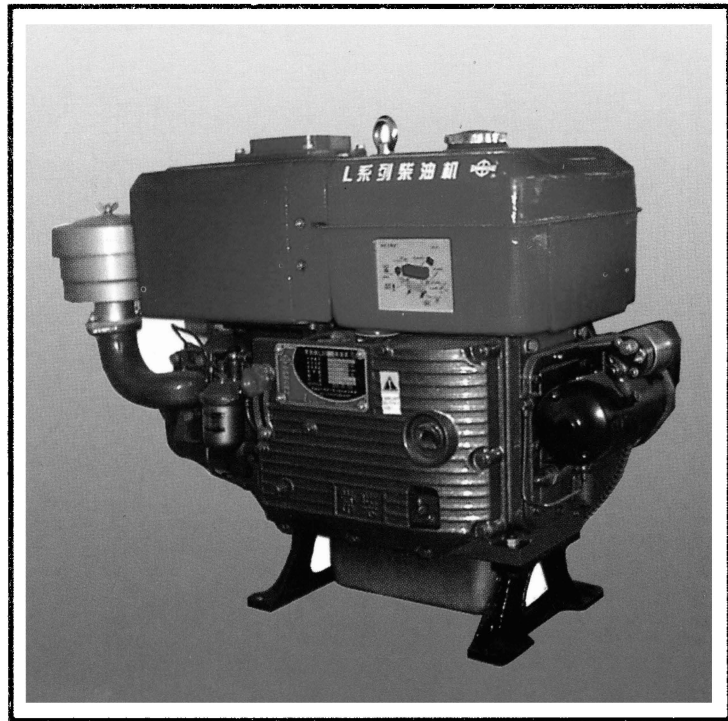


L26/L28/L30/L32

DIESEL ENGINE
OPERATION MANUAL

—changchai



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PREFACE

(To the Customers)

Many thanks for your purchasing our CHANGCHAI brand L26/L28/L30/L32 diesel engines. It is recommended that the operator, before operating the engine, reads the manual carefully.

CHANGCHAI brand L26/L28/L30/L32 diesel is of single cylinder, horizontal, four-stroke, water cooled, direct injection engine. The L26/L28/L30/L32 diesel engines have the advantage of more powerful output, higher torque reserve, lower fuel/water consumption, easy starting, high safety coefficient, reliable operation, convenient maintenance and wide applications.

L26/L28/L30/L32 diesel engines have the same dimensions, power take-off and operation method as the predecessor ZS1125. They are suitable for powering small sized 4-wheel tractors, boats, engineering machinery, they can also be used as a prime mover for transportation vehicles, small electric generators and agricultural processing machines.

For normal, reliable and safe operation of the engine, it is hoped that the operator, when operating the engine, pays close attention to the following:

1. It is forbidden to touch high temperature parts such as water hopper and silencer, and moving parts such as flywheel and starting shaft to prevent being scalded and injured. Keep the fuel tank away from fire and never direct the exhaust towards inflammables such as straws, haystacks and cotton to avoid dangers.

2. Children, the aged who acts slowly and the person who has abnormal behaviors are not allowed to enter the working site.

3. When coupled with driven machines, the engine should develop its rated output at rated speed as specified on the name plate, avoid running the engine with overload and at overspeed or with underload and at low speed for a long time. It is forbidden to run the engine in the absence of watchers.

4. A fuel and a lubricating oil of specified grade is to be used, and before being used, they should be completely precipitated and thoroughly filtered. Any utensils used herein should be kept clean. And the used lubricating oil should be periodically changed. The element of fuel filter and the screen of sump strainer should be periodically cleaned.

5. Fill the air filter with oil up to the oil level line. Regular clean, maintenance and change of oil should be done. Especially when the engine is used for powering tricycles and small sized 4-wheel tractors, operating in very windy and dusty condition, clean, maintenance should be done every day.

6. Clean soft water is used for cooling water. The engine is to operate under boiling condition of the cooling water in the hopper. The quantity of water should always be kept in such a way that the red ball of the float must not go down below the mouth of the funnel of the hopper.

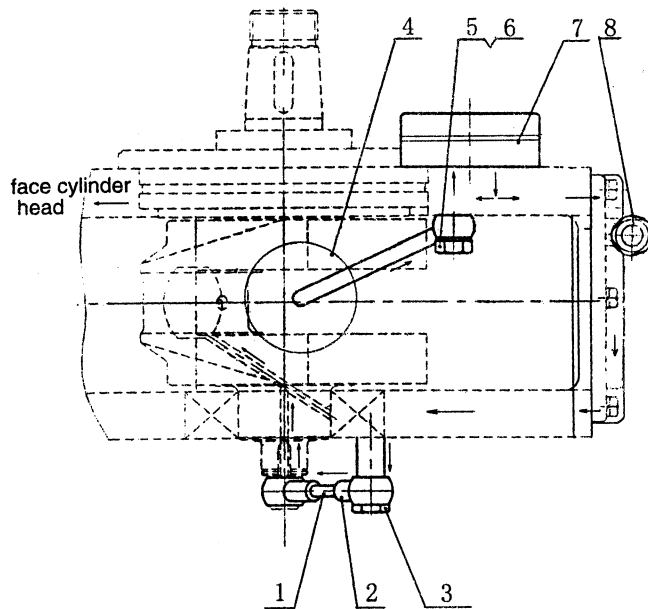
7. Regularly check the mounting connection and fastening bolts of the engine parts for looseness. If any looseness is found, tighten it at once.

8.The fuel,controller fitted on the gear casing has been adjusted and sealed before engine shipment. Do not take off or adjust it at random.

9.The users must drain out completely the cooling water of the engine in winter.While the cooling water can not be to drain out completely,it is necessary to screw off the water–drain cock or cylinder head and must clean all the dirt.

It is hope that the operator make a correct operation and maintenance of the engine,do not allow the engine to run under abnormal condition.Then high quality Changchai brand L26/L28/L30/L32 engines will certainly build up your family fortunes.

Since improvements on products and broadening of applications are made from time to time,your engine may be slightly different from instructions and statements contained within this manual.They won't be altered until the new revised edition is published.The users are requested to pay attention to this.



Schematic drawing of lubrication system

- 1.Pipe connection seat 2.Pipe connection 3.Connecting pipe 4.Sump strainer
5.Pipe connection bolt 6.Washer 7.Oil pump 8.Oil pressure indicating float

Section I Principal Technical Specifications

A. Technical Specifications

Items	Specifications							
Engine Model	L26	L28	L26M	L28M	L30	L32	L30M	L32M
Type	Single cylinder, four stroke, horizontal type							
Combustion Chamber	Direct injection							
Cylinder bore(mm)	120	125	120	125	125	130	125	130
Piston stroke(mm)	120							
Piston displacement(L)	1.357	1.473	1.357	1.473	1.534	1.659	1.534	1.659
Rated output/Rated speed (kW/r/min)	18.5/ 2200	20/ 2200	18.5/ 2200	20/ 2200	21/ 2200	23/ 2200	21/ 2200	23/ 2200
Specific fuel consumption (g/kW·h)	244.8							
Specific lube oil consumption (g/kW·h)	2.04							
Cooling method	Water cooled, evaporative							
Starting method	hand cranking		Electrical		hand cranking		Electrical	
Fuel injection pressure(MPa)	19.13							
Net weight(kg)	205	208	217	220	210	212	222	224
Overall dimensions (L×W×H) (mm)	916×475×709		978×475×709		916×475×709		978×475×709	

B. Principal Technical Data

Valve clearance(cold)	Intake valve(mm)	0.35±0.05
	Exhaust valve(mm)	0.45±0.05
Fuel injection timing	20°~23°before T.D.C.	
Tightening torque of main bolts and nuts	Cylinder head nut(N·m)	385~415
	Connecting rod bolts(N·m)	100~120
	Flywheel nut	320~370
	Balancing block bolts of crankshaft	100~120

C.Models and Specifications of Main Fitting Components(L26/L28)

Items	Models/Specifications
Fuel injector	PF68S125
Nozzle couple	ZCK154S530A
Fuel injection pump	B139-1
Lube oil pump	Rotor type
Fuel filter	C0506C

Models and Specifications of Main Fitting Components(L30/L32)

Items	Models/Specifications
Fuel injector	PF68S125
Nozzle couple	ZCK154S530A
Fuel injection pump	BFIAWI05Z01
Lube oil pump	Rotor type
Fuel filter	C0506C

Section II Mounting of the Engine and Coupling of Driven Machine with the Engine

A.Mounting of the Engine

The engine should be bolted down to a rigid base with the same mounting dimensions as the diesel engines of its kind(see the drawing of overall and mounting dimensions of the engine). The axial dimensions of the pulley of the driven machine should coincide with that of the engine to avoid torsion of the V-belts.

The engine and driven machine should be in good coupling. Protection measures of the flywheel and belt pulley should be taken to avoid danger.

B.Selection of the Size of the Pulleys

When the engine is used to drive working machines, the user should make a correct selection of the size of pulleys to ensure normal operation of the engine and driven machines. 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 pulley on the engine shaft (use pitch diameter in case V-belt is used);

D_2 , the diameter of the pulley on the shaft of the driven machine (use pitch diameter in case V-belt is used);

n_1 , the rotative speed of the engine;

n_2 , the rotative speed of the driven machine.

One piece of V-belt pulley, 148mm in outer diameter, is attached to the engine on its delivery from the maker's works. Pulleys of special specifications may be provided through negotiation when customer place an order. (Don't increase the diameter to get more efficiency and higher speed. Our company will not bear three guarantees responsibility for this)

Section III Operation of the Engine

A.Preparation before Operation

1.Lubricating oil

1.1 Lubricating oil for the engine should conform to the standard of GB11122-1997.Use lubricating oil of CC20W/40 grade in summer,CC10W/30 grade in winter.

1.2 Lubricating oil should be stored in a clean and tight container to prevent dirt from getting in.Before adding oil,draw out the dipstick and pour clean oil into the crankcase.The quantity of oil added is about 4.5 litre so that the oil level in the crankcase will lie between the two marked lines on the dipstick.Caution;The oil level must not go over the upper line,nor fall down below the lower one.

