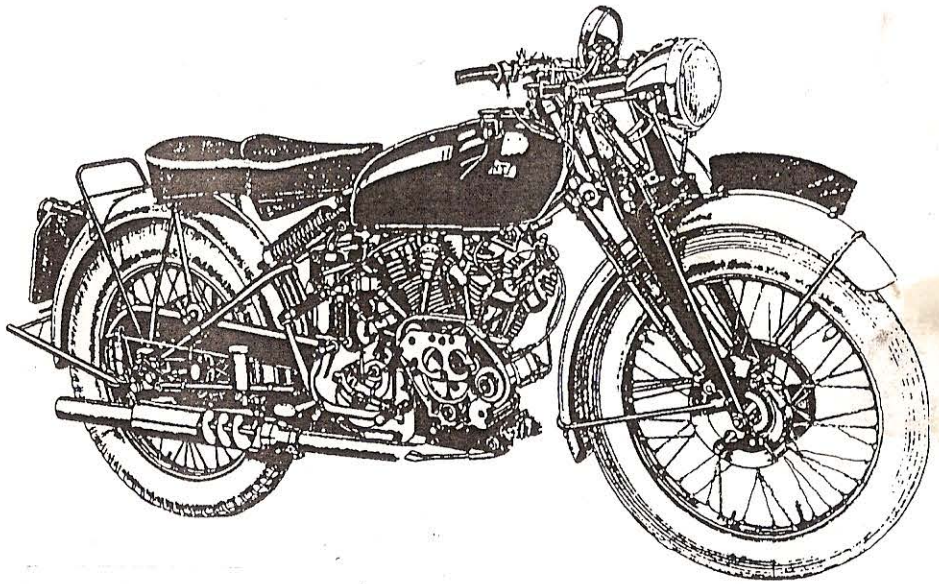
THORNTON SUSPENSION SYSTEM

as designed for the Vincent Series "B", "C", and "D" Twins

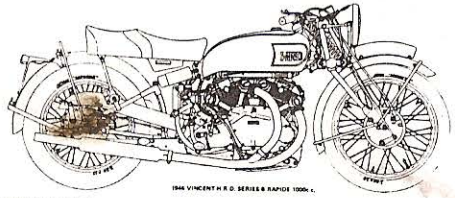
1946-1955

OWNERS MANUAL

EDITION 6/97



THE VINCENT-H.R.D. OWNER'S CLUB
NORTHERN CALIFORNIA SECTION



DAVE MOLLOY
Section Organizer
P.O. Box 785
Chicago Park, CA 95721

Phone: 530-273-3726
Fax: 530-271-1167
Email: molloy@inreach.com

it is against the shoulder. Add the flappers, making sure the compression holes are not blocked, and put the nut and washer back on. Make sure the nut is tight enough that it won't loosen and allow the flappers to rotate.

Ride 'em, don't hide 'em

the flappers with the compression holes (see figure 12). The compression holes are of different sizes, and the ball bearings can be seen on the other side of the holes. If the flappers are blocking the compression holes, it will have a very serious effect on damper action and may even keep it from moving at all.

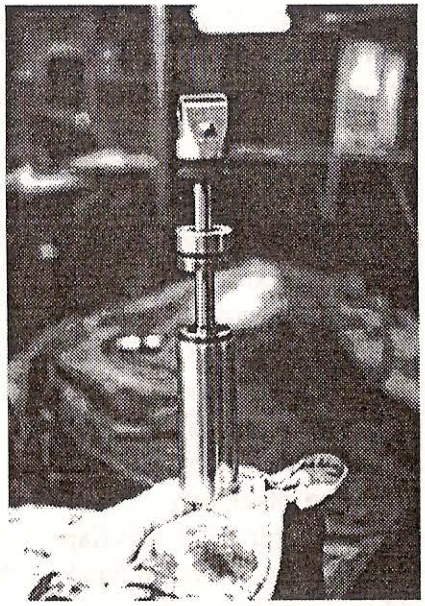


figure 13

Push the piston and shaft carefully into the damper body, and screw the cap on tightly, with the shaft all the way in (compressed).

After assembly, turn the damper so that the body is on top, and the shaft is facing downwards. Compress the damper completely. If there is more than 1/4" at the end of the travel that doesn't feel dampened, you will need to add some damper fluid to the shock. Use 5 H.V.I. oil, but *don't overfill.* If there is too much fluid, air pressure will build up at full compression, affecting the ride. In the extreme, the damper will actually lock before full compression. Once the damper is reassembled, replace it in the bike and test it *carefully.* Subtle differences can have very strange affects on handling.

If for whatever reason you wish to remove the piston from the shaft, pull the piston off of the shaft with your fingers wrapped underneath it in order to hold the spring cover to the piston (fig #12). Otherwise, the springs and ball bearings will fall out. Then invert the piston and pull the clip away from the top. Note that there is a depression in the clip that goes over the through hole (the hole with no ball bearing).

On reassembly, make sure the springs are over the ball bearings in the three largest holes. The springs are of three different lengths, the shortest for the small compression hole, the longest for the largest hole. Make sure the depression in the retaining clip is over the through hole, and seated in the piston. Invert the piston, and place it on the shaft until

INDEX

If you don't have time to read this whole book, at least familiarize yourself with the index so that you may use it for reference. If you're anxious to install your kit, then I would recommend the following procedure:

- •Skim Sections I & II.
- •Obtain the necessary tools in Section III.
- •Follow the instructions of Section VII.
- •If you have a "B" or "D", see section IV.
- •Keep this book by your bedside or your shop bench and read it at your leisure and when needed.

