt

control handle has resulted from this condition. When you consider that there are about 20 points of friction for the locking bolts, you can realize the condition that develops when all of these points become clogged with rust. Your service methods on cases like these should include the cleaning and lubricating of all points of friction. More important, it should be stressed to the management that regular service on the door is required to keep it functioning smoothly.

Occassionally you will come across a condition in which the locking bolts of these steel plate vault doors cannot be moved far enough to allow the combination lock to be locked when the door is in the closed position. Swing the door open and try the bolt operation; if it is normal, check immediately the bottom bolt receptacle holes. An accumulation of dirt in these holes will prevent full bolt action; merely cleaning out the holes will restore it.

The combination locks used on vault doors are basically the same as those used on ordinary floor safes. Three styles are most prominent, however—the direct drive lock, the indirect drive lock and the bolt and cam type lock.

The direct drive lock functions by having the bolt bar engage directly against the combination lock wheels. This type of lock is found on the Hall's vault doors and also on the Cary vault doors.

The indirect drive lock functions by having an arm connected on the bolt bar, in which the arm presses into a lever which, in turn, forces the lever up into the wheels of the lock. This type of combination lock is found on Herring-Hall-Marvin and Mosler vault doors.

The third type—the bolt and cam mechanism — employs a brass cam within its case, which protrudes from the case, when activated, to prevent a cam attached to the bolt mechanism from passing.

Each of these three basic types of locks require different lockout service procedures. While some of the vault doors on which they are mounted have hard steel drill resistive guard plates to protect the lock, these plates can be penetrated with carbon tipped drills running at high speeds.

Unlike the insulated fire resistive safe where the combination lock is located well inside the door behind three to four inches of insulation, the combination locks on the old steel plate vault doors are mounted right behind the face plate of the door. At most, it is only about ½" away from the front, which will enable you to see the mechanism much easier than by peering through inches of insulation.

INSTALLING ESCAPE DEVICES ON OLD VAULT DOORS

Old vault doors that are not equipped with an inside escape device present a considerable hazard in the event someone accidentally gets locked inside since there is no way in which the person can let himself out.

It is good business on the part of the safe expert to recommend the installation of an escape device mechanism on those vault doors that are not so equipped.

In some cases, because of the age and construction of the vault door, the installation of an escape device can be a lengthy and expensive job. However, there are a few old makes of older vault doors that can be worked on quickly and easily, and at comparatively low expense. One such door in particular is the old style Mosler Underwriters Labelled

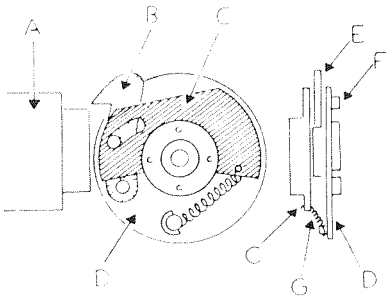


Figure 1—Mosler Relocker Disc Assembly. A — Combination Lock; B — Finger; C — Outside disc; D — Inside disc. In the side view, C — Outside disc; D — Inside disc; E — Finger; F — Bar holders (4); G — Spring.

grout type vault door. These doors do not have any escape devices, and in the event a safe expert runs across one of these doors in his work, he has a perfect opportunity to recommend the alteration to his customer.

Installing a Mosler escape device is relatively easy for the experienced safe expert. The main part of the escape device is standard for all vault doors, but the inside handle arbor (shaft) varies in length to coincide with the thickness of the door on which the device is in-

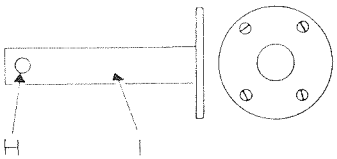


Figure 2—Inside Handle (arbor) Assembly. H — Handle Bolt Screw Hole; I — Inside handle (arbor) assembly that is to be attached to the disc assembly.

stalled. Thus, before the installation can proceed, the safe expert must determine the thickness of the door, which is done quite easily by reading the information, as to whether the door has a one, two, four or six hour rating, right off the UL label on the top of the door frame or on the inside lock cover plate.

Order an escape device mechanism from the manufacturer stating what label the door bears.

To install the escape device, proceed as follows:

1. Remove the large back plate from the door. On doors equipped with thermostatic valve door, remove the valve door first; then, remove the thinner sheet steel plate.

2. Remove the handle arbor (shaft) nut and the cam plate from the vault door. NOTE! When the cam plate is removed, the bolt bars fitting on the lugs of this cam plate will become disconnected.

3. Separate the escape device into two sections — a round disc with attached arbor and the main re-locker disc assembly. Install the main disc assembly in the same place as the old cam plate. Be sure that all bolt bars are reconnected on the protruding round lugs of the new escape disc.

4. Attach the round nut to the outside handle arbor thread. Note that this round nut is equipped with two holes which are used for tightening, either with a special wrench or by tapping with a 1/8″ punch. Be sure this nut is tightened securely.

5. The other half of the escape device consists of a round disc with attached arbor. This forms the inside handle. Attach the inside disc and arbor to the main relocker disc already on the door. Four flat head machine screws are provided for this. When attaching this portion to the relocker, make sure that the handle bolt screw hole in the arbor is in a horizontal position.

6. Temporarily attach the handle grip to the inside escape arbor. Then, with the door open, twirl the combination lock dial to extend the bolt. Now check the inside escape handle to make sure that it releases with the lock in the locked position. Next, check the outside bolt control handle and make sure that it functions in the normal manner.

7. Remove the temporarily installed handle grip and prepare to re-install the back cover plate of the door. NOTE! Before the cover plate can be re-installed, it will be necessary to drill a 5/8″ diameter hole at the point where the inside escape handle arbor protrudes. This hole in the back plate allows the handle arbor to pass through it. Once the hole is drilled, attach the back plate securely.

8. Included with the escape device are various thickness collars or washers which are used to provide a smooth fit of the assembly. Place the washers or collars as needed on the shaft to fill out any space between the handle hub and the back plate.

9. BEFORE LOCKING THE VAULT, CHECK ON THE COMBINATION, BOLT MECHANISM AND ESCAPE DEVICE. MAKE SURE EVERYTHING IS IN WORKING ORDER.

Section Three

General Servicing Techniques

BOLT-LOCK MECHANISMS

Drilling Unconventional Bolt-Lock Mechanisms

Most safes have used, and continue to use, a mechanical lock-bolt arrangement which places the combination dial to the right of the bolt control handle. In addition, the dial is located in the same place (in alignment with) as the handle. This conventional arrangement permits any of four conventional drilling possibilities to reach the opening position or "drop-in point," depending on where the drop-in point is located.

The drop-in point can be located in either of four positions: directly above the dial; directly below the dial; directly left of the dail; or twenty numbers down on the left side of the dial, starting from the line-up indicator, a position found usually on safes using a retractable bolt lock. These four vital positions are standard on most safes.

