

Operation Instruction of ZS1110, ZS1115 Diesel Engine

PREFACE

ZS1110, ZS1115 Model Diesel Engine are new members of our Diesel Engine family, and are the latest products of our corporation supplied for broad users. They are single – cylinder, horizontal and direct injection type with the largest power in China.

With the advantages of beautiful appearance, novel construction, large power, stable and reliable running, lower fuel, less water consumption, easy starting, broad application and simple maintenance etc., these diesel engines have reached the advanced level in 1980s in the respects of economy and reliability. Their connection size with other machines and power output style are as the same as that of S195 and S1100 diesel engines etc. they are the ideal power supplier for small-size four-wheel tractor, project machinery, driven boat, agricultural irrigation and drainage pumps, small-size generator unit and processing machines of agriculture and sideline products etc.

Following points must be paid great attention to when operating.

1. Power complete sets must be strictly in accordance with that marked on the nameplate. Heavy load and super speed must be avoided, as well as light load and low speed for a long time.

2. Diesel oil and engine oil of specified brand should be used. Before filling, then should be fully precipitated and filtered. Filling tools should be kept clear and engine oil replaced periodically.

3. Periodically check fixed screws and see if they are loose both in connecting with other parts and in engine itself. Tighten if necessary.

4. Wash and clean on air filter body, diesel oil filter body and engine oil filter body, replace if necessary. Regularly clean and replace engine oil of oil-bath air filter cover.

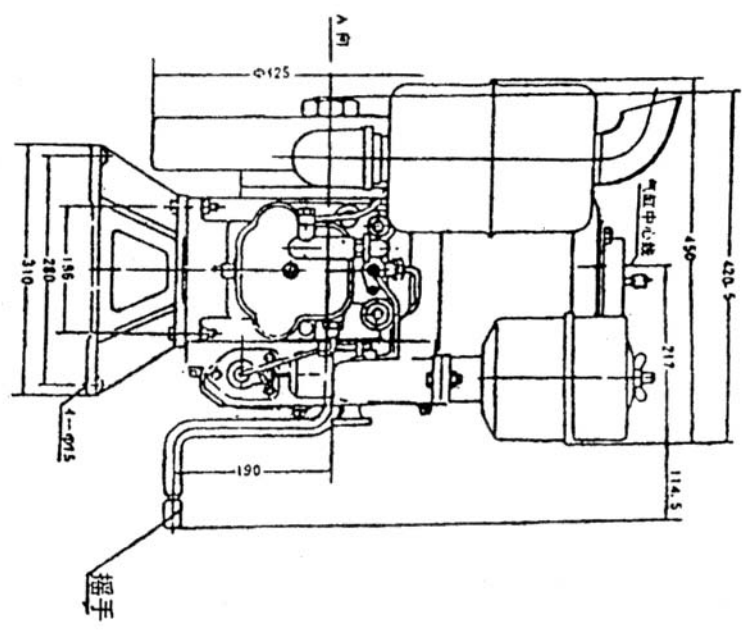
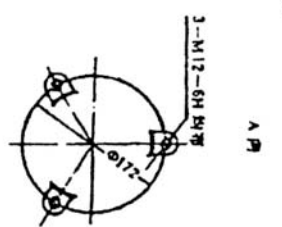
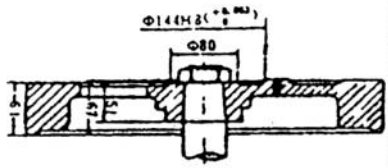
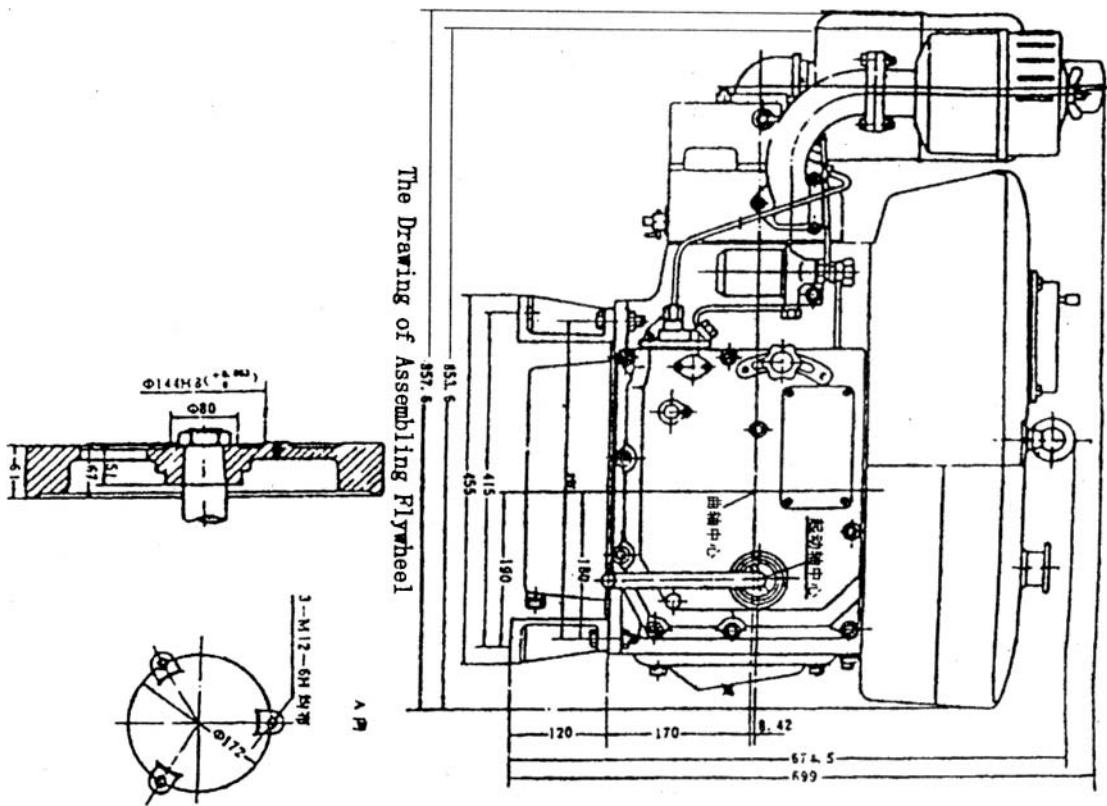
5. Oil corrector mounted on the cover of the gear casing should not be dismounted or adjusted at all. It has been adjusted and sealed while leaving the factory (i. e. Limited within the nominal working conditions).

6. Operator should be familiar with operation principle and structure of the diesel engine. It should persist in maintaining regularly and removing trouble timely. Operating diesel engine with trouble is strictly prohibited.

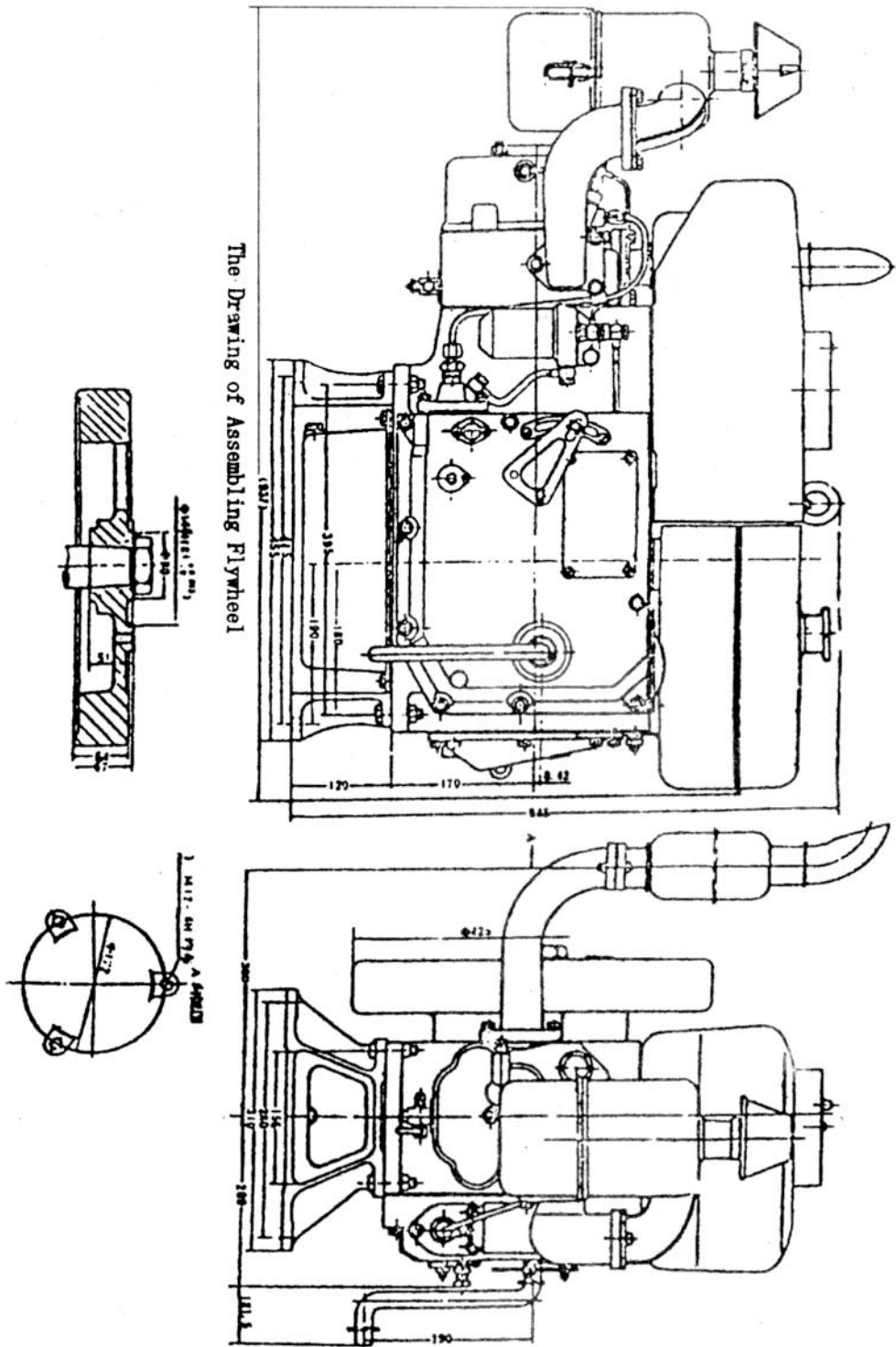
Please read this instruction carefully before putting this engine into operation. Applying and maintaining it correctly so as to make full use of the engine and to serve your machine for a long time.

