

Please read this  
operation Instructions, be-  
fore operating

**ZS1105G SERIES**  
**DIESEL ENGINE**  
**OPERATION MANUAL**

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**Our company has met the ISO9001 Quality Assurance System  
by authentication**

## Precautions

1. Don't touch the heating and turning parts.
  2. Don't let those people enter into the operating place, for the children, slow-action old man, epileptic or the man who has no disposing capacity.
  3. Don't make the engine operate for a long time without operator.
  4. This kind of diesel engine operates with the power of 12.1kW and with the rated 2200r/min in 12-hour operation. As for the performance, please read the performance specification attached for reference don't operate the engine in over-speed and over-load.
  5. After starting, allow the engine idle operating in 3~5minutes and it is prohibited to run the engine in high speed and over-load.
  6. Don't set the adjusting screw of governor system to make the engine operate in over speed.
  7. Don't shutdown the engine by means of push down decompression lever unless heavy accident happens.
  8. Don't feed the salt-water or dirty water into water tank.
  9. Feed and replace the fuel and lubricating oil stipulated in Operation Manual.
  10. Feed the lubricating oil in air filter according to the requirement of Operation Manual.
  11. Ensure that the red (blue) floater is not below the hopper of water tank during its boiling water operation.
  12. As soon as engine starts, starting handle leave off automatically. It is necessary to hold the starting handle to avoid it to fly out.
  13. In the climate below 0 C, to prevent the cylinder block and head from breaking, the cooling water should be drained in good time.
  14. Firmly fasten the connections between the engine and the working machine and take the necessary protecting measure in pulley belt area.
  15. If there are some trouble occurring, keep the damaged site in original situation and settle it after consultation between sales agent and repairman.
  16. Run in and maintain the engine according to the requirements of Operation Manual.
- As the diesel engine is now improving constantly, and there maybe some difference between the manual and the diesel engine, and we will correct it when we revise the manual, Please forgive us for this matter.

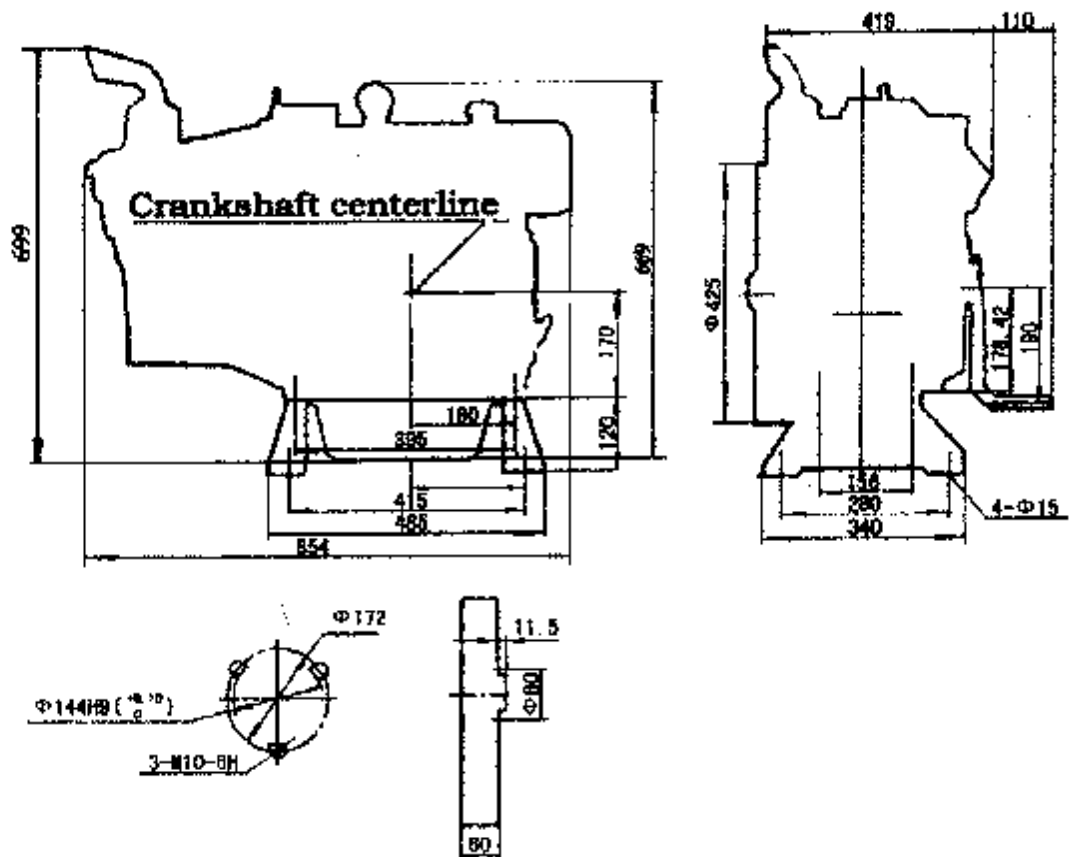
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ZS1105G Diesel Engine Over-all Size and Mounting Size

## **Section I . General Description**

**ZS1105G Diesel engine, is the single cylinder, horizontal, 4-stroke, direct injection and water evaporative cooling diesel engine. Having the advantages of light weight, compact construction, easy transport , simple installation, little vibration, smooth running and easy maintenance. It is ideal power machine combined with mini-tractor with four wheels, transportation vehicle with three wheels, inland ships, engineering machinery, processing machines for agricultural products and sideline products(e.g. Thresher, rice mill, flour-milling machine, fodder grinder).**

**The operation of this kind of engine is reliable. It should be the perfect choice of all the customers and good assist in your enriching road.**

## Section II . Principal Technical Specifications

Model	ZS1105G	ZS1105GM
Type	Single-cylinder, horizontal, four-stroke	
Combustion system	Direct-injection	
Cylinder bore	105mm	
Piston stroke	115mm	
Piston displacement	0.996l.	
12-hour power	12.13 kW	
1-hour power	13.34kW	
Rating rotation speed	2200r/min	
Compression ratio	17	
B.M.E.P	664kPa	
Specific fuel consumption	$\leq 246.2\text{g/kW} \cdot \text{h}$	
Injection pressure	$18.13 \pm 0.5\text{MPa}$	
Cooling method	Water-evaporative	
Starting method	Hand cranking	Hand cranking + motor cranking
Net. Weight	$\leq 158\text{kg}$	$\leq 163\text{kg}$
Overall dimensions	$858 \times 450 \times 699$	$970 \times 463 \times 699$
Valve clearance(cold engine)	Intake valve $0.35 \pm 0.05\text{mm}$	
	Exhaust valve $0.45 \pm 0.05\text{mm}$	
Torque of cylinder head nut	$290\text{N} \cdot \text{m} \sim 310\text{N} \cdot \text{m}$	
Torque of flywheel nut	$350\text{N} \cdot \text{m} \sim 450\text{N} \cdot \text{m}$	
Torque of connecting rod bolts	$88\text{N} \cdot \text{m} \sim 110\text{N} \cdot \text{m}$	
Fuel injector type	PF68S19	
Fuel injector nozzle	ZCK154S42A	
Fuel injection pump type	BFG1 AK90Z02 fuel injection pump	
Fuel filter type	C0506B	
Generator	Flywheel AC generator	
Air filter	According to the requirement of customer	
Valve Timing	Intake valve open	$14^\circ$ before T.D.C.
	Intake valve close	$38^\circ$ after B.D.C.
	Exhaust valve open	$42^\circ$ before B.D.C.
	Exhaust valve close	$14^\circ$ after T.D.C.
Fuel injection timing	$21^\circ \pm 1^\circ$ before T.D.C.	

### Section III . Selection of the Size of Pulleys

When the flywheel of diesel engine is connected with working machine, the selection of the size of pulleys, directly affects the operation conditions of the engine and the productivity of the driven machine. The size of pulleys may be calculated according to the following formulas:

$$D_2 = \frac{D_1 \times n_1}{n_2}$$

Where:

$D_1$  is the diameter of the engine pulley (The diameter of V-belt used for pulley is calculated by the pitch diameter, mm):

$D_2$  is the diameter of the pulley on the shaft of the driven machine (The diameter of V-belt used for pulley is calculated by the pitch diameter, mm):

$n_1$  is the rotation speed of the engine:

$n_2$  is the rotation speed of the driven machine.

One V-belt pulley with pitch diameter of 125mm is attached to the engine on its delivery from the factory (If the pulleys of special size are required, it can be ordered through negotiation.).



## Section IV. Operation and Adjustment of the Engine

### (1)、Preparation

#### 1. Lubricating oil

Use lubricating oil #CC15W/40 in summer . #CC15W/30 in winter.

**Caution: The oil level must not go over the upper line on the dipstick, nor fall down below the lower one , when the engine is in operation.**

#### 2. Diesel fuel

Use light diesel fuel #0 in summer, #-10 or #-20 in winter.

(1) Loosen the vent screw on the fuel injection pump or loosen the fuel pipe connection. When it is noted that fuel without air bubbles flows out, retighten the vent screw or connections.

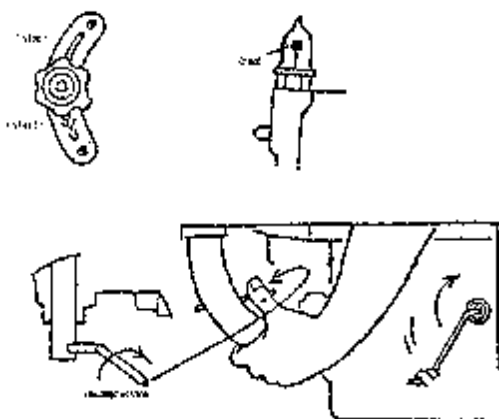
(2) Set the speed --- control lever knob at the "start" position indicated on the panel. Screw off the plug on the gear casing , insert the fuel priming handle through the hole and move it to and fro until a "chattering" action of the fuel injector is noted.

**Caution: Pour clean diesel fuel into the fuel tank. Do not get into any dust.**

#### 3. Cooling water

Pour clean water into the hopper, until the red ball of the float stem rises up to the highest position. Do not use dirty water or water which contains alkaline or salt.

### (2)、Starting the Engine



Set the speed --- control lever knob at the "start" position indicated on the panel.

Push down the decompression lever towards the right with your left hand and hold it, Crank the engine clockwise with your right hand by means of the starting handle and gradually speed up. When the cranking speed attains its maximum, suddenly release the decompression lever, but continue to crank the engine with effort. Then the engine will start running itself.

After starting, check again the red float in the oil indicator and see if it rises up, and allow the engine to run for 3~5 minutes at low speed without any load just after its being started, then increase the speed gradually and load the engine.

**Caution:**

**Once the engine starts up running, the starting handle, because of the action of the spiral – jaws on its clutching end, will disengage and jerk out of itself, and therefore the operator must keep on holding it firmly in order to prevent any incident.**

**★ Running at high speed with full load after its being started is strictly forbidden.**

### **( 3 )、 Stopping the Engine**

Gradually unload the engine and let it run idle for a while. Move the speed – control lever knob to the “stop” position, the engine will then stop running.

If the engine is to be put out of service for a long period of time,

1. Drain out the cooling water completely.
2. Turn the engine until fail to turn it, then push down the decompression lever and continue to turn the flywheel the mark – line T.D.C on the periphery of the flywheel coincides with the mark – line on the hopper.
3. Close the fuel cock.
4. Examine the oil in the air filter. If it becomes either dirty or diluted, it should be changed with clean oil, after both the filter cartridge and the filter body have been cleaned and wiped. The quantity of oil is such that its level is just up to the marked line inside the body.
5. Adjust the valve clearance to the specified value ( Intake valve clearance  $-0.35\pm 0.05$ mm, exhaust valve clearance  $-0.45\pm 0.05$ mm).

### **( 4 )、 Adjustment of Valve Clearance**

1. Turn the Flywheel until the mark T.D.C. on its periphery coincides with the line marked on the hopper, in order to set the piston at its top dead center position in the compression stroke.
2. Remove the cylinder head cover.

3. Loosen the locking nut and the adjusting screw on the rocker arm, set the valve clearance to the specified value by means of a feeler gauge inserted between the valve stem and the rocker arm. (Intake valve clearance is 0.35 mm. And exhaust valve clearance 0.45mm).

4. In the course of adjusting screw — in the adjusting screw to such an extent that push rod is just free to turn but not too loose. When this is done, tighten the locking nut in order to prevent any loosening afterwards.

