

Super Tuning the 1950 Lionel 773 Hudson

By Dennis Waldron at justtrains.com/Hudson/773-1.asp 2020-06-16

The 1950 version of the 773 is the best of the postwar Hudson's, far better than the 1964-66 versions, but not nearly as precisely manufactured as the 700E, its predecessor. Many of the 1950 773 Hudson's ran well as manufactured, but they and their 1964-66 versions can be made to operate even better and Lionel provided all of the information you need to accomplish the task. Follow along and we will walk you through the process.

Super tuning the 773 is not for the faint of heart, as you will need to partially disassemble your engine to get to critical parts. Make sure that you have all of the proper tools necessary to disassemble and reassemble your Hudson. Proper tools means proper screw drivers with good blades (tips), wrenches or socket drivers that actually fit the various hex head screws and an Allen wrench to remove the Allen screw that holds the motor to the frame. With this in mind, let's get started.

Tools you should have at hand:

Screw drivers: Medium flat blade and a medium Phillips;

Socket drivers to remove the side rod and eccentric screws;

Allen wrench to remove the motor mounting screw;

Soldering iron;

Small flat file; and

Some 1500 grade sand paper and some crocus polishing paper.

***Note:** It would probably be a good idea to have a few extra 671M-23 thrust washers on hand.

Disassembly

First: Remove the pilot truck, trailing truck and ash pan. Remove the small screw that holds the boiler front in place, as well as the small screw that holds the pilot/cowcatcher in place, being careful to note the location of the parts you are removing as you do so.

Second: Remove the eccentric crank screws and then the left and right hand valve gear assemblies followed by the side rods.

Third: Now it's time to remove the cab and boiler (the engine shell). Turn the engine upside down on an old towel or other soft cloth and locate the front boiler mounting screw. You will find the single screw just behind the pilot (cowcatcher). The ladders or steps at the front of the boiler should fall free - just set them aside for safe keeping.

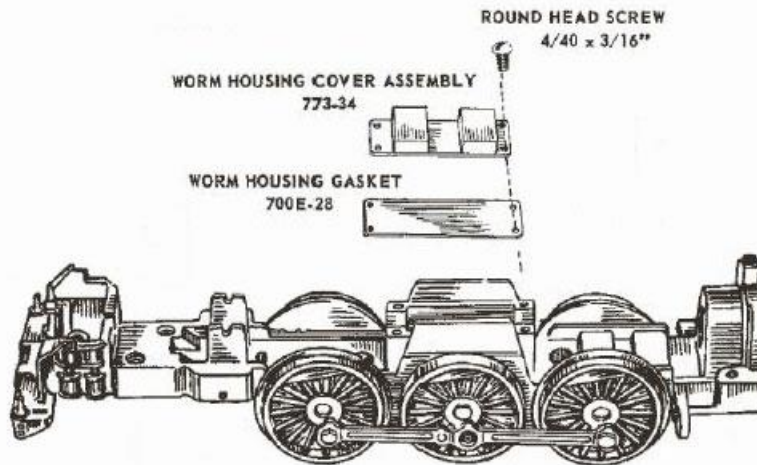
Fourth: Now move to rear of the frame and remove the two screws that hold the rear of the cab to the frame. At this stage you should be able to lift the frame/chassis out of the cab and boiler shell and set it aside. Set the boiler/cab aside where it won't get scratched or damaged.

Fifth: You should now have what is referred to as a running chassis in front of you. The final step before your start the super tuning process is to remove the motor, E-Unit and smoke unit. There is a small wire lead between the solder lug on the front collector assembly and the E-Unit. Unsolder that wire at the solder lug. Now loosen the motor by removing the single motor mounting screw. Now loosen the E-Unit and smoke unit mounting screws. This will allow you to remove the three components out of the chassis as one assembly.

Now we are ready to start the super tuning process.

With the rolling chassis in front of you, with the front of the chassis facing to your left, take note of the location of the magnet cover that covers the worm shaft and axle worm gear. See the illustration below.

