

SHOCK ABSORBERS Gabriel Snubbers & Watson Stabilators

In our February 2008 Restoration Forum we printed an inquiry from a reader about Watson Stabilators. I admitted that personally, I had never heard of them. But, as usual, our readers came through. A number of you submitted some wonderful information on the Watson Stabilator. It turns out that the Stabilator was a 'shock absorber' (reasons for the quotation marks a bit later) similar to the more common Snubber manufactured by Gabriel. And yes. I am familiar with Snubbers. I have them on one of my cars, have rebuilt them and can comment on their operation.

We are devoting a great deal of attention to shock absorbers in this issue. Besides this article, which primarily focuses on the operation and maintenance of the 'band' type 'shock absorber', Fritz Hennig, in his On The Fritz column (beginning on page 25) addresses the history of the shock absorber.

The real 'shock absorbers' on a car, then and now, are the springs and the tires. Between the two components, virtually all the bumps are taken out of the ride. But without something to dampen the bounce and recoil, the chassis is liable to begin to oscillate (sort of like what happens to a front wheel when it is out of balance and you hit a pothole). Today's shock absorber is actually a tight-fitting piston within a tube. Within the tube is a cushion of air or gas and a bit of oil as a lubricant. The tight-fitting piston resists lifting or dropping, making the ride smoother, safer and more stable.

Back in the 'teens and 1920s (and earlier) though, roads required a different set of controls.

Many of the roads weren't paved, were pot-holed, rutted, muddy, and, in short, often pretty lousy and unpredictable. Some of those pot-holes seemed to have no bottom, and if a wheel dropped into one, the car could easily break a spring or even bottom out. The roads and the cars were the catalyst for some very creative inventors. Unfortunately, most of their devices didn't succeed in adequately addressing the problems and their 'shock absorbers' soon fell by the wayside.

Gabriel developed a system (in 1907) so that the wheel would follow the 'contours' of the road, but under a very controlled set of parameters. The axle (both front and rear could benefit from them, and they were used both front and rear) was secured by a very strong fabric band on both the left and right sides. The other end of the fabric band was wound around a split spool, contained within a metal canister, with its downward movement severely restricted by a very strong coiled spring. When the wheel dropped into one of those road pits, it would tend to rebound with tremendous force. As the tension on the fabric band momentarily relaxed, the spring would force the pressure to slow the rebound. In a nutshell, that's how the Snubber and its imitator, the Stabilator worked. Both units limited the rate of fall of the wheel/axle allowing for a smoother, safer ride. But more importantly, the spring pressure within the unit would ease the rebound of the axle, softening the ride. The springs and the tires still did the primary job of absorbing the bumps in the road, kept the car from bouncing too high, and smoothed the ride. But the Snubbers and Stabilators saved the car from much of the damage that it would otherwise experience on those tough roads.

To quote from a copy of Dyke's Automotive, "Watson Stabilators are friction brakes to hold the car down against the rebound or throwing action of the car springs. Stabilators do not in any way stiffen the car springs against compression, but leave the springs perfectly free and supple to act as soft cushions in protecting the car and passengers from road shocks. The braking resistance produced by Stabilators is always automatically in proportion to the mildness or viciousness of the rebound force."

Although the principles of both the Snubber and the Stabilator are similar, the technology differed somewhat. The end results though, were that when the axle moved away from the frame a resistance, in the form of a woven fabric band coiled

around a drum and spring kept the axle in check and slowed the rebound of the axle. The major difference between the Snubber and the Stabilator seems to be the configuration of the spring used.

The Snubber used an extremely strong compression spring, compressed between the two halves of a steel core, one of which was affixed to the car's frame, against which the fabric band was wrapped to keep tension on the fabric. The Stabilator used a flat spring, similar to the spring used in a clock or Gramophone, to keep tension on the fabric band. In either case though, as the axle 'recovered' from dropping away from the frame, as would be the case when the wheel dropped into a pothole, the spring tension slowed the rewinding of the fabric band and tended to minimize the shock of the released tension on the car's springs.