5. Remove the feeler gauge and check the clearance once again.

6. Install the cylinder head cover to ensure normal operation of the decompression handle.

### **(5)、 Adjustment of Fuel Injection Timing**

Disconnect the high-pressure fuel pipe from the injector. Loosen the nut which connects the high pressure fuel pipe to the injection pump, turn the pipe around so that the open end of the pipe is upwards, and retighten the nut. Turning the flywheel slowly. Until the fuel just begins to flow out of the open end of the pipe. Stop turning and check whether the mark — line on the periphery of the flywheel coincides with the mark line on to hopper, In case the injection timing is too advanced or too lagging behind, adjustment is then necessary. Increase or decrease the number of shims between the pump flange and mounting surface of gear casing. Increase the number of shim if injection timing is advanced, decrease the number of shims if lagging.

**Caution: The ball of the plunger adjusting arm must be engaged with the slot in the speed — governing fork inside the gear casing.**

## Section V . Troubles and Remedies

### A. Engine Fails to Start

Cause	Remedy
1. Unsteady fuel flow	Check the fuel tank and the element of the fuel filter whether there is any water or dirt. Clean the element in clean fuel if it is choked with dirt, or clean the fuel tank and fill it with clean fuel of recommended grade if any water is found in the tank.
2. Air in the fuel pipe line	Release air and then tighten all fuel pipe connections.
3. Fuel injection timing incorrect	Adjust according to the recommended procedure.
4. Valve clearance incorrect	Adjust according to the recommended procedure.
5. In cold weather, lubricating oil becomes too viscous, difficult to crank the engine	Pour hot water into the hopper, or preheat the lubricating oil before pouring it into the oil sump, but do not heat the oil sump with external fire. It is also advisable to disconnect the engine from the driven machine by pulling off the belt, then start the engine. Stop it after the engine has been warmed up, repute the belt on and start the engine again.
6. Insufficient compression in the cylinder	The wearing-out of intake and exhaust valves, as well as of piston, piston rings and cylinder liner is the main factor to give rise to insufficient compression. Pouring about 25 grams of lubricating oil into the intake manifold will be of some assistance to increasing the compression pressure in the cylinder. If leakage at the cylinder head gasket occurs, it is then necessary to tighten the cylinder head nuts. Any worn gasket should be replaced.
7. Pumping element (plunger and barrel) of the injection pump or injector nozzle worn-out	Replace with new one.

## B. Engine Does Not Develop Full Power

Cause	Remedy
1. Insufficient compression in the cylinder	Proceed as item 6 under "Engine Fails to Start." If parts are worn, in excess of the specified wear limit, then replacement should be made.
2. Fuel injection timing incorrect	Adjust according to the recommended procedure.
3. Valve clearance incorrect	Adjust according to the recommended procedure.
4. Air filter choked	Clean it in clean fuel or kerosene.
5. Engine speed too low or too high	Adjust the speed-control lever knob to make the speed attain its rated value.
6. Opening pressure of the injector incorrect	Replace the pumping element (plunger and barrel) of the injection pump, or injector nozzle, adjust the opening pressure of the injector to $18.13 \pm 0.5$ MPa.

## C. Engine Stalls

Cause	Remedy
1. Flow of fuel interrupted	Supply with sufficient quantity of fuel to tank. If there is air in the fuel pipe line or the fuel filter is choked, vent and remove all air and dirt.
2. Quantity of lubricating oil insufficient, or some parts burnt due to faults in lubrication system	Examine the quantity of oil by means of the dipstick, replenish if insufficient. Inspect the oil pump to see if it works normally and check all oil ducts. Find out the troubles and remedy them. Replace the burnt part with new one if any exists.
3. Sticking of the needle valve with the nozzle body of the injector	If no "chattering" is heard from the injector while turning the starting shaft of the engine, it will often indicate that the needle valve is stuck or seized. In that case, clean it in clean fuel and lap it a little with the nozzle body. Replace it if necessary.
4. When the load increased, speed system blocked	Find out the reason of block and remedy them
5. Valve spring or injection pump spring broken	Replace a new one

### D.Engine Exhausts Dense Black Smoke

Cause	Remedy
1.Engine overloaded.	Reduce the load appropriately.If the belt- ing or coupling with the driven machine is not right,correct it.
2.Faulty injector.	Check the opening pressure of the injector and the atomization of the fuel spray.Correct it if necessary,or replace it if worn.
3.Incomplete combustion.	This results mainly from faulty injector,incor- rect fuel injection timing,leakage through the cylinder head gasket and from insufficient compression.etc.Remedy whatever the real cause may be.
4.Connecting rod bearing shells burnt,or stick- ing of the bearing shells with crankshaft.	Replace the connecting bearing shells,or re- pair the crankshaft.

### E.Other Defects

(If any of the following conditions arises, it is necessary to stop the engine immediately)

Cause	Remedy
1.Engine speed "hunting"	Check the sensitivity of the governor system, and vent the fuel supply line if there is any air in it.
2.Abnormal engine noise suddenly arises	Make a careful check for every moving part
3.Engine suddenly exhausts black smoke	Proceed according to the part "D".
4.Red float in the oil indicator suddenly drops down	Examine the lubrication system to see if the oil strainer screen and other oil duct are choked to observe whether the oil pump operates normally.

## Section VI. Dismounting and Reassembly of the Engine

If it is necessary to dismount the engine for maintenance and repair, it is recommended to proceed in the following order:

- A. Draining out the cooling water by opening the drain cock.
- B. Removing the cylinder head cover and the cylinder head.

1. Turn off the pipe connection bolt from the inlet of the oil indicator and the fixing nuts on the cylinder head cover. Then the cylinder head cover may be removed.

2. Close the fuel cock under the fuel tank, and then disconnect the fuel - leak - off connecting pipe of the injector from the fuel filter.

3. Screw off the two bolts which connect the air filter with the intake pipe. And remove the air filter and intake pipe.

4. Screw off the two bolts which connect the exhaust silencer with the cylinder head and remove the silencer as a whole.

5. Turn off the two nuts which hold down the rocker-arm shaft support on the cylinder head, remove the support and draw out the two valve push rods.

6. Remove the high pressure fuel pipe.

While reinstalling the high pressure fuel pipe, it is necessary to turn but not to tighten the connecting nuts on both ends of the pipe simultaneously, and first tighten the one which connects the pipe with the injection pump. Operate the pump with the fuel priming handle until fuel flows out of the other end of the pipe which is connected with the injector. Then tighten the nut on this end.

7. Screw off the nuts holding down the injector clamping plate, then remove the injector and the clamping plate.

While reinstalling the injector, the sealing copper washer should be slipped on the nozzle before it is put back into its place. The two nuts are to be tightened evenly.

8. Turn off the cylinder head nuts, and remove the cylinder head. While reinstalling, the cylinder head nuts are to be tightened one by one in a diagonal order and with a final torque of about 290~310 N·m.

9. Remove the fuel cylinder head gasket. Pay attention to the right-side and back-side of it when remounting.

C. Removing the fuel tank and the hopper

- 1. Close the fuel cock in the fuel supply pipe.
- 2. Remove the lifting eyenut.
- 3. Disconnect the fuel supply pipe from the fuel filter.
- 4. Screw off two bolts located above the rear cover of the cylinder block, which fix the fuel tank on the block, and also screw off the two bolts connecting the fuel tank and the hopper together. Then remove the fuel tank.

5. Remove the funnel assembly from the hopper.
6. Screw off the four bolts inside the hopper, which fix the hopper on the cylinder block. Then take off the hopper and remove the hopper gasket.
7. Remove the upper cover of the cylinder block and its gasket.

#### D. Dismounting the gear casing

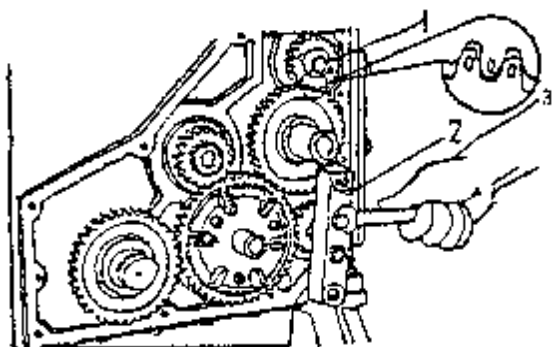


Fig. 1 Arrangement of gear train (tooth- mesh- makes must be lined up) and dismantling of balancing shaft gear by means of a puller

1. Fixing bolt
2. Puller

#### E. Removing the rear cover of the cylinder block.

1. Take out the oil dipstick.
2. Screw off the bolts which fit the rear cover on the cylinder block, then remove the rear cover and its packing.

#### F. Dismantling and reinstalling the piston-connecting rod assembly

1. Turn the flywheel until the big end of the connecting rod is in the position nearest to the rear opening of the cylinder block, in order to facilitate the removing of the connecting rod bolts.
2. Cut off by means of a pair of pliers the steel wire which locks connecting rod bolt and remove it. While re -installing, new wires should be used and twisted tightly.
3. Unscrew the connecting rod bolts by means of the special wrench supplied with the engine.
4. Take off the connecting rod cap.

**Caution: The connecting rod bearing shells must be well protected while taking off the cap.**

5. Turn the flywheel slowly until the piston is at the top dead center position (Any carbon deposit on the wall of the cylinder liner should be pre-moved). Then push slowly the piston-connecting rod assembly out of the cylinder bore by means of a wooden rod against the big end of the connecting rod through the rear opening of the cylinder block.

**Caution: Be careful of this operation not to damage the crankpin, the cylinder liner and the piston.**

1. Screw off the bolts which fix the gear casing to the cylinder block, and take off the gear casing.

2. Draw out the camshaft along with its gear, and take of the starting gear along with its shaft.

3. Dismantle the speed-governor gear, sliding ball-race and steel balls.

While assembling, it is absolutely necessary that marks on all the gears must be respectively lined up with one another as they were before dismantling.



While reinstalling, the  $45^\circ$  parting surface of the big end of the connecting rod must be kept downwards, the cap must be fitted on in such a way that the matching marks on both the cap and the rod should be on the same side. The piston rings are to be so fitted on to the piston that the gaps are spaced  $120^\circ$  apart from one another, and the ends of the second and third compression rings on which there is a mark "T" are kept upwards (towards the cylinder head). The connecting rod bolts are tightened with a torque of about  $88\sim 110\text{N}\cdot\text{m}$ , but before being completely tightened, it is necessary to turn the flywheel to see if the moving parts move freely, and then tighten the bolts evenly and completely. Furthermore, while reinstalling, the crankpin, the connecting rod bearing shells, the piston and the piston rings are connecting rod, then after replacement, the connecting rod should be so assembled back with the piston as it was before.

#### G. Dismantling the flywheel

1. Remove the pulley.
2. Unlock the lock washer of the flywheel nut.
3. Loosen the flywheel nut by means of a special wrench (knock the handle of the wrench with a hammer counter-clockwise, if necessary.), but do not screw it off (Fig. 2)

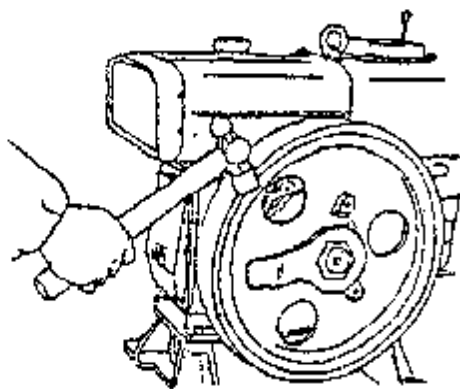


Fig. 2 Loosening the flywheel nut by knocking the handle of the wrench with a hammer.

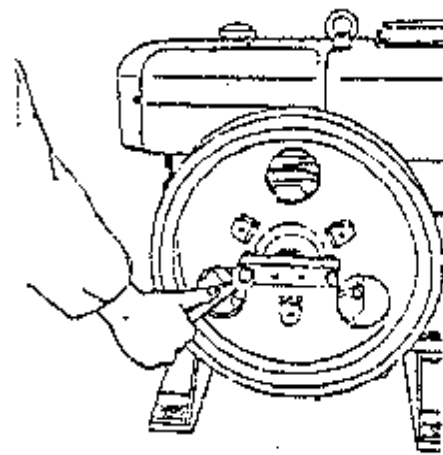


Fig. 3 Removing the flywheel by means of the puller

4. Pull out the flywheel by means of the puller. A hammer may be used to knock the center of the bridge of the puller if the flywheel is difficult to pull out (Fig. 3, Fig. 4).

5. Screw off the flywheel nut and take off the flywheel. Be careful not to damage the thread on the end of the crankshaft while taking off the flywheel, and do it with safety since the flywheel is heavy.

