# Engine Upgrade Instructions
## For Cyclone Rakes with Old Tecumseh or B&S Intek and Vanguard Engines

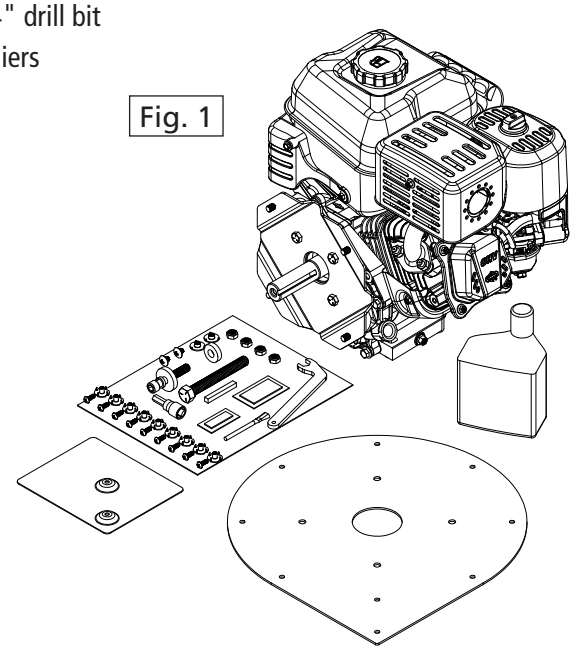
### Parts and Tools Provided (Fig. 1)

- Special curved wrench (included if replacing a Tecumseh engine)
- A 5/16 hex-bit socket
- An impeller bolt with lock washer and heavy washer
- A new backplate
- An aluminum engine heat shield
- A 1/2-13 x 4" full threaded bolt (for use as an impeller puller, if needed)
- A 1/4" crankshaft spacer
- A set of four low-profile 5/16-18 nuts
- A shaft key for engine
- A packet of anti-seize grease (for engine shaft) and applicator brush.
- A packet of thread locker
- A set of extra T-nuts and screws
- A set of two 1/4" T-nuts and screws
- A set of two plastic plugs
- A bottle of oil

### Customer Tools Required:

- A socket wrench (3/8" drive),with a 6" or longer extension bar, and a 3" extension
- A 1/2" and a 3/4" sockets
- A 7/16 " wrench or socket
- A 1/2" box wrench
- A small flat blade screwdriver (3/16" or 1/4" blade width)
- A 2-foot length of 2 x 4 lumber or other sturdy object
- A drill with 1/4" drill bit
- Vise grips or pliers

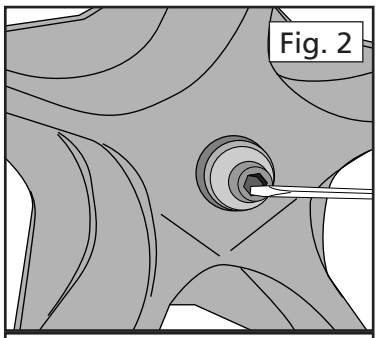
Fig. 1



## Step 1. Remove the impeller bolt:

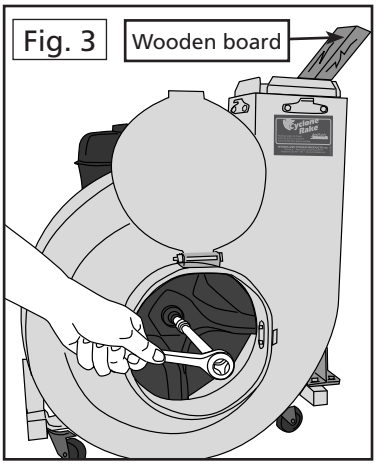
- Disconnect the spark plug wire on the old engine.
- ***Clean the impeller bolt hex socket thoroughly,*** using the small blade screwdriver. You must remove ***all dirt and debris*** so that the hex-bit socket seats all the way to the bottom of the bolt head. See Fig. 2.
- Place the wooden 2x4 or other long, sturdy object into the top of the blower housing to prevent impeller rotation. See Fig. 3. Use a ratchet with 6" extension and a 5/16" hex drive bit to remove the impeller bolt. See Fig. 3.