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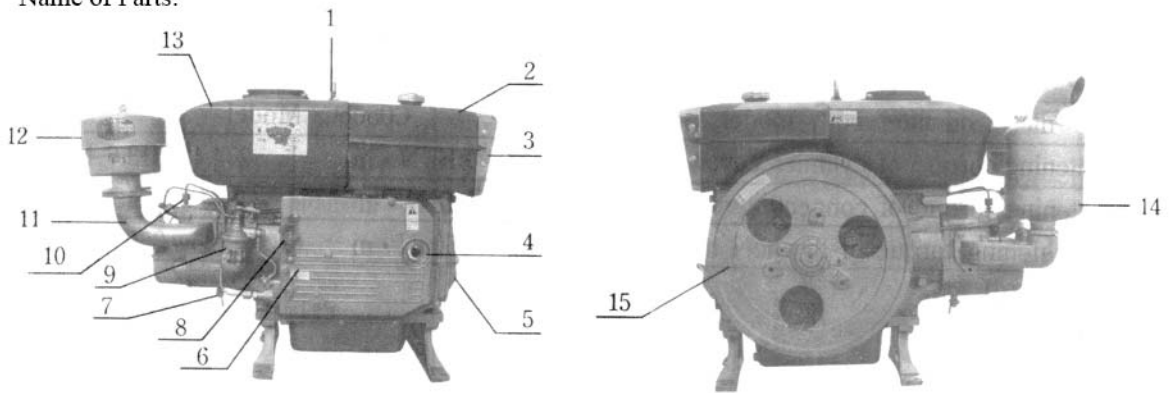
THE DRAWING OF OUTER
AND ASSEMBLAGE DIMENSION FOR ZS1110 DIESEL ENGING



The Drawing of Assembling Flywheel

THE DRAWING OF OUTER AND ASSEMBLAGE DIMENSION FOR S1110T DIESEL ENGINE

Name of Parts:



- | | | |
|-----------------------|-----------------------------|---------------------|
| 1. hanger | 6. oil volume corrector | 11. oil indicator |
| 2. fuel tank | 7. water drainage cock | 12. air filter body |
| 3. cock of fuel tank | 8. Speed-control lever knot | 13. water tank |
| 4. starting spindle | 9. diesel oil filter body | 14. Silencer |
| 5. oil lever dipstick | 10. decompression handle | 15. flywheel |

Item	specification	
Model	S1110	S1115
Type	Single-cylinder, horizontal and four-stroke circle	
Type of combustion chamber	Direct injection	
Cylinder bore	110 mm	115 mm
Piston stroke	115mm	
Piston displacement	1.093 L	1.194 L
Average speed of piston	8.44 m/s	
Compression ratio	17	
Rated power	13.23kw/2200r/min 14.55kw/2200r/min	14.70kw/2200r/min 16.20kw/2200r/min
Average effective pressure	661 kpa	739.75 kpa
Fuel consumption ratio	< 238 g/kw • h	
Oil consumption ratio	< 1.47 g/kw • h	
Injection pressure	18.62 ± 0.49MPa	
Cooling style	water cool evaporation	
Starting style	hand cranking	
Net weight	≤ 180 kg	≤ 185 kg
Outline dimensions	858 × 450 × 690 (mm)	858 × 450 × 699 (mm)
Valve gaps (cold state)	intake valve 0.35 ± 0.05 mm	exhaust valve 0.45 ± 0.05 mm
Type of injector	PF68S19	

Type of injector coulper	ZCK154S432A	
Type injector pump	AK Model, single-piece and separable	
Oil pump	Rotor type	
diesel oil filter body model	C0506C Model	
Tightening torque of cylinder cover nut	290 ~ 310 N • m	274.4 ~ 313.6 N • m
Tightening torque of connecting-rod nut	95 ~ 105 N • m	78.4 ~ 117.6 N • m
Tightening torque of flywheel nut	330 ~ 350 N • m	295 ~ 350 N • m

1.2 Valve Timing

Intale valve opens at 12°
before T. D. C.

Intale valve closes at 38°
after B. D. C.

Intale valve opens at 55°
before T. D. C.

Intale valve closes at 12°
after B. D. C

Advance angle of fuel delivery
at 22° ± 1° before T. D. C.

1.3 fit Clearance of Main Parts:

No	Name of parts	Standard sizes (mm)	Kind of fit	Fit clearance (mm)
1	journal of connecting rod with bearing	axle Φ 68 0 -0.019 hole Φ 68 +0.085 +0.060	clearance	0.060~0.104
2	piston pin with connecting rod bushing	axle Φ 36 0 +0.007 hole Φ 36 +0.041 +0.025	clearance	0.025~0.048
3	camshaft with its front bushing	axle Φ 28 -0.040 -0.053 hole Φ 28 +0.033 0	clearance	0.040~0.086
4	camshaft with its rear bushing	axle Φ 40 -0.025 -0.041 hole Φ 40 +0.039 0	clearance	0.025~0.080

续表

No	Name of parts	Standard sizes (mm)	Kind of fit	Fit clearance (mm)
5	speed-govering gear shaft with its bushing	axle $\Phi 25-0.020$ -0.033 hole $\Phi 25-0.021$ 0	clearance	0.020~0.054
6	starting shaft with its bushing(A)	axle $\Phi 30-0.040$ -0.053 hole $\Phi 30+0.033$ 0	clearance	0.040~0.086
7	starting shaft with its bushing(B)	axle $\Phi 35-0.050$ -0.066 hole $\Phi 35+0.050$ 0	clearance	0.050~0.116
8	piston shirt with cylinder liner	axle $\Phi 110-0.190$ -0.220 hole $\Phi 110+0.035$ 0	clearance	0.190~0.057
9	rocker arms shaft with its guide bushing	axle $\Phi 16 0$ -0.011 hole $\Phi 16+0.043$ +0.016	clearance	0.016~0.054
10	intake valve stem with guide bushing	axle $\Phi 9-0.040$ +0.062 hole $\Phi 9+0.022$ 0	clearance	0.040~0.084
11	exhaust valve stem with guide bushing	axle $\Phi 9-0.040$ -0.062 hole $\Phi 9+0.022$ 0	clearance	0.040~0.084
12	open gap of the top piston ring	(in $\Phi 110+0.005$ feeler) 0	clearance	0.040~0.60
13	open gaps of the 2nd and 3rd piston rings	(in $\Phi 110+0.005$ feeler) 0	clearance	0.25~0.45
14	open gap of the oil scraper ring	(in $\Phi 110+0.050$ feeler) 0	clearance	0.25~0.45

2. Selection of the Size of Pulleys

As the appearance of the S1110 Diesel Engine differs greatly from that of S195 and S1110 diesel engines, their dimensions connected with other working machines are all the same, see outline and installation drawings for details.

When the flywheel of the diesel engine is connected directly with working machines, it must be assured that the coaxiality of them should be less than 0.10mm, otherwise parts should be damaged.

When the diesel engine is connected with working machines by pulleys, the selection of the size of pulleys should affect directly the operating conditions and the productivity of the driven machines. The size of pulleys should be selected according to the following formula:

$$D_1 = (D_2 \times N_2) / N_1 ; \quad D_2 = (D_1 \times N_1) / N_2$$

where D_1 is the diameter of the pulley on the engine shaft (adopting pitch diameter in case V-belt pulley is used);

D_2 is the diameter of the pulley on the driven shaft;

N_1 is the rotation speed of the diesel engine;

N_2 is the rotation speed of the driven shaft.

The diesel engine is supplied with one 4-slot V-belt pulley which has a pitch diameter of 15mm for user while its delivery from the factory. Special requirement may be submitted on request.

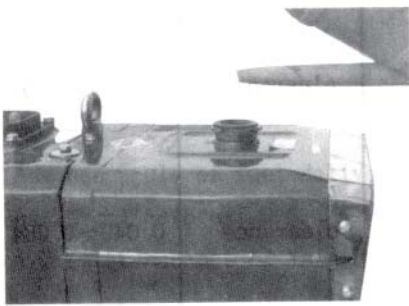


Fig. 1 Fill Diesel oil



Fig. 2 Cock of Fuel Tank

3. Operation and uses of the Diesel Engine

3.1 Preparatory Works

3.1.1 Diesel oil

Diesel oil should be stored in a clean and closed container and should be precipitated for a long time before use. Filtrate it again with screen when filling, open fuel tank cover, fill clean diesel oil into it fully (Fig.1)

Open the cock of the fuel tank (Fig.2)

0# light diesel oil is selected in summer and 10# or -20# light diesel oil should be used in winter.

3.1.2 Lubricant oil

The lubricant oil with certain viscosity according to ambient temperature should be selected and it should conform to the stipulations of GB5323:3# (No. HC-14) lubricant oil is selected in summer and 20# (NO. HC-11 or HC-8) lubricant oil in winter.

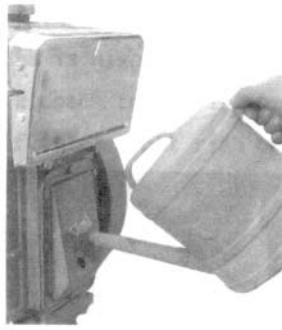


Fig. 3 Fill Lubricant oil



Fig. 4 Measure Oil Level with Dipstick

Different kinds of lubricant oil (including different model or viscosity) should not be mixed together when filling.

Lubricant oil should be stored in a clean and closed container so as to prevent im-purities entering. When filling, draw out the oil dipstick and fill clean lubricant oil into the oil sump (Fig. 3).

The amount of filled oil should be about 2.5kg. Check oil level with oil level with oil dipstick to see if the level is between two marking lines (Fig. 4)

Note: The oil level should not be over the upper line when filling or below the bo-tom line when running normally.