Confusion and perplexity can be generated, even in the experienced safe man, if a safe is

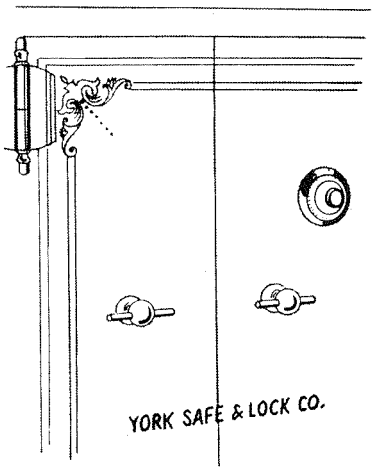


Figure 1

encountered with the combination dial placed in an unconventional position. The safe shown in Figure 1 is typical of the unconventional position that may be encountered. This old York safe has its dial placed way above and to the right of the handle. Normally, if the dial is not right beside the bolt handle,

it is placed directly above the handle, which is the type arrangement used even on some of today's modern labeled safes like York and Diebold.

Drilling a safe with the unconventional lock-handle arrangement such as this old style York can present a problem. Unless you are thoroughly familiar with this safe, you will be at a loss as to where to drill and you will usually end up guessing at the point. Most of the times, drilling into an unfamiliar safe for the first time, you will be in the wrong spot.

There is a rule, however, will help you to determine the proper drill point and to prevent unnecessary drilling. Remember this — regardless of where the combination dial is placed on the safe door in relation to the handle, the combination lock is standard. Thus, your drilling should be done in the normal manner as if the lock were adjacent to the handle.

Before going further, study Figure 1. Ask yourself what you would do on this safe and try to visualize the inside mechanism. Now look at Figure 2, which is the inside view of the same safe. You can see that this uses a standard roller bolt combination lock with the exception of its unconventional position. Note also that the mechanism functions exactly the same as if the lock were in its normal position next to the handle. Your drilling operation, therefore, would be done in the same manner as with any other safe using the same type of roller bolt combination lock placed next to the handle.

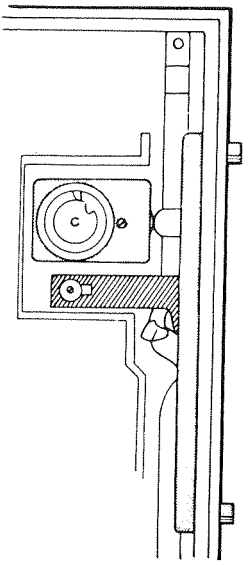


Figure 2

Of course, you must understand that not all safes with locks in unconventional positions use this roller bolt lock.

Some manufacturers use standard retractable square bolt lock. Others, to be extra tricky, invert the locks so that they are installed up or down. Each case, therefore, is individual but the basic rule to follow with unconventional lock-handle positions is to concentrate on the lock position for drilling.

BROKEN DIALS

With crime on the increase and more and more safe burglaries occurring, locksmiths are encountering repair jobs on burglarized safes more frequently. In the majority of cases, the combination lock dial has been knocked off, leaving the safe in-

operative. Locksmiths who are called upon to gain entrance can use several methods.

Usually, on a dial break, the stub of the combination spindle remains protruding from the safe about 1/4" to 1/2". If this spindle is still free and can be revolved, the combination can be operated even with the dial broken off. Many times, you will find that the dial has not been so mutilated that it cannot be used as an indicator, and a few quick repairs to the dial can put it back in shape.

One of the methods that can be used is fastening the dial back to the spindle. First, drill a small hole through the center of the spindle stub and tap this hole for an 8/32 or 10/32 screw. Then, drill a slightly larger hole through the center of the broken dial. Fit the dial on the spindle so that it is replaced exactly the way it was before breaking, and fasten it to the shaft with the long screw.

You can readily see here what the theory is and how important it is to place the dial exactly where the break occured. If the dial is not placed exactly as it was originally, *the safe will not open because the wrong numbers will be dialed!* The owner of the safe can supply the combination, but it remains up to you-the-locksmith-to dial it open!

In some cases, the break of a spindle shaft is so jagged and pronounced that the dial can be refitted as easily as fitting a jig saw puzzle together. In other cases, however, the break may be rather smooth, making it difficult to locate the right position for refitting the dial. Usually, you should be able to detect, within a short range, where the dial should be fitted. If the dial falls within a close range of the numbers, the combination can be dialed by carrying the numbers over or under the line-up indicator, following a trial and error process to eventually hit upon the correct opening sequence.

When encountering a spindle stub that is jammed tight because of the excessive pounding from the attempts to drive it through the safe door, a different approach is required. As long as the spindle stub is visible, there should be some connection with the inside of the lock; therefore, an attempt should be made to free this spindle before attempting entrance by another method. Using a hollow reamer, attached to an electric drill, to clean the burrs and peen the dents from the outer surfaces of the spindle, helps considerably in freeing the spindle and making it operative. Once the spindle is movable, try refitting the dial to the spindle as explained

DRILLING BOLT

The usual method of approach used by safe burglars is knocking off the dial and attempting to drive in the dial shaft or spindle. On most safes with good quality locking mechanisms, the spindle cannot be driven in, and the burglar leaves the safe in this damaged condition, locked tighter than ever. It will become necessary for the locksmith to approach his opening technique in a different manner, if the stub of the spindle cannot be worked to open the safe

The first approach is to locate

the combination lock bolt. In all probability, the lock is still intact and the bolt is still checking the bolt mechanism. If you are sure where this lock bolt is located because of your previous knowledge of the make and style of safe, drill a ¼" hole in the general area.

However, if you are not sure of the location of the bolt, your best bet is to drill a ¼" to ½" hole between the bolt control handle and the spindle hole, on the left side. If this first hole does not reveal the bolt, a second hole will be necessary. Use the same outside hole, but tilt your drill upward, downward, to the left, or to the right, until you locate the bolt. In this manner, you will have only one hole on the outside of the safe where it shows; but inside, where appearance doesn't matter much, there will be several holes.

Once the bolt is located, it is suggested that a series of small holes be drilled to sever the bolt. If the bolt is punched out of the way, the relocking-device (if so equipped) will be activated!

In the event you do not locate the bolt after drilling it may be possible that you have not drilled deep enough. You should always drill through two steel plates before you strike any part of the lock: the outside steel plate, on through the insulation, and the inside lock mounting plate. Once by the second plate, you should find something. To help you get your bearings, try activating the bolt control handle to see if anything moves inside. Try to locate the point where the cam strikes the bolt; after this, you should be able to locate the bolt by drilling other holes in the general area.

It also is possible to drill off the nose of the cam, (the part that strikes the bolt) in order to allow it to bypass. In the repair, it is necessary to merely weld the drilled off section back on the cam; in this manner, no further damage is done to the combination lock.