I. Introduction:

The Thornton Suspension differs radically from all previous Vincent suspensions. This is because the springs are lower rate, installed with more preload, and the damping rates are staged. Importantly, the Kit allows the user to "tune" his own suspension through external adjustable rear pre-load as well as internal settings for spring rate and damping.

Modern springs with external adjustable pre-load have been retrofitted into the stock series "C" rear spring boxes. This altered rear suspension may at first prove a little cumbersome to install properly. *Consequently, these instructions must be followed and referenced carefully to gain safe and full benefit from these new parts.*

Installation will require the use of a few specialized tools. Two of these (a set of carpenter's bar clamps and a set of "tie downs") are not included in the kit but are readily available in hardware or automotive part stores and are described below.

Instructions are also given to internally increase (or decrease) the rebound damping of the damper unit to accommodate personal taste or stiffer springing and to increase or decrease spring rates.

II. Cautions and trouble shooting:

a)**Installation may be hazardous**: Vincent owners should be extremely careful because springs will be put under compression and can be very dangerous if they come loose during installation.

b)***Rear* spring pre-load adjustment is critical for the *front* (!) forks to work properly.** The Vincent front suspension is a little

valves, the higher the force the the more these discs will distort, the more the holes will remain open, and the lower the damping rate.

There are two different thicknesses of flapper discs, .010" & .015". Importantly, the resultant damping is not in proportion to the thickness but is actually 3-to-1 (three thin flappers is the same as one thick flapper). A third flapper, simply called a backup, has a reduced diameter from the other two. This is equal to about 2 2/3 thin flappers and may come in handy when the rider desires to make small damper changes when adding extra loads. The backup, though, cannot be used by itself.

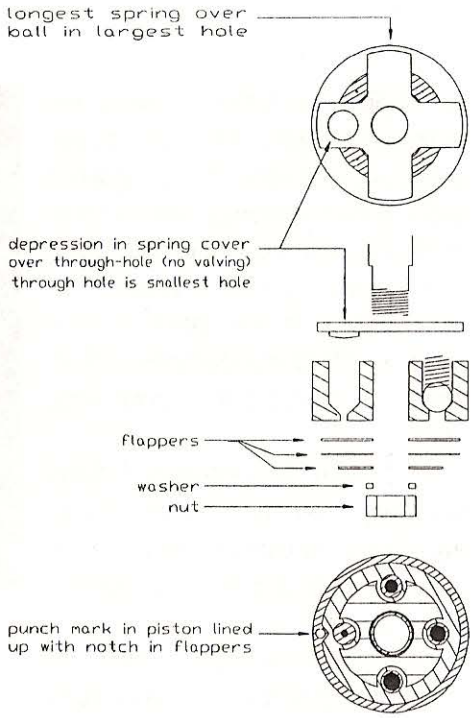


figure 12

There is also a hole with no ball bearing, the "through hole", that allows fluid to flow when the pressure is below the threshold of the compression holes or flappers. It has no valving, so it stays open always in both directions.

The easiest modification with the best effect is to change the number of flappers on top of the piston. This directly effects the way the wheel tracks the ground, by changing the rebound damping rate.

To change the rebound damping, remove the shock from the bike (see Section VII). With the shaft on top, clamp the mounting eye (*not* the shock body) in a vice (protect it with a cloth so it won't scratch). Use the included shock wrench to unscrew the body end (fig #13). Slowly remove the shaft and piston from the body. Invert the shaft and clamp it in the vise (*not* by the shaft!).

There is a nut on the end of the shaft that holds the piston. Remove the nut. *Do not remove the piston from the shaft.* Now, add or remove flappers. Replace the nut, making sure to align the holes in

springing.

Typically, the second spring is engaged at 50% (1-1/2 inches) of travel, which would have the effect of increasing the average spring rate by half the rate of the crossover spring (initial rate 180, final rate 250, average 215). The following procedure explains how to measure and set the crossover point.

Setting the crossover point: When using the short inner crossover spring, the point at which it engages is controlled by a combination of inner pre-load spacers and external pre-load. More pre-load shortens the spring boxes and causes the spring to contact earlier. While the damper is fully extended, hold the spring outside of your spring boxes and in line with the end of one spring box. Measure the distance to the end of the other spring box. This is the amount of travel that will be used up before the spring contacts (e.g. 2" out of the 3" total is 2/3 or 66% of travel). If you later add 1/2" of pre-load to the side with the short spring - subtract 1/2" from crossover point. (e.g. 2" - 1/2" = 1 1/2", or half the travel). If you need to estimate the crossover point after the springs are installed, you can do it by holding a ruler up next to the spring box. the short inner spring is about six inches long.

X. Damper rates: Internal changes if necessary:

Under conditions of extreme load, or perhaps to make up for peculiarities of specific bikes or riding styles, you may want to increase the damping rate in the rebound stroke. First, understand how the damper works.