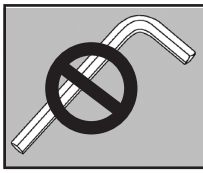
Fig. 2



**Note:** Thoroughly clean all debris from the impeller bolt hex socket before trying to remove the bolt.

Fig. 3



**WARNING:** Never use an L-shaped hex wrench to remove the impeller bolt. You will not get enough torque and risk stripping the bolt head. If you strip the bolt head, you will not be able to remove the engine.

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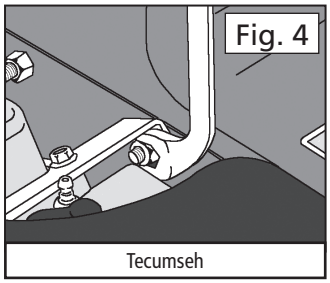
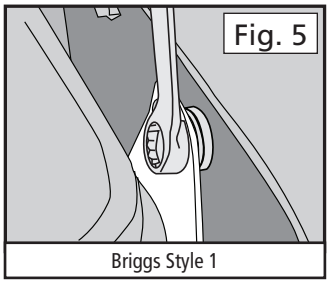
## Step 2. Remove the blower housing nut which connects the engine to the blower unit

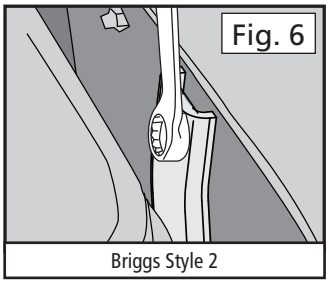
- For Tecumseh engines, use the special curved wrench to remove the nut. See Fig. 4.
- For other engines, use the 1/2" box wrench.
- There are several styles of bracket under the nut, depending on the engine being replaced, but the nut is the same for all. See Fig. 5 & Fig. 6.



Tecumseh



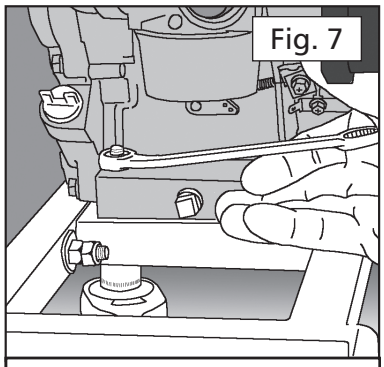
Briggs Style 1



Briggs Style 2

## Step 3. Remove the engine bolts

- Use a 1/2" socket from below and a 1/2" box wrench from above to remove all four bolts. See Fig 7. Set them aside. You will use these later.

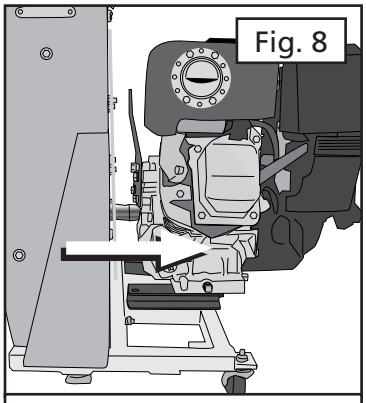


Remove the engine bolts

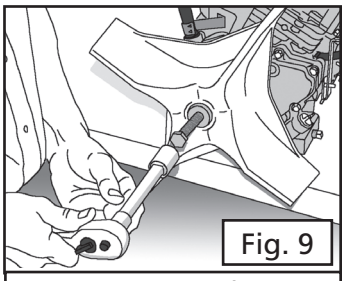
## Step 4. Remove the engine and frame from Blower Unit

**TIP:** Because the engine frame is on wheels, it is helpful to clamp one or two short lengths of 2x4 to your work bench so the frame does not roll around. This is especially helpful if you are doing a one-person job.