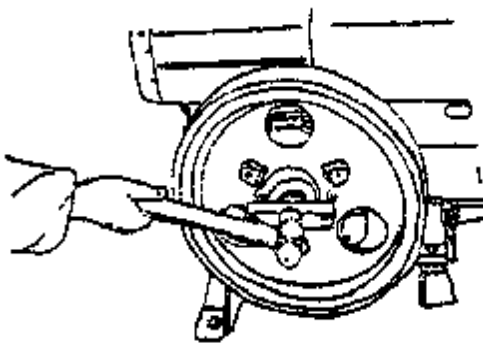


Fig. 4 Knocking the center of the bridge of the puller by means of a hammer.

6. Remove the flat key from the crankshaft by means of a M6 cap screw.

H. Removing and reassembling the crankshaft.

1. Take off the oil pipe, which connects the main bearing housing with the oil indicator by screwing off the pipe connection from the housing.

2. Remove all the fixing bolts of the main bearing housing.

3. A wooden hammer may be used to knock the timing gear side of the crankshaft and carefully take the crankshaft out of the cylinder block.

**Caution: during this operation, all the bearing on the crankshaft should be protected from being scratched or damaged.**

I. Removing and reassembling the balancing shafts

Under ordinary conditions, it is not recommended to remove the balancing shafts. But if the ball bearings are worn and need to be replaced, they may be removed and reassembled according to the following procedure:

1. Take off the bearing cover of the upper balancing shaft on the flywheel side of the engine, and remove the lubricating oil pump from the lower balancing shaft on the same side.

2. Screw off the bolts on the gear end of both the balancing shafts and remove the gears by means of the puller.

a) Remove the circlips from the block.

b) Tap both the balance shafts from the flywheel side of the engine by means of a wooden hammer or a copper rod, until the ball bearings on the other end of the shafts come out of the cylinder block, and then remove the ball bearing.

c) Similarly, push the balancing shafts towards the flywheel side and remove the ball bearings on this end of the shafts.

d) After removing the ball bearing, carefully take out the balancing shafts from the cylinder block.

## Section VII. Fitting Clearances and Wear limits of the Main moving Parts

No	Fitting parts	Kind of fitting	Standard Clearance mm	Limits of wear mm
1	Crankpin of crankshaft with connecting rod bearing	Clearance	0.08 ~ 0.119	0.25
2	Piston pin with connecting rod small end bushing	Clearance	0.020 ~ 0.056	0.12
3	Piston skirt with cylinder liner	Clearance	0.130 ~ 0.195	0.45
4	Open gap of the first piston compression ring		0.35 ~ 0.55	2
5	Open gap of the second piston compression ring		0.30 ~ 0.50	2
6	Open gap of oil scraper ring		0.25 ~ 0.45	2
7	Valve stem with guide bushing	Clearance	0.04 ~ 0.098	0.30
8	Rocker arm shaft with its bushing	Clearance	0.016 ~ 0.052	0.20
9	Camshaft with its front bushing	Clearance	0.035 ~ 0.089	0.25
10	Camshaft with its rear bushing	Clearance	0.03 ~ 0.093	0.25
11	Speed-governing gear shaft with its bushing	Clearance	0.02 ~ 0.066	0.25
12	Starting shaft with its bushing (A)	Clearance	0.04 ~ 0.088	0.25
13	Starting shaft with its bushing (b)	Clearance	0.04 ~ 0.12	0.25

## Section VIII. Maintenance of the Engine

Item	Maintenance	Period
1. Cooling water	As soon as the red ball of the float in the hopper goes down near the mouth of the funnel, replenish water	As required
2. Lubricating oil	As soon as the oil level in the sump drops down near the lower marked line on the dipstick, replenish oil.	Everyday
	After the first 50 hours of operation of a new engine, it is necessary to clean the crankcase and the oil sump once, and renew the oil.	First 50 hours
	Hereafter, the oil must be changed for every 100 hours of operation	100 hours
3. Lubricating oil strainer	After the first 50 hours of operation of a new engine, it is necessary to dismantle the strainer and clean it.	First 50 hours
	Hereafter, the strainer must be cleaned for every 100 hours of operation.	100 hours
4. Air filter	Ordinarily, the filter is to be cleaned and the oil inside is to be changed one every 100 hours of engine operation, when the environment air condition is comparatively clean.	100 hours
	But when the engine is used to power a walking tractor, the cleaning of the filter and the change of oil are to be done every 50 hours of operation.	50 hours
	In case the engine is operating in a dusty atmosphere, it is necessary to clean the filter and change the oil inside every shift of work.	Every shift
5. Fuel filter element	Clean the paper element of the filter with clean fuel or kerosene and blow it from inside out, Replace it if element is broken out.	100 hours
6. Cylinder head nut	Retighten cylinder head nuts with a torque of 290~310 N·m. After the first 30 hours of a new engine.	First 30 hours

Item	Maintenance	Period
7. Fuel tank and fillingscreen	<p>Remove the screen from the inlet of the fuel tank and clean it in clean fuel.</p> <p>Clean the inside of the fuel tank with clean fuel.</p>	<p>50 hours</p> <p>500 hours</p>
8. Lapping of valve	<p>Smear the valve seats with a little bit of lapping paste and lap them together with the valves carefully (Caution: do not let the lapping paste get into the valve guides). After lapping, wash the valves and the valve seats with clean fuel and wipe them dry. Checking the valve for tightness may be done by pouring into the intake and exhaust ports a small quantity of fuel and observe whether they leak out around the valve seats.</p>	500 hours
9. Valve clearance	Adjust according to the recommended procedure.	100 hours
10. Cylinder head, Cylinder liner and Piston—connecting rod assembly	<p>Remove carbon deposit if any, and clean them with clean fuel. It may not be necessary to dismantle them for cleaning if the engine operates normally.</p>	1000 hours
11. Oil ducts in the crankshaft	<p>Screw off the oil duct plug from the crankshaft. Clean the center hole of the crank pin and the two oil passages in the crankshaft with clean fuel.</p>	1000 hours
12. Cooling water passages	<p>Pour into the water passages a solution of hydrochloric acid (HCL) of 25% concentration, keep it for about 10 minutes and then blow wash with fresh water. Repeat it again if not thoroughly cleaned. Note: the hopper must be removed from the engine before cleaning.</p>	500 hours

## ❁ Section IX. Preservation and Storage of the Engine

If the engine is to be put out of service for a comparatively long period of time, it is necessary to preserve it according to the following procedure, in order to prevent any corrosion.

1. Drain out the lubricating oil from the oil sump by screwing off the oil — drain plug. Screw back the plug after draining. This operation may better be performed immediately after the engine stops running when the oil temperature is comparatively high (Fig. 5).

2. Drain out completely the cooling water by opening the water — drain cock.

3. Drain out the fuel from the fuel tank.

4. Remove the rear cover of the cylinder block. Take out the oil strainer, dismount and clean it.

5. Clean the crankcase, and then reinstall the oil strainer.

6. Clean the filtering element and the inside of the air filter.

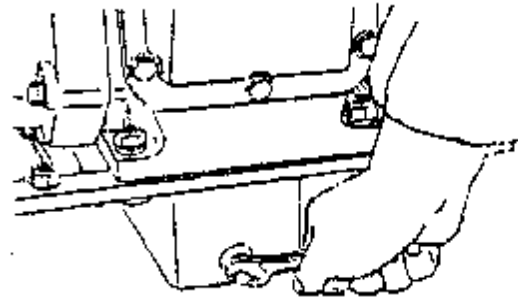


Fig 5

7. Take 1.8 kg of filtered, #CC15W/30 oil and give it a dehydration treatment (Heat it to 100~150 °C, until all bubbles on the surface of the oil disappear). Pour into the crankcase about 1 kg of this treated oil, and turn the engine. Until the red float in the oil indicator rises up, so as to make sure that the lubricating system is completely filled up with this oil.

8. Pour into the intake pipe about 0.3kg of this dehydrated oil, turn the engine to make sure that the piston, the cylinder liner and the valve seat are all covered with a layer of this oil. Then set the piston at its top dead center position in the compression stroke by turning the engine slowly, in order to isolate the inside of the cylinder from outside.

9. Add about 0.2kg of industrial vaseline to the remains of the dehydrated oil and heat it with agitation until the mixing is homogeneous.

10. Install all the parts that have been dismantled. Clean all the outside surfaces of the engine.

11. Wrap up properly the air filter, the exhaust pipe outlet and the funnel — mouth of the hopper with any kind of preservative paper in order to prevent any dust from getting in.

12. Smear with the above-mentioned mixture all the exposed surfaces of the engine which have not been painted (such as flywheel, oil pipe, etc.).

13. It is advisable not to smear the mixture on the surfaces of any parts made of rubber or plastics.

14. The engine so preserved should be stored in room of good ventilation and low humidity but without any dust. It is strictly forbidden to store the engine wherever there are chemicals (such as synthetic fertilizer, agricultural insecticide, etc.).

The preservation according to the above procedure may be good for six months. Over this period, repeat this procedure.

## PART TWO PART LIST WITH ILLUSTRATIONS

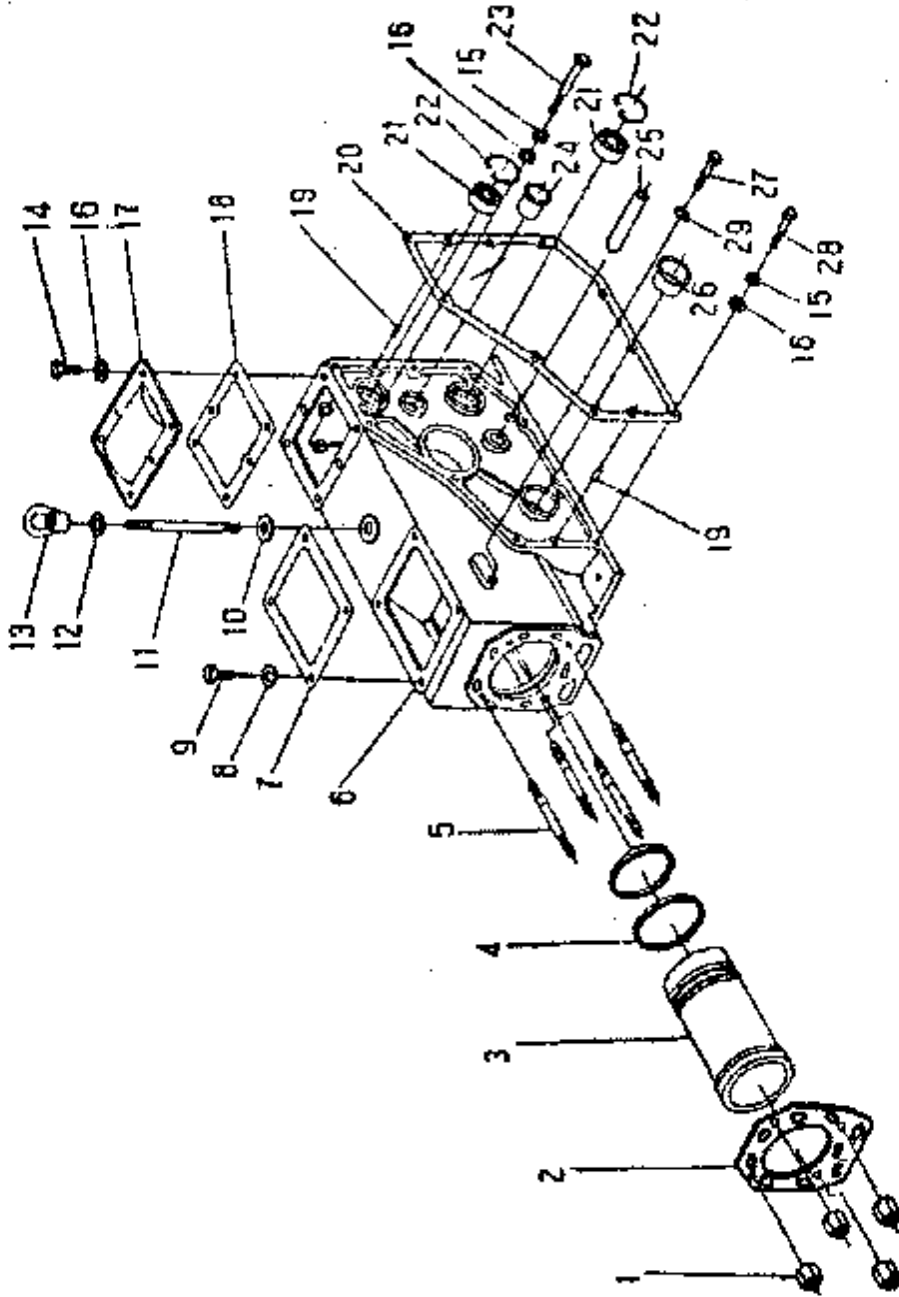


Fig.1: Cylinder Block Assembly -1

### Cylinder block Assembly — 1(Fig1)

III us NO.	Name of part	Part NO.	Qty.
1	Cylinder head nut	S195-01001	4
2	Cylinder head gasket	ZS1105G-01002	1
3	Cylinder liner	ZS1105G-01003	1
4	Cylinder liner water seal ring	S1100-01004	2
5	Cylinder head stud	ZS1105G-01005	4
6	Cylinder Block	ZS1105G-01006	1
7	Hopper packing	S195 01007	1
8	Washer 10-140HV	GB/T97.1	4
9	Hexagon bolt M10×25Zn.D	GB/T5783	4
10	Washer	S195 01008	1
11	Lifting stud	S1100-01005	1
12	Washer 12-140HV	GB/T97.1	1
13	Lifting eye nut	S195-01010	1
14	Hexagon Bolt M8×18	GB/T5783	6
15	Spring washer 8	GB/T93	9
16	Washer 8-140HV	GB/T97.1	15
17	Upper cover of the cylinder Block	S195-01011	1
18	Packing sheet of upper cover	S195 01012	1
19	Locating pin	GB/T119	2
20	Gear casing packing	S195-01014	1
21	Bearing 6205	GB/T276	2
22	Circlip	S195-01015	2
23	Hexagon bolt M8×95	GB/T5782	3
24	Starting shaft bushing (A)	S195 01016	1
25	Speed-governing gear shaft	S195 01017	1
26	Camshaft front bushing	S195-01018	1
27	Hexagon Bolt M10×25	GB/T5783	1
28	Hexagon Bolt M8×25	GB/T5782	6
29	Washer 10-140HV	GB/T93	1