The body of the damper is filled with oil. In compression, the damping rate is controlled by three holes of increasing size in the piston which are blocked by ball and spring valves. Ball bearings are held in place by springs of increasing length (fig #12) and when force is exerted on the damper, the valves allow more and more fluid to pass through the damper piston. This allows the damper to take up a large amount of travel from a large bump, while remaining controlled over normal road textures.

During the rebound stroke, these ball bearings block their three holes completely. Instead, fluid flows through four other holes by distorting spring steel discs (or "flappers") on the top of the piston. The flappers block these holes during compression. Like the ball and spring

temperamental and full movement of the front (as well as the rear) wheel is maximized by trial and error setting of the external pre-load in the rear spring boxes. Although a general setting is called for in these instructions, the final setting for the particular motorcycle's wheels and load needs to be determined by riding the bike.

c)**Spring boxes may foul**: After installation, the motorcycle should be test ridden to ensure the rear spring boxes are working properly. For instance, the rear springs can force the spring boxes to bend too much at their joints, essentially "locking" the rear end so that it doesn't have its full motion (see Section VII).

d)**Make sure the dampers are working properly.** If the damper rate has been adjusted, are the flapper discs in place over the piston? Have the dampers been overfilled? Occasionally the discs will rotate and block the valves if the damper nut was not tightened correctly. Additionally the user should verify that the rear damper is centered on the bottom mounting bolt (fig. #4). (See Section VII for specific instructions.)

e)**Dampers not interchangeable**: The two damper units included in the kit have the same external body, but unlike other Vincent dampers, the front and rear Thornton dampers have very different damping rates and therefore should not be switched. The unit stamped "front" and displaying the Mercury Crest decal should be used only on the front of the machine. (By compressing and extending each damper the user will be able to feel that the front unit has lighter rebound damping than the rear).

f)**Use shorter eyebolts for the front** (part no. FF57): The Thornton damper has been designed to the dimensions of the original Vincent "C" damper. Because other shock absorbers have been substituted in many Vincent motorcycles over the years, very often the original eyebolts have been replaced by the longer "D" eyebolts (part no.FF57/1). The correct eyebolts are approximately 1-3/4" long, while the "D" eyebolts are 2-1/4". *Do not install the front shock or any portion of the kit until you are sure that you have the correct eyebolts.*

g)**Check the dimensions of your rear spring boxes**: Read Section VII for instructions on how to measure and test your spring boxes. The new springs do not have captive ends like the original ones and the springs must be held in place entirely by the spring cases. Spring cases that are too short may not adequately contain the springs on full extension. Cases that are too long may foul before full compression of the damper.

h)**Eliminate friction**: Check your bike for friction in the girdraulics and rear swingarm. If any exists, eliminate it first and then install the suspension kit. Also, with a partially unsprung seat (stock setup), the friction knobs should be as loose as possible (safety wire is recommended to prevent their loss).

i) **Caution: Rear luggage carriers and the like:** Bear in mind that "C" rear springs and dampers of the Thornton Suspension System were designed to function properly in a partially unsprung mode without the added complication of the Craven or similar rack. When later tested with the Craven rack, it was found that the rack tended to foul on the rear fender hinge Tommy bar, and possibly other spots along the travel. This is because the Thornton Suspension allows for substantially more rear travel than the Craven rack was designed to accommodate. Therefore, if the rider wishes to use the Craven rack, it will be important to check for fouling along the full length of travel while the bike is on the bench. Eliminate these binding points if any exist. Bear in mind that the moving parts of the Craven will still result in extra friction, even after reducing all unnecessary rubbing or binding. *Consequently the rider may wish to reduce the damping or spring rate of the rear in order to offset this remaining intrinsic higher friction.*

j)**Increase tire pressure**: Typically, vehicles with very stiff suspension like the original Vincent perform better with relatively low pressure in the tires. This apparently compensated for the lack of suppleness in the springing. The Thornton Suspension System in the test Vincent performed best with 30lbs pressure in front and 27lbs in the rear when used with Metzeler ME33 Rear/ME99 Front. In any event, it is best to run modern tires at the recommended tire pressure for modern motorcycles and not at the lower pressure indicated in previous

only been tested over a limited range of loads. Therefore, after making any adjustments, riders should thouroughly check the ride characteristics before embarking on extended touring.

Phil Vincent always maintained that the standard (partially unsprung) "C" configuration was designed so that the damper and spring would not have to be altered when adding luggage and/or a rear passenger. This is because extra weight would be taken up directly by the unsprung wheel. This is the famous "bend in the middle" design of the unique Vincent rear suspension.

IX. Changing spring rates.

Spring Rate Chart

Desired Rate:	**Rear Spring Boxes:**	
Pounds per inch:	*Left side*	*Right side*
180	90/outer	90/outer
180 intial crossing to 250 final* (recommended setting)	90/outer 70/short inner	90/outer
250	90/outer 70/long inner**	90/outer
250 crossing to 320 final*	90/outer 70/short inner	90/outer 70/long inner**
320	90/outer 70/long inner**	90/outer 70/long inner**

* When using the short inner crossover spring, the point at which it engages will be affected by the inner pre-load spacers and external pre-load. See below.
** The long inner spring is not normally included in the kit. It can be supplied if it is required.

Experimenting with dual rate suspension: The short 70lb crossover spring for the rear was designed to allow for dual rate

Further, most of the added weight of passenger and luggage is carried by the rear wheel so extra pre-loading of the front springs should not be required.