Illustration #1



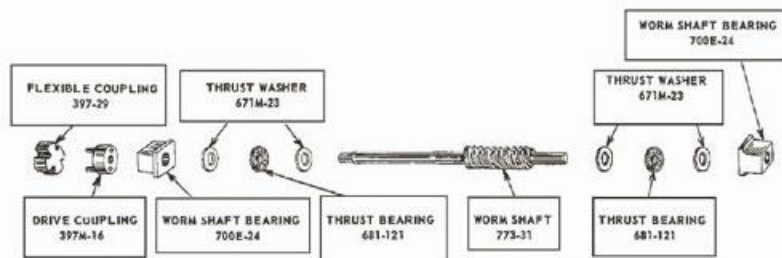
Using some nail polish, any color is fine, put a dot of the nail polish on the corner of the magnet cover as well as the corresponding corner of the worm housing. Let the nail polish harden so that you do not accidentally wipe it off. This will enable you to replace the magnet cover later and put it in the exact location it was before you started. Don't overlook this step as the magnet cover must be reinstalled in its original position. Failure to do so will defeat the magnetic properties of the cover and its magnets by reversing their polarity.

Now remove each of the screws holding the magnet cover to the frame and lift the magnet cover and the paper gasket from the worm housing and set it aside.

Next, carefully remove the worm shaft along with its bearings, thrust washers and bronze bearings and set it in front of you. Take careful note of the shape of the bronze worm shaft bearings, those odd shaped block as the ends of the shaft. Note the taper and how they fit into the housing with the taper down. This is very important!

The illustration below details the components forming the complete worm shaft assembly, although your components will be facing in the opposite direction.

Illustration #2



For now, wash all of the components in mineral spirits. You won't be able to disassemble the end of the worm shaft where the drive coupling is mounted, so just clean them in place. You can use enamel or lacquer thinner to clean the pieces, but don't use any other product, especially those that may contain water as a component. Mineral spirits or thinners will remove the grease residue and most of the varnishes left over from the evaporated factory oils and grease. You should be able to polish off the remainder.

Some minor do's and don'ts:

Do clean the parts thoroughly, including the 681-121 thrust bearings. Use a small stiff brush to clean out the old oil and grease in the bearing race (channel the bearing balls ride in).

Do make sure that the 671M-23 thrust washers are perfectly flat and not grooved, warped or bent.

Don't soak the bronze worm shaft bearings in any cleaners of any kind, especially enamel or lacquer thinner as doing so will dry out the sintered bearing material and cause the bearing to squeal later on during operation. Wiping them thoroughly with a rag moistened with mineral spirits or thinners will do.

Once the components are clean, reassemble them and set them aside.

Now we are ready to start the next cleaning phase.

This next phase of the cleaning process is very important and it is the most difficult to perform. It is important in that any residual caked on grease will hide the very flaws you will be looking for during the final phase of the super tuning process. Ideally, remove the screw at the bottom of the frame that is used to lubricate the center axle and worm wheel. Turn the chassis right side up and place it over a pie or cake tin and wash out the worm wheel housing thoroughly.

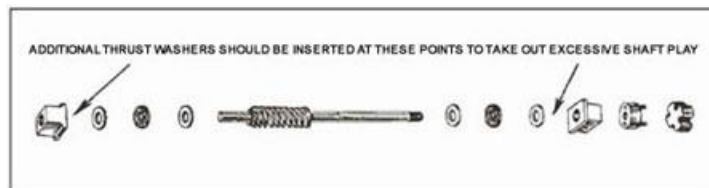
***Note:** Be careful not to wash off the nail polish marker on the chassis!

Let the excess mineral spirits flush out through the hole where the lubricating screw was. You may have to use toothpicks to scrape out hardened grease, and you may have to turn the chassis upside down to get out all of the old clumps of dried grease. Once clean, replace the screw at the bottom of the chassis and then set the chassis aside to air dry.

Now it's time to start the final phases of our super tuning.

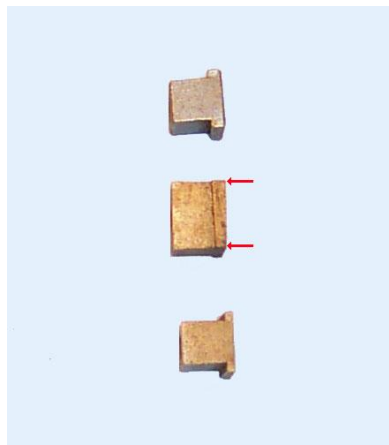
Take the worm shaft assembly that you cleaned earlier and set it in front of you on a clean cloth, then lightly oil the components and reassemble them using the following illustration as a guide. We will use this same illustration as we refit the worm shaft to the worm housing.