2.Diesel Fuel

2.1 Fuel for the engine should conform to the standard of GB252-2000.Use light diesel fuel NO.0 in summer,No.-10 or No.-20 in winter.

2.2 Open the fuel tank,pour into it clean diesel fuel already thoroughly precipitated and filtered.Any utensils used herein should be kept clean.

2.3 Open the fuel cock.Then fuel will flow through the fuel filter to the injection pump.

2.4 Loosen the vent screw on the fuel injection pump or loosen the fuel pipe connections,in order that air,if any,in the fuel pipe line may get out.When it is noted that fuel without air bubbles flows out,re-tighten the vent screw or connections.

3.Cooling water

Clean soft water such as rain water,snow water or river water is used.Pour it into the hopper until the red ball of the float rises upto its top position.Never use foul water or hard water such as well water.In case hard water has to be used under particular condition,a soften treatment should be made by a simple way of boiling and precipitating before use.Otherwise,the blockage of water passages or erosion of hopper may occur.The cooling water in the hopper should be changed regularly and be free from foreign matter and dirt.

B.Starting the Engine

A careful check should be made after preparations mentioned above have been done.Then start the engine according to the following procedure.

1.Set the speed-control knob at "START" position indicated on the panel.

2.Insert the starting crank into the starting shaft hole.Push down the decompression lever and crank the engine,until a normal fuel injecting sound is noted.

3.Speed up the cranking of the engine to make the flywheel gain enough inertia,then suddenly release the decompression lever,but continue to crank the engine with efforts.Then the engine will start running itself.

4.Once the engine starts up running,the starting crank,because of the action of the spiral jaws on its clutching end,will jerk out of itself,and therefore the operator must keep on holding it firmly and gently take it off from the starting shaft hole to prevent any incident.

C.Running of the engine

Caution:While running the engine,take precautions against winding,scalding and fire.

It is hope that the operator pays attention to the safety marks nearby the filler of fuel tank, water tank cap of the radiator,flywheel,gear casing starting shaft and silencer.

1.After starting the engine,check the red float in the oil indicator and see if it rises up.In case it fails to rise up or suddenly drops down,stop the engine and fill it with sufficient quantity of oil or remedy the trouble.

2.Allow the engine to run idle at low speed for 3~5 minutes after its being started.When the temperature of cooling water becomes relatively high,gradually increase the engine speed and load. Never run the engine at high speed and with full load immediately after starting.

3.The water in the hopper keeps boiling during the operation of the engine.Sufficient quantity of fresh water must be fed in at once when the red ball of the float goes down to the mouths of the funnel of the hopper.

4.The engine is not allowed to run under black smoke exhausting conditions.During the operation of the engine,the operator should pay close attention to the color of the exhaust.In case black smoke in the exhaust is found,if everything else is normal,the load on the engine should be reduced or remedy the trouble.

5.If any abnormal noise is noted during the operation of the engine,stop it immediately for check.

6.A new engine is not allowed to operate with full load in its first 50 hours of operation. After a period of 40~50 hours,it is necessary to check and retighten all the loosened bolts and nuts.

D.Stopping the Engine

1.Gradually unload the engine and then slow down the speed of the engine and let it run idle for several munites.Shift the speed-control lever knob to "STOP" position,the engine will then stop running.

2.Under particular conditions where emergency stop is necessary,it is advisable to loosen any of the connections of the high pressure fuel pipe or use clothes or towels at hand to block the inlet of the air filter.The engine can also be stopped by putting the decompression device into action.

E.Precautions After Stopping the Engine

1.Close the fuel tank cock.

2.If the engine is to be put out of service for a long period of time,it is necessary to drain out the cooling water by opening the draining cock on the cylinder head.Especially in winter,the cooling water must be drained out immediately after the engine has been stopped in order to prevent subsequent cracking of the cylinder block and other parts as well because of freezing.

3.Turn the flywheel until fail to turn it.Then push down the decompression lever and continue to turn the flywheel until the marked line on the flywheel matches with the marked line on the hopper,so that both the intake and exhaust valves are set under closed condition and the piston is set at the top dead centre position in the compression stroke in order to prevent any dust from getting into the cylinder.

4.Periodically dismantle the draining cock, clean the water passages and remove the scale.

5.Check the connection between the engine and its support often.Check and retighten all the loosened bolts and nuts.

Section IV Adjustment and Maintenance of the Engine

A.Adjustment of Valve Clearance

- 1.Remove the cylinder head cover.
- 2.Turn the flywheel until the mark T on its periphery coincides with the marked line on the hopper in order to set the piston at its top dead centre position in the compression stroke.
- 3.Loosen the locking nut and turn the adjusting screw on the rocker arm with a screw driver to set the valve clearance to the specified value (the intake valve clearance is 0.35mm,and the exhaust 0.45mm)by means of a feeler gauge inserted between the valve stem and the rocker arm.
- 4.In the course of adjustment,screw in the adjusting screw to such an extent that the push rod is just free to turn but not too loose.When this is done,tighten the locking nuts in order to prevent any loosening afterwards.
- 5.Draw out the feeler gauge,and re-check the valve clearance.

B.Adjustment of Injection Timing

- 1.Disconnect the high pressure fuel pipe from the injector.
- 2.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 re-tighten the nut.Then prime the injection pump until the high pressure fuel pipe is full of fuel.
- 3.Turn the flywheel slowly until the fuel just begins to flow out of the end of the pipe.Stop turning and check whether the injection timing mark line on the periphery of the flywheel coincides with the mark line on the hopper.In case the injection timing is too advanced or too lagging behind,adjustment is then necessary and should be made according to the following procedure.
 - (1)Shut off the fuel filter cock.
 - (2)Set the speed-control lever knob at the middle position.
 - (3)Disconnect the high pressure fuel pipe from the fuel pump.
 - (4)Screw off the pump fixing bolts and take off the pump.
 - (5)Increase or decrease the number of shims for adjustment.Increase the number of shims if injection timing is advanced.Decrease the number of shims if lagging.
 - (6)Mount back the injection pump and tighten the fixing bolts.While doing so,it is necessary to pay special attention to that the ball of the plunger adjusting arm must be engaged with the slot in the speed-governing fork inside the gear casing.This should be checked again through the inspection hole after the pump has been mounted back in order to prevent the engine from"running away"resulting from possible mis-mounting.

After adjustment,it is advisable to check again according to the above-mentioned item 3. Readjustment is necessary if something is found incorrect.Caution:The adjustment of injection

timing of each engine has already been made carefully by the engine manufacturer. Therefore it is not recommended that the engine operator increases or decreases the number of shims at option, which would affect the normal operation of the engine.

C. Adjustment of Decompression Device

The good function of the decompression device may be tested by hand feeling in the following way: Turn the decompression lever clockwise with your left hand, and at the same time, crank the engine with your right hand by means of the starting handle. If your left hand feels heavy while your right hand feels light, then the decompression device works correctly. However, attention should be paid to that the decompression shaft must not touch the rocker arm while cranking the engine, after the decompression lever has been released back.

If the contrary is the case, adjustment must be made as follows:

1. Remove the decompression cover on the cylinder head cover.
2. One hand hold the decompression lever, the other hand loosen the locking nut, turn the adjusting screw by a driver. After the adjustment, tighten the locking nut again.
3. Mount back the decompression cover.

D. Maintenance of the Engine

The maintenance of the engine should be conducted as the following items and requirements.

Maintenance of the Engine

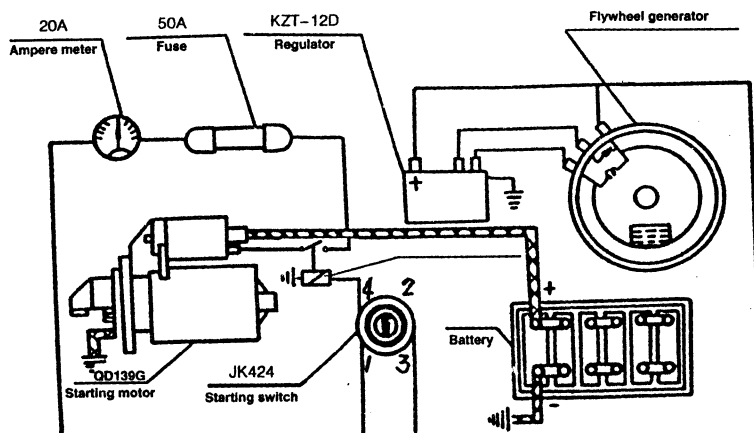
Item	Maintenance	Period
1.Cooling water	As soon as the red ball of the float in the hopper goes down near the mouth of the funnel, replenish water.	as required
2.Lubricating oil	As soon as the oil level in the sump drops down near the lower marked line on the dipstick, replenish oil. After the first 50 hours of operation of a new engine, it is necessary to clean the crankcase and the oil sump, and renew the oil. Hereafter, the oil must be changed once every 100 hours of operation.	Everyday First 50 hours 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. Hereafter, the strainer must be cleaned once every 100 hours of operation.	First 50 hours 100 hours
4.Air filter	Ordinarily, the filter is to be cleaned once every 100 hours of engine operation. But when the engine is used to power a walking tractor, the cleaning of the filter is to be done every 50 hours of operation. In case the engine is operating in a dusty atmosphere, it is necessary to clean the filter every shift of work.	100 hours 50 hours 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 damaged.	100 hours
6.Main bolts and nuts	Retighten main bolts and nuts with required torques after first 40~50 hours operation of a new engine. Retighten them every 300 hours of operation after this.	First 40~50 hours 300 hours

Item	Maintenance	Period
7. Fuel tank and filling screen	<p>Remove the screen from the inlet of the fuel tank and clean it in fresh 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 seat with a little bit of lapping paste and lap it together with the valves carefully (Caution; do not let the lapping paste get into the valve guides).</p> <p>After lapping, wash the valves and the valve seats with fresh 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 it leaks 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	Remove carbon deposit if any, and clean them with fresh fuel. It may not be necessary to dismantle them for cleaning if the engine operates normally.	1000 hours
11. Oil ducts in the crankshaft	Clean the center hole of the crankpin and oil passages in the crankshaft with fresh fuel.	200 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 if not thoroughly cleaned.</p> <p>Note: the hopper must be removed from the engine before cleaning.</p>	500 hours

Item	Maintenance	Period
13.Fuel injector	<p>Check fuel injection pressure and sprayability of the injector. Normally the spray is in 4 concentrated jets pattern and no fuel dribbling or non -atomized jet is found. If necessary, clean the nozzle couple and remove carbon deposits inside the injection orifices with a Ø0.30mm needle. In case fuel dribbling is found and no clear "chattering" is heard when spraying it is necessary to lap the fitting surfaces of nozzle couple with a little bit of lapping paste. After washing and reassembly. Readjust fuel injection pressure again.</p>	as required

Section V Electrical Starting System

A.Wiring diagram of Electrical Starting System



B.Main Elements of Electrical Starting System

The main elements of electrical starting system is composed of starting motor, flywheel generator, voltage regulator, starting switch and battery.