The rear springs of the Thornton Suspension System can be combined with another optional long inner spring to create a range of spring rates for the rear that varies all the way from 180lbs to 320lbs per inch of travel.

Try the following steps: At first, loads should be accommodated by simply adding pre-load to the existing springs. This is done by simply turning the nut down on the shaft of the long Thornton eyebolt. After a certain point the rider may find that the optional extra 70lb long inner spring should be added opposite the short inner spring, which will add more pre-load and increase the spring rate. Because higher loads help the sprung-to-unsprung weight ratio, extra damping should not be required initially. At some point though, the extra spring rate may result in too much rear end "kick". Only then should the rear damper rate be increased by adding no more than one thin flapper at a time (see Section X).

Regarding side car suspension, experienced hackers may have a better idea of the suspension requirements than the developers of this kit. If higher spring rates are required, perhaps higher rate stock Vincent springs can be used with Thornton dampers. The maximum rate obtainable for Thornton springs is 320lbs/inch (see chart). Two standard Rapide springs (see appendix, Paul Richardson, "Vincent Motorcycle Maintenance and Repair Series") are 378lbs (189 each). The stock "side car" springs are 264lbs each. Of course, extra flapper(s) would probably be needed to stiffen the Thornton damper with certain stiffer spring combinations. Higher rate Vincent front springs may also be tried if needed. The 16-1/2" "D" front springs are 60lbs each, compared to Thornton springs which are 40lbs each. "C" springs are even stiffer than "D" springs.

Limits of Compression: The spring boxes themselves will collide and lock before full compression if they are screwed down too much along the Thornton eyebolt shaft (your spring boxes may vary, so measure the point of shortest combined length when the spring boxes are empty and make sure you do not exceed that).

Although it is hoped that this kit will accommodate a complete range of motorcycle loads, as of this edition of the instructions it has

Vincent literature.

k)**Chain adjustments**: The drive chain will appear to be very loose until the bike is loaded, due to the increased travel of the system. Check chain tension with someone sitting on the motorcycle.

l)**Re-assembling damper unit**: Section X details disassembly and re-assembly of the damper unit in order to change the damper rate. These instructions should be followed carefully. Two common problems are worth mentioning. 10

First, do not overfill the damper. Use 5 H.V.I. oil and check the damper by hand, compressing and extending after it has been reassembled. It is very easy to overfill the damper with oil or air which can result in a visible rebound force on full compression. *Even the slightest expansion tendency will cause a significant deterioration of the motorcycle's ride characteristics.*

Second, the flapper discs and valving must be positioned exactly or the damping will be altered radically. Be careful to follow the procedures in Section X.

m)**Comets**: Although the Thornton Suspension System was designed for Twins, it should work adequately for Vincent singles. However, as of this date this has not been verified.

10

n)**Changing Oil:** Periodic oil changes are required for proper maintenance of the dampers. The dampers work best with fresh 5 HVI oil. The old oil should be discarded and replaced with new approximately once a year.

o)**Spring box modifications:** To reduce friction in the rear suspension, see section VII-2 for instructions on drilling holes in your springboxes to allow air movement, and on installation of velcro and brackets to steady spring boxes.

p)**Watch out for Vincent handling limitations**: Even though the Thornton Suspension System attempts to address some of the handling problems that have occasionally affected Vincents, keep in mind that the motorcycle will still have certain limitations. Among

them, two come to mind:

1.**possibility of high-speed wobble**:

Many articles have been written in MPH concerning the mysterious high-speed wobbles or tank-slappers that Vincents occasionally "fall" into. Any tendency to high speed wobble may result from the relatively high unsprung weight of the girdraulics being carried significantly in front of the steering head and may in the past have been aggravated by insufficient damping, bad tires, or even girdraulic shaft FF29 being made too long and fouling with another part of the bike. With the Thornton Suspension System the front end may feel more stable than with the stock suspension. Even so, riders are warned against over-confidence and should be careful to avoid any situations that could lead to this dangerous occurrence. *Never ride with a loose steering head damper.* The faster you ride, the tighter the steering damper should be. Consider installing an hydraulic steering damper for added safety. *These are a wonderful addition to girdraulic forks.*

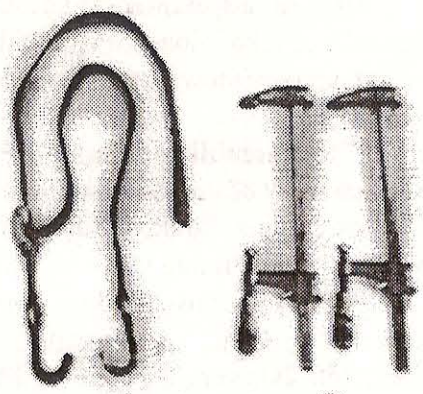


figure 1

2.**cornering limitations**:

The rider using the Thornton Suspension System may also develop a higher degree of confidence in cornering than Vincent anticipated. As an illustration, consider a minor accident that occurred during initial testing of the suspension prototype. In a steep lean angle into a left hand hair-pin turn, the clutch cover of the rider's motorcycle contacted the pavement and caused the rear wheel to lose contact with the road. The bike spun out almost immediately, dumping the rider. In addition to minimum left side clearance, your specific bike may have other cornering limitations, so be careful! The testers of the kit have had only limited experience with rigorous modern style cornering. Also, the rider should seek expert advice regarding such things as

Remove the nuts from the front damper eyebolts. The bike may need to be on the rear wheel stand to keep the eyebolts from binding in their holes. Push the damper bottom and eyebolts up to remove the eyebolts from their holes. At the top of the damper, remove the lock nut and push out the pivot pin. Remove the damper unit.