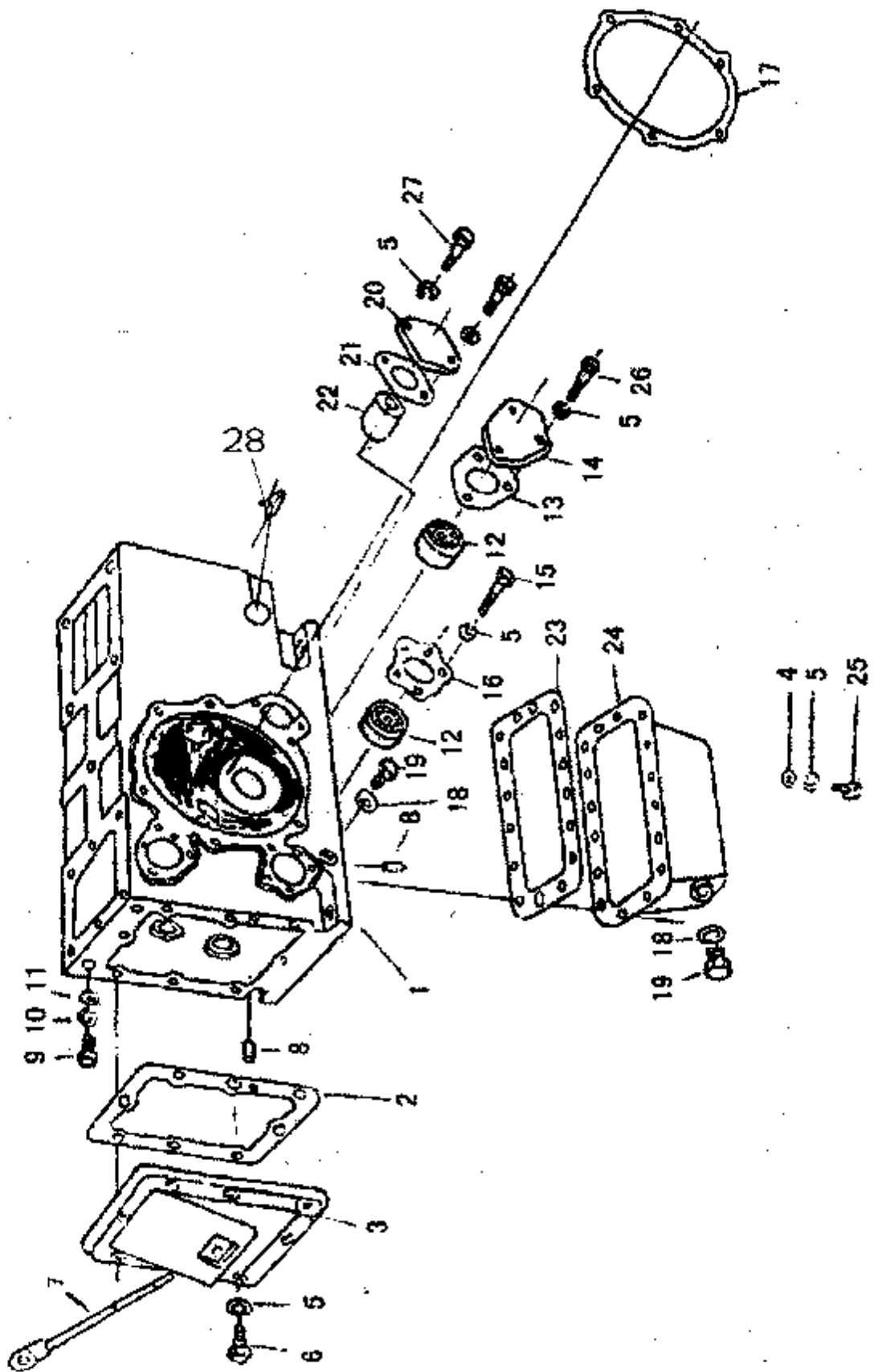
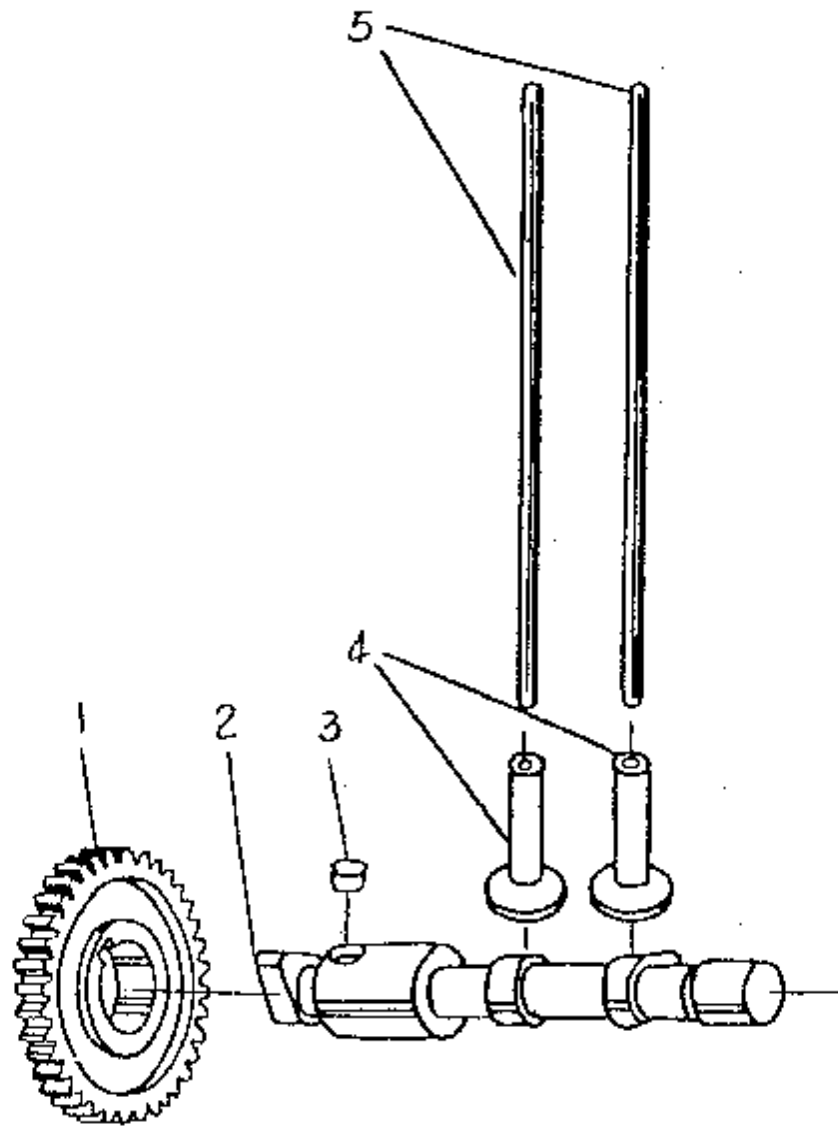


Fig.2: Cylinder Block Assembly 2

## Cylinder block Assembly — 2

III us NO.	Name of part	Part NO.	Qty.
1	Cylinder Block	ZS1105G-01006	1
2	Packing of the rear cover	S195-01019	1
3	Rear cover	S195-01020	1
4	Washer 8-140HV	GB/T97.1	16
5	Washer 8	GB/T93	38
6	Hexagon bolt M8 × 25	GB/T5783	8
7	Oil dipstick	S195-01100	1
8	Oil hole plug on the block	S195-01021	2
9	Hexagon bolt M10 × 20	GB/T5783	2
10	Washer 10	GB/T93	2
11	Washer 10-140HV	GB/T97.1	2
12	Bearing 6205	GB/T276	2
13	Packing for balancing shaft cover	S195-01022	3
14	Balancing shaft cover	S195-01023	1
15	Hexagon bolt M18 × 40	GB/T5782	3
16	Packing for lubricating oil pump	S195-01024	1
17	Main bearing Housing mounting shim	S195-01029	1
18	Washer	S195-01025	2
19	Plug	S195-01026	2
20	Camshaft cover	S195-01030	1
21	Packing for camshaft cover	S195-01031	1
22	Camshaft rear bushing	S195-01032	1
23	Packing for oil sump	S195-01033	1
24	Oil pump	S195-01200	1
25	Hexagon M8 × 18	GB/T5783	16
26	Hexagon M8 × 25	GB/T5783	3
27	Hexagon M8 × 25	GB/T5783	2
28	Water drain cock ZG3/8	S195-01300	1



**Fig.3 Camshaft Assembly**

**Camshaft Assembly (Fig. 3)**

III us NO.	Name of part	Part NO.	Qty.
1	Camshaft gear	S195-02001	1
2	Camshaft	ZS1105G-02002	1
3	Flat key 10 × 16	GB/T1096	1
4	Valve tappet	S195-02004	16
5	Valve push rod	S195-02005	38