1. Starting motor

Model QD139G motor is used, with a rated power of 3kW and a voltage of 12V. It is of shorttime rating design with a battery as its power supply. The motor is fitted with a solenoid operated switch and an one way clutch. When it is connected to power supply, since the action of the solenoid-operated switch, its 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 motor pinion and the end surface of flywheel is 3.5~5mm, which can be adjusted with insulating shims.

2. Flywheel generator

Flywheel type charging generator is used, with a rated capacity of 150~300W at user's option, and a voltage of 12V. It is used together with regulator. It is also used for charging the battery for electrical starting operation and lighting power source. If generator be used or not may customer option.

3. Voltage regulator

Model KZT-12D regulator is used. It rectifies AC produced by the generator, regulates its voltage to 14V and charges the battery. And it has the function of automatic limitation of voltage.

4. High capacity battery for starting use, self-provided by the users, with a rated capacity of no less than 150Ah and a rated voltage of 12V.

5. Circuit key switch

Model JK424 ignition key switch is used,with four positions:

5.1 Initial position "O" (Circuit is disconnected)

5.2 Position "I" (Turn the key clockwise)

5.3 Position "II" (Continue to turn the key clockwise)The key can turn back to position "I" automatically.

5.4 Position "III" (Turn the key counterclockwise from position "O")

C.Operation Procedure of Electrical Starting

1.Preparation before starting

1.1 Check all the wiring connections for tightness.

1.2 Check to see if there is a distance of 3.5~5mm between the two end surfaces of the pinion of the starting motor and the ring gear.

1.3 Check to see if the key switch is at position "O".

2.Starting

Insert the key into the JK424 switch and turn it to position "I",then the battery will be put in the main circuit of the starting motor.After that,turn the key to the position "II"then the pinion of the starting motor will come out and engage with the ring gear to rotate the flywheel.In most cases the engine will start up running and the charge-indicating lamp will light up.After starting, turn the key back to the position "I"immediately,and the pinion of the starting motor will draw back of itself and disengage with the ring gear.Once the engine starts running normally,turn the key to the position "III"to put the starting motor and the battery in the circuit,then the current pointer will shift in "+" direction,which indicates that the charging of the battery is under way normally.

3.Precautions

3.1 Each starting operation must not last over 5 seconds,and the maximum duration must not over 15 seconds.The interval between the two consecutive starting operation shall be at least 2 minutes.Otherwise the starting motor will be burnt out and damaged.

3.2 Never turn the key to the position "II"during the running of the engine to prevent the pinion of the starting motor and the ring gear from being damaged due to their collision.

3.3 Turn the key back to position "O"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 from being burnt out.

3.4 In case of failing to starting the engine on several consecutive times,it is recommended to refer to the related operation manual and check the electrical system of the engine or consult the professional for maintenance.

3.5 Wiring connections of starting motor.

All the conducting wires must as short as possible.Sectional area of the copper wiring with the battery must no-less than 25 mm²,and sectional area of the wire with the starting switch must no-less than 4mm² also.

Section VI Defects and Elimination

A.Engine Fails to Start

Cause	Remedy
1.In cold weather,lube oil becomes too viscous,difficult to crank the engine	Fill the hopper with hot water.Use lube oil of specified grade or preheat lube oil before pouring it into the oil sump,but do not heat the oil sump with external fire.If necessary,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,reput the belt on and start the engine again.
2.Faults in fuel system	
2.1 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.
2.2 Freezen fuel	Use fuel of specified grade and heat it.
2.3 Air in fuel pipe line	Release air and tighten all of fuel pipe connections.
2.4 Fuel injection timing incorrect	Adjust according to recommended procedure.
2.5 Insufficient fuel injection pressure,needle valve seized, injection orifices choked with carbon deposits	Clean,lap or renew the injector nozzle,adjust injection pressure to specified value.
2.6 Pumping element (Plunger and barrel of the injection pump worn out)	Renew pumping element(Plunger and barrel)
3.Insufficient compression in the cylinder	

Cause	Remedy
3.1 Excess wearing-out of piston rings,piston or cylinder liner.	Renew piston rings,piston or cylinder liner.
3.2 Leakage between valve and valve seat due to bad tightness or incorrect valve clearance	Lap intake and exhaust valves and valve seats.Renew them if necessary.Check valve clearance and adjust it to specified value.
3.3 Cylinder head nuts untightened or cylinder head gasket damaged	Tighten the cylinder head nuts evenly and diagonally or renew the gasket.

B.Engine Does Not Develop Full Power

Cause	Remedy
1.Insufficient compression in the cylinder	Proceed as item3 under"Engine Fails to Start".
2.Fuel injection timing incorrect	Adjust according to recommended procedure.
3.Valve clearance incorrect	Adjsut according to recommended procedure.
4.Air filter choked	Clean it in clean fuel or kerosene,or renew.
5.Flow of fuel interrupted	Check the fuel cock,clean fuel filter and fuel pipe line.
6.Engine speed too low	Adjust the speed-control lever or the governor spring-adjusting screw to reach specified speed.
7.Nozzle needle valve worn out or fuel injection pressure incorrect	Proceed as item 2.5 under A"Engine fails to start"

C.Engine Stalls

Cause	Remedy
1.Fuel flow interrupted	Supply with sufficient quantity of fuel to the fuel tank.If there is air in the fuel pipe line or the fuel filter is choked,vent and remove all dirt.
2.Quantity of lube oil insufficient,or bearing shell burnt or damaged due to faults in lubrication system	Check lube oil level by means of the dipstick,replenish if insufficient.Check float of the oil indicator to see if it rises up, and check all oil ducts to find out troubles and remedy them.And renew the damaged parts.
3.Sticking of needle with nozzle body of the injector	If no" Chattering" is heard from the injector while cranking the engine,it will oftern indicate that the needle valve of the injector is stuck or seized.In that case,clean it in clean fuel and lap it a little with the nozzle body.Renew it if necessary.

D.Engine Exhausts Dense Black Smoke

Cause	Remedy
1.Engine overloaded	Reduce the load appropriately.If the belting or coupling with the driven machine is not right,correct it.
2.Bad spraying of injector	Check injection pressure and spraying,and adjust it or renew it if worn.
3.Fuel injection timing lagging	Check and adjust injection timing.
4.Air filter choked	Clean or renew element.
5.Insufficient compression due to leakage of cylinder	Proceed as item3 under A."Engine Fails to Start".
6.High friction resistance of the engine in its self.	Check lubrication system and see whether there is any friction member burnt or damaged due to faults in lubrication system or choking of oil ducts.

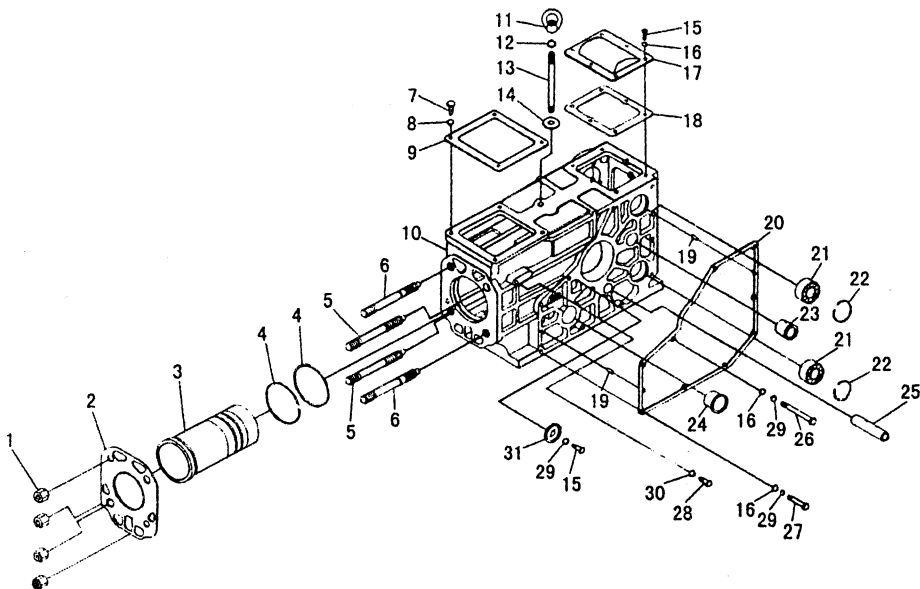
E. Other Defects

Cause	Remedy
1.Engine exhausts too much lube oil	
1.1 Piston and cylinder liner worn out	Renew.
1.2 Valve guide worn out	Renew.
1.3 Piston rings stuck, worn out or broken.	Clean or renew.
1.4 Piston rings ends upside - down	Remove and refit. While fitting the second and third rings. The ends on which there is mark should be upwards.
1.5 Lube oil too much	Drain lube oil to normal oil level.
2.Nozzle couple often seized	
2.1 Suddenly stop the engine at high temperature	Avoid stopping the engine suddenly at high temperature.
2.2 Fuel not clean, fuel filter element damaged	Clean fuel system, change fuel and fuel filter element.
3.The red float in the oil indicator suddenly drops down	Check the lubrication system to see if the oil strainer screen and oil dusts are choked and if the oil pump works normally.
4.Engine speed "hunting"	Check the sensitivity of the governor system. And check the adjusting screw on the governor fork for wearing. Vent the fuel supply line if there is any air in it.
5.Abnormal engine noise suddenly arises	Make a careful check for every moving parts.