Illustration #3



Place the reassembled worm shaft into the worm housing and note the position of the bronze worm shaft bearings relative to the top of the worm housing. Earlier we mentioned the importance of how these worm shaft bearings are installed. Let's take a moment and look at these bearings so that you may better understand why they must be installed a certain way. In the illustration below you will find three views, top, side and bottom, of the 700E-24 bronze worm shaft bearing. Take note of the "T" shape of the bearing as well as the tapered sides. When you install the worm shaft, you will be doing so with the thin part of that taper facing down. The taper is used to preload the bearings on the worm shaft so that the worm shaft doesn't move back and forth excessively in the well. Let's move on and check the fit of the worm shaft to the chassis.

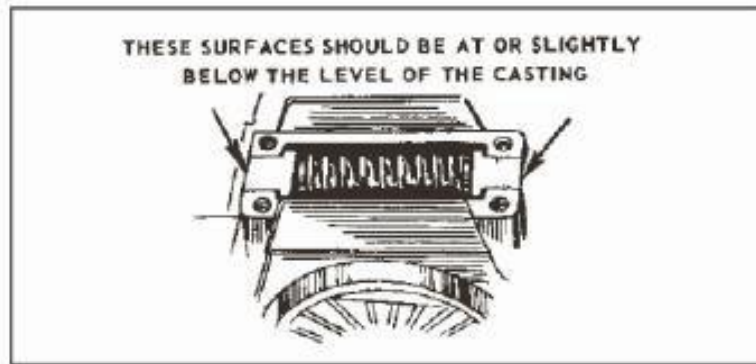
Illustration #4



Make sure that the worm shaft well in the chassis is clean and free of any dirt and debris. Check it carefully to make sure there is no excessive flash on the well casting from its original manufacture. If excessive flash is present, remove it and clean and flush the worm housing again. If all looks good, carefully place the assembled worm shaft (with the taper of the bronze bearing facing down) into the worm shaft well. Make sure that it is fully seated as far down as possible, finger pressure only. Note the location of the top of the worm shaft bearings relative to the top of the worm housing casting.

The top of the bearing should be at or below the top of the well casting. If it is above, even slightly, you will need to file the top of the bearing to reduce the height of the bearing so that it is at or below the housing. If you do have to file the bearings, make sure to clean them well before trying to fit them to the housing again. This added clearance will allow these bearings to float in the housing once the worm cover is reinstalled.

Illustration #5



Once you have the height of the bearings set, it's time to check the end to end play in the worm shaft. Place two fingers from one hand on the two bronze bearings to hold them down. Now, using your free hand try and push and pull the worm shaft to see how far it slides back and forth. The optimum play is .010 inches, or the thickness of one 671M-23 thrust washer. Check the fit carefully and if there is too much play, add one thrust washer to the end opposite the drive coupling. See Illustration #3 to see where to place the thrust washer.

If there is still too much play and another thrust washer is necessary, you will need to remove the drive coupling and install the second thrust washer at that end. You can't double up the thrust washers on one end as it will cause the worm shaft to bind. Once you have the fit of the worm shaft just right, remove it from the worm well and set it aside.

Checking the drive wheels

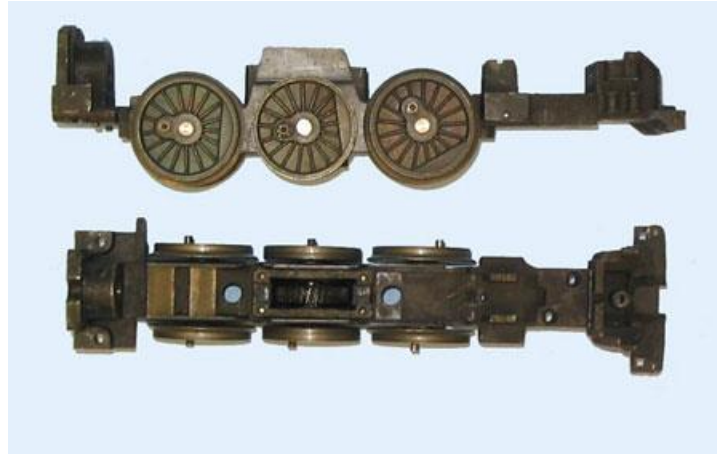
Now it's time to make sure that all three sets of drive wheels turn freely without resistance and that they are straight without any evidence of wobble. This will also enable you to ensure that the wheels were properly quartered when installed. We will discuss the quartering issue in detail in the next section. Flip the chassis onto its back and set it on your work surface. Turn each wheel set and make sure that the wheels are straight; that the wheel sets are aligned with each other and that they turn freely. A drop of oil at each axle where it enters the wheel bearing would be a good idea. Turn the wheel sets to work the oil into the space between the axle and the bearing.

