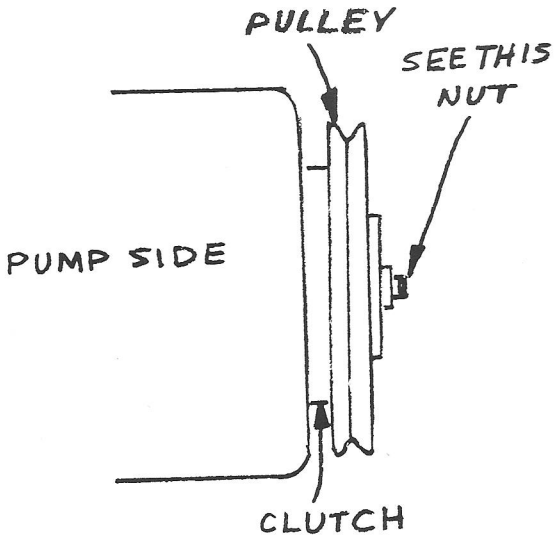
leave the vacuum pump on over-night. As you know, big commercial systems and many package units have service valves; and these units can be purged by blowing Freon through the system. Freon will push the air out ahead of the gas. But in the case of the full hermetic, there are no service valves; and the only practical way of getting all air out of the system is to use a vacuum pump. In addition to hermetics, you can evacuate any system with a vacuum pump, no matter how large it is, if it is air tight.

It is important that you remember to evacuate all household units (dry out, too), all window units, and other units that you can get your evacuator hooked to with no trouble. It takes only a few minutes to pull a vacuum on an automobile unit and get rid of all the air and other foreign gases that may be in the system. Where small units are concerned, you do not worry about saving the gas that is left in the unit. Blow it out. You will not be doing the customer any favor by trying to save a few ounces of gas left in any hermetic or automobile air conditioning system.

We can move on to automobile air conditioning now, and you can keep in mind that a vacuum pump is the handiest tool you can have when charging an automobile unit.

The automobile unit is the simplest and easiest of all refrigeration systems to service and trouble shoot. For one thing, you have no electrical problems to cope with. The auto system is driven by the auto engine itself, and you have only the clutch and evaporator fan system to worry about as far as the electrical is concerned. Most of you can figure out why a blower fan will not operate off the auto battery if you will look for fuses and electrical connections. Servicing the evaporator fan motor is no more complicated than finding out why the fan motor on the hot water heater is not working. The pump on an auto unit is driven by belts coming off the engine drive pulley. These belts may also turn the radiator fan and generator. Some units have only one belt, and there are a dozen different ways to drive the pump. Most of these pumps have magnetic clutches. These clutches operate off the same voltage that operates the evaporator fan, that is, the battery. There are so many different kinds of installations that it would confuse you to attempt to describe all of them. The one best way to know whether the clutch is working is to flip the air conditioner switch while the auto engine is running and then take a look at the nut on the end of the clutch mechanism and see if it is turning. This nut is the end of the crankshaft; and in most cases, it will be exposed to view when the unit is pumping or not pumping (idling).

See this drawing in **Figure 10-6**:



(Fig. 10-6)

An automobile air conditioning system is just like any other system as far as the principle is concerned. There will be an evaporator inside of the car. The pump will be mounted by the engine, and the condenser will be out in front of the radiator. The principle the condenser works on is that it depends upon a stream of air to come through the front grill of the auto while the auto is in motion. This air will cool the hot gas down to a liquid. The liquid leaves the bottom of the condenser, and in most cases, flows into a small receiver much like the receiver on commercial equipment, but much smaller. Instead of being horizontal, it may be an upright tank. The liquid leaves this tank through a liquid line; and in many cases, there will be a sight glass in this liquid line through which you can actually see the liquid flowing to the expansion valve and evaporator.

See the drawing in **Figure 10-7**.

The suction line from the evaporator runs back to the low side of the pump; and generally, you will find a service valve there which can be back-seated. By backseating this service valve, you can put your gauge hose on with little effort. You will find that these valves have a valve stem cover which must be removed before you can backseat the valve itself. On newer model cars, service valves are no longer used. Instead they have schraeder valves that look like air cores for inner tubes. The gauges can attach to these. You may also find that the suction test port is in an accumulator near the