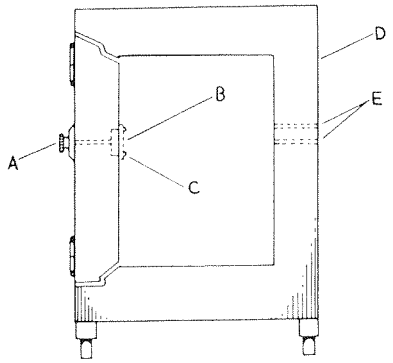
DRILLING BACK

Locksmiths who are called upon to service burglarized safes which have had their dials knocked off can use another method if all previous ones are ineffective—drilling through the back of the safe. The theory of this method is simple—spanning the safe interior to reach the inside of the door.

This is a very neat way of opening a damaged safe since the door is not disfigured. All the necessary repair marks are out of sight in the back of the safe where appearance is not important. There are, however, some precautions that should be noted when attempting to drill through the back.

The first is that a thorough knowledge of the safe contents be known. A heavily loaded interior will block your line of vision even after you have drilled through the back. Tightly packed ledger books and steel interior equipment are some of the obstacles that could reduce your vision through the drilled hole. If your customer knows exactly what is in his safe, and where it is located within the safe so that you can determine before-hand whether or not your passage through the safe would

not be blocked by interior components, it may be practical to drill through the back. Normally, if the safe is equipped with plain shelves, without interior boxes, files, or drawers, you can



View of operation in servicing lockouts through back of safe: "A" — lock; "B" — cover plate; "C" — cover plate screws; "D" — back of safe; "E" — drilled holes.

be reasonably sure that a good view of the inside of the door can be seen through the hole.

Another important factor is the construction of the lock. For best results with this method, the lock should be of a type constructed so that the cluster is exposed or only partially covered by a small cover plate. In the event the lock is completely covered by a large cover plate the same thickness as the door itself, this method of drilling through the back would not be practical even though all other conditions were favorable.

Here's another point which is rather elementary but very important—you must be able to get to the back of the safe in order to drill. Many safes are built right into a partition or wall where it is impossible to expose the safe back. Other safes are so large and heavy that moving them away from the wall would require special handling equipment.

In order to illustrate the use of this method, let us assume that a safe is encountered which fulfills all requirements—it's a late model, medium size safe that can be moved. It's interior layout is such that the inside of the door can be viewed clearly, and the combination lock cluster can be reached without difficulty. Your method of approach then should be as follows:

Directly opposite the combination lock (either measure or go by eye), drill two holes through the safe back. One hole is to be used for a safe light; the other is for the insertion of a long screwdriver. The light which you use can be a special flexible neck light or, in some cases, a strong flashlight, focused properly in the hole, will suffice. The long screwdriver, of course, must be made specifically for this job.

When the holes are drilled, insert the screwdriver and remove the cluster screws. If the cluster is covered by a small plate, remove the plate, then, the cluster. Once the cluster is out, the dial can be turned to retract the bolt. In the event the lock is equipped with a re-locker, hold it down or in, while an assistant turns the dial to retract the bolt.

This method of drilling through the back is ideal on many of the newer safes equipped with hard steel guard plates. However, all of the above conditions must be ideal before it can be used practically!

DROP-IN POINTS

DETERMINING A DROP-IN POINT

A positive indication of the locksmith's "professionalism" in safe repair can be seen from the visible work he puts into solving a lockout as well as by the degree of damage that results from his efforts. A lockout that is solved quickly and neatly, with a small degree of subsequent damage to the door, lock or bolt, is a sure sign that the locksmith knows what he is doing. On the other hand, repair work that tends to "butcher" the door or lock, imparts a feeling of doubt about the locksmith's abilities, especially if the repair work causes additional expense and aggravation to the customer.

Knowing how to handle safe lockouts in a "professional" manner can come only from developing the mechanical techniques as well as from understanding the operation of the internal parts. Refinements such as knowing the position of the drop-in point often will earn recognition of your efforts as "professional". Although it is not absolutely essential to know the position of the drop-in point, the chances of further damaging the lock during the drilling operation are lessened if this position is known. Thus, it is helpful to know whether the drop-in point is to the right or left, or if it is on the top or bottom of the dial.

Practical experience, of course is the best means of determining this position, but if it is not known where the drop-in point is, you can locate it by working the dial or handle. Oscillate the dial back and forth until you feel a slight "bounce", which will

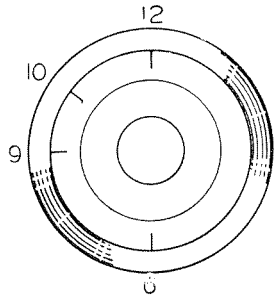


Figure 1

indicate that the wheels are in alignment with the fence. If this "bounce" cannot be detected, apply slight pressure to the bolt throw handle. This will tend to make the dial bind as it is turned; however, as the gateway of the drive wheel is reached, the dial will move freely within a range of two to four numbers. While this will reveal the approximate opening number, or drop-in area, of the lock, it will not show exactly where the action is taking place. In this case, you must use an "educated guess", using the information that the three most widely used drop-in points are set in the positions of twelve o'clock, ten o'clock and either six or nine o'clock. (See figure 1.)

When you have determined the exact drop-in point, either from memory or from working the dial and handle, *you should not drill at this point.* The reason is obvious . . . the fence can be damaged easily by drilling too close to it, especially with a

roller type fence. Rather than risk this damage, drill ten to fifteen numbers away from the drop-in point. (See fig. 2 and 3.)

Figure 2 shows an outside view of a drop-in point at 83 on the dial. The hole is drilled at 95, twelve numbers to the right so that the drill bypasses the

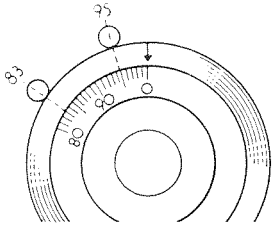


Figure 2

fence. Figure 3 is an illustration of the inside of this drop-in point. If drilling was made at 83, the fence would be damaged as shown by the arrow. However, when drilling at 95, (shaded area), the wheels can be lined up without damage to the fence.

When the hole has been drilled, peer inside using a small safe light. Then, line up the

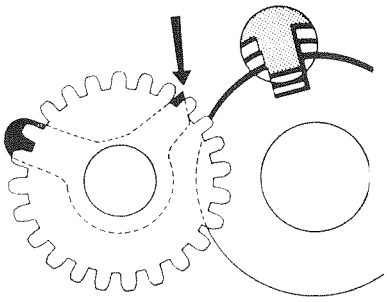


Figure 3

wheels using a probe and take the reading of each wheel as it appears on the dial.

Assuming that the combination reads 20-40-60, you still do not have the opening combination since the drop-in point has been transposed twelve numbers to the right. You have to determine how far to carry this sequence of numbers to the opening alignment point. This can be done by marking lines on the dial with a pencil, starting from the standard center indicator line and marking the next thirteen numbers counterclockwise. Dial the combination, as you read it through the hole, to each pencil mark until the lock opens.