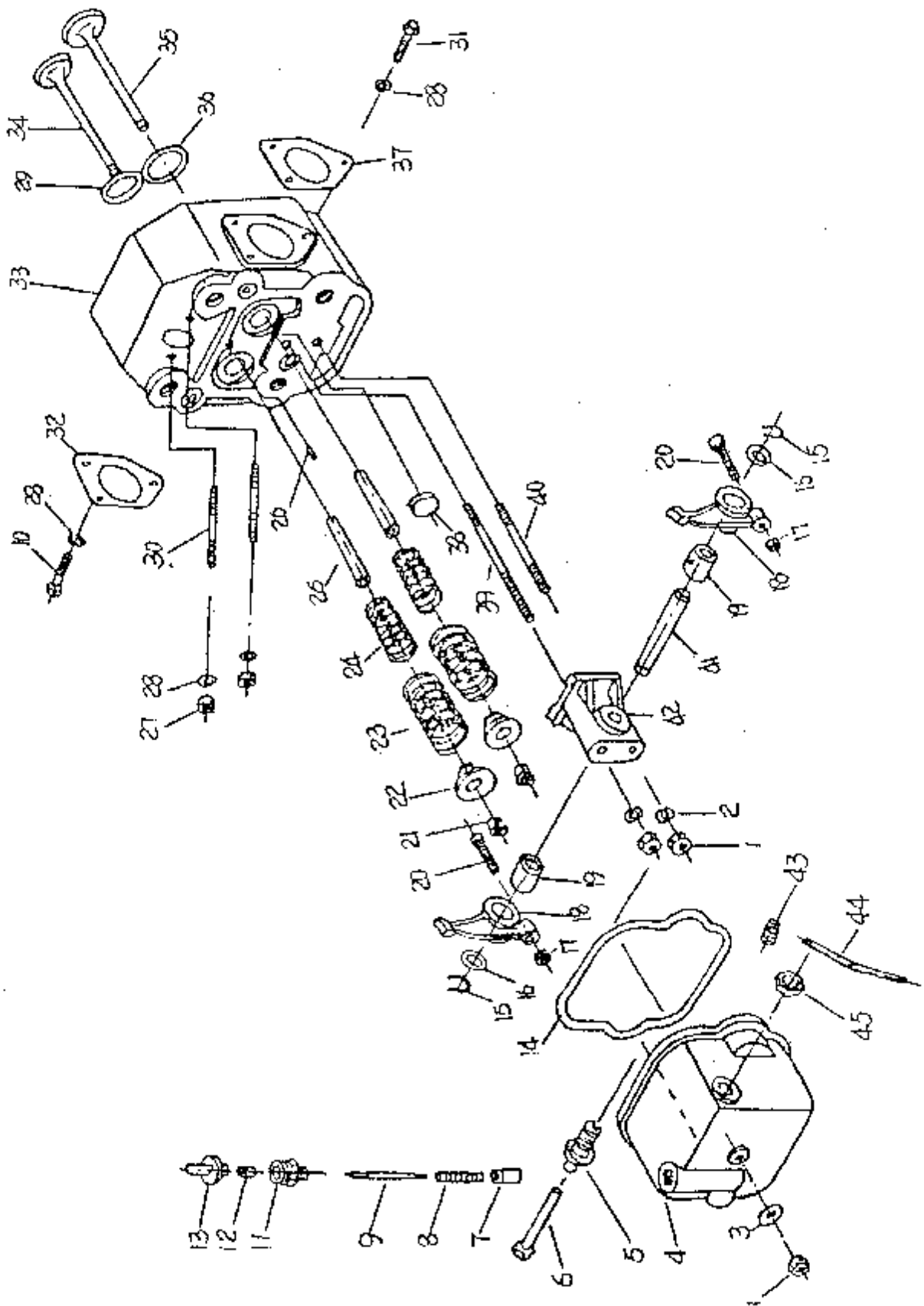


Fig.4 Cylinder Head Assembly

### Cylinder Head Assembly (Fig4)

III us NO.	Name of part	Part NO.	Qty.
1	Hexagon nut M10	GB/T6170	3
2	Washer 10	GB/T93	2
3	Washer 10-140HV	GB/T97.1	1
4	Cylinder Head cover	S195-03101	1
5	Decompression shaft bushing	S195-03102	1
6	Decompression shaft	S195-03103	1
7	Oil indicator piston	S195-03111	1
8	Oil indicator spring	S195-03112	1
9	Oil indicator spindle	S195-03113	3
10	Hexagon bolt M8×30	GB/T5783	1
11	Oil indicator union	S195-03115	1
12	Red float of oil indicator	S195-03116	1
13	Cap of red float of oil indicator	S195-03117	1
14	Cylinder head cover packing	S195-03003	1
15	Circlip for rocker arm shaft	S195-03002	2
16	Washer for rocker arm shaft	S195-03003	2
17	Hexagon nut M8×1	GB/T6176	2
18	Rocker arm	S195-03004	2
19	Rocker arm bushing	S195-03005	2
20	Adjusting screw	S195-03006	2
21	Valve collet	S195-03007	2set
22	Valve spring self	S195-03008	2
23	Out valve spring	S195-03009	2

### Cylinder Head Assembly (Fig4)

Ill us NO.	Name of part	Part NO.	Qty.
24	Inner valve spring	S195-03010	2
25	Valve guide	S195-030202	2
26	Locating pin B5×12	GB/T119	1
27	Hexagon nut M8	GB/T6170	2
28	Washer 8	GB/T93	8
29	Exhaust valve seat	ZS1105G-03201	1
30	Stud for injector clamping plat	S195-03014	2
31	Hexagon bolt M8×25	GB/T5783	3
32	Exhaust pipe packing	S195-03015	1
33	Cylinder head	ZS1105G-03017	1
34	Exhaust valve	ZS1105G-03002	1
35	Intake valve	ZS1105G-03020	1
36	Intake valve seat	ZS1105G-03021	1
37	Intake pipe packing	ZS1105G-03005	1
38	Plug	S195-03023	3
39	Long stud for rocker arm shaft support	S195-03024	1
40	Short stud for rocker arm shaft support	S195-03025	1
41	Rocker arm shaft	S195-03026	1
42	Rocker arm shaft support	S195-03027	1
43	Decompression lever spring	S195-03104	1
44	Decompression lever	S195-03105	1
45	Set nut	S195-03106	1

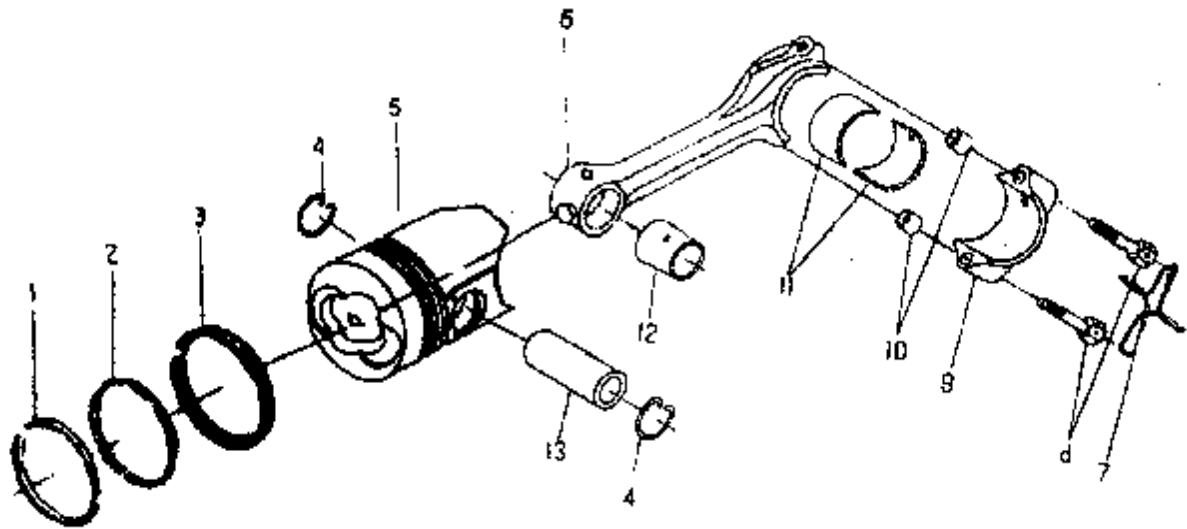


Fig.5 Piston and Connecting Rod Assembly

Piston and Connecting Rod Assembly (Fig.5)

Ill us NO.	Name of part	Part NO.	Qty.
1	Compression ring (I)	ZS1105G-04001	1
2	Compression ring (II)	ZS1105G-04002	2
3	Oil scraper ring	ZS1105G-04100	1
4	Circlip 35	GB/1893.1	1
5	Piston	ZS1105G-04005	1
6	Connecting rod	S195-04006	1
7	Locking wire	Galvanized wire $\phi 1.8 \times 170$	2
8	Connecting rod bolt	S195-04008	2
9	Connecting rod cap	S195-04009	1
10	Guide	S195-04011	2
11	Connecting rod bearing shell	S195-04010	1 set
12	Connecting rod bushing	S195-04012	1
13	Piston pin	ZS1105G-04013	1

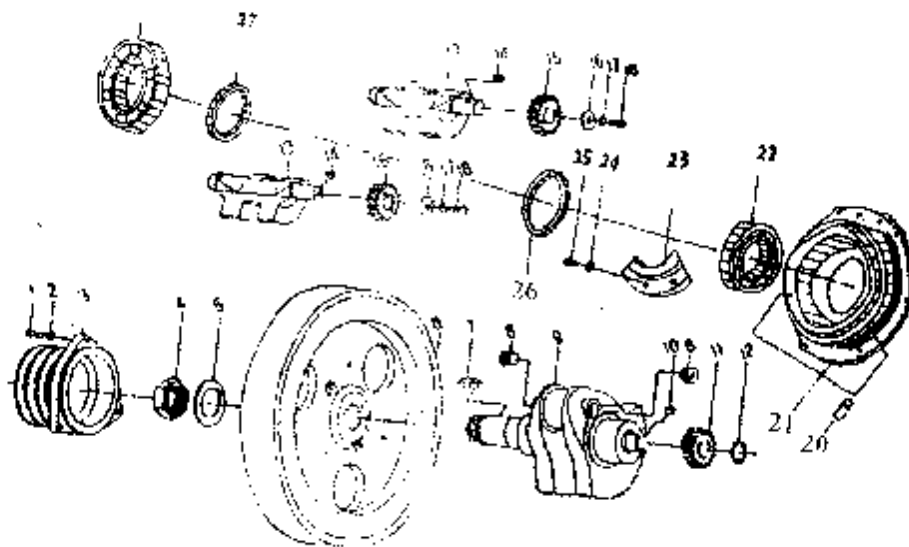
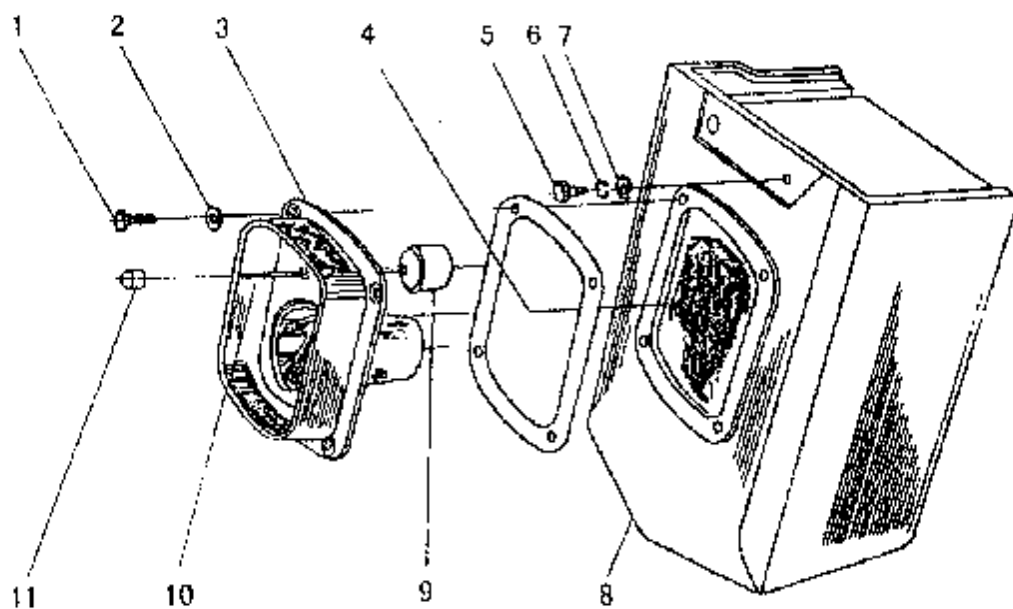


Fig 6. Flywheel Crankshaft and Balancing Mechanism

Flywheel Crankshaft and Balancing Mechanism (Fig 6)