F. Faults in Electrical Starting System

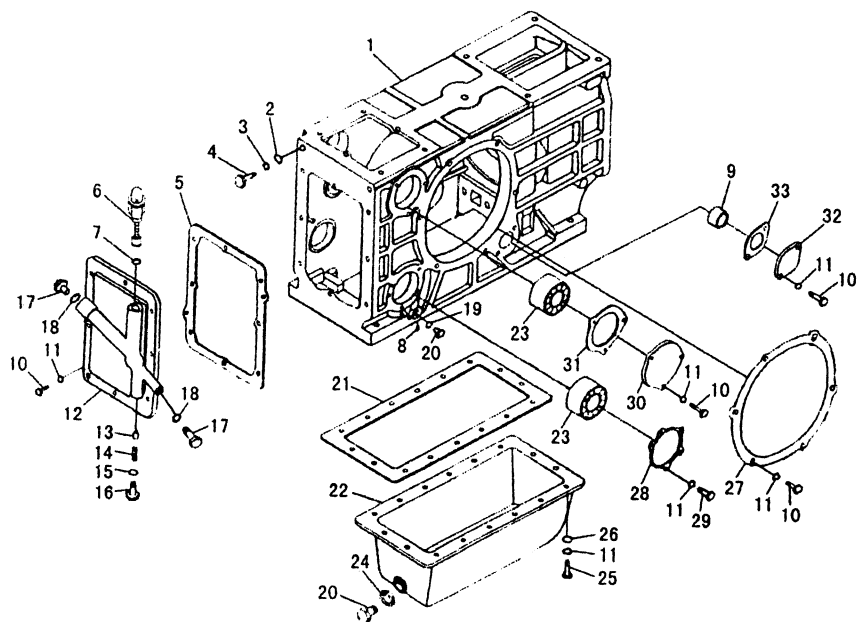
Cause	Remedy
1. Insufficient electric power of the battery	Check and repair or renew the battery.
2. Wiring or terminal loose, separated and broken	Check and repair
3. Contact points of fuse separated or burnt	Press the fuse button to get the circuit connected or turn the button to change the contact point.

Parts Catalog



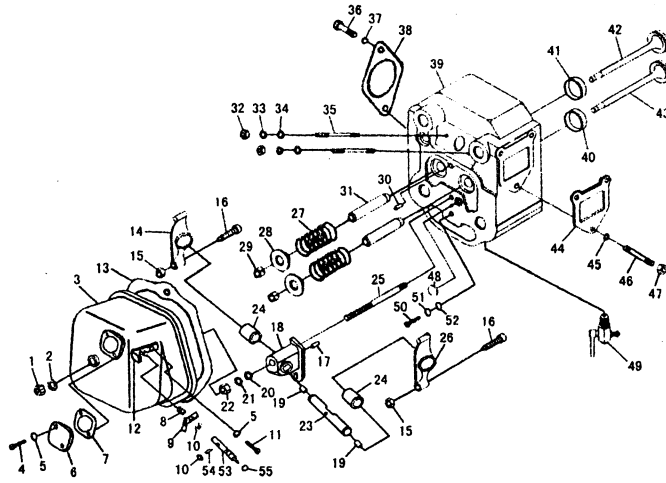
Engine Block Assembly-1(Fig. I)

Illus. No.	Name of part	Part No.	Qty	Illus. No.	Name of part	Part No	Qty
1	Cylinder head nut	1120-010032	4	17	Upper cover	S1110-01013	1
2	Cylinder head gasket	1125-010014	1	18	Upper cover gasket	L30-010012	1
3	Cylinder liner	L30-010001	1	19	Pin 5 M6×12	GB/T119.1-2000	2
4	Water seal ring	1125-010012	2	20	Gear cover gasket	L30-01011	1
5	Cylinder head bolt(I)	1120-010015	2	21	Bearing 6305	GB/T276-94	2
6	Cylinder head bolt(II)	1120-010016	2	22	Ball bearing retainer	S1110-01010	2
7	Bolt M10×30	GB/T5783-2000	4	23	Starting shaft bush	S1110-01102	1
8	Washer 10	GB/T97.1-2002	4	24	Camshaft front bush	L30-011002	1
9	Water block gasket	195-01007	1	25	Speed control gear shaft	L32-015000	1
10	Engine block	L30011001	1	26	Bolt M8×95	GB/T5783-2000	3
11	Flying rings	195-01010	1	27	Bolt M8×55	GB/T5783-2000	6
12	Washer 12	GB/T97.1-2002	1	28	Bolt M10×25	GB/T5783-2000	1
13	Lifting-eye bolt	S195M-24010	1	29	Washer 8	GB/T93-87	10
14	Washer	195-01008	1	30	Washer 10	GB/T93-87	1
15	Bolt M8×16	GB/T5783-2000	7	31	Crankshaft bearing clamp	L30-010034	1
16	Washer 8	GB/T97.1-2002	15				



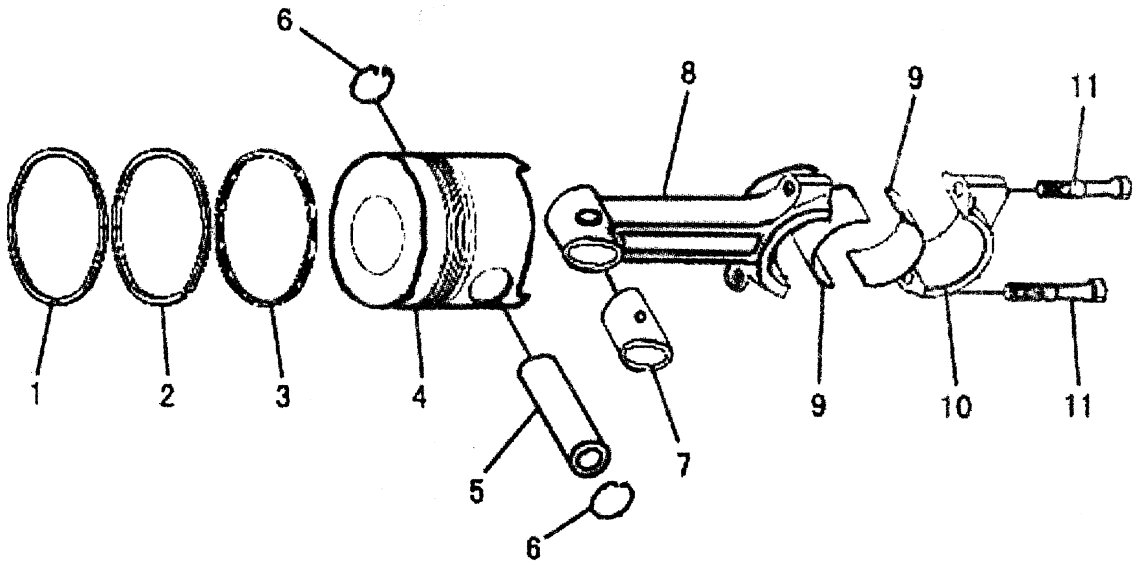
Engine Block Assembly-2(Fig. II)

Illus. No.	Name of part	Part No.	Qty	Illus. No.	Name of part	Part No.	Qty
1	Engine block	L30-011001	1	18	Washer	195-09001	2
2	Washer 10	GB/T97.1-2002	2	19	Washer	195-01025	1
3	Washer 10	GB/T93-87	2	20	Plug	195-01026	2
4	Bolt M10×20	GB/T5783-2000	2	21	Oil pan gasket	195-01033-1	1
5	Rear cover gasket	L30-010015	1	22	Oil pan part	S1110-01200	1
6	Oil pressure indicator valve parts	S1110A-031100	1	23	Bearing 6305	GB/T276-94	2
7	Oil pressure indicator valve connector washer	L30-013002	1	24	O type seal ring 16×2.4	GB/T1235-76	1
8	Oil orifice plug	195-01021	2	25	Bolt M8×20	GB/T5783-2000	16
9	Camshaft rear bush	195-01032	1	26	Washer 8	GB/T97.1-2002	16
10	Bolt M8×25	GB/T5783-2000	19	27	Main bearing cover gasket	L22-010029	1
11	Washer 8	GB/T93-87	38	28	Oil pump gasket	S1110-01014	1
12	Rear cover	L30-013001	1	29	Bolt M8×45	GB/T5783-2000	3
13	Pressure-adjusting plunger	1100AT-01303	1	30	Balancing shaft cover	S1110-01008	1
14	Pressure-adjusting spring	1100AT-01306	1	31	Balancing shaft cover gasket	S1110-01009	As needed
15	Protecting washer 12	1100AT-01307	1	32	Camshaft cover	195-01030-3	1
16	Pressure-adjusting screw	1100AT-01304	1	33	Camshaft cover gasket	195-01031-2	1
17	Cap screw	1100AT-01305	2				



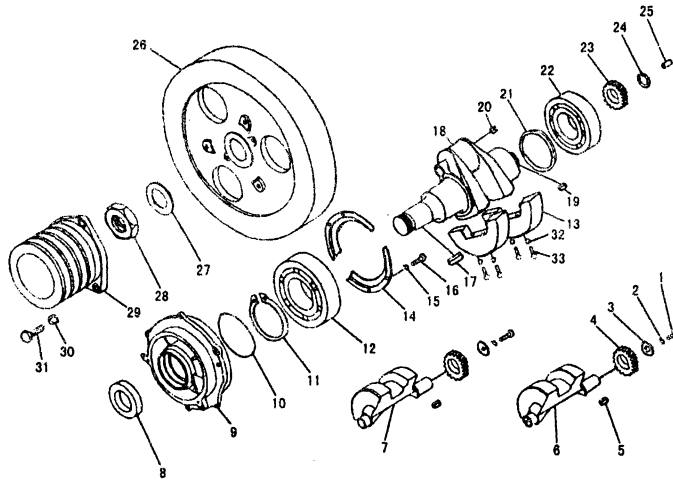
Cylinder Head Assembly (Fig.III)