- Pull the engine away from the blower housing. See Fig 8. The engine shaft should pull right out of the impeller. If necessary, reach inside the front of the blower to support the impeller while you pull out the engine. The impeller will stay inside the sealed blower housing.
- If the impeller does not pull out easily by hand, insert the 1/2-13 x 4" bolt into the hub and use a 3/4" socket to tighten the bolt. It will act as a puller to remove the impeller. See Fig. 9.



Slide engine out



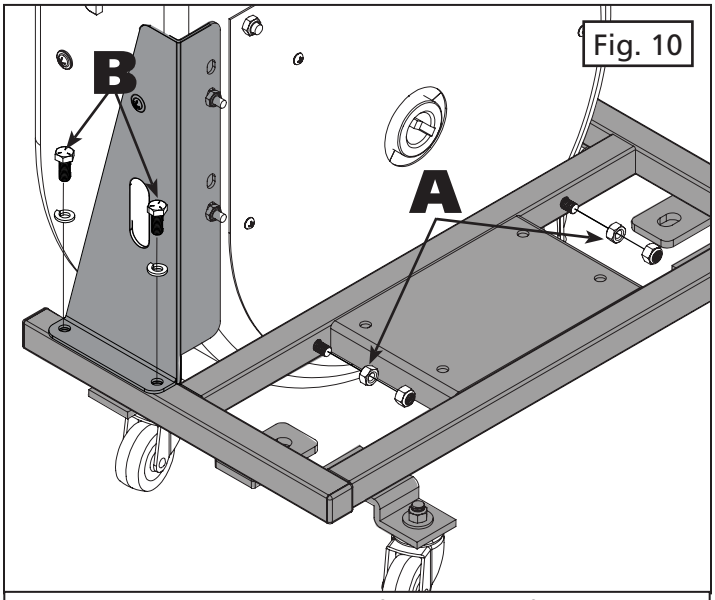
Use 1/2" puller bolt if needed

## Step 5. Remove the engine frame from blower unit

- Use a 1/2" wrench to remove all four nuts holding the bottom of the blower unit to the engine frame. See Fig. 10A.

**NOTE:** If the carriage bolts spin while removing the nuts, hold the head of each carriage bolt with pliers or vise grips from inside the blower unit.

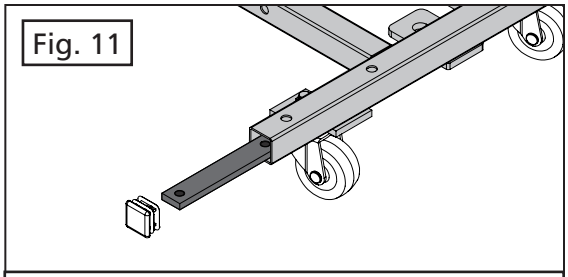
- Use a 1/2" wrench or ratchet with 1/2" socket to remove the bolts securing the blower Support Bracket to the engine frame. See Fig. 10B.
- Hold the engine frame steady and slide the blower away from the engine frame until separated.



Remove the nuts and bolts from the engine frame.

## Step 6. Remove threaded insert from the engine frame

- Use a flat head screwdriver or other tool to gently pry the cap plug from the end of the engine frame.
- Tilt the engine frame to slide out the threaded insert, Fig. 11, then reinstall the cap plug.



Remove threaded insert

## Step 7. Prepare the blower unit for new engine

- Lay the blower face down on its inlet to remove the two carriage bolts. See Fig. 12A.

**NOTE:** If necessary, push or gently tap the two carriage bolts into the blower housing to remove.

- Use a 1/2" wrench or ratchet with 1/2" socket to remove the nut holding the threaded stud of the backplate gusset. See Fig. 12B.

**NOTE:** If necessary, push or gently tap the backplate gusset into the blower to remove.

- Use a 7/16" wrench or ratchet with 7/16" socket to remove the nuts holding the support bracket to the back of the blower.
- Lift off the support bracket to remove. See Fig. 13.