Fig. 5 Fill Water

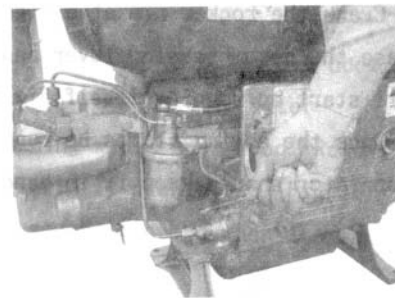


Fig. 6 Let the air go from Fuel

3. 1. 3 Cooling water

Clean soft water should be used as cooling water and waste or hard water (well water for example) is not allowed to use. If it has to use hard water in certain conditions it should be softened. The simplest way is to boil it and then precipitate and filtrate it before use, otherwise water channel should be blocked. Often replace cooling water in tank to remove impurities and dirt.

The red mark in float should rise to its highest position while filling water into the tank (Fig. 5).

3. 1. 4 Remove air from fue:

Loosen the connecting bolt on fuel pipe to remove air mixed in fuel pipe until diesel oil flows out without bubbles, then tighten the bolt (Fig.6)

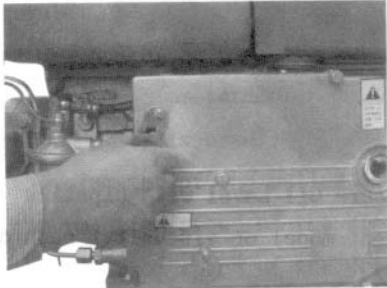


Fig. 7 Set speed-control lever knot at START Position



Fig. 8 Start up the Engine with Hand

3. 2 Starting

After preparatory works above mentioned being finished, check the engine carefully and start it according to following to following procedures:

3. 2. 1 Set the speed-controt lever knot at the START position on speed panel (Fig.7).

3. 2. 2 Open the decompression lever with your right hand and crank up the rocker arm until normal injection sound is heard.

3. 2. 3 Crank the rocker arm at a high speed until the flywheel obtaining enough momentum, release the decompression lever and continue to crank the rocker arm with effort, the engine will start up running itself (Fig.8).

3. 2. 4 Once the engine starts up running, the starting handle will disengage and slip out. The operator should keep it in hand firmly to prevent any possible accident.

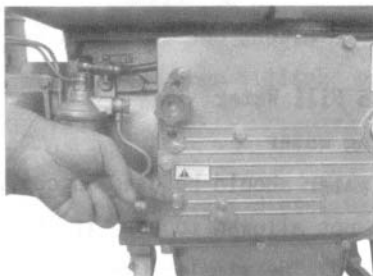


Fig. 9 Check on Indicator and See if it Rises Up

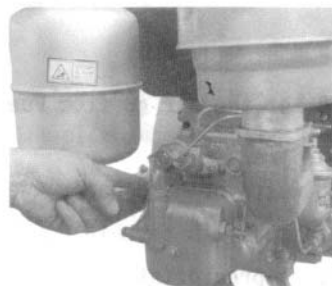


Fig. 10 Forbid to Remove Oil Correntor

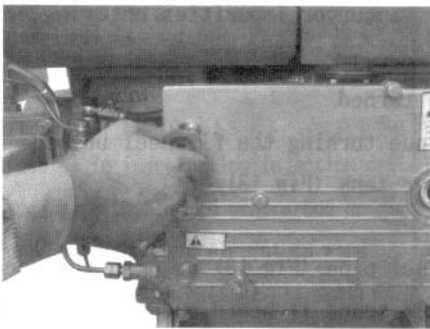
3.3 Running

3.3.1 After starting, make the engine running for 5-8 minutes at lower speed, then increase speed gradually. The engine runs with full load only when the temperature of the water tank is higher.

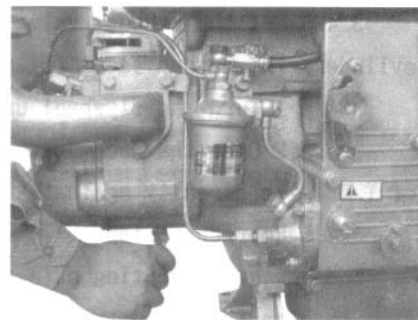
3.3.2 Check to see if the oil indicator is rising up. The lubrication system is abnormal if it does not rise up or drops suddenly, stop the engine at this time and fill lubricant oil fully or remove troubles (Fig.9).

3.3.3 It is normal that the cool water is boiling when the engine is necessary to fill water in time.

3.3.4 Often view the colour of exhaust air when the engine is running. It is not allowed to run the engine when black smoke occurs. This necessary to decrease load or remove troubles in time.



**Fig.11 Set the Speed-control
Lever Knob at STOP Position**



**Fig.12 Drain out Cooling
Water**

3.3.5 It is not allowed to make the engine running with super load. Removing the fuel corrector to increase the power of the engine is strictly prohibited (Fig.10).

3.3.6 Stop the engine immediately if abnormal sound is heard when the engine is running, the check carefully.

3.3.7 During the period of first 50 hours when a new diesel engine is used, operate it carefully and do not run the engine with the largest load. Check again and retighten all loosened bolts and nuts after that period.

3.4 Stopping

3.4.1 Unload the engine and run it at lower speed for a while.

3.4.2 Set the throttle handle at the STOP position (Fig.11), the engine should go out itself.

Note stopping the engine with the decompression lever is strictly prohibited.

3.4.3 Close the cock of the fuel tank.

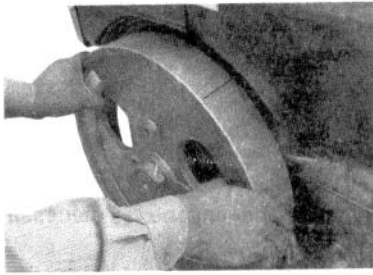


Fig. 13 Turn the Flywheel to T. D. C. Position

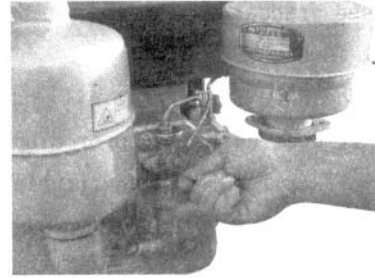


Fig. 14 Loosen Nut on the High Pressone Fuel Pipe

3. 4. 4 Drain out all cooling water in winter or when stopping the engine for a long time. Remove drain cock regularly to dredge water channel and remove dirt (Fig.12).

3. 4. 5 Set the exhaust valve closed to prevent vapour or impurities entering into the cylinder. The method is as follows:

3. 4. 5. 1 Turn the flywheel until it can not be turned.

3. 4. 5. 2 Open the decompression lever to continue turning the flywheel until its mark of T. D. C. is directly against the mark on the water tank (Fig.13).

3. 4. 6 Emergency stop

Loosen the connecting nuts on high-pressure fuel pipe (Fig.13) or open the decompre-ssor to stop the engine running at once if abnormal sound is heard suddenly or flying running occurs.

4. Maintenance of the Diesel Engine

Item	Description	Period (hours)			
		8	50	100	300
diesel oil	check and fill diesel oil chean and wash filling screen chean and wash filter screen and oil filter chean and wash fuel tank	*		*	*
lubran' t oil	check and fill lubricant oil chean and wash filling replace with new oil and-clean oil sump chean and wash oil filter chean air lilten	*		* *1*	* *2*
cooling water	check and fill water drain out cooling water clean water channel	* *3*			*4*
Others	Adjust gaps of valves check & tighten all important bolts & nuts check wearness of all moving parts			*1*	* *

Notes:

1. Drain off dirty lubricant oil when it is warm, clean the oil sump and fill new oil.
2. Air cleaner should be cleaned every 50 hours if more dust exists around the engine.
3. Drain off the cooling water at once after stopping the engine in winter to prevent engine and cylinder cover from being frozen.
4. Remove the water tank and fill hydrochlorine acid with a density of 25 per cent into water channel and keep it there for 20 minutes, then drain off it and clean channel with water again and again.
5. Troubleshooting and removing:
 - 5.1 Diesel engine starts difficultly or fails to start

Feature and Cause	Remedy
1. The weather is too cold	Fill warm water into water tank
2. Troubles in fuel system	
(1) Diesel oil is frozen	Warm up
(2) Water in diesel oil	Clean tank and pipe, replace diesel oil
(3) Air in fuel pipe	Exhaust air and tighten all pipe joints
(4) Troubles in injector: low injection pressure, needle valve blocked and carbon on jet	Clean, grind and replace fuel jet, adjust injection pressure to $18.13 \pm 0.49 \text{MPa}$ ($185 \pm 5 \text{kgf/cm}^2$)
(5) Fuel injection pump element is worn	Replace fuel injection element
3. Compression force in cylinder is small	
(1) Nuts on cylinder cover cover are loosened and gasket is burnt	Tighten nuts on cylinder cover evenly and diagonally, replace cylinder gasket
(2) Piston ring, piston and cylinder liner are worn out badly	Replace piston ring, piston and cylinder liner
(3) Piston ring is stuck and broken	Clean, wash and replace
(4) Air-tightness between valve and seat is not good, leakage occurs	Grind
(5) Clearances of intake and exhaust valve are incorrect	Adjust clearance according to stipulations
(6) Valve stem is blocked in guide bushing	Remove valve, wash valve and guide bushing with diesel oil
(7) Compression ratio is decreased due to more repairs	Replace valve seat
4. Advance angle of delivery is incorrect	Adjust it at 22 ± 1 before T. D. C. according to stipulation
5. Viscosity of lubricant oil is thicker, speed could not be increased by hand	Replace lubricant oil with specified brand

5. 2 Power is insufficient

Feature and Cause	Remedy
1. Trouble in fuel system (1) Diesel oil filter and fuel pipe blocked, fuel delivery is not smooth (2) Fuel delivery of pump is bad (3) Troubles in in jector 2. Compression force in cylinder is small 3. Air filter clogged 4. Advance angle of fuel delivery is wrong	Check diesel oil cock, clean oil filter and fuel pipe Repair or replace damaged parts of pump Refer to item 2. (4) . of 5. 1 Refer to item 3. of 5. 1 Remove, clean or replace filter Adjust according to stipulation