Illus. Mo.	Name of part	Part No.	Qty	Illus. No.	Name of part	Part No.	Qty
1	Nut M10	GB/T923-88	3	29	Valve collet	L30-030006	4
2	Washer	195-03029	1	30	Pin 2×12	GB/T119.1-2000	1
3	Cylinder head cover	S1120-032001	1	31	Valve guide	L30-031004	2
4	Screw M6×12	GB/T818-2000	2	32	Nut M8	GB/T6170-2000	2
5	Washer 6	GB/T859-87	1	33	Washer 8	GB/T859-87	2
6	Decompression cover	192-031008	1	34	Washer 8	GB/T848-2002	2
7	Decompression cover gasket	192-031009	1	35	Stud GM8-M8×55	GB/T898-88	2
8	Decompression shaft torsion spring	192-031006	1	36	Bolt M12×30	GB/T5783-2000	2
9	Decompression lever	1120-032004C	1	37	Washer 12	GB/T859-87	2
10	Nut M6	GB/T6170-2000	2	38	Exhaust pipe gasket	S1120-030003	1
11	Bolt M6×12	GB/T5783-2000	1	39	Cylinder head	L30-031001	1
12	Decompression lever bracket	192-031007	1	40	Inlet-valve seat	L30-031002	1
13	Cylinder head cover gasket	S1120-030007	1	41	Exhaust valve seat	L30-031003-1	1
14	Exhaust valve rocker arm	S1120-030101	1	42	Exhaust valve	L30-030002-2	1
15	Nut M12×1.25	GB/T6176-2000	2	43	Inlet valve	L30-030001	1
16	Adjusting screw	S1120-030007	2	44	Inlet pipe gasket	S1120-030010	1
17	Rocker arm bracket locating pin	S1120-030008	1	45	Washer 10	GB/T859-87	3
18	Rocker arm shaft bracket	L30-032002	1	46	Stud GM10-M10×25	GB/T898-88	3
19	Plug	S1120-030202	2	47	Nut M10	GB/T6170-2000	3
20	Washer 12	GB/T848-2002	1	48	Plug	195-03023	1
21	Washer 12	GB/T93-87	1	49	R3/8 drain cock	195-01300-1	1
22	Nut M12	GB/T6170-2000	1	50	Bolt M10×35	GB/T5783-2000	1
23	Valve rocker arm shaft	L30-032001	1	51	Washer 10	GB/T93-87	1
24	Rocker arm bush	1120-030102	2	52	Washer 10	GB/T97.1-2002	1
25	Rocker arm shaft bracket bolt	S1120-030009	1	53	Decompression shaft	S1120-032003	1
26	Inlet-valve rocker arm	1120-030301	1	54	Decompression shaft adjusting screw	192-031004	1
27	Valve spring	S1120-030004	2	55	O type seal ring	ZBJ22002-88	1
28	Valve spring seat	S1120-030005	2		18000900		



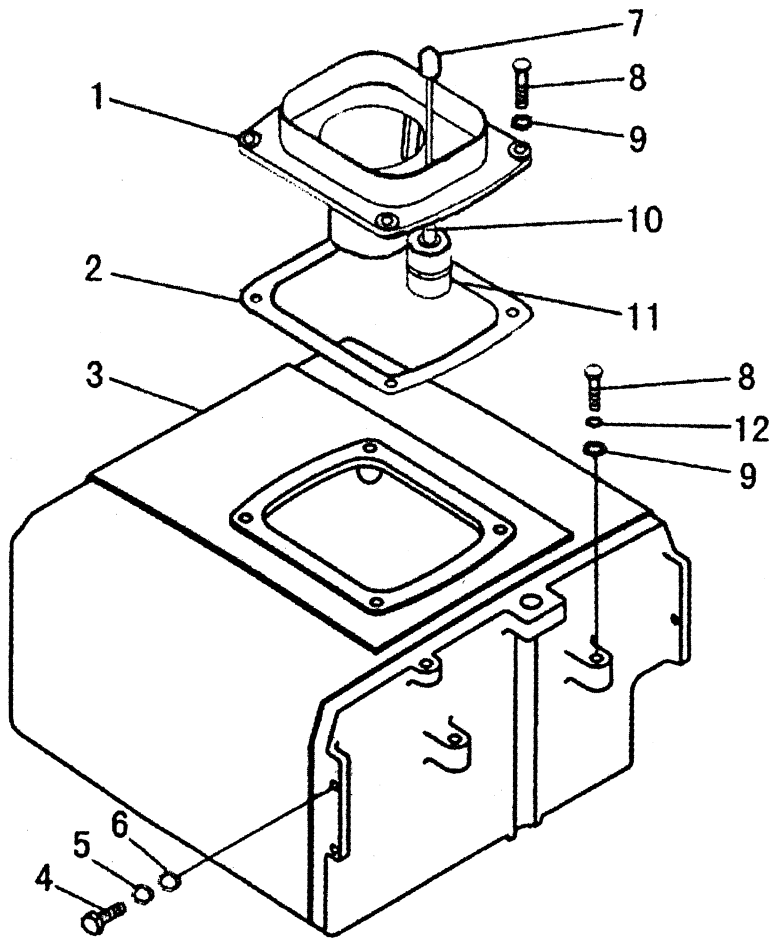
Piston and Connecting Rod Assembly (Fig.IV)

Illus. No.	Name of part	Part No.	Qty
1	1st compression ring	1125-040002	1
2	2nd compression ring	1125-040003	1
3	Coil-spring-loaded oil control ring	1125-041000	1
4	Piston	L30-040001	1
5	Piston pin	L30-040002	1
6	Retainer 36	GB/T893.1-86	2
7	Connecting rod bush	L30-042003	1
8	Connecting rod	L30-042001	1
9	Connecting rod bearing shell	1120-040005	2
10	Connecting rod cap	L30-042002	1
11	Connecting rod bolt	L30-042004	2



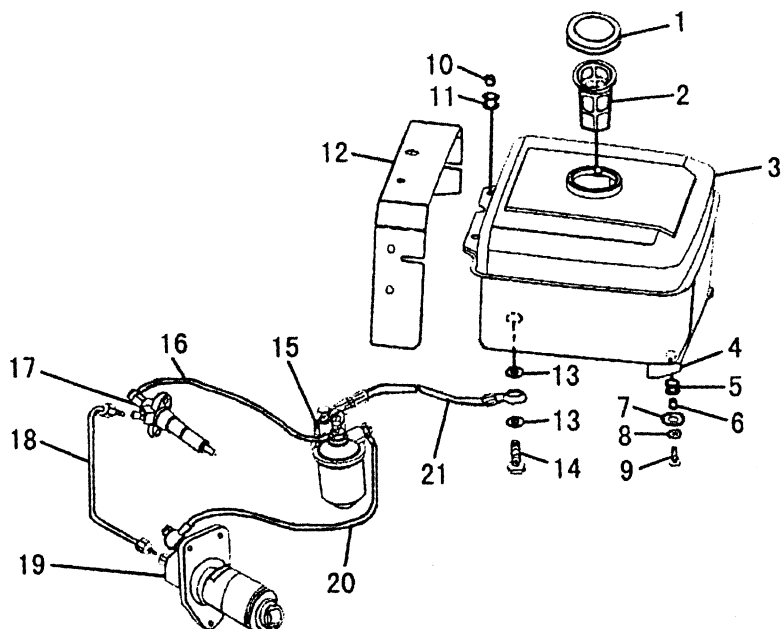
Crankshaft and Balancing shaft Assembly (Fig. V)

Illus. No.	Name of part	Part No.	Qty	Illus. No	Name of part	Part No	Qty
1	Bolt M8×18	GB/T5783-2000	2	18	Crankshaft	L30-051001	1
2	Washer 8	GB/T93-87	2	19	Key 8×18	GB/T1096-2003	1
3	Clamp	195-05013	2	20	Crankshaft oil plug	195-05007-1	1
4	Balancing shaft gear	195-05012	2	21	Retainer	L30-050007	1
5	Key C6×16	GB/T1096-2003	2	22	Roller bearing NJ2214E	GB/T283-94	1
6	Upper balancing shaft	L28-050006	1	23	Crankshaft timing gear	L30-050008	1
7	Lower balancing shaft	L28-050010	1	24	Retainer 30	GB/T894.1-86	1
8	Oil seal DL65×90×10	GB/T2600-80	1	25	Oil orifice plug	195-01021	1
9	Main bearing cover	L30-050013	1	26	Flywheel	L30-050001	1
10	O type seal ring 185×3.55	GB/T3452.1-2005	1	27	Thrust washer	1120-050012	1
11	Retainer 70	GB/T894.1-86	1	28	Flywheel nut	1120-050011	1
12	Deep groove ball bearing 63145/C3	GB/T276-94	1	29	V-belt pulley	S1115-05001	1
13	Crankshaft counter balancing	L30-051002	1	30	Washer 14	GB/T93-87	3
14	Bearing baffle	L30-050009	2	31	Bolt M14×35	GB/T5783-2000	3
15	Washer 5	GB/T93-87	4	32	Safety gasket	S1110-05105	4
16	Screw M5×10	GB/T67-2000	4	33	Counter balancing bolt	S1110-05104	4
17	Key 12×45	GB/T1096-2003	1				