**NOTE:** If necessary, push or gently tap the support bracket gusset with studs into the blower housing to remove.

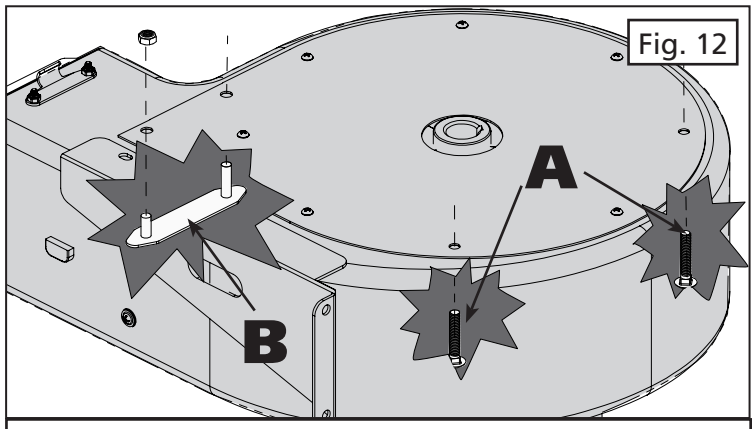
- Use a #2 Phillips screwdriver to remove the six pan head screws from the old blower backplate. You may need to grip the T-nuts on the inside of the blower with pliers or vise grips.
- Lift off the old back plate and discard. See Fig. 14.
- Look around the inside of the blower and discard any hardware that was pushed inside during disassembly.
- Locate the 2 holes left by removing the support bracket and support bracket gusset. Reach inside blower housing and fit the neck of a 1/4"-20 T-nut into one of the mounting holes. See Fig. 15.
- Then, hand thread a 1/4" truss head screw into the T-nut until it bites. Finish tightening with Phillips screwdriver.
- Repeat to seal off second support bracket mounting hole.
- Locate the new backplate. Align the new backplate over back of blower. See Fig. 16

**NOTE:** Some of the holes in the new backplate will NOT line up with the old holes in the lower housing.

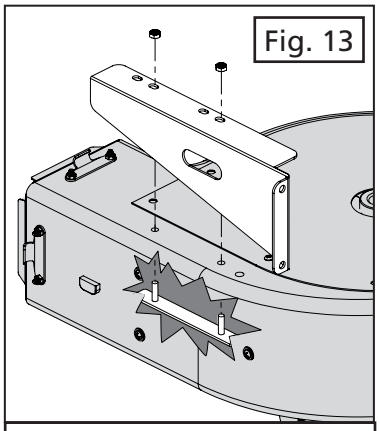
- Hand start five pan head screws in holes as shown.

**NOTE:** We have provided extra T-nuts and screws. Replace any that fall out or are difficult to tighten.

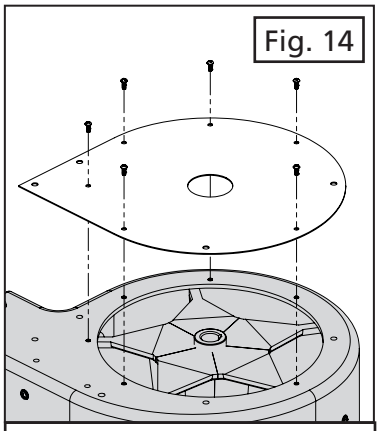
- Finish tightening with #2 Phillips screwdriver



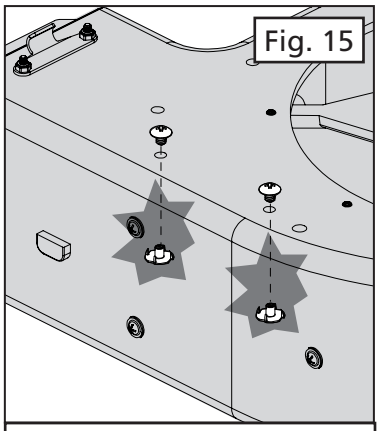
Remove the carriage bolts and backplate gusset from inside the blower unit