5. 3 Diesel engine stall

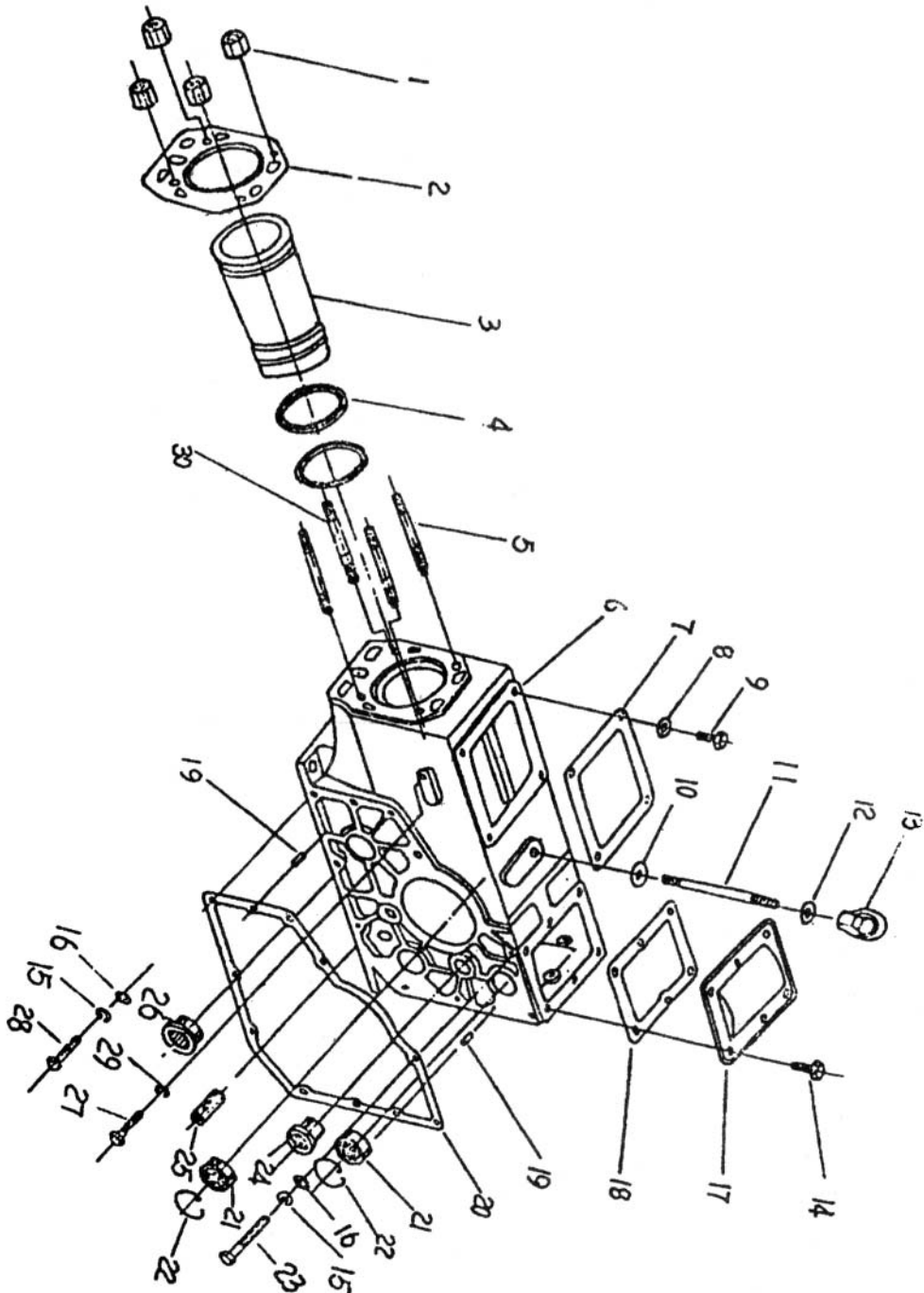
Feature and Cause	Remedy
1. Troubles in fuel system (1) Air in fuel system (2) Quality of diesel oil is bad or there is water in it (3) Needle valve in jet is blocked or injection pressure is much higher (4) Jet coupler, injection pump coupler and fuel outlet valve damaged 2. Speed system blocked or adjust bolt on speed lever worn out	Remove air Refer to item 2. (2) . of 5. 1 Refer to item 2. (4) . of 5. 1 Replace damaged parts Check or adjust the extension of bolt

5. 3 Diesel engine stall

Feature and Cause	Remedy
1. Fuel jet is often blocked (1) Suddenly stopping engine at a high speed at high temperature (2) Diesel oil is dirty and cartridge is broken out 2. Much lubricant oil escaped out from exhaust port	Avoid stopping engine at high speed at high temperature Clean fuel system, replace diesel oil and cartridge

Feature and Cause	Remedy
<p>(1) Piston and cylinder worn out</p> <p>(2) Valve guide bushing worn out</p> <p>(3) Cylindering ring stuck, worn out or broken</p> <p>(4) Cylinder ring mounted upside down</p> <p>(5) Too much lubricant oil filled</p> <p>3. Pressure of lubricant oil is not enough</p> <p>(1) Less amount of lubricant oil</p> <p>(2) Oil inlet blocked</p> <p>(3) Stator, and rotor of pump worn out</p> <p>(4) Lubricant oil filter blocked</p> <p>(5) Too large clearance between and sides of oil pump</p> <p>4. Oil pressure is too high, oil channel in engine blocked</p> <p>5. Speed is unstable and pipe connection is leaking air</p>	<p>Replace</p> <p>Replace</p> <p>Clean or replace</p> <p>Remove and remount remount</p> <p>Draw it out to normal level</p> <p>Fill it to normal level</p> <p>Remove and clean</p> <p>Replace</p> <p>Remove and clean</p> <p>Adjust with gasket</p> <p>Remove check and dradge</p> <p>Tighten or replace gasket, and refer item 2. of 5. 3</p>

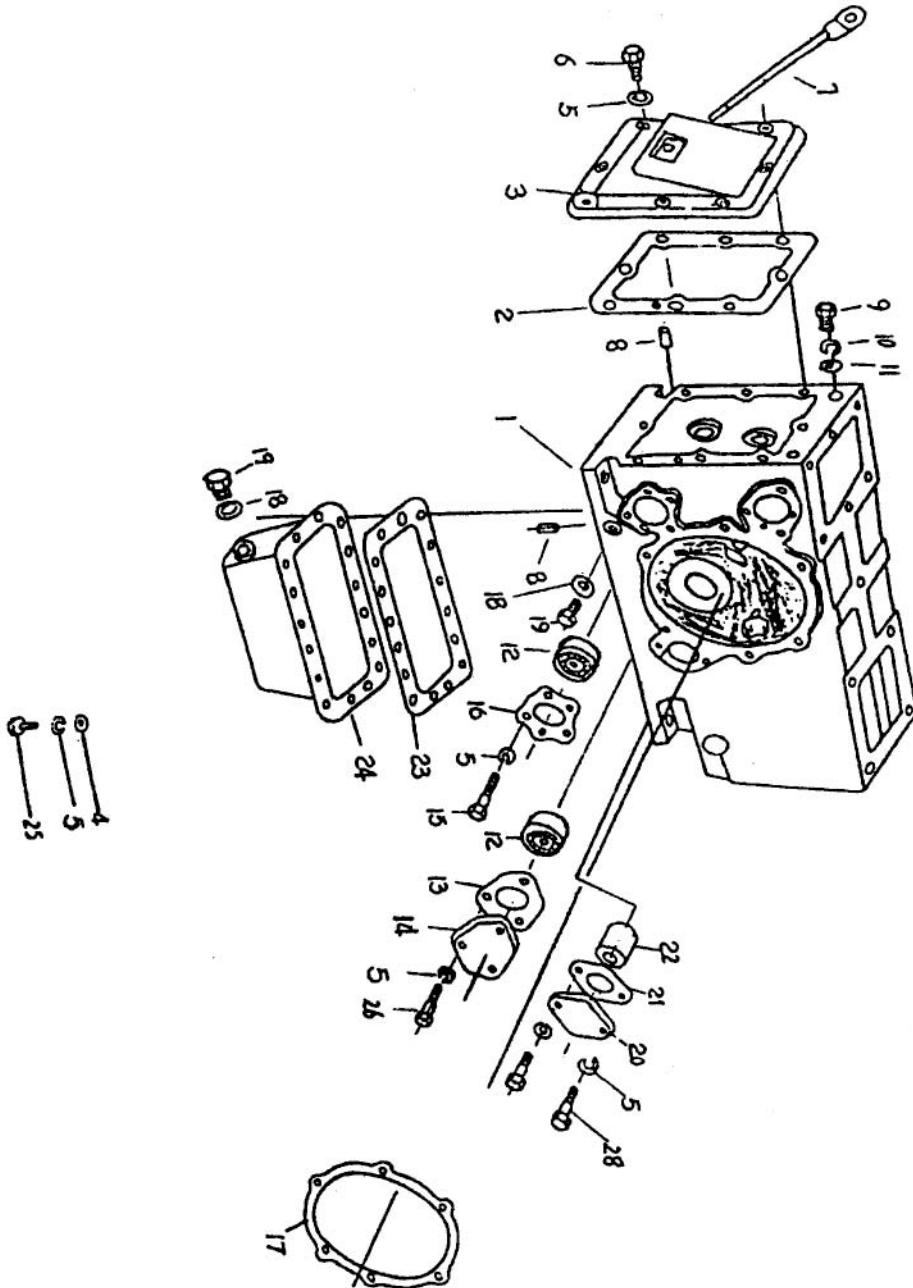
Fig. I Cylinder Block Assembly-1



Cylinder Block Assembly-1 (Fig. I)

No.	Name of Part	Part No.	Qty.
1	Cylinder head nut	1110-01001-	4
2	Cylinder head gasket	S1110-01003	1
3	Cylinder liner	S1110-01004	1
4	Cylinder liner water seal	S1110-01005	2
5	Cylinder head stud	S1110-01002	2
6	Cylinder block	S1110-01101	1
7	Hopper packing	S195-01007	1
8	Washer 10-140HV	GB97.1-85	4
9	Bolt M10×25 Zn. D	GB5783-86	4
10	Washer	S195-01008	1
11	Lifting stud	S1100-01005	1
12	Washer 12-140HV	GB97.1-85	1
13	Lifting eye-nut	S195-01010	1
14	Bolt M8×16	GB5783-86	6
15	Washer 8	GB93-86	15
16	Washer 8-140HV	GB97.1-85	15
17	Upper cover of the cylinder block	S195-01011	1
18	Packing sheet of upper cover	S195-01012	1
19	locating pin 5ga×12	GB119-86	2
20	Gear casing packing	S1110-01011	1
21	Single row self-centering ball bearing 305	GB276-82	2
22	Circlip	S1110-01010	2
23	Bolt M8×95	S195-01034	3
24	Starting shaft bushing(A)	S111-01102	1
25	Speed-governing gear shaft	S1110-10105b	1
26	Camshaft front bushing	S195-01018	1
27	Bolt M10×25	GB5783-86	1
28	Bolt M8×55	GB5782-86	6
29	Washer 10-140HV	GB93-87	1
30	Cylinder head stud(locating)	S1110-01007	2