HARD PLATE

Many of the fire-resistant safes in use today are equipped with hard steel guard plates which protect the combination lock. These plates can be penetrated with high speed carbon tipped drills but, the job requires plenty of energy and hard work. Carbon tipped masonry drills will do the job just as effectively as any high priced quality drill made expressly for cutting through hard steel.

There are three other methods of cutting hard steel that can be used, and, in some instances, offer greater possibilities than the drilling method. If, for instance, the hard plate is located just under the skin or face plate of the door, a small hand grinder can be used. After drilling through the soft steel face plate, a hole can be ground through the hard plate in half the time it takes to do the same job with a drill.

The grinder should be held at a 45 degree angle to allow the sides of the mounted point to

work. Do not hold the grinder straight at 90 degrees—nothing can be accomplished this way. When the hole is almost through, it may be possible to punch the the hole and break through the plate. Then, the hole can be enlarged with the grinder, if necessary.

Another method of penetration of hard plates is the use of "Cutrode", a stick of carbon attached to an electric welding outfit. With the proper amount of voltage the carbon stick will melt steel on contact. Since there is no air pressure involved, the melted steel is not cleared away as in the use of the acetylene cutting torch. Thus, when using "Cutrode" (trade name) the conditions must be such that the flowing molten steel has an escape. If the molten steel cannot flow away, the carbon will keep melting the same over and over again, rendering unsatisfactory results.

An acetylene torch is the third method of penetration and you are undoubtedly familiar with this.

It is the duty and responsibility of a safe manufacturer to keep one step ahead of the burglar at all times, for soon after manufacturers make improvements, the skillful burglar finds ways of defeating them. Thus, the standard hard plate has been defeated by carbon tipped drills and safe manufacturers were required to come up with a tougher steel that carbon drills cannot penetrate. This they did! There now is a special steel so tough and strong that hard steel drills cannot penetrate. One of the trade names for this special steel is called RELSOMITE and it should be making its appearance on safes in the very near future. This new steel, of course, can be burned out with a torch, but being backed up with a layer of thick copper, the job of penetration is very hard to accomplish.

BYPASSING PLATE

The test of a true craftsman in safe work is his method of operation in a situation where he finds himself at a disadvantage. The optimum situation, of course, is one in which adequate knowledge about a safe is known, combined with proper tools to handle the plan of service in an efficient manner. However, this is not always the case!

Even the most thorough preliminary discussions of a safe job will not reveal complete information which is needed to determine exactly what tools will be required. Consequently, it could happen quite frequently that a safe repair man gets to a job and finds out that one of the tools he needs is sitting in the shop. Although this can be very annoying, especially if the man is miles from his shop, a situation like this also is a test of his abilities.

Suppose, for example, a safe man travels to an isolated spot and finds a late model pressed steel type safe which has a hardened plate. His carbon-tipped drills lay in his shop. Here is where the craftsman must use his knowledge. He knows that the neatest way to service any of these safes is to drill right through the hard plate. But he also knows that in a given emergency, a successful service job can be done by another plan

of operation—for example, if it is not possible to go through the plate, bypass it and go above it.

Of course, a thorough knowledge of the safe construction is essential. In the event the hard plate is located up front, just under the face plate (See Figure 1) and the lock is located in back of the safe, only one hole will be required as shown in Figure 1. The path of drilling is indicated by the dotted line.

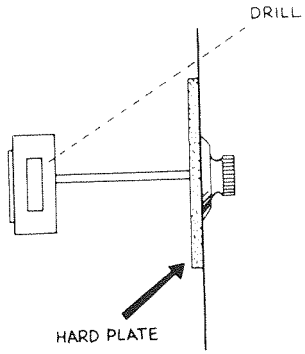


Figure 1

In most cases, however, the lock is mounted to the hard plate which is set back in the safe about 2½". An example of this is shown in Figure 2. Drilling at an angle above the hard plate to reach the bolt is practically impossible, since this plate effectively guards the lock. The plan of operation here should be to cut a hole in the door, above the lock, to be able to reach down and behind the hard plate.

This alternate method is shown in Figure 3. A series of small holes (about 4" square) are drilled above the hard plate, directly between the bolt handle and the dial. The hole then is scored out by using a chisel. The insulation also is cut away. Since the hole should be large enough to fit the hand, reach

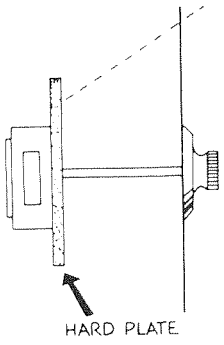


Figure 2

in with a slightly bent steel rod to contact the lock bolt. Hand pressure applied to the rod should be enough to force the bolt back to permit the door to open.

Prior to applying pressure to the bolt, it is advisable to set the dial at the opening number or drop-in point (gateway in drive wheel lined up with fence or lever). This will result in an easier action being required for forcing back the bolt. In most cases, you will find that the lever or roll fence has been bent or broken but no further damage will be made to the lock.

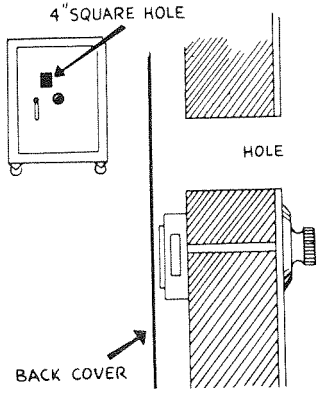


Figure 3

Repairing the safe after the hole cutout method has been

used is a bit more involved than a single hole repair. With the larger hole, vermiculite insulation or vermiculite plaster must be used to patch the break in the insulation. Then, the square plate that was cut out must be welded to the door. All weld scars then must be ground down smooth so that the door can be repainted evenly.

The hole cutout method will come in handy not only on jobs where the hard plate blocks the bolt but also on jobs in places where the use of a cutting torch is not permitted because of fire regulations. It also can be used on vault doors on which the position of escape device handles (on the inside) are known. Merely cut a hand size hole through the door, reach in to grab the escape device and open the door without any trouble.

SHAFT DRILLING

When servicing a burglarized modern safe, equipped with a hard steel plate, you may find that a carbon tipped drill will be of no value. In these cases, there is another method that can be used, but it requires a thorough knowledge of the safe's mechancial construction since it cannot be used on all safes—only certain models!

The theory of this method is to drill directly through the center of the handle shaft to shear off the threads of the handle shaft attaching screw. This will permit access to the cam, which then can be moved.

Your method of approach should be as follows: Cut off the head of the bolt handle as close to the door as possible, close enough so that the handle shaft can be seen. Mark the exact center of the shaft and prick punch at this point. Before drilling, make every effort to be as accurate as possible in your drilling operation to safeguard against going off true center.