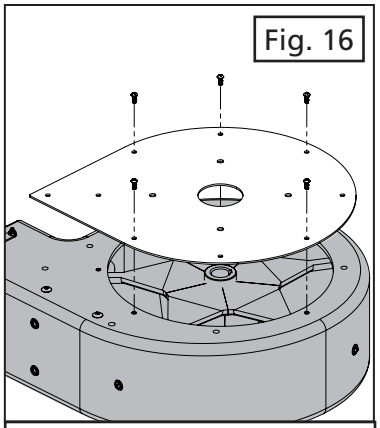
Remove support bracket gusset



Remove the old backplate

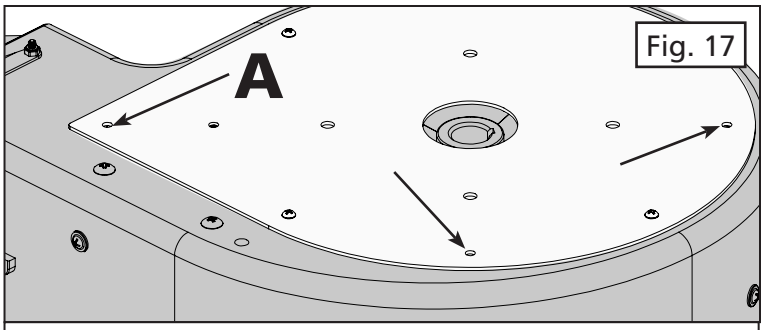


Fill gusset holes

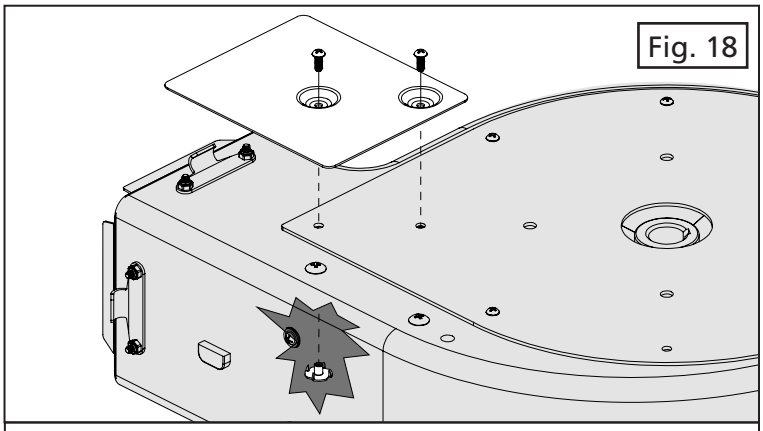


Carefully install the new backplate

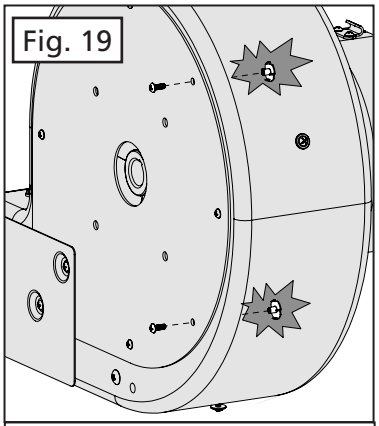
- Drill three additional holes into the blower unit using the backplate as a drill guide. Use a 1/4" drill bit to drill the holes into blower housing at marked locations. See Fig. 17.
- Locate the aluminum heat shield.
- Reach inside blower housing and fit the neck of a 10-24 T-nut into the newly drilled hole nearest the blower's square exit hole. See Fig. 17-A.
- Align aluminum heat shield over mounting holes. See Fig 18.
- Secure with two pan head screws and tighten with a #2 Phillips screwdriver.
- Stand up the blower unit on its flat side.
- Reach inside blower housing and fit the neck of a 10-24 T-nut into one newly drilled lower holes. See Fig. 19.
- Hand thread a 10-24 pan head screw into the T-nut until it bites. Finish tightening with Phillips screwdriver.
- Repeat for the second hole.
- Locate the 1/4" spacer.
- Insert spacer into the impeller's hub. See Fig. 20.
- Use a screwdriver or other object to slide it all the way in until it is flush against the end of the hub's bore.