Put the eyebolts, pivot bolt, and pivot bolt sleeve on the Thornton front damper (the one with the Mercury Crest). Put the damper in place (fig #10), install the pivot pin, push the eyebolts into their holes, and install the eyebolt nuts. Place a jack under the engine and jack the bike up slowly, checking that the damper doesn't foul at full extension, especially on the front top girdraulic pivot.

4.**Front spring replacement**: Put the bike on its stand and jack it up in front until the front wheel is off the ground. Place a towel over the front of your tank to protect it in case of an accident.

Cock the wheel to one side. Using the nylon line, tie one end of the tie-down to the top of the spring box *securely*. Tie or hook the other end of the tie-down to the brake lever pivot on the brake back plate (fig #11). Tighten the tie-down as much as you can. The springs may be under a lot of pre-load, which will cause the spring box to extend rapidly when the bolt is backed off. Loosen the bolt until the spring box is free to move, then swing the spring box carefully down in an arc until the spring is decompressed. Pull the spring box apart and replace the spring with a Thornton Suspension front spring.

Compress the spring by hand and tighten the tie-down. Swing the spring box back up, compressing the spring further. You may need to swing the spring box back down and adjust the tie-down. When in position, the spring box should be just lower than its hole. Have a friend lower the jack until the bolt will go into the hole and tighten the bolt. Cock the wheel to the other side and repeat. *Be careful of your tank and yourself. A flying spring box is very dangerous.*

VIII. Carrying passengers and loads, and experimenting with different spring rates:

Riders are invited to experiment with different spring rates to accommodate a wide variety of requirements, including carrying loads.

The comfort /softness vs. control /hardness of the total suspension seems mostly to be related to the rear spring and damper rates.

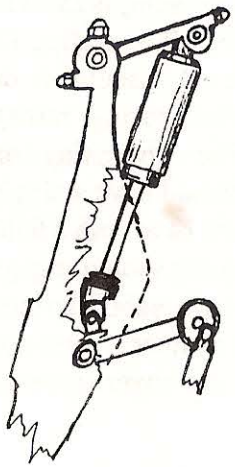


figure 10

to avoid fouling with tank and fender (fig #9) and tighten it until the first clamp falls away.

Always keep the clamp *and* the spring box in your hands to keep the clamp from slipping off. The spring pressure is quite high at this point. Put a towel over your tank near the pivot bolts to avoid paint damage in case of a mistake.

Place spring box into position. You will have to adjust the clamp until the eyebolts line up with the pivot bolt ends. BE CAREFUL. Once the eyebolts are on the pivot bolts, the clamp can be removed and nuts put on the pivot bolts. Don't tighten the nuts all the way yet.

Now rotate the spring boxes so that the velcro on each side is facing toward the center line of the bike. Place the angle-iron/Velcro assemblies (see figure 5). You will have to slip the angle iron assembly between the spring box and the damper. Engage the velcro. Do not tighten the screw that holds the angle iron brackets. It is intended only to align the top and bottom brackets. If it is tightened, it will cause the spring boxes to bow out and bind. This is why the brackets are supplied with locknuts. Put one bracket assembly on each side of the damper. Now tighten the spring box nuts fully, making sure the two inner and two outer spring boxes stay parallel to each other.

Loosen the nuts on your seat's front mount and add lock nuts in order to achieve proper flexibility in seat motion. The springs should be set up to allow the rear damper to compress about one third of its travel when the rider sits on the bike (see Section V). Final adjustment should be to the rider's taste. Don't forget to remove the rear fender-hinge Tommy Bar if you have a Craven rack.

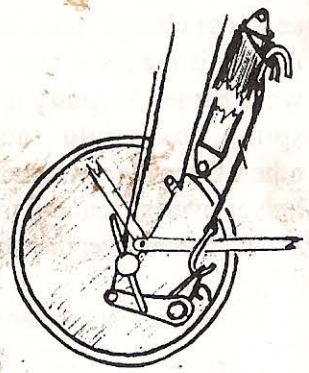


figure 11

3.Front damper replacement:

selection of tires and appropriate riding style.

III.Additional tools you will need: In order to install the suspension kit, you will need a few specific items:

- two (2) carpenter's clamps 15" long (fig#1)
- a motorcycle tie-down (fig #1)
- a few feet of nylon parachute cord (1/4" braided)

IV. Series "B" and "D":

This book is oriented toward Series "C" bikes, but components are designed to work with Series "B" and "D" bikes as well.

Series "B": Install "C" rear damper and springs as per section VII. The normal setup should work fine with the Brampton front forks.

Series "D": A seperate Thornton mono-shock is available as a direct replacement for Series "D" Armstrong, Koni, or Spax mono-shocks. These have multi-rate springs. The spring preload and crossover point are adjustable. Instructions for these adjustments are included with the shocks.