The drill bit you use should be ¼" or less in diameter, should be long in length, and should be *sharp!* Your drilling operation

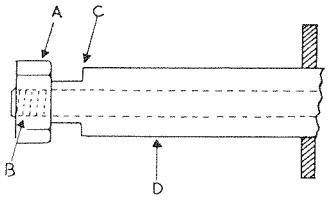


Figure 1
"A" — Nut; "B" — Thread; "C" — Shoulder; "D" — Handle Shaft.

should carry this small leader hole right through the center of the shaft.

After this hole is drilled, use a ⅜" drill bit and follow the hole through the end of the handle. If your second hole is accurate, you will have drilled off the thread at the end of the handle and the attaching nut will fall off. This will permit you to extract the handle shaft from the door. A view of the drill path is shown in Figure 1.

With the shaft out, insert a large screwdriver into the square of the cam and press in firmly while turning in the opening direction. As the inward pressure is being applied, the cam will be moved out over the bolt to allow the cam bypass. (See Figure 2.)

Although this method sounds quite simple, it could prove to be

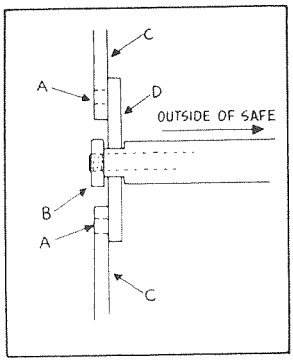


Figure 2

"A" — Cam Pins; "B" — Shaft Nut; "C" — Bolts; "D" — Cam.

very damaging if used on the wrong type safes. Consider Figure 3 as an example. On safes with bolt and cam arrangements as shown in Figure 3, pressing in on the cam will not move the cam over the lockbolt. In order to use the method described here the bolts must be connected to the cam so that the bolts are not disconnected when the cam is pressed in.

On some safes, the bolts are

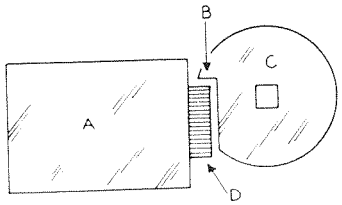


Figure 3

"A" — Lock; "B" — Cam Nose; "C" — Cam; "D" — Bolt.

attached to the cam in the reverse of that shown in Figure 2, that is, the bolts in front of the cam. Thus, when the handle shaft drilling method is used and the cam pressed in, the bolts will become disconnected which will add another obstacle to overcome!

On other models, a variation of this method can be used when a hex head bolt, which holds the handle grip in place, is encountered. With these, unscrew the hex bolt to remove the handle. Since the outside portion of the handle shaft on these safes is tapered, the shoulder stop can be ground or reamed away to permit the shaft to be pushed in. As the shaft is pushed in, the lock cam will slide over the bolt in position to be turned. However, the inward pressure required for this must be quite

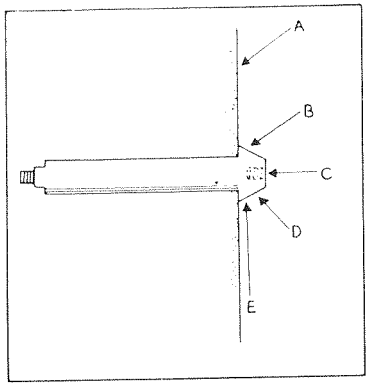


Figure 4

"A" — Safe Door Face Plate; "B" — Shoulder Stop that is reamed away; "C" — Screwhole for attaching handle; "D" — Taper of outer shaft; "E" — View with handle removed.

forceful since the pressure is being applied directly into the bolts. Thus, it will be necessary to use a wrench or vise-grip pliers to turn the shaft after it is pushed in.

INSULATION

In modern safe insulation an element such as vermiculite or mica suspends and holds moisture. This moisture is converted into steam when high temperatures occur. As long as the insulation is able to generate steam, the temperature will remain at about 212 degrees which is actually steam temperature). Paper will begin to char when the temperature of a safe reaches 350 degrees inside. The steam generated from the moisture in the insulation, holds in check the temperature inside the safe until the safe is "baked out."

You may have wondered, perhaps, why paper or books inside are damp and mildewed in the safes that are kept closed for any prolonged period. The reason is simply that the new insulation is damp. Until the excessive dampness dries out in the course of time, the moisture laden interior will continue to exist. To help alleviate this condition, you should tell the owner to leave his safe open as much as he can for the first few months to allow the dampness to escape. Of course, this dampness is a necessary evil. It must be there, in order for the safe to be fire proof.

The dampness in new safes often causes quite a bit of damage to the mechanical actions. Rust forms very quickly. I have seen bolt mechanisms tighten up so badly that the users have snapped off bolt handles. Some of these new safes are heavily coated with grease on the inside bolt mechanism. But even this has not checked dryness nor prevented corrosion. On extremely damp safes it is advisable to remove the back plate of the door and leave the door open during the day. At night, when the safe is closed, place a couple of containers of silica-gel inside. This is available from any chemical supply house. (Silica-gel has many fine pores and is highly absorbent). During the day, to dry out the silica-gel, merely put it in a sunny place. It can be used over and over without losing its absorbent properties.

HINGE PINS

REPAIRING HINGE PIN WEAR

The doors of any steel plate safe, double door, "A" label construction in the 75" high category, range in weight from 350 to 600 pounds depending on the make of the safe. Also, the left door of any double door safe is always heavier than the right door because it is approximately six inches wider on the inside. The amazing part of these doors is their free swing; in spite of their weight, the doors swing freely during opening and closing because of scientific balancing on the hinges.

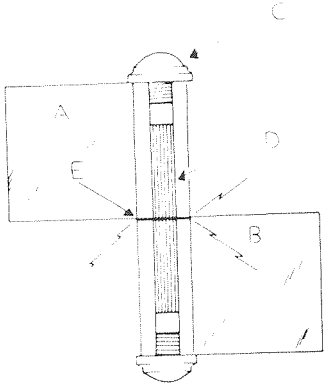
The hinges consist of two portions — the top or female section and the bottom or stationary male section. In use, the top sec-

tion (which is bored out) balances on the pin of the lower section. In addition, a hinge cap is used in both the female and male sections. Although these caps are generally considered as part of the decor of the safe, the caps are functional and do serve a definite purpose . . . they can be unscrewed to permit lubrication of the hinge pin and hinge bearing.

It is safe to say that this simple process of preserving a vital part of the safe rarely, if ever, gets done. The continued opening and closing of the door results in definite wear right at the point of contact at the split between the two hinge halves. Once the hinge becomes bone dry, it doesn't take long for the 600 pound weight of the door to grind down as much as 1/16" at the point of contact. The result that follows — the doors of the safe will not seat properly.

Since the hinge is attached to the door, the door will sag as the hinge wears, resulting in a serious binding and rubbing on the bottom of the door opening. Severe door sag has been responsible for many broken safe handles. Users who are not aware of what is actually happening to their safe, although they know it closes hard, still persist to force the locking bolt handle.