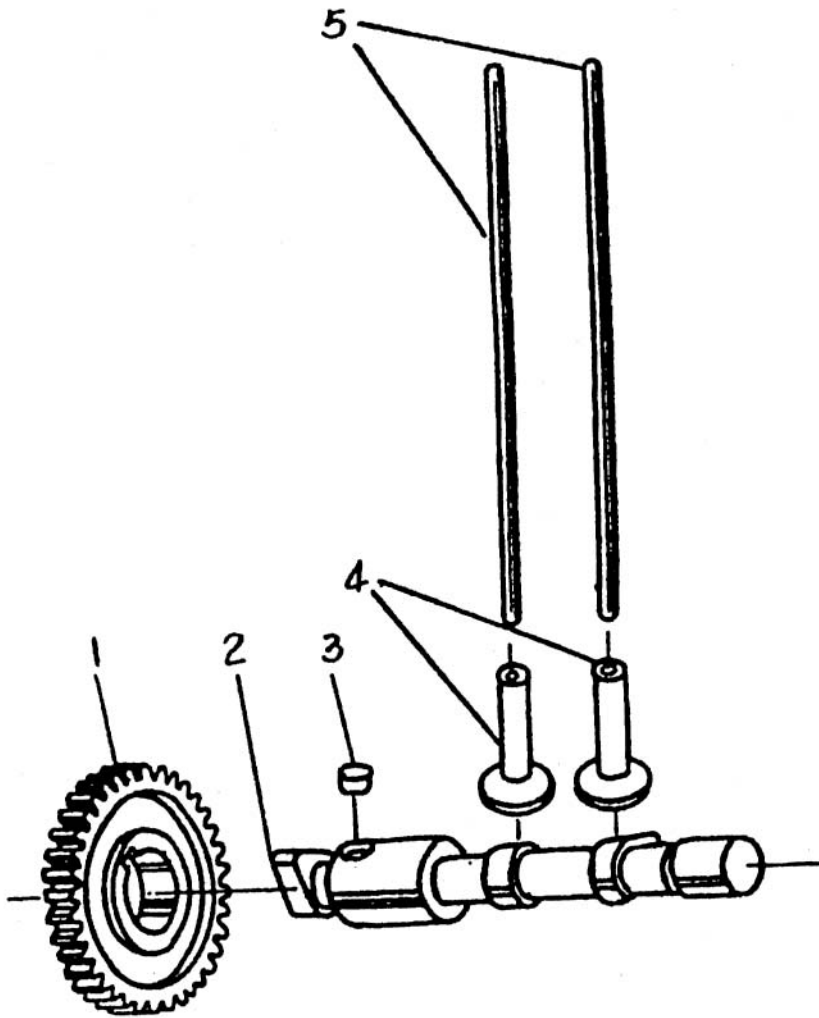
Fig. II Cylinder Block Assembly-2



Cylinder Block Assembly-2 (Fig. II)

No.	Name of Part	Part No.	Qty.
1	Cylinder block	S1110-01101	1
2	Packing of the rear cover	S195-24249a	1
3	Rear cover	S195-01020a	1
4	Washer 8-140HV	GB97.1-85	16
5	Washer 8	GB93-87	38
6	Bolt M8×20	GB5783-86	8
7	Oil dipstick	S195-01100a	1
8	Oil hole plug on the block	S195-01021	2
9	Bolt M10×20	GB5783-86	2
10	Washer 10	GB93-87	2
11	Washer 10-140HV	GB97.1-85	2
12	Single row, self-centering ball bearing 305	GB276-82	2
13	Packing for balancing shaft cover	S1110-01009	as required
14	Balancing shaft cover	S1110-01008	1
15	Bolt M8×40	GB5782-86	3
16	Packing for lubricating	S1110-01014	as required
17	Main bearing housing mounting shim	S1110-01006	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 sump	S1110-1200	1
25	Bolt M8×20	GB5783-86	16
26	Bolt M8×20	GB5782-86	3
27	Bolt M8×25	GB5782-86	2

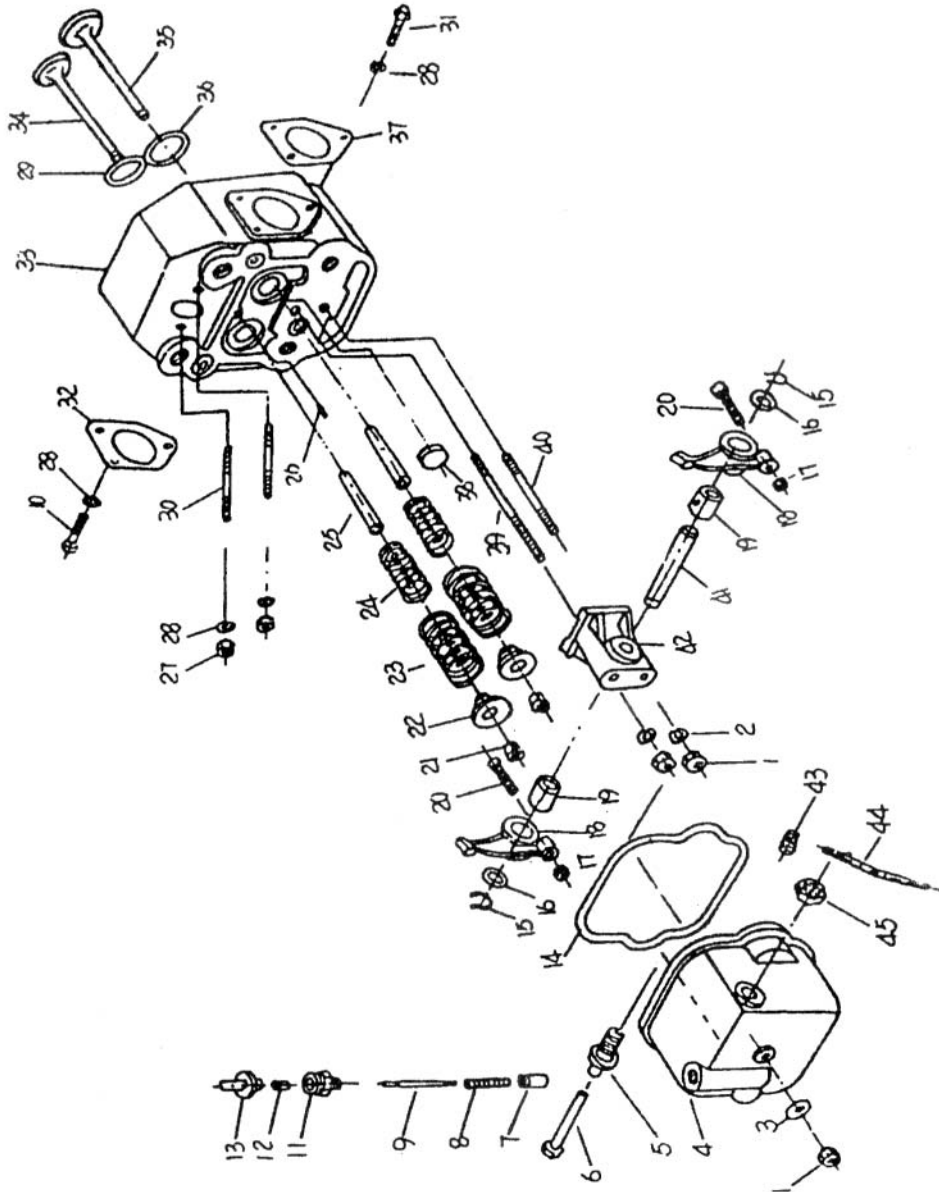
Fig. III Camshaft Assembly



Camshaft Assembly (Fig. III)

No.	Name of Part	Part No.	Qty.
1	Camshaft gear	S195-02001	1
2	Camshaft	S1110-02001	1
3	Flat key 10×16	GB1096-79	1
4	Valve tappet	S195-02004	2
5	Valve push rod	S1110-02002	2

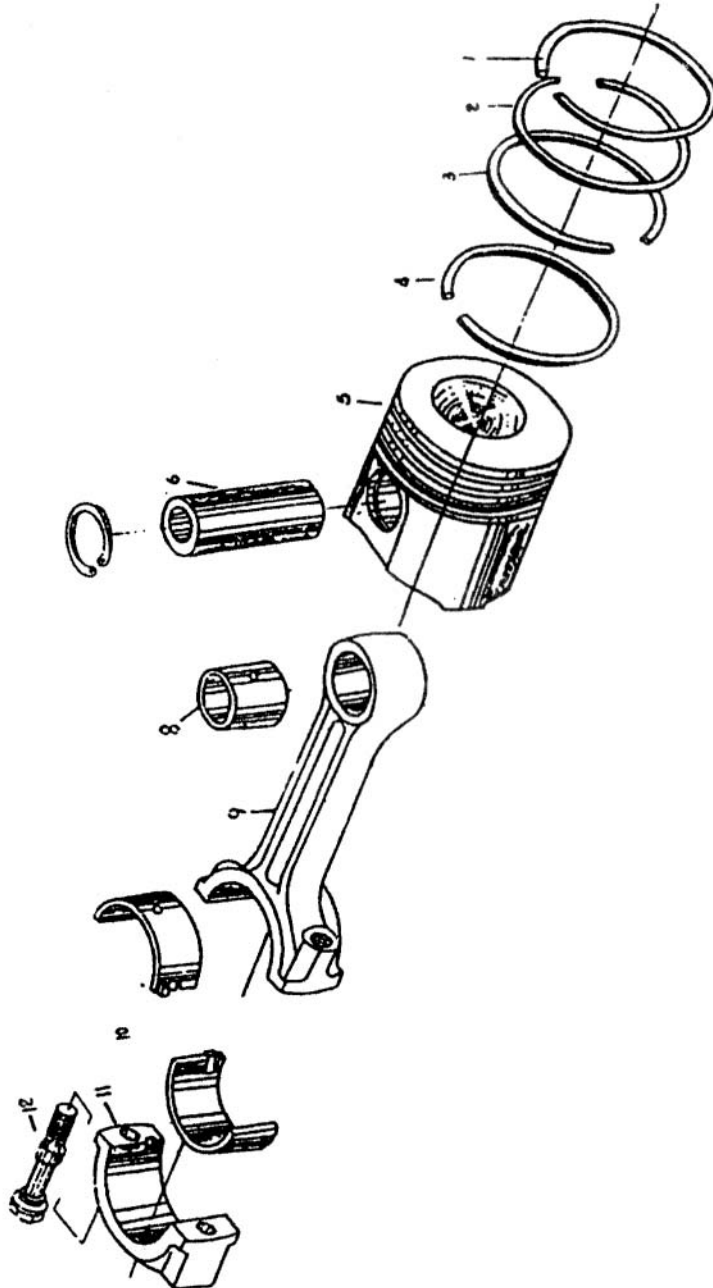
Fig. IV Cylinder Head Assembly



Cylinder Head Assembly (Fig. IV)