Checking the wheels for proper quarter

What exactly does "quartering the wheels" mean? Basically, it is the setting of the wheels of a two or four cylinder locomotive to ensure that the crank pin on one side is exactly 90 degrees from the crank pin on the opposite side. If the crank pins on both sides on the same axle were synchronized or at the same position the locomotive would operate unevenly or sluggishly, presuming that it could even get started. Sooner or later, the locomotive would stop with both pistons at the same end of the cylinder preventing it from starting forward again.

Take a look at Illustration #6 below, a rolling 773 chassis. Now look at the center drive wheel and note the position of the crank pin. The crank pin is that pin or post on the wheel to which the side rod is mounted. As you can see, the crank pin on the center wheel is approximately at the 9 O'clock position. Now put the center wheel of your chassis in the same position, and without turning the wheels, look at the opposite side. The crank pin on the opposite side should be offset exactly 90 degrees, or at either the 6 O'clock or 12 O'clock position.

Illustration #6

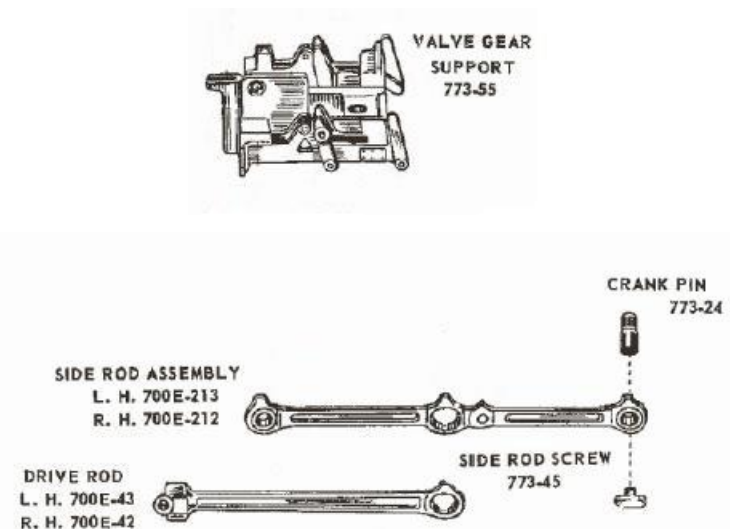


Given that you have disassembled this engine to perform the super tuning, we can presume that the wheels have not lost their quarter. On the other hand, if you are assembling the engine with a new rolling chassis, then you will need to pay particular attention to the next phase.

Fitting the side rods and valve gear eccentric cranks

If you have removed the valve hanger assembly (Illustration #7) to clean the chassis, you must reinstall it at this time to refit the side rods, drive rods and eccentric cranks. Make sure to install the smoke lever at the same time!

Illustration #7



Above, in illustration #8 the side rod and drive rod are left hand. Take the right hand side rod and fit it to the crank pins on the right side of your locomotive, adding a small drop of oil to the crank pin and bushing. When Lionel manufactured the side rod assemblies, the side rods were fitted with tight fitting bronze bushings. On relatively new locomotives, these bushing are very tight on the crank pins. A drop of oil and some run time will resolve this. There is, however another issue often overlooked.

With the right hand side rod in place, add the front and rear side rod screws and gently tighten them, but don't over tighten them. Now turn the wheels and see how tight the side rod bushing are on the crank pins. Try and wiggle them to make sure that the side rod screws are not binding the side rod bushings. You should be able to turn the front and rear wheels with little or no resistance or binding.

If the side rod screws are causing the bushing to bind, remove the side rod and place it face down on your work surface. Now take that small flat file and carefully file away some of the material from the rear of the side rod at the bushing location. Make sure to hold the file flat to the side rod surface and take your time - remove a little material, clean the side rod add a drop of oil and then test the fit again.