There is a method of repairing safes with this type of wear without making a major job out of removing the doors. The purpose of the repair job is to replace the metal that has been worn away from the hinge halfs so that the doors do not sag on the hinge pins. This repair can be accomplished with a washer



A — Hinge (female); B — Hinge (Male); C — Hinge Cap; D — Hinge Pin; E — Point of wear due to lack of lubrication.

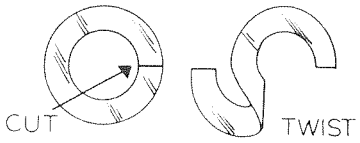
and an automobile jack.

One of the most useful tools a safe mechanic has at his disposal at all times (although he may not realize it) is his automobile or truck bumper jack. These jacks are made to lift weights much heavier than the 600 pounds of a safe door. Use the jack in this repair, as follows:

With the safe door open, place the nose of the jack under the safe about six to eight inches from the hinge side. Start pumping to raise the door but *go slowly* since you usually will have no way of knowing how long the hinge pin is. IF YOU RAISE THE DOOR UP TOO FAR, THE DOOR WILL DISENGAGE FROM THE HINGE PIN AND COME CRASHING DOWN. *This is what should not happen!*

Raise the door only about 5/8". Then, select a washer that has the same thickness as the amount of wear on the hinges. Cut through one side of the washer. Twist the ends in op-

posite directions. This will make the washer look like a figure S if you look at it sideways.



By manipulating this washer, you can slide it between the two halves of the worn hinge. Once set, the door can be lowered and as the door comes down, the hinge will flatten out the washer so that the washer curls itself around the hinge pin.

Actually, the washer serves as a shim but its effect will cause a free swinging door again.

WARNING: While inserting the twisted washer between the two hinges, use a pair of pliers and not your fingers — just in case the jack gives while you are in the process.

SAFE LOCKOUTS

ANALYZING THE CAUSE OF SAFE LOCKOUTS

"Mr. Locksmith, my safe won't open. Can you come fix it?" These words, common to every locksmith who handles safe work, immediately implies that some malfunction has occurred within the safe mechanism to cause this lockout. Just what caused the lockout, of course, can't be determined without a thorough understanding of the conditions and operating characteristics of the safe.

Thus, when a locksmith approaches a safe lockout, his first action should be a consultation with the customer about the circumstances involving the lockout. The answers to two questions will reveal much to the locksmith. First, did the lockout come on suddenly that day?, or second, has the safe been difficult to open for the month or so?

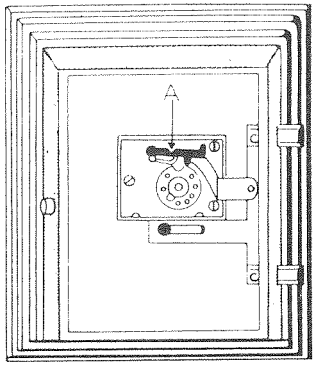
If the safe has been operating without difficulty and suddenly fails to open, a definite breakdown of one of the parts of the lock is the logical cause. Or, if the safe has been tricky and difficult to open for a prolonged period of time, then suddenly refuses to respond, a gradual deterioration of one of the parts is indicated.

With this knowledge, the insight, imagination and perception of the professional locksmith, that can be gained only by experience, will help tremendously in determining the possible cause of the lockout. Once the cause is determined, a professional locksmith will be able to save much valuable time since he will be able to approach solving the lockout efficiently.

Experience on lockouts is all important in determining the cause. Within a short time, the locksmith will be able to understand what causes a sudden lockout, just as he will be able to learn the causes of lockouts that occur over a prolonged period of time. The prolonged lockout is like a rubber band; it will expand just so far and, one day, it will suddenly break. On safe locks, some parts will function haphazardly for many

months without giving in to old age. Then, one day, because of old age or inadequate maintenance, the parts stop working.

In quite a number of cases, the parts may not be completely worn but a steady accumulation of dirt and oil (I call this conglumeration, "gum") will prevent the parts from functioning properly. For example, the lever in any combination lock (this is the part of the lock that falls into the wheel slots when the slots are in alignment) must be a free working part. In most locks, this lever is not spring controlled but it falls into place by gravity, when it is raised up into position by the turning of the drive wheel. Gum will accumulate on the bearing hinge post of these levers, especially on the older cast iron locks. And the steady accumulation of this gum will slow down the dropping action of the lever until the time when the lever will not drop at all, causing a lockout.



Typical gravity drop lever "A" installation in a safe door.

On most locks with a gravity drop lever, you can feel the bounce (or click of the lever) as it comes in contact with the gateway of the drive wheel. If, when turning the dial, there is no click or bounce at the contact point, you can be fairly sure the lever is jammed or stuck.

Here's how to handle a jammed or stuck lever: Run through the combination in the normal manner. After the last number is dialed, bring the dial back to the right to the contact (or drop-in) position. *Hold the dial there for a few minutes.* Then, oscillate the dial *slowly* and try to detect the bounce.

In the event the lever is sticking, the few minutes waiting time should permit the lever to fall down slowly to give you a slight indication of a bounce or click. Such an indication after the slight delay at drop-in will confirm the fact that the lever is slow moving and is gummed up.

Now dial the combination through again and bring the driver back to the opening position. Wait a few minutes again. Then, vibrate the lock with a soft face hammer, tapping on the face of the door just above the combination dial. This, in conjunction with rapid oscillation of the dial, should bring the lever down into the drop-in.

HOW TO APPROACH TEMPORARY LOCKOUTS

Most locksmiths have found that a number of service calls on safes deal with locks that will not open on the first try of the combination but will open on succeeding tries. These "temporary" lockouts, as they may be called, differ from the positive lockout where the lock will not open regardless of the number of tries. The difference

lies in the degree of malfunction. In a temporary lockout, there usually is some minor trouble that is upsetting the efficiency of the lock whereas in the positive lockout some interior part has broken to completely block the lock's operation.

Safes suffering from temporary lockouts should be treated with the same care as positive lockout safes since minor malfunctions usually lead to positive lockouts. While it is true that a minor malfunction can exist for years without a lockout, there is never a guarantee when and if this will occur.

To the progressive locksmith, this presents an excellent area in which to sell regular safe servicing to customers. A smoothly functioning lock, with a minimum of play and wear which can be determined only by systematic servicing is the only way to make sure that a safe lock will open every time. In the true sense, this can be be considered as preventive maintenance, but, when customers realize the annoyance and aggravation caused by a positive lockout, they usually will agree to a regular service plan.

When confronted with a temporary lockout, the locksmith should concentrate first on dialing the combination. Try the lock three or four times to get its "feel." Almost always this will reveal a number of malfunctions to the safe expert without even looking into the lock. You may find that the dial turns too freely and literally "runs away." Also, you may feel that the wheels are not being picked up smoothly with the rotations. Knowing this before going further will save valuable time in tracking down the cause of the temporary lockout.

In most cases, you will find that the cause of difficulty to open safes is the alignment of the wheels. There are many reasons why wheels do not align properly. A very common one is looseness. This creates play that is magnified by the momentum of the wheels as they are rotated by the dial spin; the momentum will carry the wheels beyond the point where they should stop.