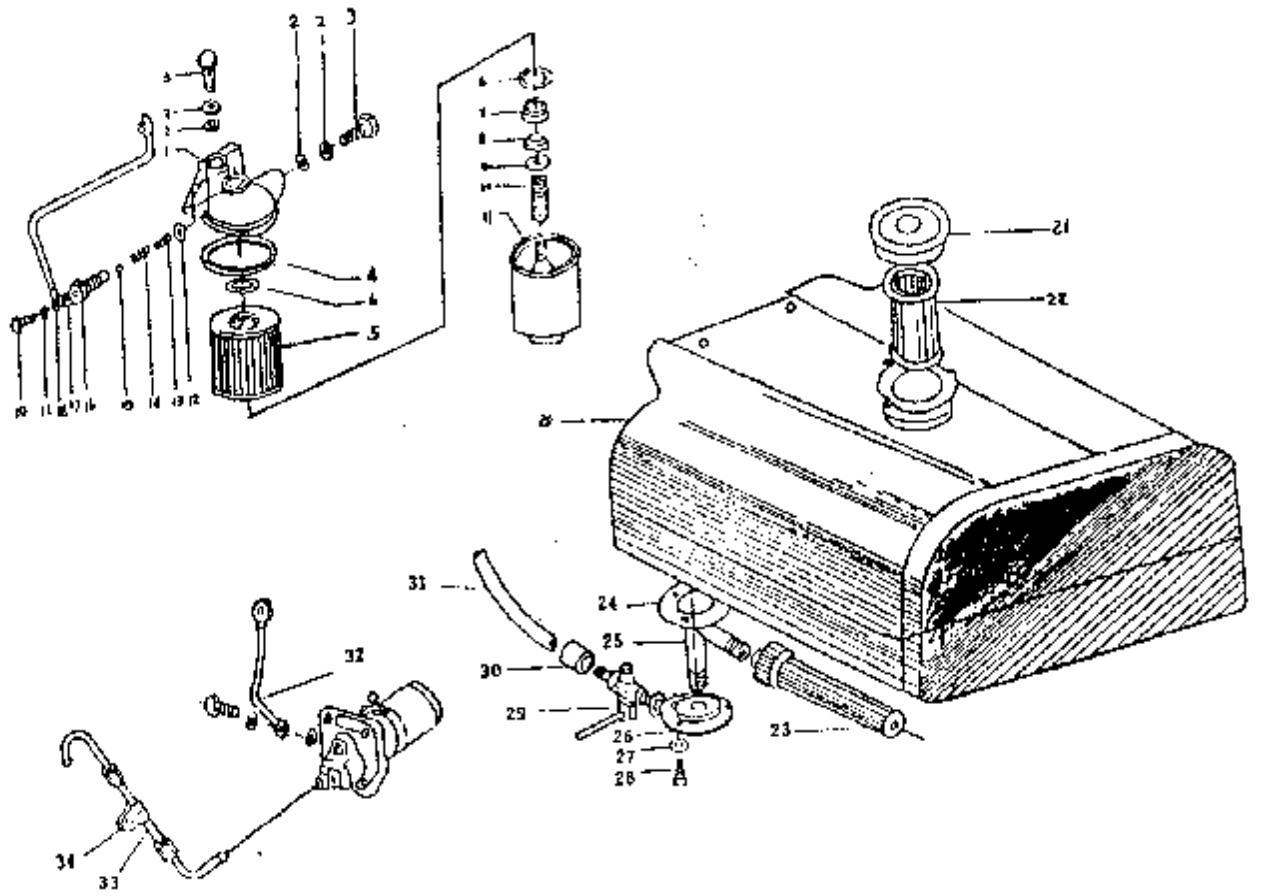
SlusNO.	Name of part	Part NO.	Qty.
1	Hexagon bolt M10 × 35	GB/T5783	3
2	Washer 10	GB/T93	3
3	V belt pulley	S195-05001	1
4	Flywheel nut	S195-05002	1
5	Lock washer	S195-05003	1
6	Flywheel	S195-05004	1
7	Flat kev 12 × 40	GB/T1096	1
8	Crankshaft screw plug	S195-05007	2
9	Crankshaft	ZS1105G-05005	1
10	Flat kev 8 × 16	GB/T1096	1
11	Crankshaft timing gear	S195-05009	1
12	Circlip 30	GB/T894.1	1
13	Upper balancing shaft	S195-05010	1
14	Flat kev C6 × 6	GB/T1096	2
15	Balancing shaft gear	S195-05012	2
16	Washer	S195-05013	1
17	Spring washer 8	GB/T93	2
18	Hexagon bolt M8 × 18	GB/T5783	2
19	Lower balancing shaft	S195-05014	1
20	Plug	S195-01021	2
21	Main bearing housing	S195G-05002	1
22	Bearing 6314	GB/T276	1
23	Fender plat	S195G-05011	1
24	Washer 6	GB/T93	3
25	Hexagon bolt M5 × 10	GB/T67	3
26	Circlip A	S195G-05014	1
27	CirClip B	S195G-05015	1
28	Bearing NJ2211	GB/T283	1





**Fig 7 Hopper Assembly**  
**Hopper Assembly (Fig 7)**

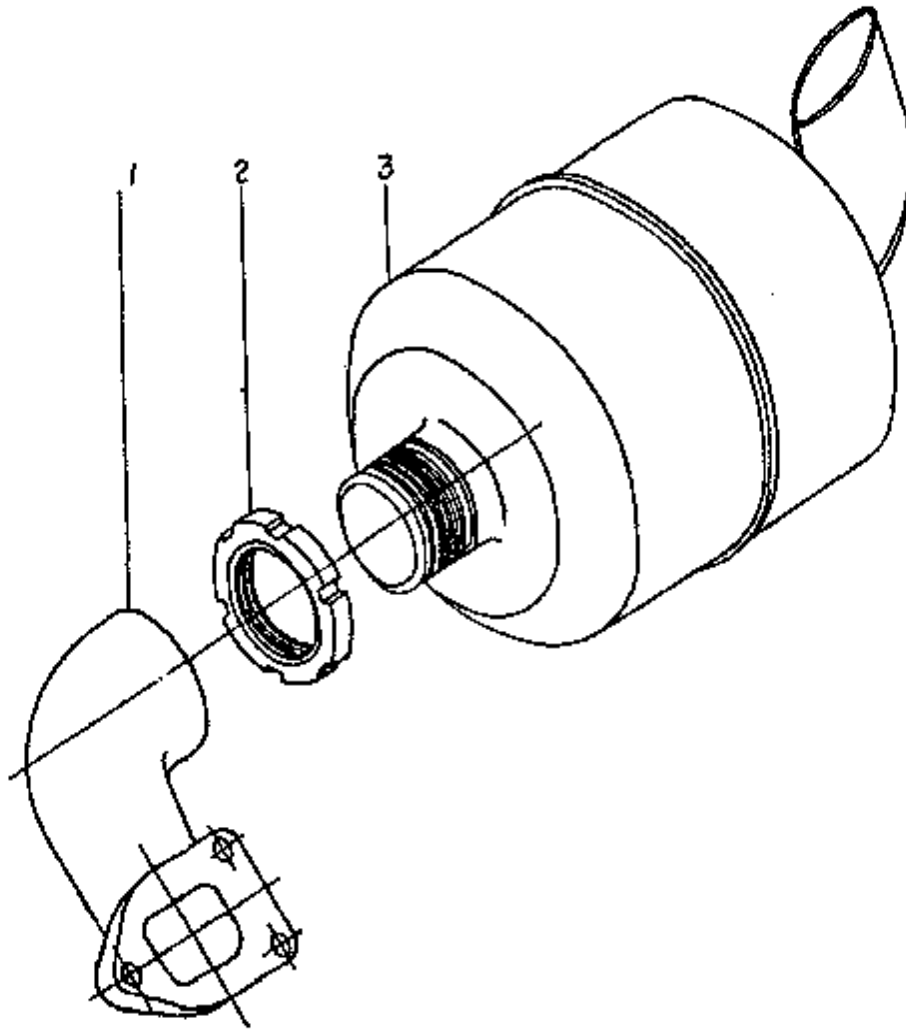
Ill us NO.	Name of part	Part NO.	Qty.
1	Hexagon bolt M8×20	GB/T5783	4*
2	Washer 8-140HV	GB/T97.1	4
3	Funnel	S195-06103	1
4	Packing for funnel	S195-06001	1
5	Hexagon bolt M8×18	GB/T-5783	1
6	Washer 8	GB/T93	1
7	Washer	S195-05013	1
8	Hopper	S1100-06001	1
9	Float	S195-06203	1
10	Float stem	S195-06101	1
11	Red indicating ball	S195-06202	1



**Fig. 8: Fuel system**

### Fuel system ( Fig 8 )

Ill us NO.	Name of part	Part NO.	Qty.
1	Fuel filter cover	C0506B-0002	1
2	Washer	S195-07204	4
3	Pipe connection bolt	S195-07203	3
4	Seal ring	C0506A-0003	1
5	Bracket	C0506A-1000	1
6	Seal ring	C0506A-0005	2
7	Bracket	C0506A-0006	1
8	Seal ring	C0506A-0013	1
9	Washer	C0506A-0015	1
10	Spring	C0506A-0016	1
11	Fuel filter body	C0506A-3000	1
12	Washer	C0506A-0001	1
13	Screw	C0506B-0011	1
14	Spring	C0506B-0010	1
15	Steel ball	C0506B-0009	1
16	One way valve seat	C0506B-0008	1
17	Washer	S195-09001	2
18	Fuel return pipe	ZS1110G-07401	1
19	Pipe connection bolt	S195-09002	1
20	Fuel tank	ZS1110G-07100	1
21	Fuel tank cap	S195-07300	1
22	Filling screen	S195-07400	1
23	Primary fuel filter	S195-07600	1
24	Packing	S195-07004	1
25	Fuel outlet pipe	S195-07005	1
26	Fuel cock seat	S195-07006	1
27	Washer	GB/T93	3
28	Hexagon bolt M6 × 16	GB/T783	3
29	Fuel cock	S195-07910	1
30	Pipe sleeve	S195-07903	1
31	Fuel feed	S195-07900	1
32	Fuel pipe	ZS1110G-07300	1
33	High pressure fuel pipe and its accessories	ZS1110G-07200	1
34	Pipe clip	ZS1110G-07205	1



**Fig. 9 Exhaust System**

**Exhaust System (Fig'9)**

Ill us NO.	Name of part	Part NO.	Qty.
1	Exhaust pipe	ZS1110G-08002	1
2	Lock nut	ZS1110G-08001	4
3	Silencer	ZS1110G-08100	3

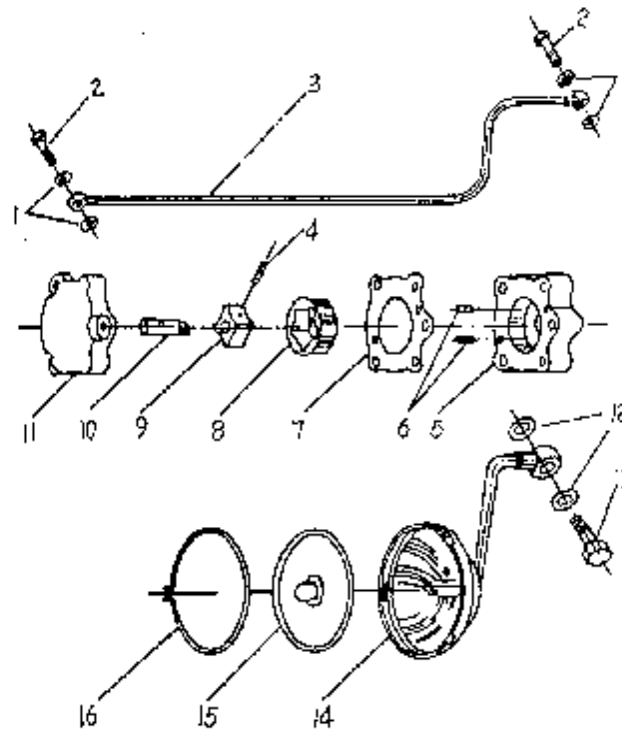


Fig . 10 Lubrication system

Lubrication system (Fig.10)

Ill us NO.	Name of part	Part NO.	Qty.
1	Washer	S195-09001	4
2	Pipe connecting bolt	S195-09002	2
3	Oil pipe	ZS1110G-09100	1
4	Cylindrical pin	S195-09201	1
5	Lubricating oil pump body	ZS1110G-09201	1
6	Locating pin	GB/T119	2
7	Lubricating oil pump packing shim	ZS1110G-09202	As required
8	Outer rotor	ZS1110G-09204	1
9	Inner rotor	ZS1110G-09211	1
10	Oil pump shaft	ZS1110G-09212	1
11	Oil pump cover	ZS1110G-09203	1
12	Washer	S195-01025	2
13	Pipe connection bolt	S195-09003	1
14	Oil strainer body with suction pipe	S195-09310	1
15	Oil strain screen	S195-09320	1
16	Circclip	S195-09301	1