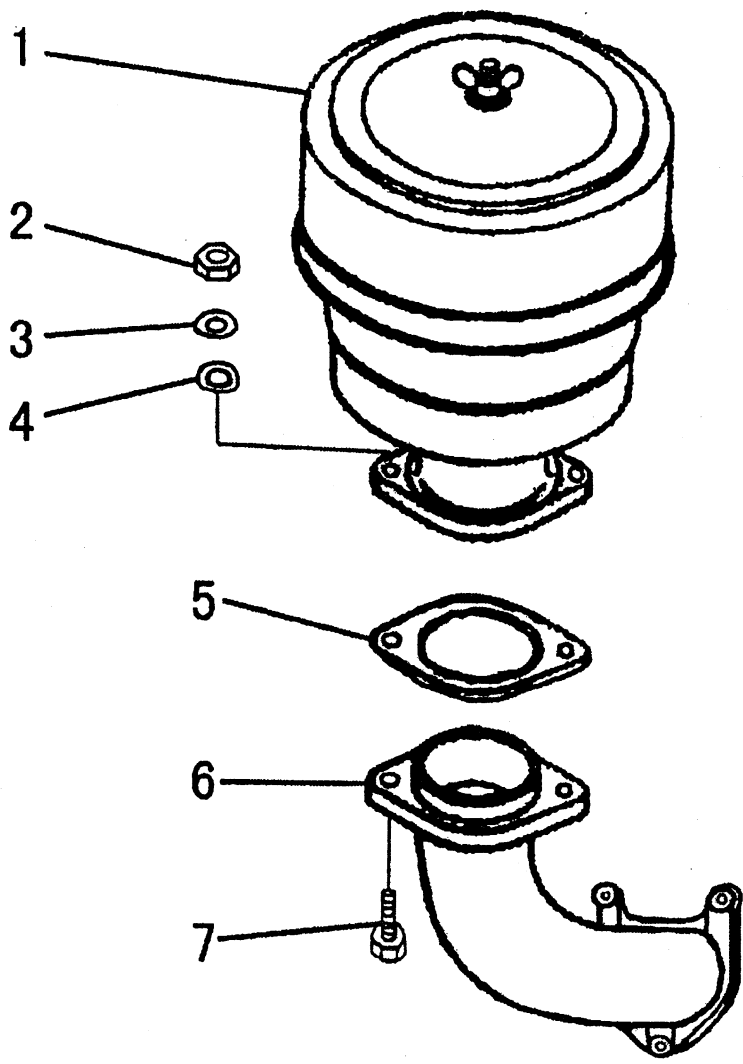
Water Block Assembly (Fig.VI)

Illus. No.	Name of part	Part No.	Qty
1	Water block funnel	195-06103-6	1
2	Funnel gasket	195-06001	1
3	Water block	L22-060002D	1
4	Bolt M6×15	GB/T5783-2000	3
5	Washer 6	GB/T93-87	3
6	Washer 6	GB/T97.1-2002	3
7	Float head	195-06202	1
8	Bolt M8×25	GB/T5783-2000	6
9	Washer 8	GB/T97.1-2002	6
10	Float rod	195-06201-2	1
11	Float	195-06203	1
12	Washer 8	GB/T93-87	2



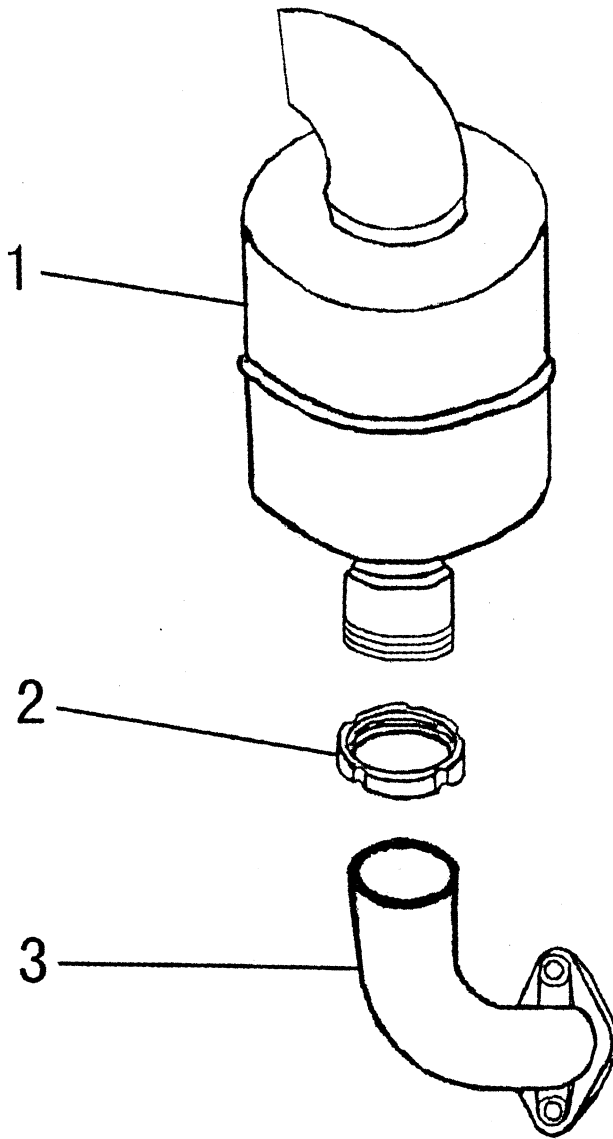
Fuel System (Fig.VII)

Illus. No.	Name of part	Part No.	Qty	Illus. No	Name of part	Part No	Qty
1	Oil tank cover part	L18-077000	1	12	Decorating cover	L22-071001	1
2	Filter screen part	S1110-07600	1	13	Washer 12	JB/T6013-2000	2
3	Oil tank part	L22-071000B	1	14	Articulated bolt M12 × 1.25	JB/T6013-2000	1
4	Bearing plate part	L22-071400B	1	15	Fuel filter part (C0506C)	S1110-16000	1
5	Damping rubber gasket	L22-071005B	2	16	Oil-return pipe part	S1110-07400	1
6	Sleeve	L22-071006B	2	17	Injector assembly(PF68S125 E)	L30-180000	1
7	Gasket	L22-071004B	4	18	High-pressure pipe part	L30-072000	1
8	Washer 8	GB/T93-87	2	19	Injection pump assembly(BF1AD105 Z01)	B139-1	1
9	Bolt M8 × 25	GB/T5783-2000	2	20	Fuel pipe part	L30-073000	1
10	Sleeve (lengthening)	L22-071008B	2	21	Fuel delivery pipe part	L22-079000-1	1
11	Damping rubber gasket(lengthening)	L22-071007B	2				



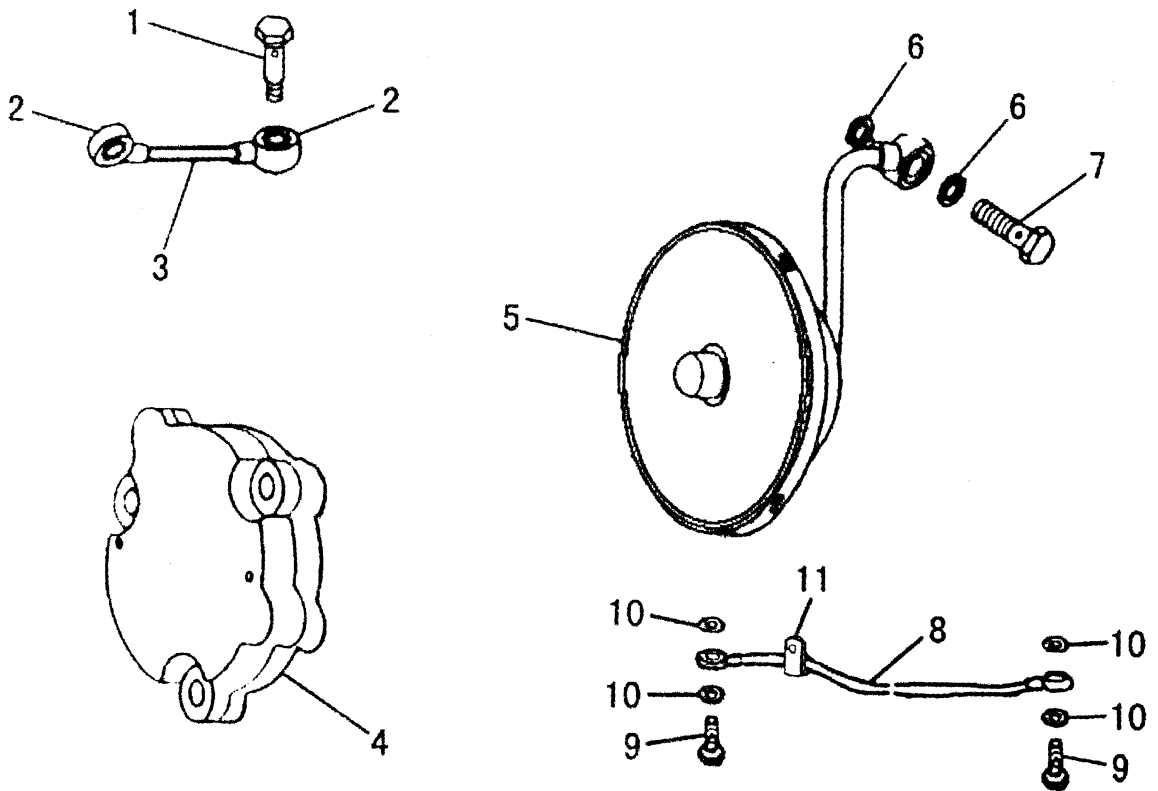
Intake System (Fig.VIII)

Illus. No.	Name of part	Part No.	Qty
1	Air filter part	L30-111000	1
2	Nut M8	GB/T6170-2000	2
3	Washer 8	GB/T859-87	2
4	Washer 8	GB/T97.1-2002	2
5	Air filter gasket	1120-110002	1
6	Inlet pipe	L30-110001	1
7	Bolt M8×30	GB/T5783-2000	2



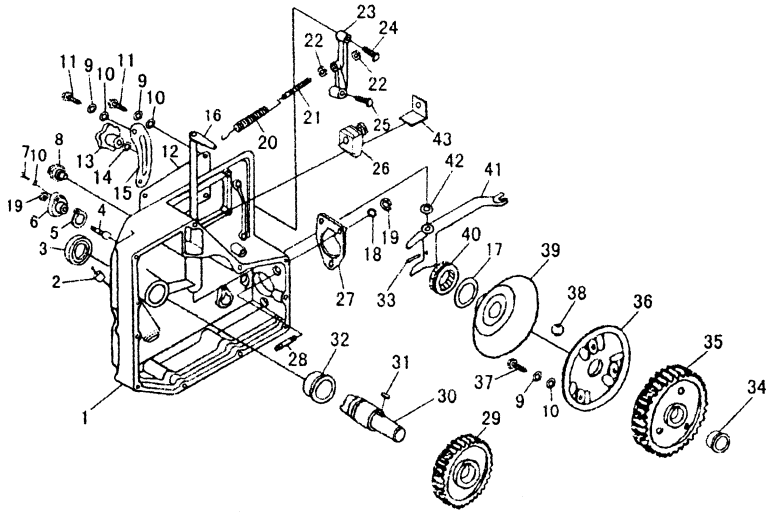
Exhaust Assembly (Fig.IX)