With the right hand side rod properly fitted to the crank pins, repeat the process on the left side of the chassis. This is the point at which you will be able to determine whether or not the wheels are perfectly quartered. The left hand side rod should literally drop onto the crank pins. If it doesn't, even by the slightest amount, it means that one or more wheel sets are not properly quartered. Do not drill out or ream the side rod bushing, fix the problem properly by re-quartering the errant wheel sets or have an experienced repairman do it for you. We do this routinely for a small fee.

NOTE: Drilling out the side rod bushing to make it fit will only cause the binding problem to resurface when you add the drive (main) rods and eccentric crank assemblies.

Presuming that there are no quartering issues, fit the left hand side rod exactly the way you did the right side. With both side rods mounted, turn the wheels again and check for resistance or unevenness. In the shop this is called looking for the knot. A knot occurs when you turn the wheels and hit one spot and need to use force to turn the wheel past that point. If you find that your assembly has a knot, you will need to retrace your steps to find the cause and resolve it. Most times it is a wheel slightly out of quarter.

Note: At this stage there should be very little if any resistance when the wheels are turned by hand!

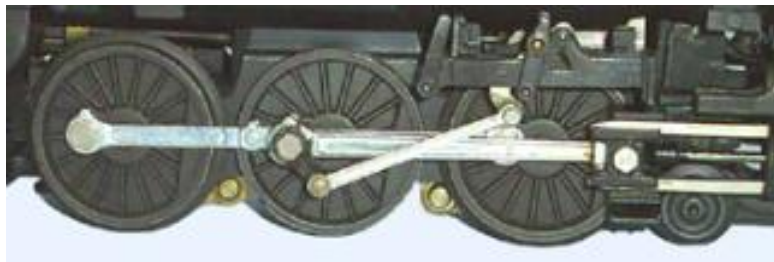
Fitting and installing the eccentric cranks

The last step in reinstalling the side and drive rods and valve gear is fitting the eccentric cranks and ensuring that they are installed correctly. Check each of the eccentric cranks for damage, especially small burrs that will cause the assembly to bind when it turns. Use a combination of the 1500 paper and crocus polish cloth to clean and polish the cylinder portion of the eccentric crank. There should be two small nubs at the end of the eccentric crank that fit into the wheel. Make sure both are present and not damaged. If they are damaged in any way, replace the eccentric crank.

Slide the drive rods and crossheads into position adding a drop of oil to the guides and then fit the eccentric cranks through the drive and side rods until properly seated and in their proper position. Remember to add a drop of oil to the cylinder of the eccentric crank before inserting it.

See Illustration #9 below for proper positioning.

Illustration #9



Add the eccentric crank screws and gently snug them up and then tighten but not too tight. Turn the wheels again and check for resistance as well as the knots we discussed previously. You should start to see some resistance from all of the rods and valve gear but not enough to impeded the smooth motion of the wheels and rods. Presuming that everything operates smoothly, let's add the worm shaft and cover.

Reinstalling the worm shaft and worm housing cover assembly

Take the worm shaft assembly that you set aside earlier and using a small artist brush apply some light grease to coat the worm portion of the worm shaft as well as the worm wheel on the axle. You do not need to pack the worm housing with grease, doing so does more harm than good. A light film of a good synthetic grease is just fine. Since you have already fitted the worm shaft to the housing, it should literally drop in place. Now let's add the worm cover with its magnets.

Remember those fingernail polish markers you put on the worm housing cover and the worm well? Now you will see why they were so important. Take the worm housing gasket and set it into place. Now take the cover and line up the markers you made and reinstall the worm housing cover and install the four screw. Tighten them evenly, but do not over tighten them. The markers enabled you to maintain the same magnetic polarity as before.

With the worm housing cover in place and the screws tightened, hold the chassis so that the drive wheels are off of the work surface. Turn the worm shaft, being careful to work in the lubricant as well as feel for any resistance or rough spots as you turn the shaft. The shaft should turn freely! If everything is fine, let's move on to the next step - if not, you will need to determine the cause of the rough spots or resistance. Our shop can work with you on resolution of any problems you find.

Reinstalling the motor, E-Unit and Smoke Unit

You're approaching the final stages of super tuning your 773 Hudson, but don't get anxious as you're not finished just yet. For this phase of the super tuning, we will presume that you have serviced the motor, E-Unit and smoke unit. If you haven't, you may want to pause here and do so.

Now it's time to check the motor and its alignment in the chassis. Again, if you need to perform any maintenance on the motor, now would be the time to do that.