V. A little bit of theory:

Before installing the kit, it will be important for the user of the Thornton Suspension System to keep in mind a few facts of modern motorcycle suspension.

a)**The springs of the front and rear wheels must be pre-loaded** (installed under initial compression) in order to achieve an initial settling of 50% of the suspension travel in the front and 33% in the rear with the rider on the bike. This settling point is best measured along the shaft of the damper. At full extension the effective length of the damper shaft can be measured to be almost 3 inches. (Bear in mind that the black bumper will compress approximately 1/4 inch at full compression and thus the shaft travel is effectively that much longer). The settle point is correct if approximately 1-1/2 inches of shaft on the front and 2 inches of shaft on the rear remain visible when the rider is seated on the bike. The front pre-load should probably not need to be altered, but the rear pre-load has external (and internal) adjustments for the rider.

For the fully sprung motorcycle, the more weight added, the more the pre-load of the rear springs will need to be increased in order

to maintain the settle point at 1/3 of the total travel. In theory, when fully sprung, if the rear wheel is asked to support an extra 125 lbs. of weight on its 250lb/inch of combined rear springing, the initial compression of the springs should be increased by half an inch (1/2 in. x 250 = 125 lbs). This can be accomplished by adding a half inch spacer to each rear spring box or by screwing the nut down on the Thornton Suspension eye-bolt shaft to reveal half an inch of extra thread. Final adjustment of preload should be according to riding feel.

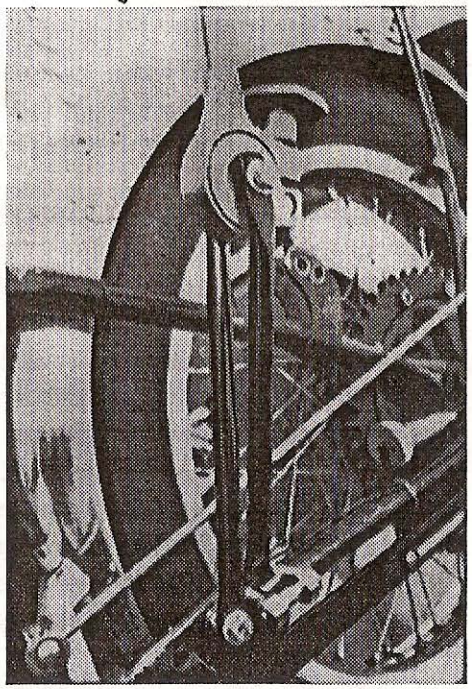
b)**Technically, the more weight you add the higher the spring rate you should have.**

$$\frac{\Delta W}{W} = \frac{\Delta R}{R}$$

"W" equals the weight of the motorcycle and solo rider, "ΔW" equals the added weight that the rider wishes to carry. "R" equals the initial rate of the rear spring and "ΔR" equals the increase in spring rate that would be required to carry the increase in load. (On the Standard "C" with unsprung seat, this relationship would not apply). On modern motorcycles, approximately 2/3 of the weight of the motorcycle and rider fall on the rear wheel in solo configuration. With a passenger and/or baggage this percentage may tend to increase for the rear wheel.

NO LONGER USED

figure 2a



c)**The damping rate should remain constant for most changes in weight.** After a substantial increase, the rider may find it necessary to increase the rebound rate of the damper. Rebound damping can easily be added by increasing the number of flap-

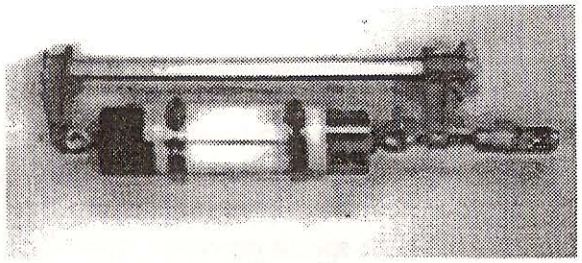


figure 8

The Thornton rear spring rate for solo riding is 250/180 lbs. (See section IX for a discussion of dual spring rates). The right spring box should have a single 90lb outer spring in it and the left spring box should have both a 90lb spring and the 70lb short inner spring. The inner spring should engage at about 33%. This means setting the length so that there is about an inch of extra room in the spring box when the damper is extended all the way. You may need to add the inner spring crossover spacer to achieve this.

Now, with the Thornton Springs in the appropriate spring box, place a clamp on the spring box, eyebolt-end to eyebolt-end (fig #7). Turn down the clamp until spring box halves overlap. You will probably have to fiddle around a bit in order to guide the inner spring box into the outer. *Be careful.* If the pre-load and spring rates are high, you may want to use the large P.V.C. plastic halves and hose clamps now, although it makes it somewhat harder to guide the spring boxes into each other. Once the spring box halves overlap enough to keep the springs contained, clamp the large P.V.C. halves over the spring box. Hose clamps should be *tight* (fig #8).

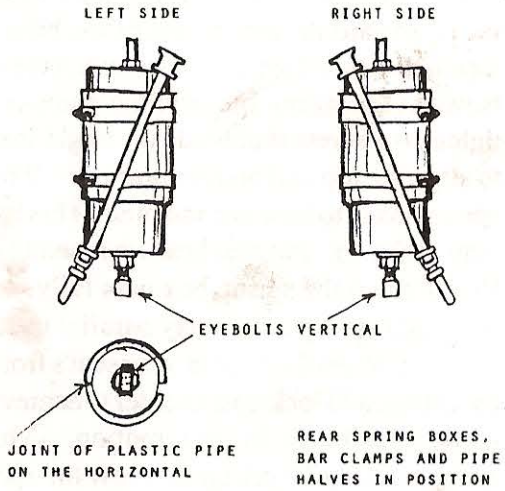


figure 9

Put a second clamp diagonally over the spring box, oriented

tion for spring box installation.