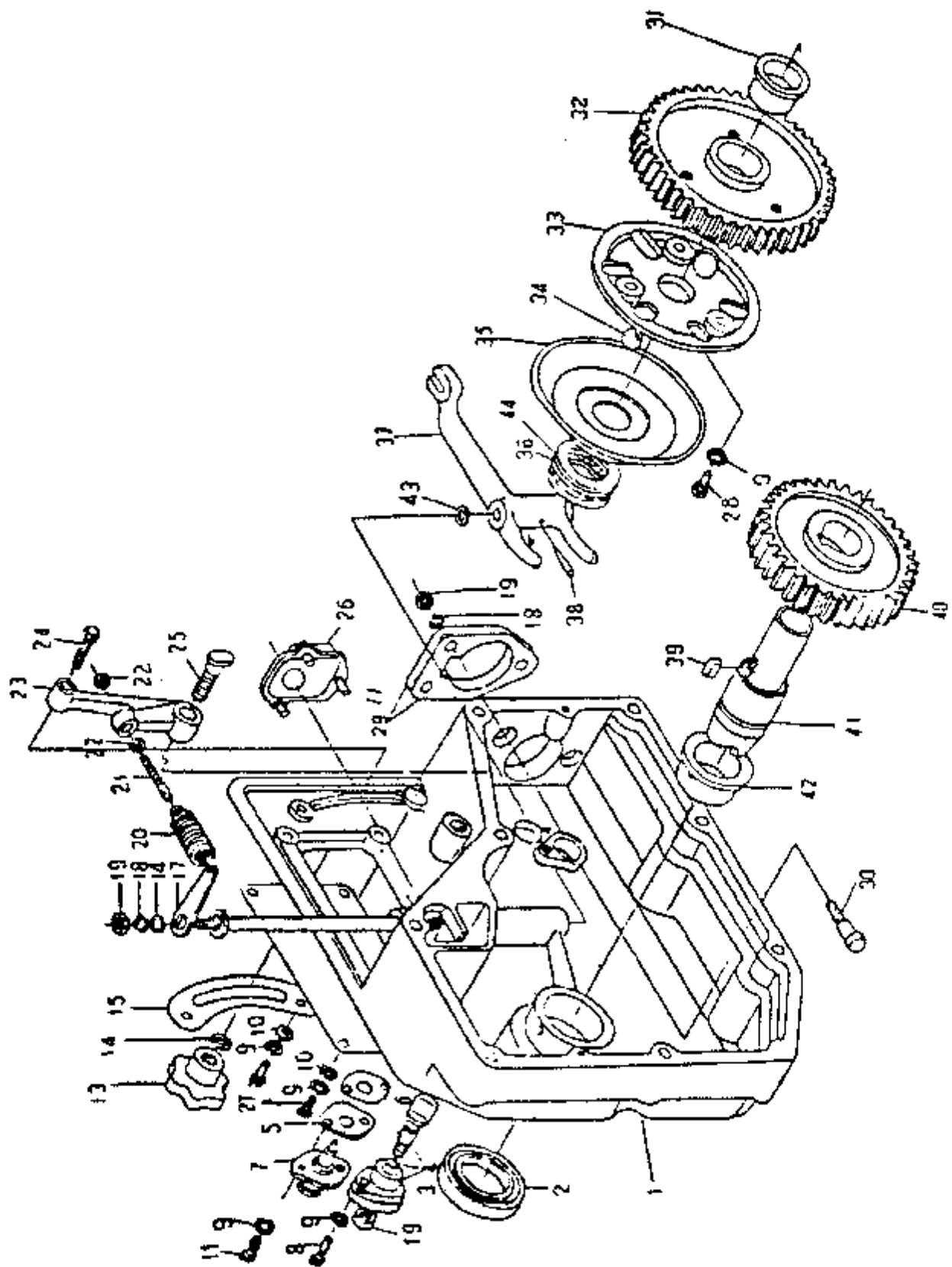


Fig 11 Gear Casing Assembly

### Gear Casing Assembly(Fig 11)-1

Ill us NO.	Name of part	Part NO.	Qty.
1	Gear casing	ZS1110G-10001	1
2	Oil seal ring $\phi 35 \times 58 \times 12$		1
3	Packing for fuel priming handle bushing	S195-10404	1
4	Fuel priming handle bushing	S195-10400	1
5	Cover	S195-10003	1
6	Fuel limiter packing	S195-10002	1
7	Fuel limiter	ZS1110G-10200	1
8	Screw M6 $\times$ 20	GB/T67	1
9	Washer 6	GB/T93	8
10	Washer 6-140HV	GB/T97.1	9
11	Screw M6 $\times$ 16	GB/T67	2
12	Name plate	ZS1110G-10002	1
13	Speed control lever knob	S195-10200	1
14	Washer 8-140HV	GB/T97.1	2
15	Speed indicating panel	ZS1110G-10003	1
16	Governor fork shaft	S195-10101	1
17	Governor arm	S195-10102	1
18	Washer 8	GB/T93	4
19	Hexagon nut M8	GB/T6170	4
20	Governor spring	ZS1110G-10138	1
21	Adjusting screw	S195-10104	1
22	Hexagon nut M6	GB/T6170	2

## Gear Casing Assembly(Fig 11)-2

Sl. NO.	Name of part	Part NO.	Qty.
23	Speed control lever	S195-10105	1
24	Hexagon bolt M8 × 40	GB/5783	1
25	Speed control lever shaft	S195-10106	1
26	Crankshaft breather	S195-10500	1
27	Button head cap screw M6 × 12	GB/T67	6
28	Button head cap screw M6 × 18	GB/T67	6
29	Shim for fuel injection pump	S195-10007	As required
30	Fuel injection pump mounting bolt	ZS1110G-	3
31	Governor gear bushing	S195-10107	1
32	Governor gear	S195-10108	1
33	Governor ball space	S195-10109	1
34	Steel ball 16	GB/T	6
35	Governor ball race	S195-10120	1
36	Single direction thrust ball bearing 51106	GB/T301	1
37	Governor fork	S195-10121A	1
38	Taper pin 4 × 25	GB/T1117	1
39	Flat key 8 × 6	GB/T1096	1
40	Starting gear	S195-10302	1
41	Starting gear shaft	S195-10303	1
42	Starting gear shaft bushing	S195-10010	1
43	Adjusting washer	S195-10113	As required
44	Packing for governor ball race	S195-10031	As required



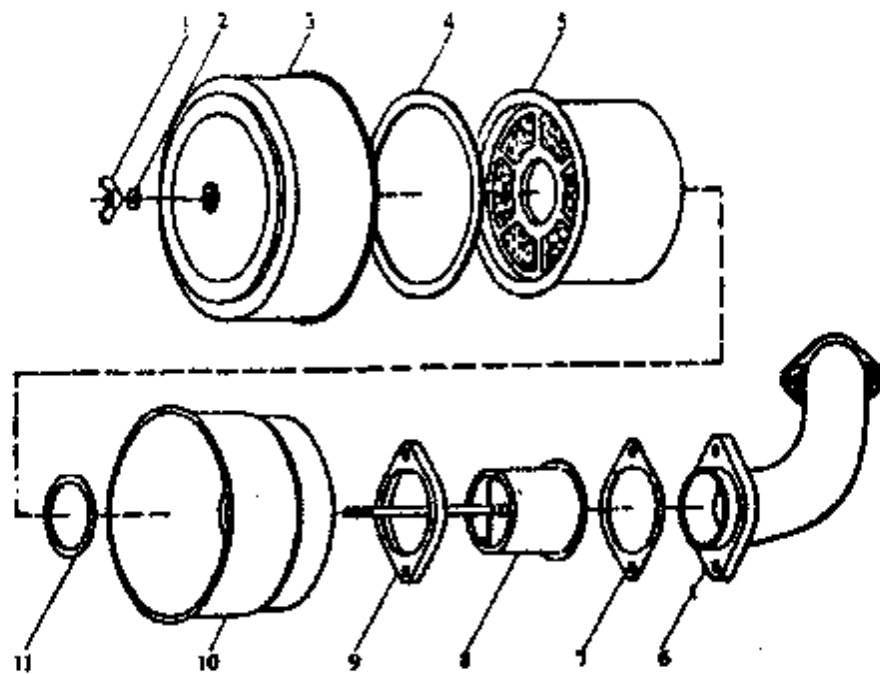


Fig. 12 Intake System

Intake System (Fig. 12)

III us NO.	Name of part	Part NO.	Qty.
1	Wing nut AM8	GB/T62	2
2	Washer 8	GB/T95	2
3	Airfilter cover	K1212QNX-2000	2
4	Rubber packing	K1212QNX-0002	1
5	Airfilter element	K1212P-1000	1
6	Intake pipe	ZS1110G-11001	1
7	Intake Pipe Packing	ZS1110G-03005	1
8	Exhaust dust bag	K1212QNX-0005	1
9	Check hoop	K1212QNX-0004	1
10	Screw M5 × 6	GB/T66	1
11	Hexagon nut M5	GB/T39	1
12	Air filter body	K1212QNX-3000	1
13	Seal ring	K1212QNX-0003	1

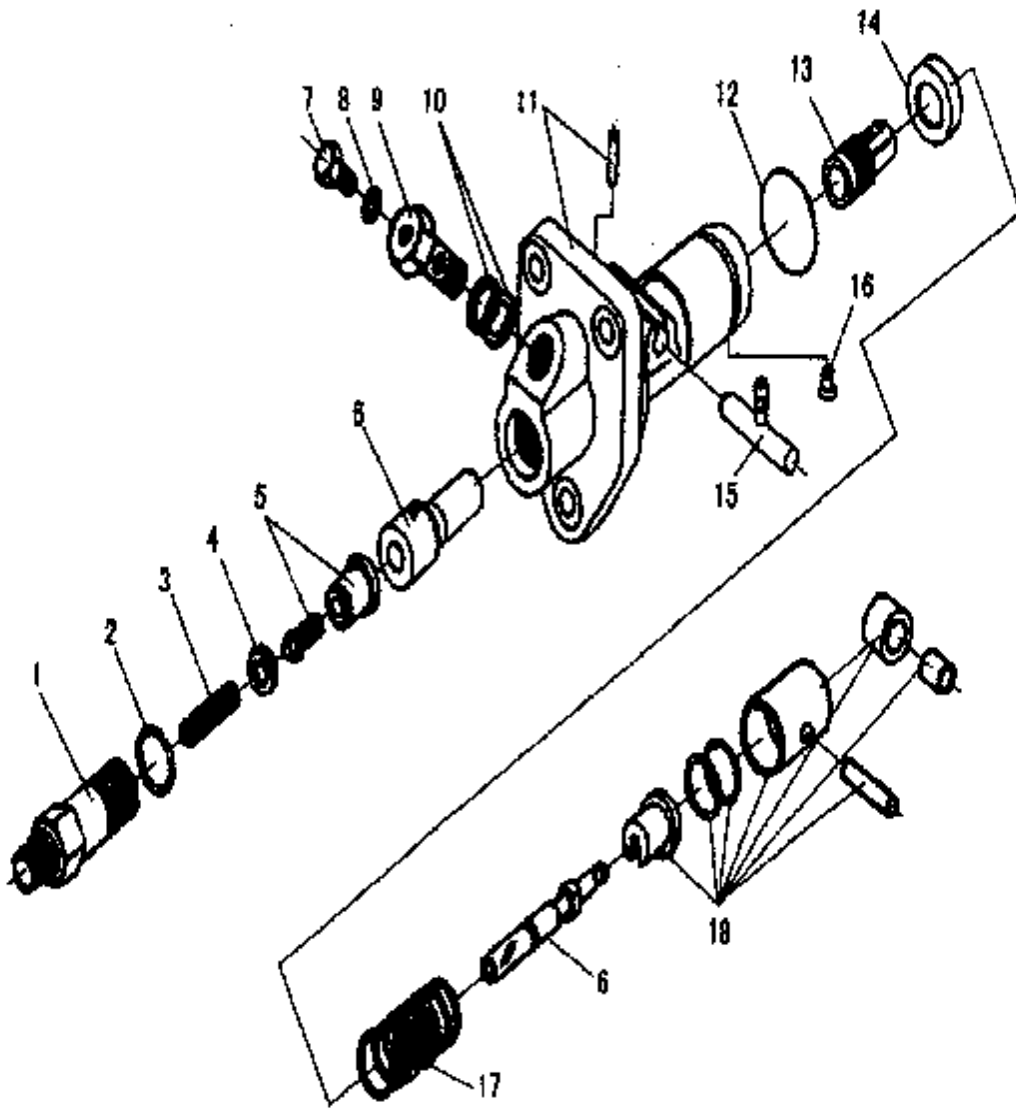


Fig 13 Fuel Injection Pump -BFGIAK90Z02

### Fuel Injection Pump (Fig 13) - BFGIAK90Z02

Slus NO.	Name of part	Part NO.	Qty.
1	Delivery valve holder	BA19—0001	1
2	O-sealing ring	BA62—0005	1
3	Delivery valve spring	BA62—0003	1
4	Delivery valve holder washer	BA62—0004	1
5	Delivery valve with seat	FA5-00	1
6	Pump element(plunger and barrel)	ZSA-00	1
7	Vent Screw	BA11-0002	1
8	Washer	BA11-0003	1
9	Fuel inlet pipe connecting screw	BA11-0004	1
10	Washer	BA11-0005	2
11	Pump body	BA19-01	1
12	Circlip	BA11-0011	1
13	Adjusting gear	BA17-0001	1
14	Upper spring seat	BA11-0013	1
15	Gear rack	BA11-02	1
16	Guiding pin	BS11-0010	1
17	Plunger spring	BA11-0012	1
18	Tappet	(Complete set)	1