Illus. No.	Name of part	Part No.	Qty
1	Muffler assembly	L30-08100	1
2	Nut	1120-080002	1
3	Exhaust pipe	1120-080001A	1



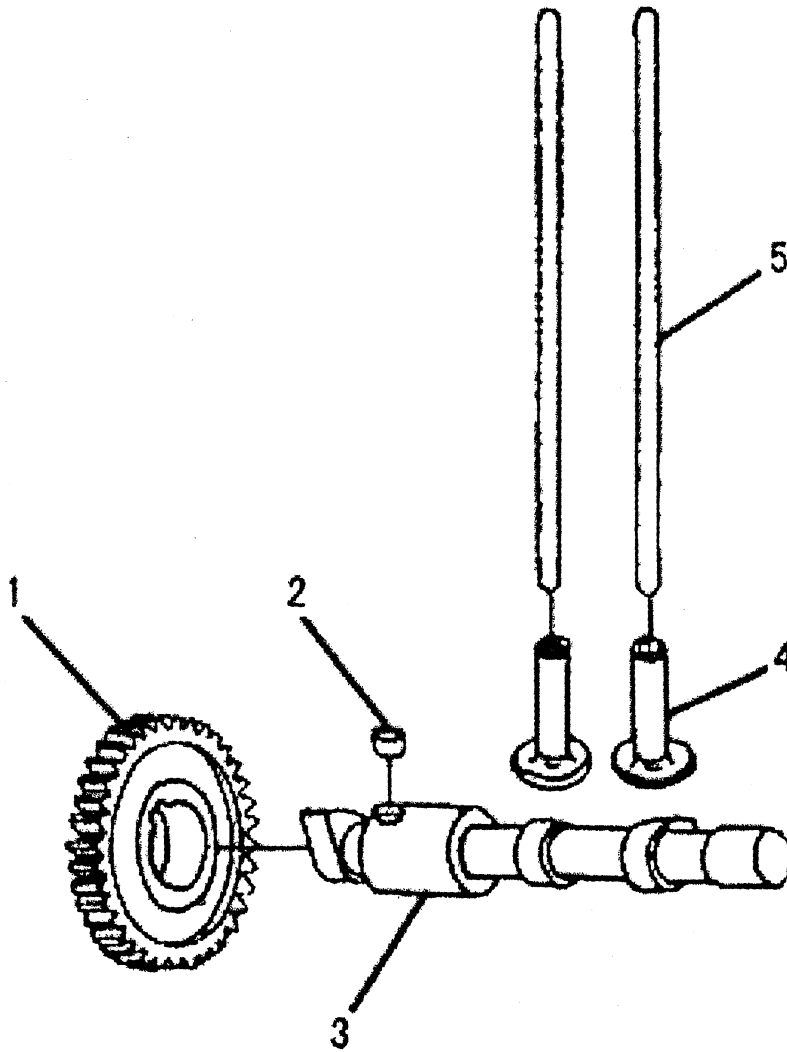
Lubricating System (Fig. X)

Illus. No.	Name of part	Part No.	Qty
1	Connecting bolt bracket	S1110A-090001	1
2	Connecting bolt	S1110A-090002A	2
3	Connecting pipe	S1110A-090003	1
4	Oil pump part	S1110-09200B	1
5	Oil filter part	CS195-09300	1
6	Washer	195-01025	2
7	Connecting bolt	195-09003	1
8	Oil pipe part	L30-095000	1
9	Connecting bolt	195-09002	2
10	Washer	195-09001-1	4
11	High-pressure oil pipe safety gasket	S1110-07201	1



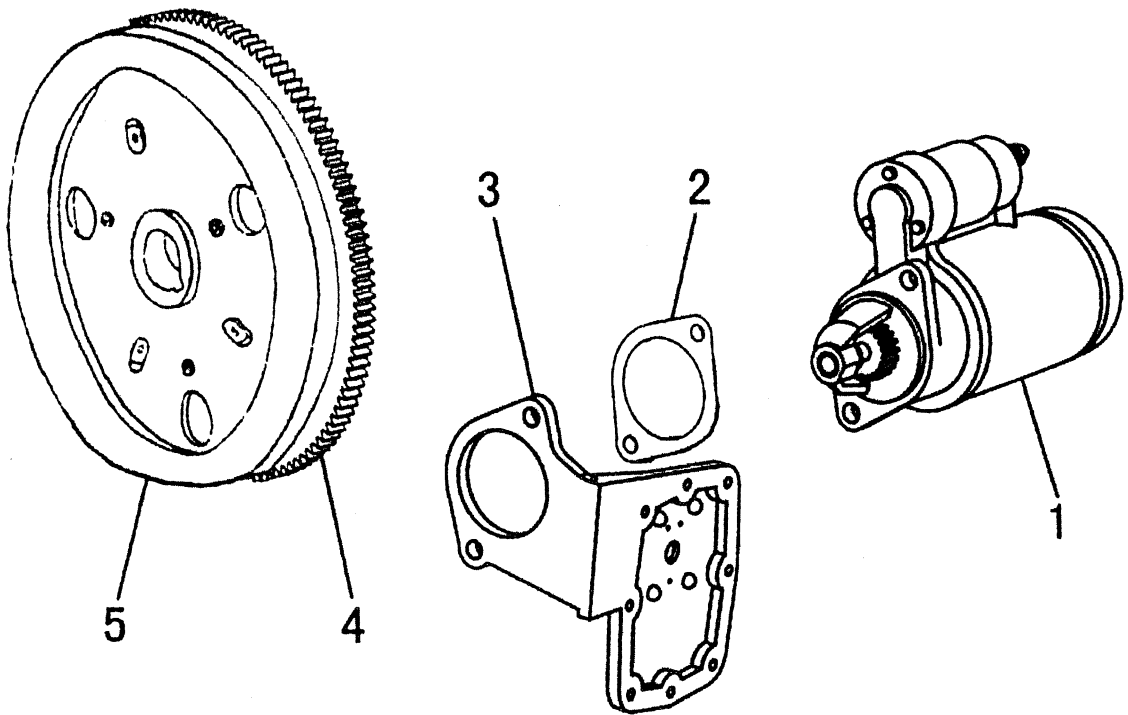
Gear Cover Assembly (Fig.XI)

Illus. No.	Name of part	Part No.	Qty	Illus. No.	Name of part	Part No.	Qty
1	Gear cover	L30-100001	1	23	Speed control jointing lever	195-10105	1
2	Oil gauge part	195-01100B	1	24	Bolt M8×40	GB/T5783-2000	1
3	Oil seal PG35×58×12	JB/T2600-88	1	25	Setscrew	195-10106	1
4	Oil spanner shaft	195-10407-3	1	26	Crankcase ventilation part	L30-105000	1
5	Oil spanner gasket	195-10404	1	27	Oil pump adjusting gasket	1120-010034	1
6	Oil spanner bracket	195-10405-3	1	28	Stud M8×22	GB/T898-88	3
7	Screw M6×25	GB/T65-2000	1	29	Starting gear	195-10302	1
8	Oil corrector	195-10600B	1	30	Starting gear shaft	195-10303-1	1
9	Washer 6	GB/T93-87	9	31	Key 8×16	GB/T1096-2003	1
10	Washer 6	GB/T97.1-2002	9	32	Starting shaft bush	195-10010	1
11	Screw M6×12	GB/T65-2000	6	33	Pin 4×25	GB/T117-2000	1
12	Nameplate	L30-100002	1	34	Speed control gear bush	195-10107	1
13	Speed control lever part	195-10200-1	1	35	Speed control gear	L30-101301	1
14	Washer 8	GB/T97.1-2002	1	36	Speed control bracket	195-10109	1
15	Indicator drop of rotate speed	1100A-10005	1	37	Screw M6×18	GB/T67-2000	3
16	Riveting units of speed control rod and arm	195-10140	1	38	Steel ball φ6	GB/T308-2002	6
17	Speed control slide gasket	195-10031	1	39	Speed control slide part	195-10120-1	1
18	Washer 8	GB/T93-87	3	40	Thrust ball bearing 8106	GB/T301-95	1
19	Nut M8	GB/T6170-2000	4	41	Speed control lever part	L30-101100	1
20	Speed control tension spring	1100A-10103	1	42	Adjusting washer	195-10113	1
21	Adjusting screw	195-10104	1	43	Clapboard	L30-105009	1
22	Nut M6	GB/T6170-2000	2				