No.	Name of Part	Part No.	Qty.
1	Hexagon nut M10	GB6170-86	3
2	Spring washer 10	GB93-87	2
3	Plain washer 10-140H	GB97.1-85	1
4	Cylinder head cover	S1110-03101	1
5	Decompression shaft bushing	S195-03102	1
6	Decompression shaft	S195-03103	11
7	Oil indicator piston	S195-03111a	1
8	Oil indicator spring	S195-03112a	1
9	Oil indicator spindle	S195-03113a	1
10	Hexagon bolt M8×30	GB5783-86	3
11	oil indicator union	S195-03115a	1
12	Red float of oil indicator	S195-03116a	1
13	Cap of red float of oil indicator	S195-03117a	1
14	Cylinder head cover packing	S1110-03003	1
15	Circlip for rocker arm shaft	S195-03002	2
16	Washer for rocker arm shaft	S195-03003	2
17	Hexagon nut M8×1	GB6171-86	2
18	Rocker arm	S195-03004	2
19	Rocker arm bushing	S195-03005	2
20	Adjusting screw	S195-03006a	2
21	Valve collet	S195-03007	2 sets
22	Valve spring seat	S195-03008	2
23	Outer valve spring	S195-03009a	2
24	Inner valve spring	S195-03010	2
25	Valve guide	S1110-03202	2
26	Pin B5×12	GB119-86	1
27	nut for injector clamping	S1110-03007	2
28	Spring washer 8	GB93-87	8
29	Exhaust valve seat	S1110-03201	1
30	Stud for injector clamping plate	S1110-03006	2
31	Hexagon bolt M8×25	GB5783-86	3
32	Exhaust pipe packing	S1110-03004	1
33	Cylinder head	S1110-03203	1
34	Exhaust valve	S1110-03001	1
35	Intake valve	S1110-03002	1
36	Intake valve seat	S1110-03204	1
37	Intake pipe packing	S1110-03005	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

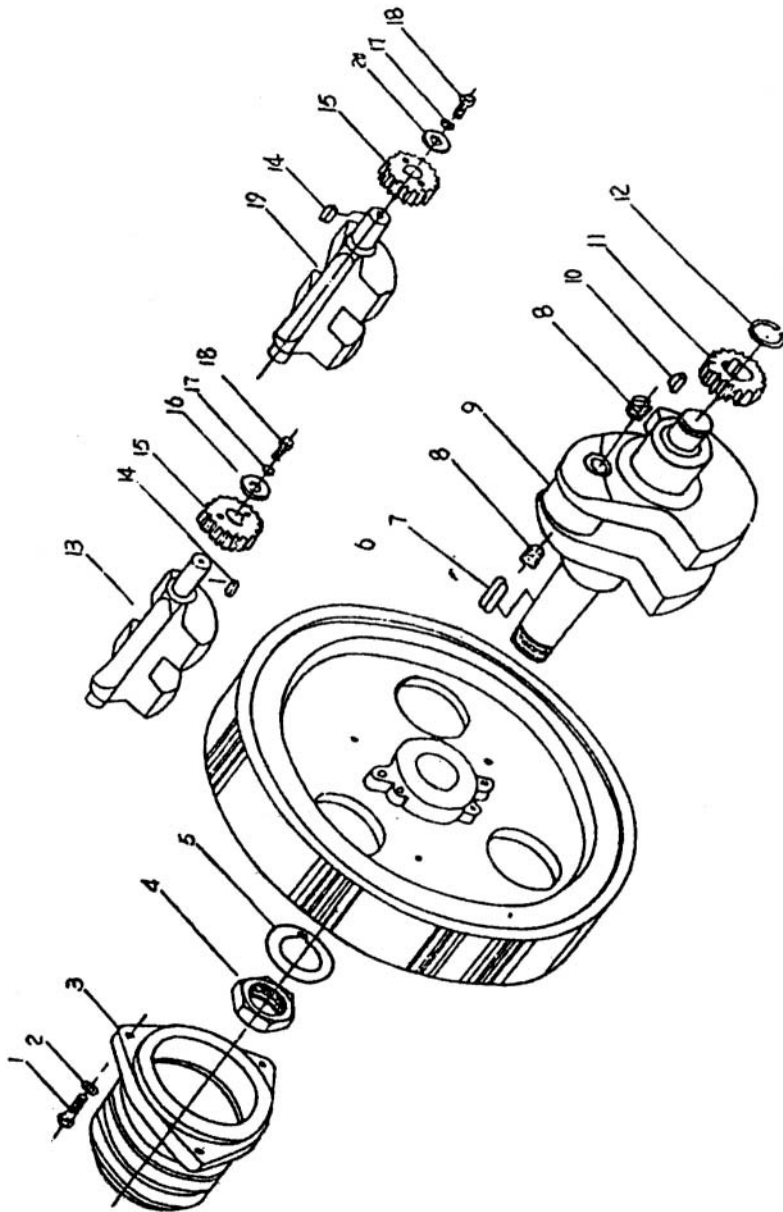
Fig. V Piston and connecting Rod Assembly



Piston and connecting Rod Assembly (Fig. V)

No.	Name of Part	Part No.	Qty.
1	Piston ring(1)	S1110-04001	1
2	Piston ring(2)	S1110-04002	1
3	Piston ring(3)	S110-04002	1
4	Oil scraper ring	S1110-04100	1
5	Piston	S1110-04003	1
6	Piston Pin	S1110-04004	1
7	Circlip 36	GB893.1-86	2
8	Connecting rod bushing shell	S1110-04201	1
9	Connecting rod	S1110-4202	1
10	Connecting rod bushing shell	S1110-04203	2
11	Connecting rod cap	S1110-04205	1
12	Connecting rod bolt	S1110-04204	2

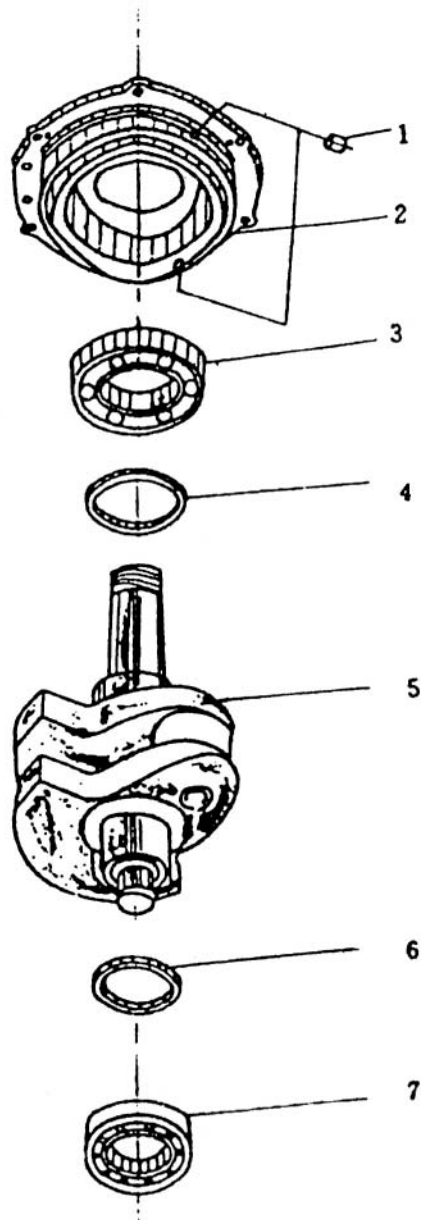
Fig. VI Flywheel, Crankshaft and Balancing Mechanism-I



Flywheel, Crankshaft and Balancing Mechanism-I (Fig. VI)

No.	Name of Part	Part No.	Qty.
1	Bolt M12×35	GB5783-86	3
2	Washer 12	GB93-87	3
3	V-belt pulley	S1110-05001	1
4	Flywheel nut	S195-05002	1
5	Lock washer	S195-05003	1
6	Flywheel	S1110-05003	1
7	Flat key 12×40	GB1096-79	1
8	Crankshaft screw plug	S1110-05011	2
9	crankshaft	S1110-05009	1
10	Flat key 8×18	GB1096-79	1
11	Crankshaft timing gear	S195-05009	1
12	Circlip 30	GB894.1-86	1
13	Upper balancing shaft	S1110-05010	1
14	Key C6×16	GB1096-79	2
15	Balancing shaft gear	S195-05012	2
16	Washer	S195-05013	1
17	Washer 8	GB93-87	2
18	Bolt M8×16	GB5783-86	2
19	Lower balancing shaft	S1110-05006	1
20	Washer	S1110-05008	1