You will need to attach the included velcro pieces to the damper body before installing the spring boxes. Stick the self-adhesive velcro sheets on the damper, in the middle of the top section. (See figure 5).

2.**Rear spring box installation:**

Remove the stock springs from your spring boxes by unscrewing the eyebolts.

To prepare the spring boxes for installation, you must attach the supplied velcro pads to the spring boxes, and drill some vent-holes. The velcro pads go on the outer (black) spring box (see figure 5). The idea is to keep the boxes parallel in order to ensure free motion of the rear end. Once the velcro is in place on both spring boxes, drill two or three 1/4" holes in the top edge of the box. this is to allow air to escape, to reduce further the resistance in the rear end. Make sure the holes are as near the top as possible, or they will be blocked by the motion of the inner spring box. If you put the holes on the same side as the velcro they will be hidden in the back of the spring box when it is installed.

Now add the various support washers to your spring boxes (as per fig #6). Put one of your stock Vincent eyebolts (part #SP4) in the outer spring box and put the supplied longer eyebolt in the bottom (inner) spring box. You may need to turn the nut on the long eyebolt a few threads away from the eye, to provide clearance for installation.

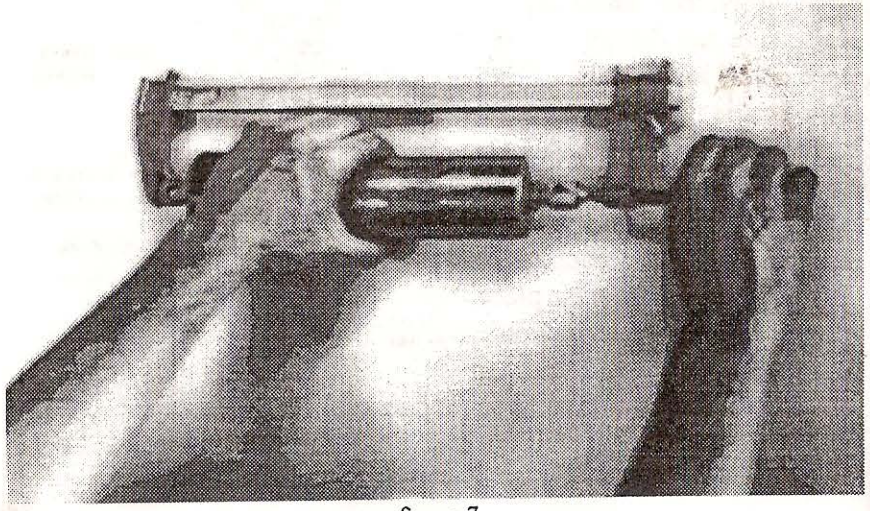


figure 7

per discs that cover the rebound holes in the damper piston (see Section X). Conversely, by reducing the amount of damping, wheel travel is increased, the ride becomes softer, but the bike does not feel as "controlled".

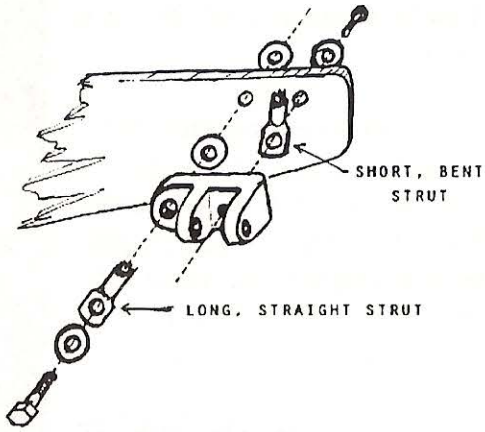


figure 2b

VI. The rear seat: Installing Thornton struts:

Copies of MPH from the early 1950's reveal photographs of riders who had already begun discarding their seat struts (FT94AS) in order to fully spring the seat. This modification continues today, while other riders try to maintain a stock appearance and keep the rear seat unsprung. The Thornton Suspension System has been designed to accommodate both configurations.

Four black Thornton seat strut extension members are available for the stock alloy seat struts to transfer the full load of the rear seat to the passenger peg brackets. This allows the rider to fully spring the seat and to maintain the alloy struts for their seat height adjustability and stock look (fig. #2a). The struts are attached as follows:

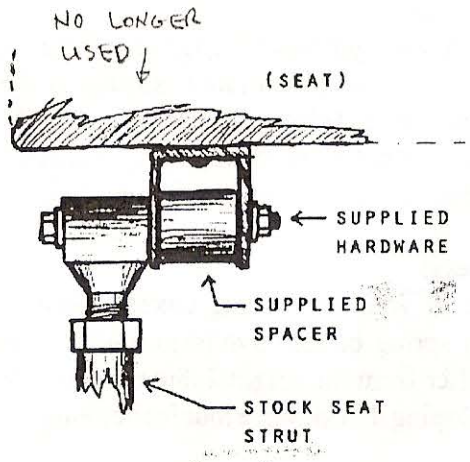


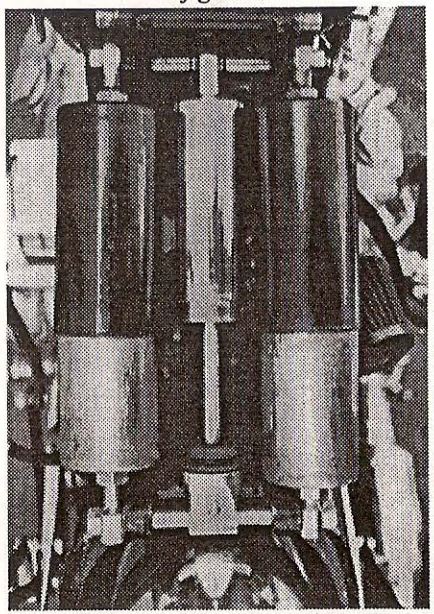
figure 3

•Remove the seat.

•Remove the stock struts from the rear frame member. You will attach the black struts underneath the supplied longer passenger footpeg bolts (fig #2b), and bolt them to either side of the stock seat strut (fig #2a). The longer strut goes from the front bolt to the back of the stock seat strut. Note that

the straight strut is flat at one end. This face goes against the stock seat strut.

figure 4



•Before completely tightening the footpeg bolts or the bolt at the stock seat strut, put the seat back on. Using the supplied spacers and longer bolts, attach the stock seat strut to the *outside* of the bracket on the seat (fig #3).

•Straighten the visual line from the seat-mounting bracket through all the struts to the footpeg mount, then tighten all the bolts. Make sure the rear frame member will not foul on the seat struts through the full range of travel of the rear wheel. Check by hand to make sure the assembly is rigid.

Once the extensions have been installed, but before the springs have been put into the spring boxes (see Section VII), the bike should be inspected to make sure that the seat does not make contact with the rear fender upon full compression. The alloy struts (FT94AS) should be adjusted to maintain a gap on full compression between the bottom of the seat and the top of the fender.

Under very heavy load (passenger *and* baggage) the rider will probably find that the two outer springs plus both inner springs will be required, resulting in a 320lb rate. In addition, the rider may find that he needs to add the spacer and compress (screw down) the spring boxes. The damper rate may need to be increased as well (see Section IX & X).

VII. Installing springs/dampers:

Check the dimensions of your rear spring boxes. Over the years, apparently replacement spring boxes have been made for the Vincent which significantly differ from the original dimensions. The inner spring boxes used in developing this kit were four inches long, the

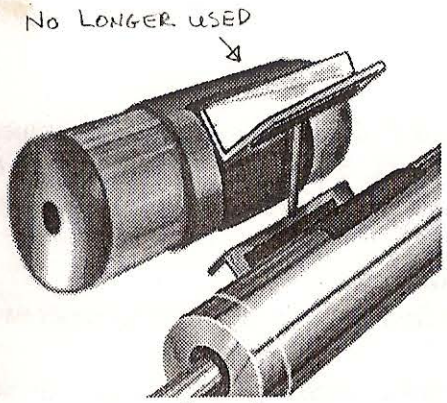


figure 5

outer spring boxes were five inches long. Without springs, test the full range of motion of the spring box while the bike is on a stand and with the rear damper in place, to ensure that the rear springs will remain fully contained by the boxes and that the upper and lower boxes will not foul on one another. Spring boxes that are too short may not adequately contain the springs on full extension. Boxes that are too long may foul on full compression.

1.**Rear damper replacement**: With the bike on a rack, use a jack to lift the motorcycle until the rear wheel is off the ground. This will keep the spring box pivot bolts from rotating. Remove the nuts from the spring box pivot bolts and remove the spring boxes. Lower the bike until the damper unit compresses slightly, this will ease removal of F28/1. Pull or tap out pivot bolts (F28/1 & F28/2) and remove damper unit.

Put the Thornton rear damper (the one without the Mercury Crest) in position as shown in figure #4 and push the pivot bolts into place again. Make sure the damper is centered on the lower shaft. (Note: If the seat is fully sprung, now is the time to verify that there is extra clearance between the fender and the seat at full compression. Lower the machine all the way with the damper in place and place the seat on its mounts). Raise the bike up until the rear wheel is off the ground to fully extend the damper in prepara-

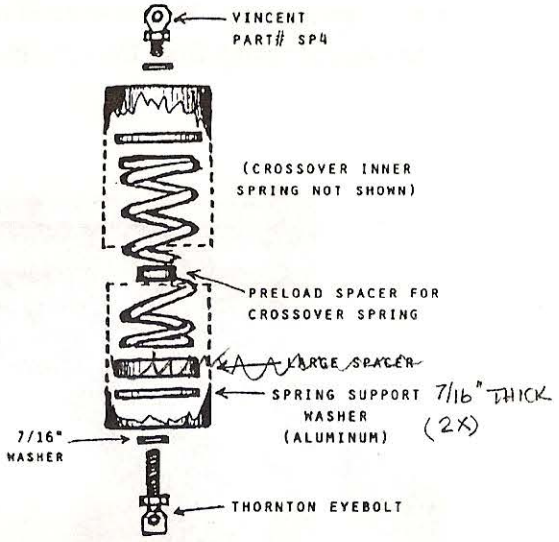


figure 6