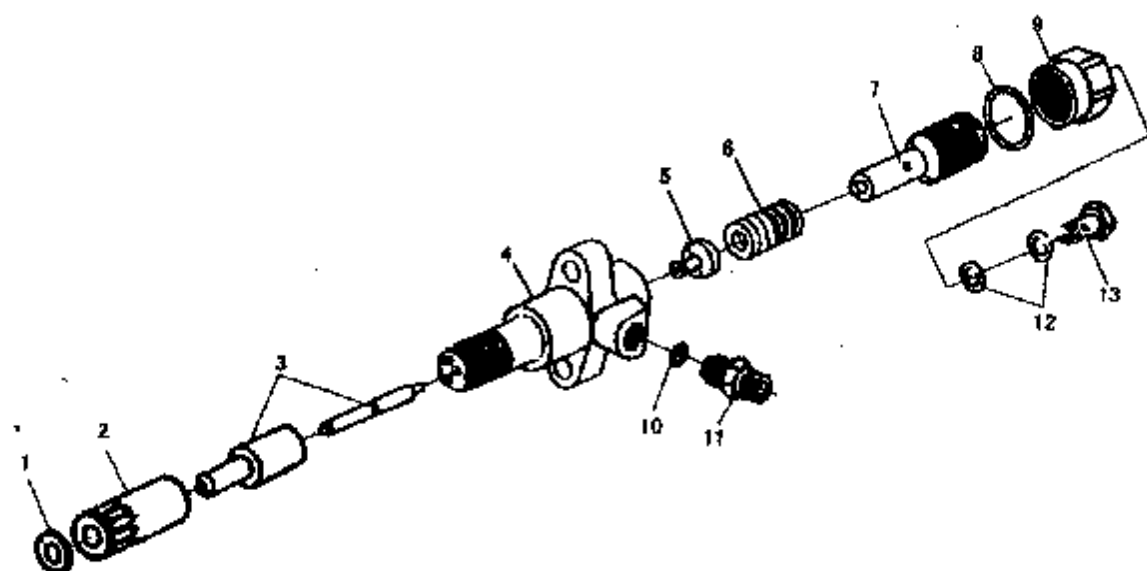


Fig. 14 PF68S19 fuel Injector

PF68S19 fuel Injector (Fig. 14)

III us NO.	Name of part	Part NO.	Qty.
1	Washer $\phi 19 \times \phi 9 \times 1$	J19-7	1
2	Cap nut	J27	1
3	Nozzle couple	ZCK154S432A	1
4	Nozzle holder	J27-1	1
5	Nozzle valve spindle	J26-6	1
6	Opening pressure adjusting spring	J26-5A	1
7	Opening pressure adjusting screw	J26-4	1
8	Washer sealing	J26-3	1
9	Lock nut	J26-2	1
10	Washer	J26-9	1
11	Fuel inlet pipe connecting bolt	J19-8	1
12	Washer	J19-13	2
13	Fuel leak off connecting bolt	J19-1	1

### Appendix I List of Tools Supplied With the Engine

No.	Name	Quantity
1	Hexagon wrench 60(special wrench for flywheel nut)	1
2	Double — open — end wrench 13 × 16	1
3	Double — open — end wrench 18 × 21	1
4	Feeler gauge (for measuring and adjusting valve clearance)	1
5	Starting handle	1
6	Special wrench for connecting rod bolts	1
7	Valve lapping tool, complete	1
8	#140 Lapping paste	1
9	Bolt M8 × 60 (for removing flywheel key from crankshaft)	2
10	Bolt M10 × 85 (for dismantling flywheel)	2
11	Fine-Stick (for spraying hole of injector nozzle)	1

### Appendix II List of Spare Parts Supplied With the Engine

No.	Name of spare part	Quantity
1	Cylinder head gasket	1
2	Piston ring	1 set
3	Nozzle body (with needle valve)	1
4	Oil seal for crankshaft	1
5	“O” Type Cylinder liner water seal ring	2

**SUPPLEMENTARY INSTRUCTIONS  
FOR ZS1105GM DIESEL ENGINES  
Electrically Starting Version**

**CONTENTS**

Section I. General Description

Section II. Electrically Started Version and Connection diagram

Section III. Operation of Electric Starting System

Section IV. Modified Parts List for Electrically Started Version

## **Section I General Description**

**ZS1105GM is modified version on the basis of ZS1105G diesel engine, "M " standing for electric starting.**

**In the climate about -5 °C, ZS1105GM can be started rapidly without any measure. But for the convenience of customer, remains hand starting mechanism.**

**In this brochure, operation of electrically starting system and modified parts catalog are presented. So before operating, please read this supplementary instructions.**

**(If the electrically starting system is required, it can be ordered)**

## Section II. Electrically Started Version and Connection diagram

1. Electric starting system consists of Starter, Generator, Voltage Regulator, Battery and Circuit key switch.

1.1 Starter: QD1332 type starter with a rated capacity of 2.0kW and a voltage of 12V. The starter is of short rated operation design, with a battery as its power supply, and is fitted with a solenoid operated switch and an one way clutch. When it is connected to power supply, since the function of solenoid — operated switch, the pinion will be pushed out and engage with the ring gear on the flywheel, thus the engine will start running up. The clearance between the end surface of the starter pinion and the end surface of ring gear on the flywheel is 3.5~5mm, which can be adjusted by the use of insulating packing.

1.2 Generator: A YFW150 type flywheel generator is adopted for ZS1105GM engine, with a rated capacity of 150W, a voltage of 12V.

1.3 Regulator KZF-12D type voltage regulator. It converts AC into DC for the charging of battery. The function of it is to limit the voltage at 14V.

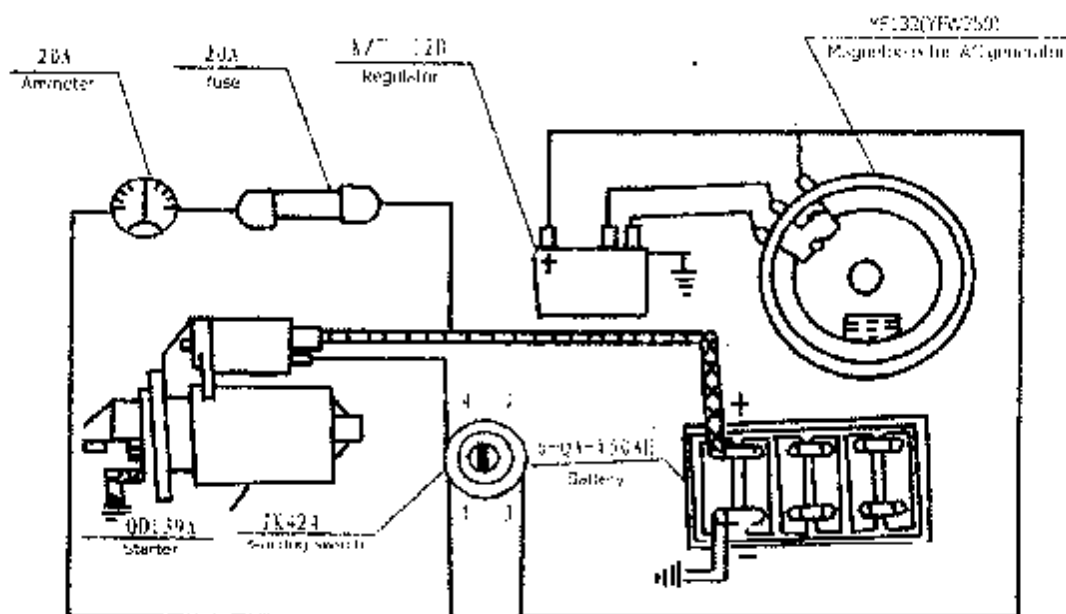
1.4 Battery: 6 - QA - 90AH type battery (self — provided) for starting use with a capacity of 150 Ah, a rated voltage of 12V.

1.5 Circuit key switch: JK 424 type ignition key switch with four positions:

- (1) Initial position "0", (cut off the power).
- (2) Position "I", (turn the key clockwise).
- (3) Position "II", (continue to turn the key clockwise).

The key will turn back to position "I" automatically.

- (4) Position "III", (turn the key anticlockwise from position "0")





## Section III. Operation of electric starting system

### 1. Check before operation

- (1) Check all the wiring connections for tightness.
- (2) Check to see if there is a clearance of 3.5~5mm between the two end surfaces of starter pinion and the ring gear.
- (3) Check to see if the key switch is at "O" position.

### 2. Starting

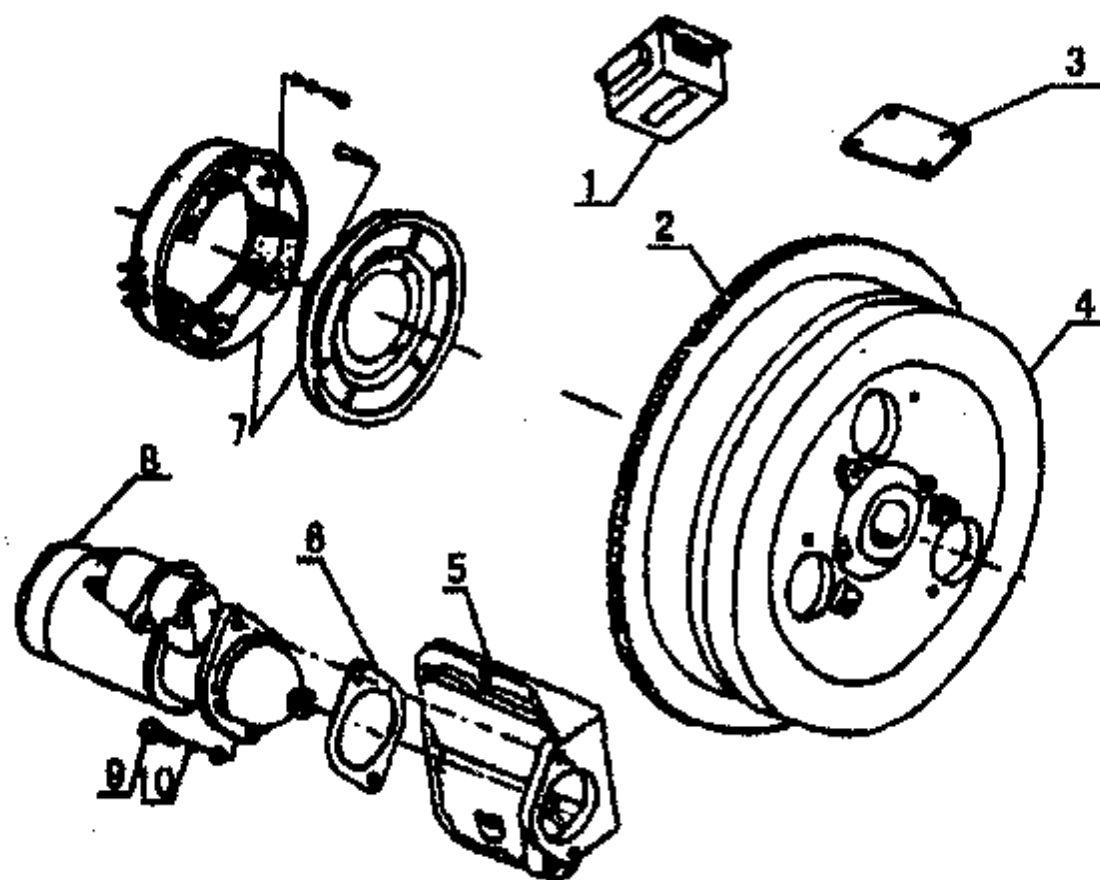
- (1) Insert the key into the JK424 switch and turn it to "I" position, putting the battery in the main circuit. Then turn the key to "II" position, the starter pinion coming out and engaging with the ring gear to rotate the flywheel. In most cases, the engine will start up running and the lamp will light up about one second. After starting, the key will shift back to "I" position immediately, and the starter pinion will draw back of itself. Once the engine starts running normally, turn the key to "III" position to put the generator in the battery. After this, the indicator of ammeter shall rotate counter clockwise and point to "+".

### 3. Precautions

- (1) Each starting operation must not last over 5seconds. The interval between two consecutive starting operations shall be at least 2 minutes. Otherwise, the starter will be burnt out and damaged.
- (2) It is forbidden to turn the key to "II" position during the running of the engine to prevent the starter pinion and the ring gear from being damaged due to their collision.
- (3) Turn the key back to "O" position and take it out after stopping the engine. If the engine is to be put out of service for a long time, it is advisable to disconnect the wires from the battery to prevent the generator and regulator from being burnt out.
- (4) In case of failing to start the engine on several consecutive times, it is recommended to check the engine and electric system following the procedures mentioned in operation manuals for engine and electric system or consult the professional for maintenance.

## Section IV. Modified Parts List or Electrically Started Versions

No.	Name of part	Part No.	Quantity
1	Regulator	KZT—12D	1
2	Ring gear	S195M-05001	1
3	Name plate	ZS1105GM-10002	1
4	Flywheel	S195GM-05001	1
5	Rear cover—Starter support	S195M-01020A	1
6	Starter packing	S195M-01018	As required
7	Flywheel Generator	SFF150	1
8	Starter	QD1332	1
9	Bolt M12 × 30	GB/T5783-2000	2
10	Washer 12	GB/T93-2000	2



Electrical Started Version