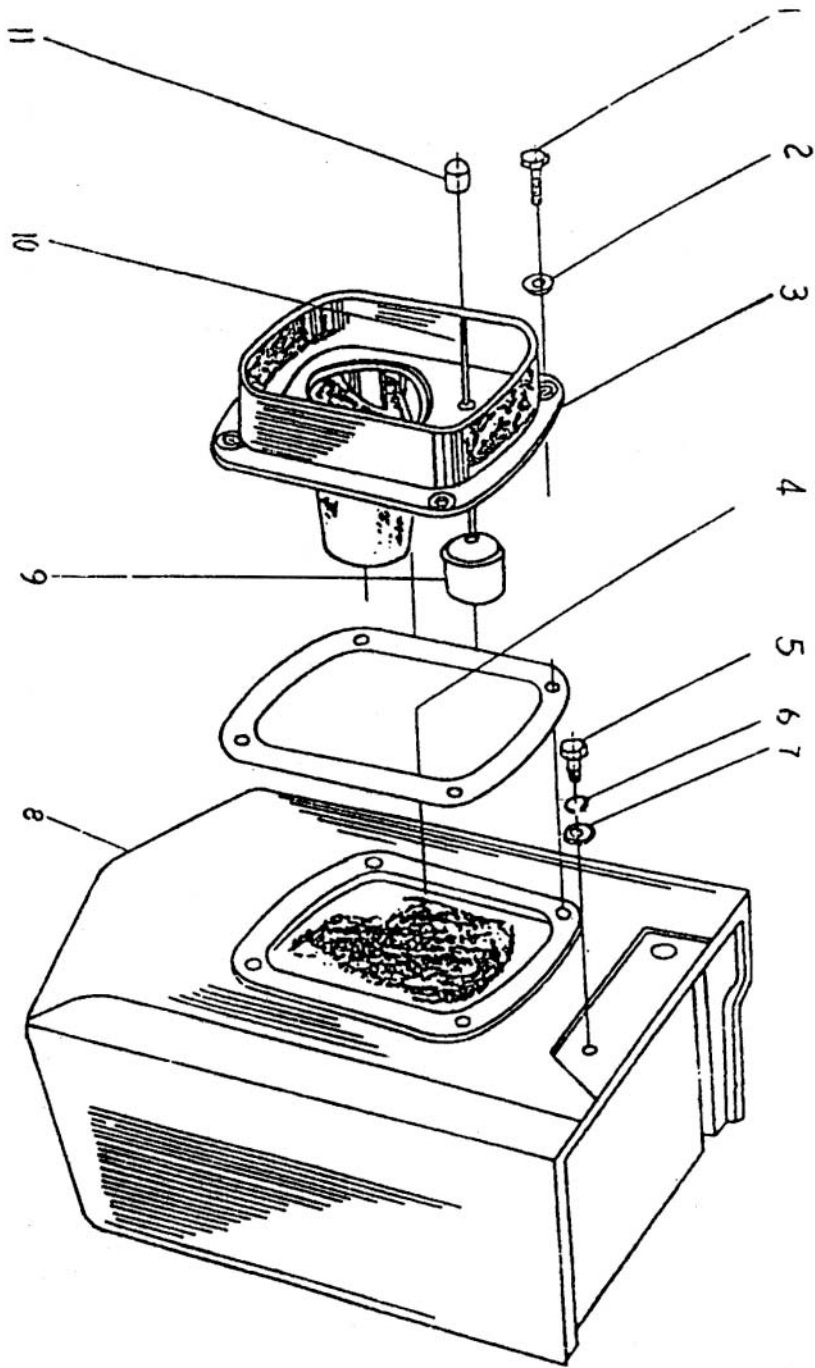
Fig. VII Flywheel, Crankshaft and Balancing Mechanism-II



Flywheel, Crankshaft and Balancing Mechanism-II (Fig. VII)

No.	Name of Part	Part No.	Qty.
1	Plug	S1110-05015	2
2	Main bearing housing	S1110-05005a	1
3	Bearing 314	GB276-82	1
4	Circlip B	S1110-05014	1
5	Crankshaft	S1110-05009	1
6	Circlip A	S1110-05007	1
7	Bearing 42312	GB283-87	1

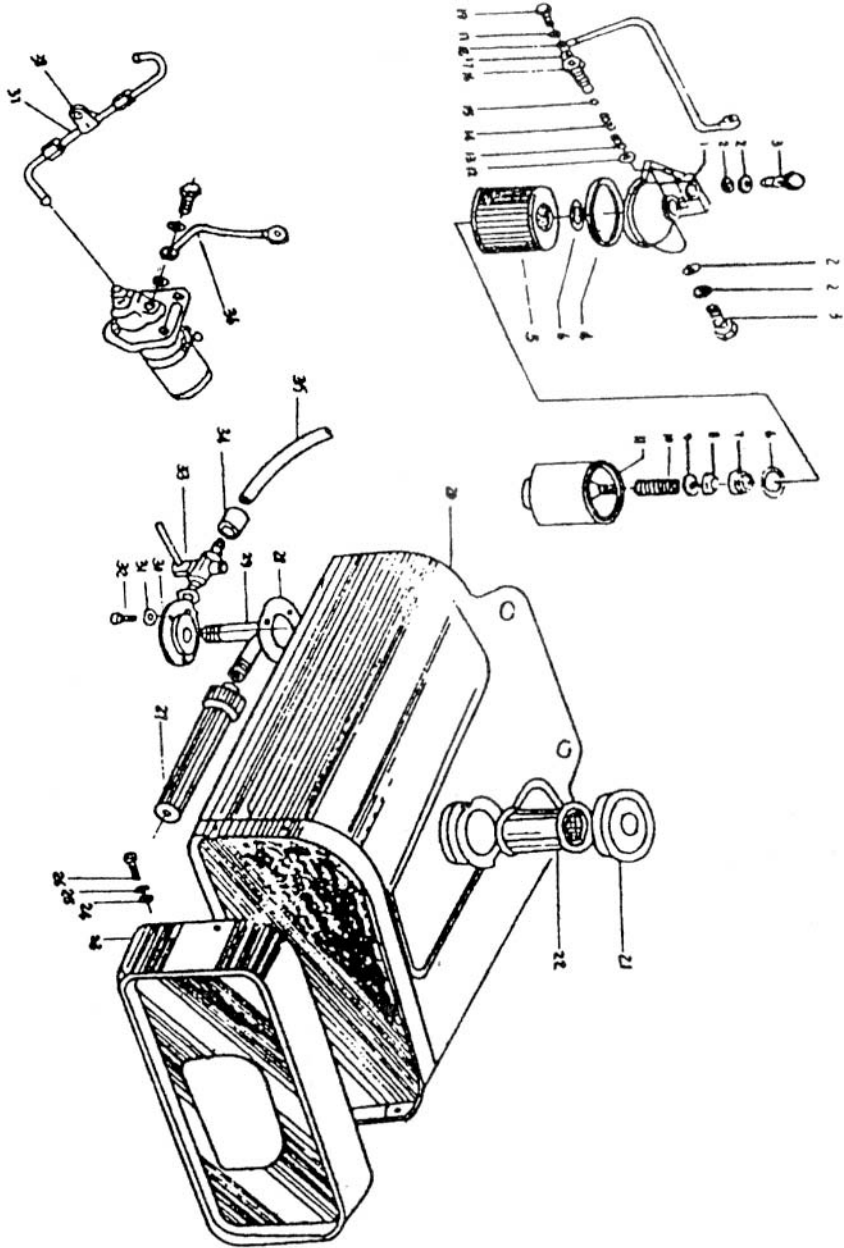
Fig. VIII Water Hopper Assembly



Water Hopper Assembly (Fig. VIII)

No.	Name of Part	Part No.	Qty.
1	Bolt M8×20	GB5783-86	4
2	Washer 8	GB97.1-85	4
3	Funnel	S195-06103	1
4	Funnel packing	S195-06001	1
5	Bolt M8×16	GB5783-86	1
6	Washer 8	GB93-87	1
7	Washer 8-140HV	GB96-85	1
8	Hopper	S1110-06001	1
9	Float	S195-6203	1
10	Float stem	S1100-06101	1
11	Red indicating ball	S195-06202	1

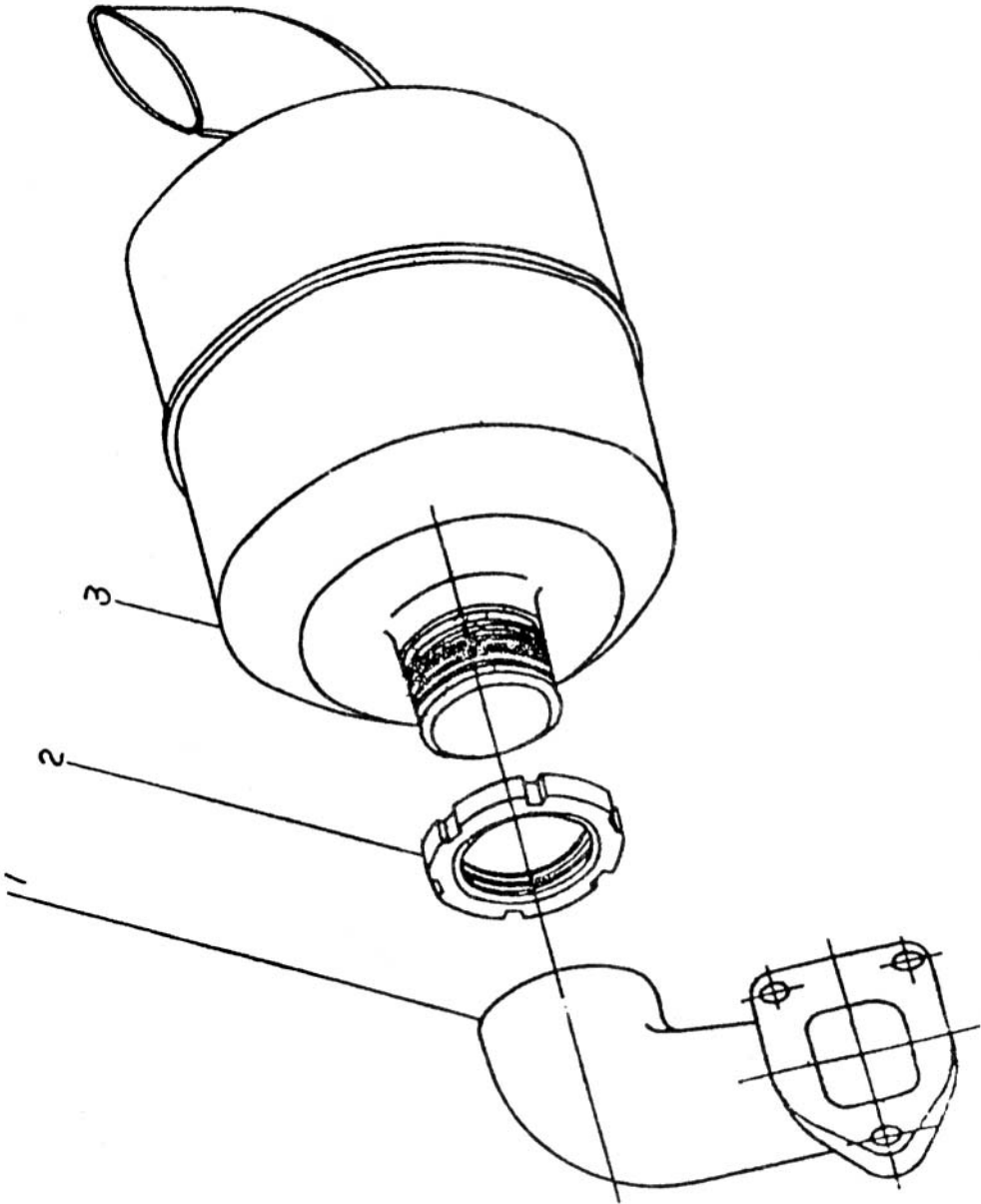
Fig. IX Fuel Syetem



Fuel Syetem (Fig. IX)