The housing of either type of unit was bolted to the frame of the car. The fabric strap extended downward from the round, can-shaped housing, and was securely fastened to the axle. The Stabilator had the advantage of being adjustable. That is, the tension on the spring could be tightened or loosened offering a 'firmer' or 'softer' ride. The fallacy though, is that too soft a ride meant too little tension and inadequate resistance to axle movement. The tension on the Snubber was pretty well fixed; a little bit of adjustment was available in the number of turns that the fabric band made around the center drum.

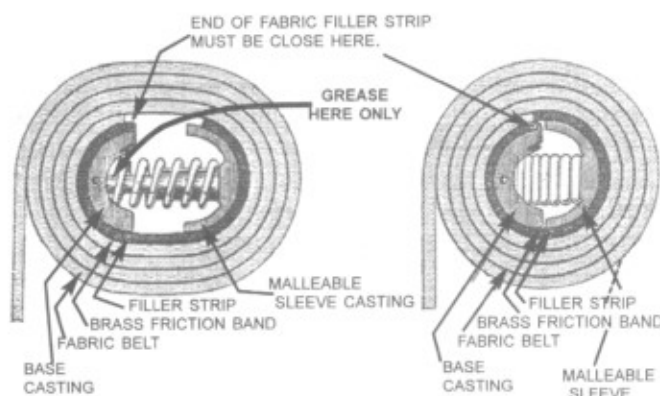
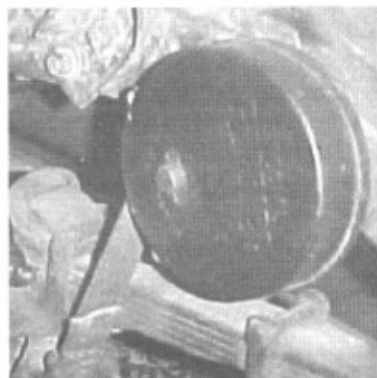
Because of the strong spring tension within the 'can' a special tool had to be used to adjust either type. The Stabilator used a wrench to wind or relax the spring. The Snubber used a lever to pull the fabric strap tighter against the spring/drum. When tension was adequate, the slack in the fabric band was taken up at the axle.

I can speak from experience in the rebuilding and adjustment of the Gabriel Snubbers; they were used as standard equipment on many model Studebakers and other marques in the 1920s. Stabilators were used on Packards, Franklins and Hupmobiles during the same period. Correspondence from readers indicates that both types of units are very effective in smoothing the shocks of rough roads. Both Gabriel and Watson were emphatic in their admonitions against using any type of oil or grease on the fabric belts. There the similarity ends, so we will, from this point forward, address each unit separately as to the care, maintenance and repair.

THE GABRIEL SNUBBER

The operation of the Gabriel Snubber is quite easy to visualize, but in reality it is a more complicated device than it appears to be, depending on a complex interplay between frictional forces and spring compression for its unique action.

The Snubber consists of two semi-circular iron castings separated by a sturdy coil spring. The base casting (to the left in illustration below) is connected to a bracket which is attached to the frame of the car. The other floating casting is free to move horizontally but is held in alignment by a sleeve that fits over a projecting pin on the base casting.



Snubber
Spring Coil Expanded

Snubber
Spring Coil Compressed

A sturdy fabric belt is attached at one end to the base casting and is wound around the castings about four turns. The fabric belt is interleaved with a soft brass strip that separates the turns of the fabric belt. The mechanism is enclosed in a sheet metal housing to keep out dirt and moisture.

The free end of the belt is brought out through a slot in the housing and is firmly attached to the axle of the vehicle by use of a metal clamp. When the vehicle is at rest, or traveling on a smooth road, the strap is under sufficient tension so that the coil spring is almost fully compressed as in the right hand view in the illustration above. If the vehicle encounters a bump that causes the axle to deflect upward appreciably, the tension in the belt is

momentarily relieved and the coil spring expands, separating the floating and base castings and unwinding the belt by a small amount. As the axle rebounds, its motion is resisted by the belt as it must act to compress the coil spring again, while at the same time overcoming the friction between the fabric belt and brass strip. Thus the rebound energy is dissipated in part by heat generated by the friction.