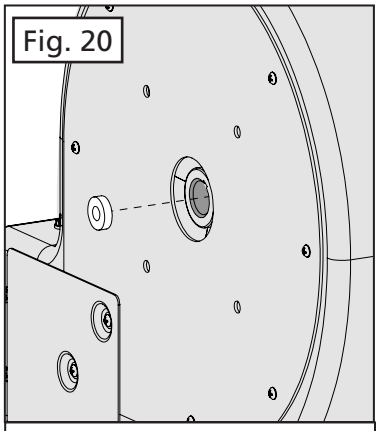
Drill 3 holes into blower .through the backplate



Install aluminum heat shield



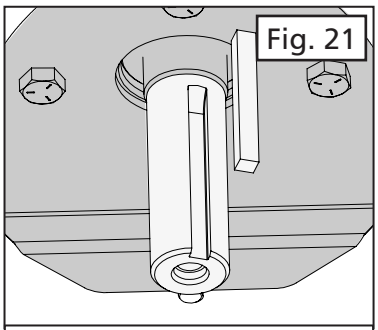
Install the lower T-nuts & screws



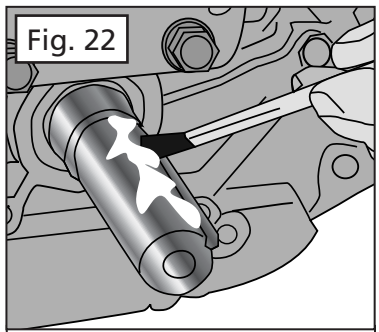
Insert spacer into Impeller hub

## Step 8. Prepare the new engine shaft

- **Set the new engine on table with crankshaft and mounting bracket hanging over edge.**
- Disconnect the spark plug.
- Orient the new engine shaft so the keyway is on top. Gently pull the starter cord to rotate the shaft into position. See Fig. 21.
- Clean the shaft keyway with a clean rag to remove all dust or grit from the keyway.
- Press the shaft key into the keyway to seat it completely. You can tap it with a soft object, such as a screwdriver handle, if needed. ***But do not tap it with a hammer!*** If you nick the key, it will not fit the impeller hub.
- Open the pack of anti-seize grease and squeeze it onto the applicator brush. Coat the shaft and key completely with the grease. See Fig. 22.



Install shaft key into key way



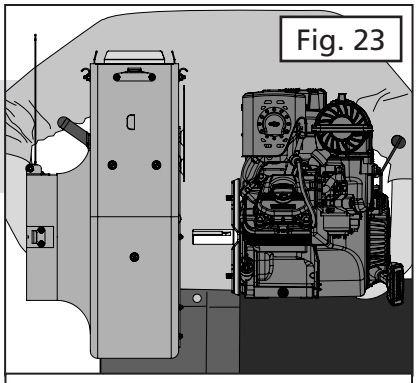
Coat shaft key with grease

## Step 9. Connect the engine to the impeller

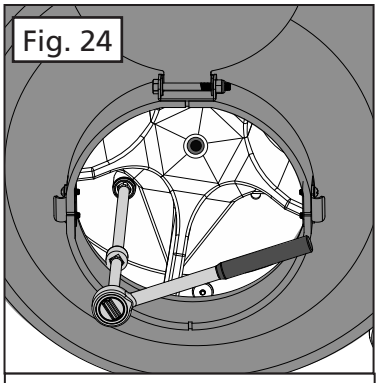
**TIP:** This can be done by one person. But it's a lot easier if you have a helper. The helper doesn't need any mechanical skill.

- Using one arm, reach through the front of the blower to grasp the impeller. Hold the impeller so the steel hub passes through the hole in the rear of the blower unit. With the other arm, slide the engine toward the impeller. See Fig. 23. Orient the slot in the impeller hub with the engine shaft key.
- Be sure to align the four holes on the blower backplate with the threaded studs on the engine plate. Push until fully seated.
- Secure the blower to the engine plate with four low profile nuts.
- Tighten the nuts using a ratchet with a 3" extension, 6" extension, and 1/2" deep socket. See Fig.24.

