I purchased a Hit and Miss Gas engine literally as a basket case. Much to my dismay upon reassembly the marks on the cam and crank gear really didn’t mean anything. Several evenings latter, with blisters on my hands from attempted starting my good friend Brady and I sat down with the cam on the bench and a carbonated beverage of our choice in our hand. A lengthy conversation ensued and when we put the cam back in, set the ignition the engine started on the first pull. I’ve since relayed this on several occasions to others and it has worked flawless for them also. Here’s what we came up with.

1. Forget for the time being about Top Dead Center (TDC), save that for ignition timing. For the purpose of cam timing on these old engine we should concern ourself with finding the middle of the exhaust stroke, or the piston in the middle of it’s travel on the up stroke. On a Horizontal engine this would be with the crank at the point when it’s closest to the ground. On a vertical engine you may need to find a way to measure the travel of the piston and position it according. One way or another get your engine with the cam out of it in this position.

2. For the most part there are two styles of cams. Those that operate just the exhaust valve, and those that work both the exhaust valve and trip the timing in some way. For simplicity sake we will begin with the style that works just the valve and then go back and ad the style that also trips the ignition. Either type of cam though, THE EXHAUST VALVE MUST REMAIN OPEN FOR 90 DEGREES OF CAM ROTATION.

3. The engine is positioned as mentioned in step one, and you’ve got the cam in your hand. A 3 X 5 card or something simular and a good machinist ruler or caliper is real handy here. Fold a good 90 degree corner of the card in a way that the crease you create is a 45 degree angle. So now you have a measuring tool with a 90 degree corner and 45 marked running right up the middle. A drill bit or anything else you might have laying around the shop that fits into the hole in the center of the cam and gives you a good idea of the center is handy also (honestly I just eye balled this part).
4. Your cam should look something like this, but pretend my star is a gear, and if your
gear looks like my star with pointed teeth, well you should start shopping for a new
cam gear.

Position your folded card on the cam like I have the shaded box above. Using your
ruler or caliper rotate the card until you find the position where the two “x” dimensions
I have illustrated are equal distances. Mark the tooth or groove on the gear that lines
up with the crease you made by folding the card.

5. Now with the engine positioned properly, the tooth or groove that you marked
should be the spot on the gear that is meshing with the gear on the crankshaft.
Insert the gear this way.

6. Adjust your valve lash so that the valve is just beginning to open at Top Dead
Center. You should find now that the valve will close at bottom dead center.

7. Adjust your ignition timing to fire right at or just a little before Top Dead Center.

8. Start your engine and enjoy!
9. For the style of cam that trips both the ignition and the valve, things look more complicated, but the procedure is the same. Like in the illustration below the cam has two “ramps” that the follower rides up. The first ramp is going to trip our ignition, then the pushrod will move a little more and stop until the end of the power stroke when the valve needs to open. Keep in mind that the particular cam you have may be a mirror image of my illustration depending on the engine set up. Either way you are looking for the Higher of the two ramps on the cam to set your valve timing. If this is the style you have mark the appropriate spot and go back to step 5.