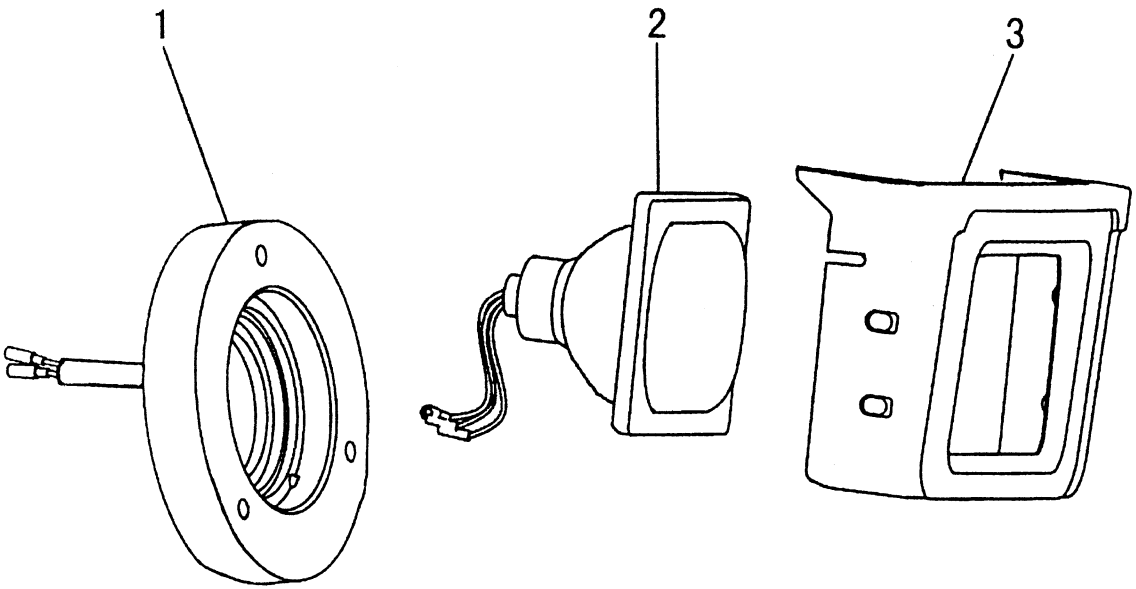
Camshaft Assembly (Fig.XII)

Illus. No.	Name of part	Part No.	Qty
1	Camshaft gear	L30-020003	1
2	Key 10×16	GB/T1097-2003	1
3	Camshaft	L30-020001C	1
4	Valve tappet	1120-020006	2
5	Valve lifter	L30-020002	2



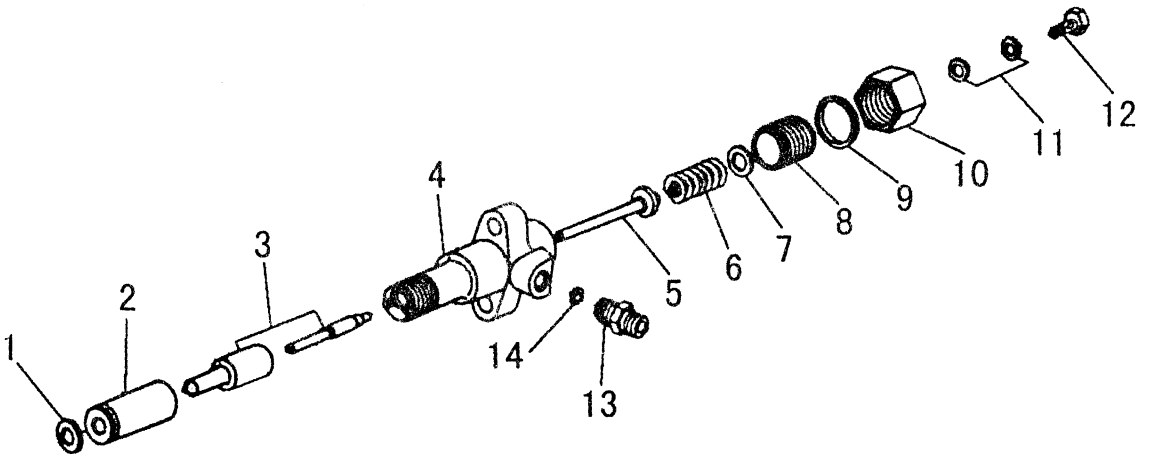
Electric Starting System (L26M, L28M, L30M, L32M) (Fig. X III)

Illus. No.	Name of part	Part No.	Qty
1	Starting motor	L30M-190000(QD139G)	1
2	Starting motor gasket	L30M-010036	1
3	Starter bracket rear cover	L30M-013001	1
4	Gear ring	1100ANM-05019	1
5	Flywheel	L30M-052001	1



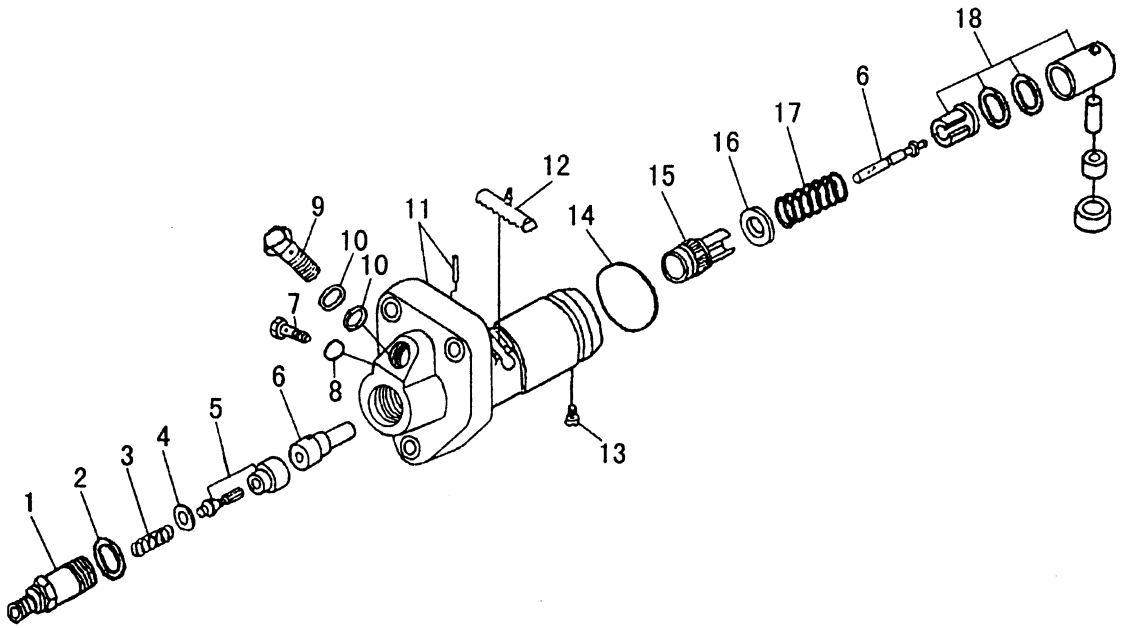
Generator and Light Fitting Assembly (Fig. X IV)

Illus. No.	Name of part	Part No	Qty
1	Flywheel generator	L30-153000	1
2	Light fitting assembly	S195N-07550A	1
3	Lamp-chimney	L22-150001	1



Model PF68S125E Injector Assembly (Fig. X V)

Illus. No.	Name of part	Part No.	Qty
1	Washer	J19-7	1
2	Cap nut for injector	J19-5	1
3	Nozzle couple	Z15B(155S530)	1
4	Injector body	J19-2	1
5	Jib components	J19-1	1
6	Pressure-adjusting spring	J19-4	1
7	Spring upper gasket	J19-10	1
8	Pressure-adjusting screw	J19-3	1
9	Washer	J19-15	1
10	Cap nut	J19-2	1
11	Washer	J19-13	2
12	Fuel overflow pipe connecting screw	J19-1	1
13	Fuel inlet pipe connector	J19-11	1
14	Washer	J19-12	1



Model BF1AD105Z01 Fuel Injection Pump (Fig. X VI)

Illus. No	Name of part	Part No	Qty
1	Delivery valve holder	BA19-0001	1
2	O-type seal ring	BA62-0005	1
3	Delivery valve spring	BA62-0003	1
4	Delivery valve gasket	BA62-0004	1
5	Delivery valve accessories	FA5-00	1
6	Plunger and barrel assembly	ZSA-00	1
7	Vent screw	BA11-0002	1
8	Washer $\phi 10 \times \phi 6.5 \times 1$	BA11-0003	1
9	Fuel inlet pipe screw	BA11-0004	1
10	Washer $\phi 27 \times \phi 13 \times 1$	BA11-0005	2
11	Injection pump part	BA19-01	1
12	Gear rack part	BA11-0011	1
13	Guide pin	BA17-0001	1
14	Snap spring	BA11-0013	1
15	Adjusting gear	BA11-02	1
16	Spring upper seat	BA11-0010	1
17	Plunger spring	BA11-0012	1
18	Tappet part	BA19-02	1

Appendix1: List of Parts of L26Diesel Engine

NO.	Parts Number	Name of Parts	Replace Number of L30	Qty
1	1120-010014	Cylinder head gasket	1125-010014	1
2	L26-010001	Cylinder liner	L30-010001	1
3	1120-010012	Water seal ring	1125-010012	2
4	L26-011001	Engine block	L30-011001	1
5	1120-040002	1st compression ring	1125-040002	1
6	1120-040003	2nd compression ring	1125-040003	4
7	L26-040001	Piston	L30-040001	1
8	1120-041000	Coil-spring-loaded oil control ring	1125-041000	1
9	L28-051001	Crankshaft	L30-051001	1
10	L28-051002	Crankshaft counter balancing	L30-051002	2
11	L26-100002	Nameplate	L30-100002	1

Appendix2: List of Parts of L28 Diesel Engine

NO.	Parts Number	Name of Parts	Replace Number of L30	Qty
1	L28-040001	Piston	L30-040001	1
2	L28-051001	Crankshaft	L30-051001	1
3	L28-051002	Crankshaft counter balancing	L30-051002	2
4	L28-100002	Nameplate	L30-100002	1

Appendix3: List of Parts of L32 Diesel Engine

NO.	Parts Number	Name of Parts	Replace Number of L30	Qty
1	L32-010001	Cylinder liner	L30-010001	1
2	L32-010003	Cylinder head gasket	1125-010014	1
3	L32-011001	Engine block	L30-011001	4
4	L32-020001	Camshaft	L30-020001C	1
5	L32-040003	1st compression ring	1125-040002	1
6	L32-040004	2nd compression ring	1125-040003	1
7	L32-040001C	Piston	L30-0040001	1
8	L32-041000	Coil-spring-loaded oil control ring	1125-041000	1
9	L32-040005	Connecting rod bearing shell	1125-040005	1
10	L32-050006	Lower balancing shaft	L28-050006	1
11	L32-050010	Upper balancing shaft	L28-050010	1
12	L32-100002	Nameplate	L30-100002	1
13	L32-170000 BF1AW105Z01	Injection pump assembly	L30-170000 BF1AD105Z01	1