**NOTE:** You may need to rotate the impeller by hand to reach all four nuts.



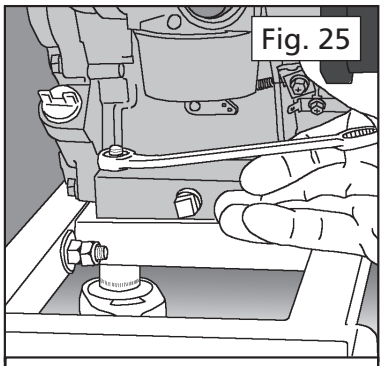
Slide engine onto impeller



Secure engine plate

## Step 10. Installing the engine frame

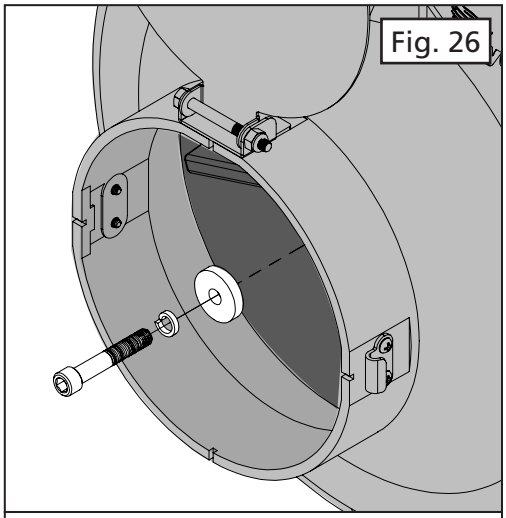
- Lift the engine and blower unit onto the engine frame.
- Connect the base of the engine to the engine frame with four bolts, lock washers, and nuts.
- Tighten the nuts with a 1/2" wrench and ratchet with 1/2" socket. See Fig. 25.



Tighten engine bolts

## Step 11. Install the impeller bolt

- Place the wooden board back into the exit chute to prevent the impeller from rotating.
- Add a drop of thread locker to the included Impeller bolt (socket head cap screw).
- Slide the Impeller bolt through the lock washer and the thick washer, then hand thread them through impeller hub and into crankshaft. See Fig. 26.
- Use a ratchet with 6" extension and 5/16" hex driver to firmly tighten the impeller bolt (about 40 ft.-lbs.). See Fig. 27.



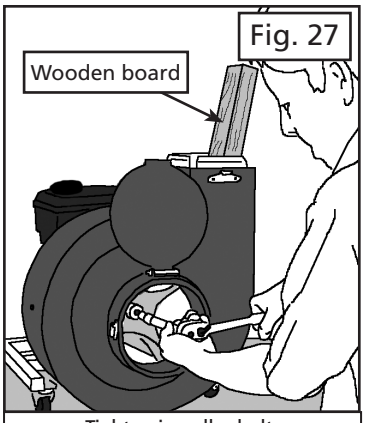
Install impeller bolt

## Final Steps

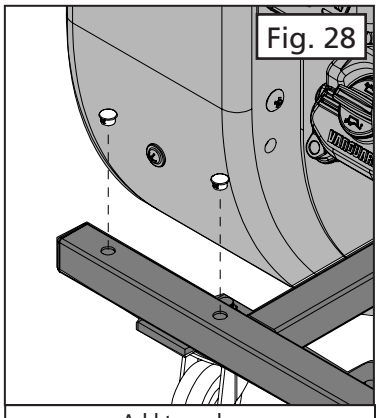
- Locate the 2 plastic plugs and snap them into the exposed holes located on the side of the engine frame. See Fig. 28.
- Reconnect the spark plug.

***Congratulations! You're all done.***

**NOTE:** Please refer to the engine's manual provided for instructions on how to add oil and use your new Briggs & Stratton engine.



Tighten impeller bolt



Add two plugs.