A well adjusted lock should cause the wheels to stop at the precise moment rotation of the dial is stopped. The wheels should not carry beyond the stop point by momentum of their own weight. To create this condition of having the wheels stop with the dial rotation, the wheels should be free enough to move without great effort.

The combination dial and drive wheel also should fit snugly but freely. Its rotation should be firm and steady, not tight. If the wheels are adjusted with the same degree of tension as the combination dial and drive wheel, a well balanced lock will result. If, on the other hand, the dial is loose and the wheels tight, the rotation of the dial will be uneven — first spinning free, then binding. When this condition occurs, adjustments should be made until the rotation is smooth and steady.

Another common cause of improper wheel alignment is wear of the pins and flys. Wear is a natural condition, more common on locks that are used constantly. Usage will cause fractional wearing of the stationary pins attached to each wheel or to the fly pins, whichever are used.

However, this fractional wear will be magnified to as much as a one or two number difference on the dial. For example, a wheel set at 50 may not line at 50 but at 53 because of the fractional wear. In cases of wear, the wheels should be replaced.

Naturally, there are scores of causes for difficult - to - open safes, each individual to the safe and its usage. Whatever the cause, however, the condition should be brought to the attention of the safe owner and a recommendation made by the locksmith as to how to overcome the condition. It even is advisable to review the techniques of dialing the combination to keep abusive wear to a minimum. Most of the time customers appreciate the extra consideration and respond favorably to suggestions for regular servicing.

SIDE DRILLING

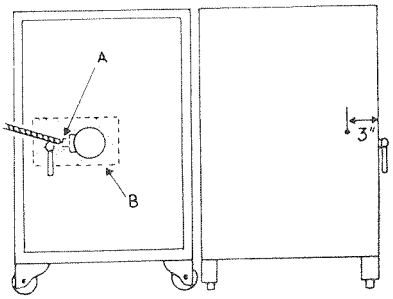
When other methods of servicing lockouts on burglarized safes cannot be used, try using the method of drilling through the side of the safe, through the door and into the back chamber of the door. In order to use this method, you must have a long drill measuring at least 9 to 10 inches in length. This will be required to span the distance from the outside of the safe to the lock. The theory of this method is to locate the lock bolt so that it can be punched out of the way to allow the passage of the bolt cam.

The main disadvantage of side drilling, however, is the amount of repair work involved. Although one hole is drilled into the safe, the hole must be plugged in three places—the outside of the safe, the inside of the door jam and the door itself.

This method is especially useful in cases where the safe is so badly damaged that the additional work of repairing three drilled holes will not matter much. Another case where this method can be used effectively is on a safe equipped with hard steel plates and a quick entry is desired.

Determining the proper position in which to drill depends upon the individual safe being worked upon. Generally speaking, the following method can be used: Draw an imaginary line starting from the center of the spindle hole, extending the line to the corner of the safe and around the side of the safe and mark three inches in. Drill about $1\frac{1}{2}$" about this mark and tilt your drill down slightly.

A good safe light is needed to penetrate the darkness of the interior and to locate the exact



Angle drill to contact bolt "A". "B" illustrates hard plate over lock.

position of the lock bolt. Once located, drive the bolt out of the way with a long punch. Most of the times, it is very difficult to see the lock bolt and you must depend on your sense of feeling and knowledge of the safe to located the bolt.

If the dial on the particular safe you are working on is intact so that the wheels can be turned, rotate the dial while probing for the bolt. Keep probing and pressing in on the rod while rotating the dial; usually when you are on the bolt while pressing in, the combination will tighten up. If you do not feel this, back off and press in at another location. When you locate the bolt, hold the punch there and drive it in.

Although this method is effective, there are more scientific methods of servicing safe lockouts, which cause considerably less damage to the safe. For this reason, side drilling is not recommended for general use. As a gauge for determining its usage, consider a safe with its combination dial knocked off, the bolt control handle knocked off, and a condition of "peeling" off the face plate. A safe in this condition, locked but damaged to be a near total wreck, would be a perfect one on which to use this method of side drilling. Further damage to the safe and insulation won't matter; the safe is probably beyond repair.

SPLINE KEY

One of the smallest parts in a combination safe lock, and often times the cause of the most trouble, is the spline key.

As small as it is, however, the spline key is quite important for its function is to prevent the combination dial spindle from separating from the drive wheel in the combination cluster. (See Figure 1).

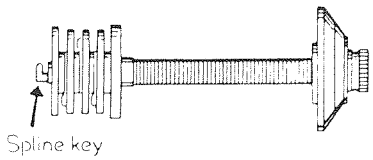


Figure 1

The dial spindle and the drive wheel can be likened to a bolt and a nut. But, in the case of a combination lock, the nut (the drive wheel) cannot be tightened because the spindle must work freely. The drive wheel can be tightened only to a point of comfortable tension, thus eliminating most of the shake or play, and it still must be free turning.

Without the spline key, the threaded dial spindle and the drive wheel would gradually unscrew until they separate. When this occurs, the combination cluster would fall apart. Thus, the spline key should fit tight enough to eliminate any possibility of it becoming too loose and falling out.

When disassembling a combination lock for servicing, you may find the opposite of this situation—the spline key could be pressed in too tight for easy removal. Use extreme caution in removing a tightly fitting spline key. Never attempt to pry out the spline key by placing the tip of a screw driver under the lip of the key. If you attempt to pry loose a spline key like this, the head of the key will snap off, unless it fits relatively loose.

The proper way to remove any spline key is with a pair of pliers. Two types of pliers can be used: either the con-

ventional plier or the wire cutting plier with the cutting edges dulled slightly.

Even with pliers, however, you should use caution in removing the key. Do not attempt to remove the key by pulling straight out. Here again, you can easily break off the head of the key, or if the head doesn't break, the sudden release of force as the key lets go will send you flying back a few feet, possibly causing injury.

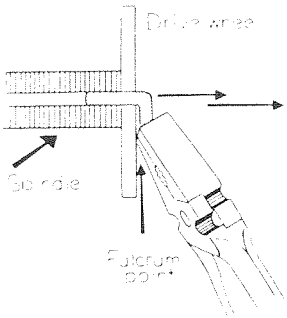


Figure 2

To remove the key properly with pliers, use the pliers as a lever (See Figure 2). Grasp the head of the spline key with the plier pointed downward. Place one corner of the plier against the drive weel as shown in Figure 2. This will serve as the fulcrum point of the downward pressure which is to be applied. Then, push downward with a series of short strokes and the key should be extracted easily and safely without damage.

It is quite common for the head of the spline key to break off, or to find one that has been broken off and left in the spindle. Without a head to grab, it is difficult to remove the key but there are two courses of action that can be taken.

First, you can drill out the key. BUT, unless you are extremely careful, you will damage the spline in the spindle and the drive wheel.