Install the motor without the flexible rubber coupling and tighten the Allen screw to hold the motor in place. Now check the alignment between the coupling on the worm shaft and the coupling on the motor's armature shaft. The two couplings should be concentric to one another, meaning they should not be out of alignment. One should not be higher than the other, nor should one be to the side in relation to its mate. If yours is out of alignment, then you will need to contact us or your local serviceman to see how this problem can be resolved.

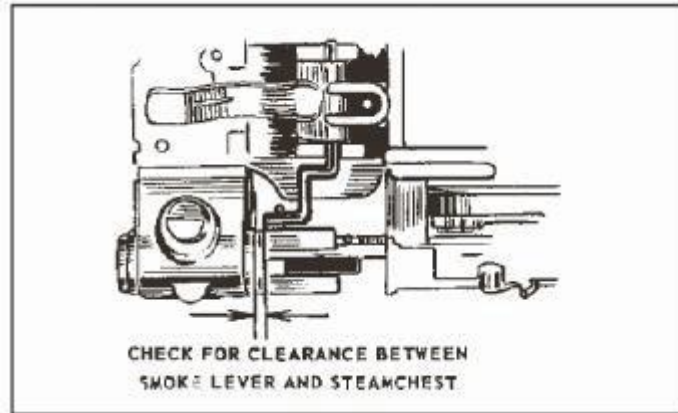
If the two couplings are aligned, next you will need to check the distance or space between the two coupling faces. Take the rubber coupling and see if its edges fit in between the two coupling faces. If it doesn't, or the fit is extremely tight, then you will need to trim the rubber coupling before installing it. You can trim the thickness using a single edge razor blade and shave a piece from the face of the rubber coupling. The ideal clearance between the two coupling faces and the rubber coupling is a minimum of 1/32 of an inch to a maximum of 1/16 of an inch. Once you have the thickness as needed, loosen the Allen screw holding the motor enough to allow you to install the rubber coupling and then retighten the motor mounting screw.

Once the motor and its coupling are in place, reattach the wire from the collector to the E-Unit and then install the E-Unit and smoke unit. Again, if either one requires service, this would be the time to do that. Set the chassis on a section of track, about 3 feet will do, and apply power gradually to make sure the motor, E-Unit and smoke unit function as they should. Fix any issues that arise before moving on to the next stage.

Checking and Adjusting the Smoke Lever

This step is often overlooked when checking for binding problems on the 773 Hudson. Lionel made two different smoke levers for the 773. The earliest version, made for what would have been the 703 Hudson, is the one often found in the earliest of the 1950 versions of the 773. It was manufactured of steel and was not plated or coated, hence its silver color. This early version was also prone to binding as the smoke lever would often strike the steam chest. The geometry of the lever was off just enough that the lever hit the steam chest before the drive rod could complete its full stroke. See illustration #10.

Illustration #10



Check the lever you installed back into your 773 Hudson, and if it is hitting the steam chest, then the lever arm needs to be adjusted ever so slightly. Do not bend that portion of the lever that hits the smoke piston in your smoke unit. Make the adjusting bend at that point on the lever where it strikes the steam chest.

In 1964 Lionel made a number of changes to the 773 for the 1964-66 period in an effort to improve performance. While they made some great improvements such as changing the geometry of the smoke lever, adding an additional (third) magnet to the frame as well as to the worm gear cover, the motor redesign was a disaster.

Illustration #11 shows the improvement to the smoke lever and Illustration #12 shows the improvement to the worm gear cover with the addition of the third magnet.

Illustration #11



Illustration #12



The Final Phase

At this point you have a couple of options, you can now reassemble your 773 Hudson or you can add additional features to enhance your Hudson's performance.

These additional features include:

1. Changing the magnet cover to add the third magnet
2. Adding a third magnet to the frame of your 773
3. Replace the standard 773 motor with a High Stack Gold Seal Motor.

Typically Lionel furnished the 773 with a standard motor as shown in Illustration #13.

Illustration #13



Lionel also made the High Stack Gold Seal motor available for the 773 Hudson and shown in Illustration #14.

Illustration #14



The later smoke lever, triple magnet cover, additional frame magnet and the High Stack Gold Seal motor are available through our parts department.

We hope you have enjoyed our Super Tuning Series for the 773 Hudson. Should you have any questions, please contact us!