In reality then, the Gabriel Snubber is a friction device of a unique type in which the coil spring functions mainly to establish a high frictional force between adjacent turns of the belt and brass strip. The energy absorbed by the compression of the horizontal spring is only incidental and is probably negligible compared to the energy dissipated by friction.

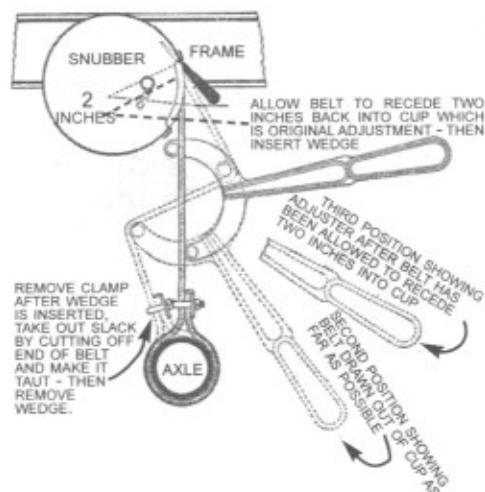
Lubrication. The belt itself should never be lubricated as any oil or grease on it will interfere with the proper operation of the Snubber. Every year or two the sleeve of the floating casting where it fits over the pin of the base casting should be greased. To do this, remove the housing and unwind the belt. Be careful not to damage the brass friction-strip. Separate the floating casting and spring and wash parts in solvent. Lubricate the pin with chassis lube or graphite grease and reassemble the parts. Make sure the wide flange of the casting sleeve is at the top. Brush the belt to remove dirt.

Assembling Belt in the Snubber. Clamp the base casting in a vise. Hook the end of the belt assembly on the rivets in the base casting and assemble the spring and floating casting as described above. Coil the belt three and one quarter turns and work it a few times by pulling on it to be sure the coil spring operates freely. The housing may then be replaced and the Snubber installed on the vehicle.

Adjustment. After the Snubber has been installed on the car, the belt should be pulled out until tight with the coil spring fully compressed. Then allow the belt to retract two inches into the housing (three inches for a rear Snubber). Hold the belt in this position with a wooden wedge inserted between the belt and the housing (see illustration next column). All the slack should then be taken up between the housing and fastening clamp with the latter tightened securely. Remove the wedge to complete the installation.

A special tool for Snubber adjustment will facilitate the operation described. While such a tool

is probably a rare antique today, the perceptive restorer should have little difficulty in improvising one. See illustration for details of its operation.



Adjustment of the Gabriel Snubber

The above adjustment may be performed at any time as a test of correct Snubber adjustment. New Snubber belts may stretch after installation, and a check should be made after a short time of use.

Depending on the size and weight, some cars may call for an adjustment different from the two inches (three inches for rear Snubber) noted for above. Follow the manufacturer's instructions if available; otherwise the numbers given above will provide an average adjustment.

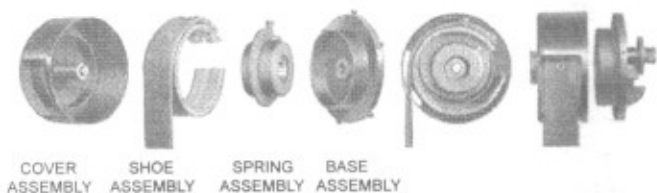
Some of the later Gabriel Snubbers had a feature called the "anti-preloading brake shoe" consisting of a spring steel strip riveted to the belt. This strip prevents the coil spring from operating until Snubber action is required. Small up and down motions while the vehicle is traveling on good roads are not subject to Snubber restraint but are taken up by the action of the spring steel strip in the first coil of the belt. Large deflections will cause the Snubber to function in the usual manner.