The second most preferred method is to punch the key in along the spindle groove until it goes in beyond the hub of the driver, thus releasing the driver to unscrew freely. For this method, you will need a long thin punch, ground down and fashioned to the shape of the spline.

This second method, however, will not work on Mosler shouldered spindles (See Figure 3). On these spindles, the key can be pushed in only up to the shoulder of the spindle, which is not far enough to dis-

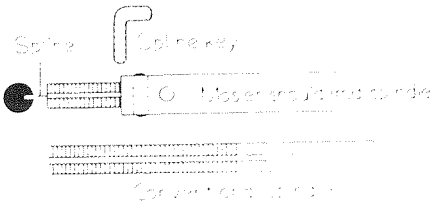


Figure 3

engage from the drive wheel.

When reassembling a combination lock and replacing the spline key, experience will tell you when a spline key fits too tightly or too loosely. Never let a combination lock with a loosely fitting key go out of your hands for a loose spline key can cause a lockout. This will be caused either by falling out completely or, by being too loose in the drive wheel, the key will cause a variance in the combination alignment.

TEAR GAS DEVICE INSTALLATION

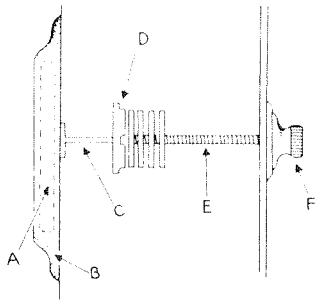
How should a tear gas protective device be installed? What is tear gas? What are the precautions I should use in servicing a safe with an unexploded tear gas device? These are some of the most common questions being asked in the trade about tear gas protective devices for safes. The absence of authoritive information on this has tended to create some confusion and misunderstanding about the installation of a tear gas protective device.

First, the definition of ***tear gas.*** Actually, tear gas is not a natural vaporous compound, such as hydrogen, oxygen or natural illuminating gas. In its normal state, tear gas is a ***liquid***; but, when it is dispersed into the atmosphere, it vaporizes and creates a strong, irritating odor. The effect of an exploded tear gas device is always a deterrent to the burglar. If he is a novice at crime, the tear gas will usually be enough to drive him away and keep him away. However, if a burglar is an experienced criminal, the vaporous tear gas will drive him away but may not dispel his determination. Some do return and work in the contaminated atmosphere.

Next, an explanation of a tear gas device: This consists of a series of ***glass tubes*** which contain tear gas in the liquid state. The glass tubes are fastened into the ***metal case***, which is open on one side, thereby exposing the tubes. The theory of a tear gas device is to install the case directly behind the combination lock spindle; thus, the tubes will be smashed and the gas released if the spindle is punched in.

To be properly installed, a tear gas device should always employ a ***plunger trigger***. This should be connected directly to the combination lock cluster so that the plunger will have ***direct contact*** between the cluster and the tear gas tubes, in the event combination dial is knocked off and the spindle driven in.

On safes where the combination lock cluster is protected by a cover plate on the inside of the door, the plunger should be installed ***through*** this cover plate. This can be effected by drilling a small hole through the plate to give the plunger



A — tear gas tubes; B — tear gas device case; C — plunger trigger; D — lock cluster; E — spindle; F — dial.

direct contact with the combination lock cluster.

Another point that must be stressed in the installation of a tear gas device is its attachment to the inside of the safe door. To work properly, the

case containing the tear gas tubes ***must*** be anchored solidly to the inside of the door. If it is not secured properly, the device is apt to weaken and fall off before the glass tubes can be smashed by the plunger. At least 10/32 attaching screws should be used for anchoring the case to the door.

It is essential to remember this rule for tear gas installations: ***Never install a tear gas device over a lock cover plate without a plunger trigger.*** The absence of a plunger with the device over the cover plate could make the entire device useless! There ***must be a passage for direct contact between the combination lock cluster and the tear gas tubes.*** Also remember that the plunger trigger should be ***attached*** to the combination lock cluster, not merely resting up against it!

There are precautions to further consider for adjusting the plunger to the glass tubes. When properly set, the plunger should be ¼" away from the tubes. It should not touch the tubes when in the normal position. If the plunger is touching the tubes, a hard slam of the safe door might cause the tubes to break and, if this occurs during the normal working hours for the area where the safe is located, considerable confusion would occur!

This brings up the point of what a locksmith should do about a tear gas device when called upon to service a safe lockout. In your discussion with the business owners or managers, make it a point to find out if there is a tear gas protective device in the safe. Its important that you know, since this will determine your course of action. If there is one, and it has not been exploded, you necessarily must proceed with caution and avoid any unnecessary pounding of the door which might break the glass tubes and release the gas.

Protect yourself against any accidental breaking of the tubes, also. Serious consequences could result if you do not clear your responsibilities with the owner. For example, can you imagine the chaos that would be created if you accidentally exploded the tear gas when working on a safe in an office of fifteen or more persons? There could be illness for some and several hours of work stoppage for all. If you don't want to be liable for damages of this type, make sure your clearance on the job is obtained in writing before proceeding!

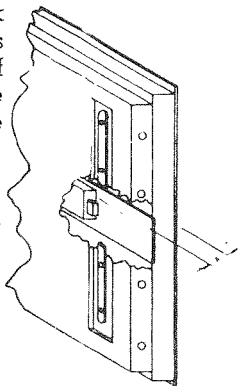
How To Order A Safe Lock

"Orders for safe locks are sometimes delayed or incorrectly filled," say Sargent & Greenleaf officials, "because of the lack of information with the order." In stressing the need for more details, Carrol Lowe, sales manager pointed out that there are five facts required for every lock to assure correct fulfillment of the order. Without these facts, the stock room personnel can only guess at the needs of the locksmith. When ordering, the following information should be given whenever possible.

1. The position of the lock **on the door**—horizontal or vertical? (The lock is horizontal when the bolt is either to the right or left of the lock when installed. It is vertical when the bolt is either on top of the lock or the bottom when the lock is on the door.

2. The hand of the lock — right or left? **The hand is determined by the hand OF THE DOOR.** Obviously, if a right hand lock were used on a left hand door, the position of the drop-in mechanism would be upside down. CAUTION: a safe door is LEFT hand when the hinges are on the LEFT side when you stand in front of the safe. It is RIGHT hand when the hinges are on the RIGHT!

3. The distance between the base of the lock itself and the outside face of the door. This is most important in determining the length of the spindle tube or spindle. If the distance cannot be given, the exact length of the tube or spindle on the old lock should be supplied.



4. The catalog number of the lock, if known. (If you don't have a catalog yet, send in for it, it's free!)

5. The over-all dimensions — length, thickness, height, and backset . . . especially if it's an old timer! A rough sketch would be most helpful.

"Full and detailed information," concluded Mr. Lowe, "will make things easier all around. The locksmith will get quicker service from his jobber with a minimum of unnecessary correspondence and delay."

NOTES