Gabriel Snubber Restoration. Nearly all parts of the typical Gabriel are almost indestructible except the fabric belt that is almost sure to have succumbed to the ravages of time. Even if intact, it is probably going to be rotten enough to break the first time it is subjected to tension. Restoration then simply requires that the belt be removed from the unit, laid out, rivets removed and the belt replaced with new rivets. The old brass strip should be reusable unless it is damaged. Brass is of course subject to 'work hardening', and often the brass strips are cracked, broken or so brittle as to be unusable. Replacement strips can be fabricated out of new

sheet brass of a similar thickness, cut to size either with a metal shear or metal snips, and the edges deburred. Old rivets should be carefully punched out of the brass. Be sure to make careful measurements of where the brass strips are placed along the length of belting, and whether the brass strips are on the top or bottom of the belting. Some of the brass strips overlap each other, although on opposite sides of the belt. They must be reassembled exactly as they were originally constructed. For this reason it is imperative that careful measurements and notes, and detailed photographs be taken of the old belt - top and bottom - prior to any disassembly. All of the other metal parts of the Snubber should be cleaned up, derusted, and painted. Follow the instructions above for lubrication, assembly, and adjustment.

THE WATSON STABILATOR

The Stabilator consists, essentially, of four parts: the cover, the spring assembly, the base assembly and the shoe drum which includes the fabric band.

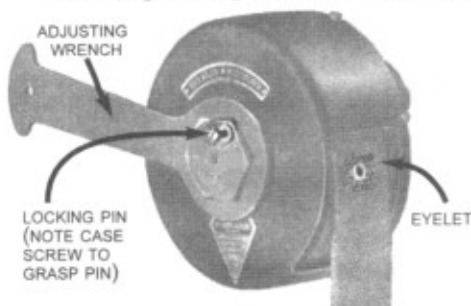


The spring assembly and the shoe drum fit inside the cover and the base fits over it, enclosing the entire unit. The base is secured by five screws. The fabric strap fits over the end of the shoe assembly with a hook; the other end exits the cover and is secured to the axle. The spring is attached, at its inner end, to a hub which, in turn, is attached to a large hexagonal nut (accessible from the outside of the cover) which is used to adjust tension. The other end of the spring exits the inner spring can and hooks over a rigid pin. The gap in the shoe (3/8" when assembled) provides the necessary movement within the Stabilator to effect braking tension as called for by road conditions.

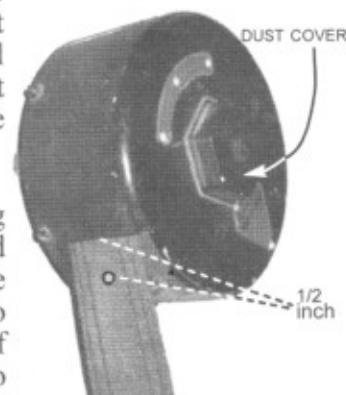
The hook on the fabric belt appears to be riveted, and removal of the rivets would be necessary for replacement of the belt. An eyelet in the belt indicates internal belt tension and, when replacing the fabric belt, it is important that this eyelet be

installed in exactly the same position as on the original. **CAUTION:** When disassembling the Stabilator, put a nail through the eyelet, or grasp the belt with a pair of ViseGrips to prevent the spring from snapping the belt back into the can (and with it, a couple of your fingers).

Adjusting the Stabilator. The car should be on level ground with all equipment on board, but without passengers or extra load. Inspect the position of the eyelet; it should be visible as the belt exits the cover. The eyelet should be 1/2" below the top of the 'window' in the cover (see picture). If the



eyelet is above this position, the Stabilator brake is too great and it will cause a stiff ride. If the eyelet is below this position, the brake is too small and it cannot properly control the recoil and may result in damage to the Stabilator.



The positioning of the eyelet is governed entirely by the way the fabric belt is attached to the axle. The winding of the spring has nothing to do with it. It is necessary to unwind the Stabilator spring before attempting to unclamp the strap from the axle in order to change the eyelet position.

To remove the locking pin, take out one of the screws in the Stabilator cover and screw it into the hole in the locking pin so you can get hold of the pin and pull it out. The pin may look like a rivet and the threads may be filled with dirt and crud making identification a little difficult. Use a needle or other sharp object to clean out the threads in order to get a screw into the hole. The pin is locked in place by the