No.	Name of Part	Part No.	Qty.
1	Fuel filter cover	C0506B-0002	1
2	Washer	S195-07204	4
3	Pipe connection bolt	195-07203	3
4	Seal ring	C0506A-0003	1
5	Fine fuel filter	C0506A-1000	1
6	Seal ring	C0506A-0005	2
7	Fuel filter holder	C0506A-0006	1
8	Rubber ring	C0506A-0013	1
9	Washer	C0506A-0015	1
10	Spring	C0506A-0016	11
11	fuel filter body	C0506A-3000	1
12	Washer	C0506A-0001	1
13	Valve seat	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 leak off pipe connecting	S1110-07401	1
19	Pipe connection bolt	S195-09002	1
20	Fuel tank	S1110-07100	1
21	Fuel tank cap	S195-07300	1
22	Fuel filling screen	S195-07400	1
23	Lamp clamp	S1110-07100	1
24	Washer	GB97.1-85	4
25	Spring washer	GB93-87	4
26	Button head cap screw	GB67-85	4
27	Primary fuel filter	S195-07600	1
28	packing	S195-07004	1
29	Fuel outlet pipe	S195-07005	1
30	fuel cock connecting flange	S195-07006	1
31	Washer 6	GB93-87	3
32	Bolt M6×16	GB5783-86	3
33	Fuel cock	S195-07700	1
34	Pipe connecting sleeve	S195-07003	1
35	Fuel pipe	Oil-resisting rubber pipe	1
36	Fuel pipe	S1110-07300	1
37	High pressure fuel pipe and its access	S1110-07200	1
38	Pipe clip	S1110-07205	1

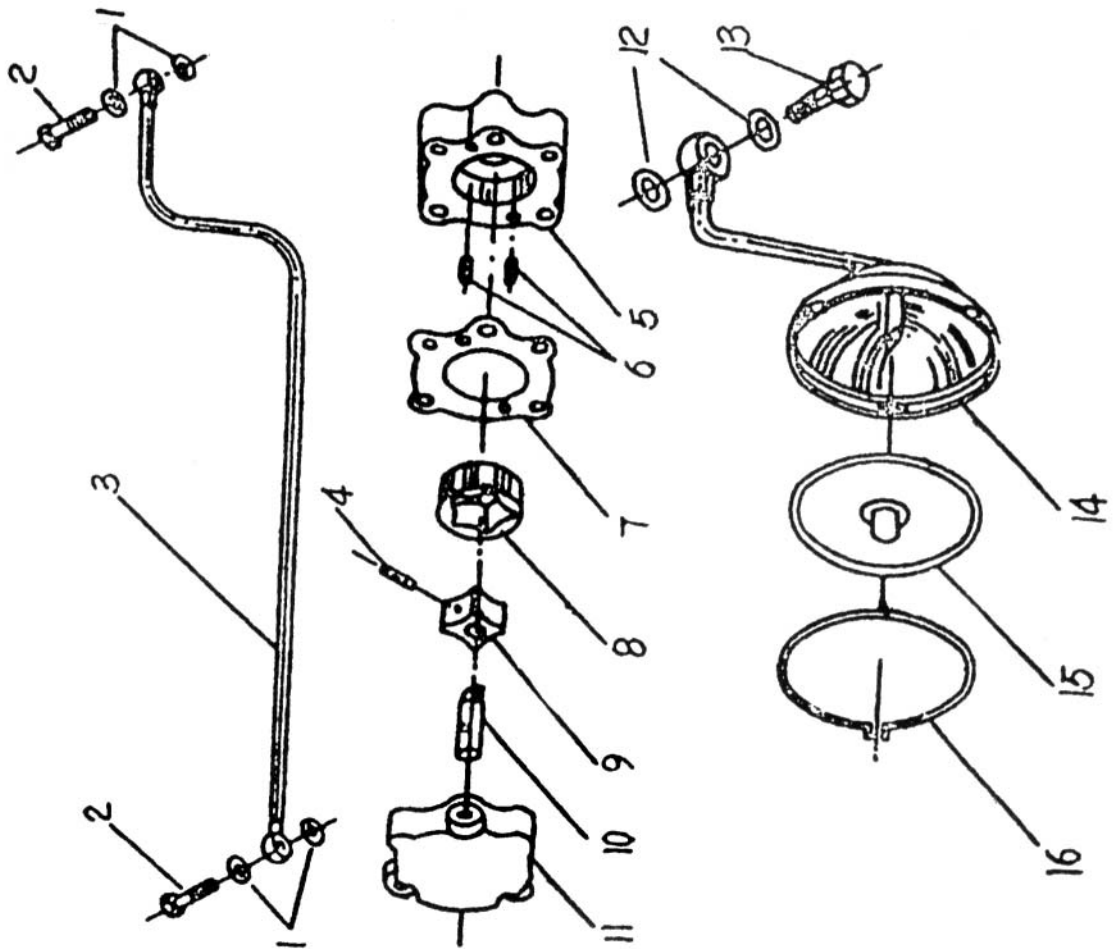
Fig. X Exhaust Syetem



Exhaust Syetem (Fig. X)

No.	Name of Part	Part No.	Qty.
1	Exhaust pipe	S1110-08002	1
2	Lock nut	S1110-08001	1
3	Silencer, complete	S1110-08100a	1

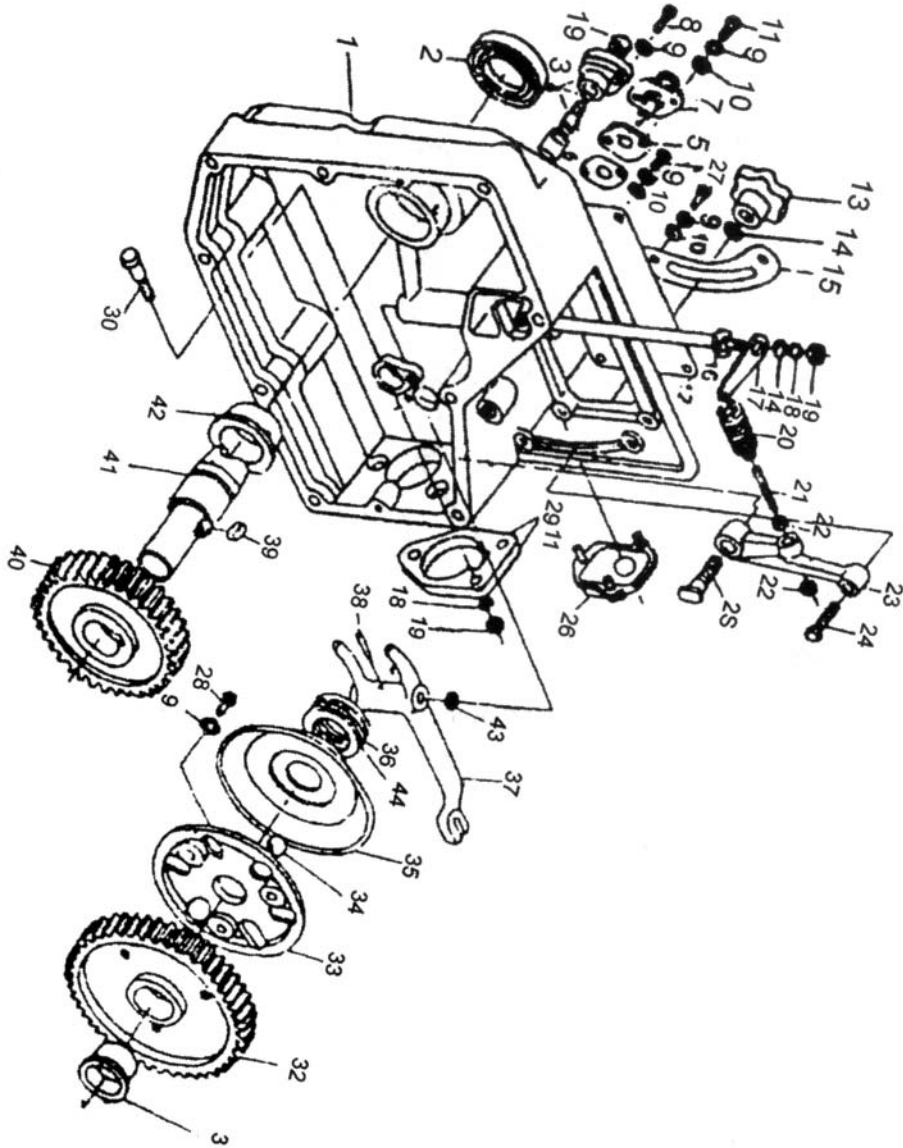
Fig. XI Lubrication System



Lubrication Syetem (Fig. XI)

No.	Name of Part	Part No.	Qty.
1	Washer	S195-09001	4
2	Pipe connecting bolt	S195-09002	2
3	Oil pipe	S1110-09100	1
4	Cylindrical pin	S195-09201	1
5	Lubricating oil pump body	S1110-09202	1
6	Locating pin	GB119-86	2
7	Lubricating oil pump packing shim	S1110-09203	as required
8	Outer rotor	S195-09204	1
9	Inner rotor	S195-09205	1
10	Oil pump shaft	S195-09206	1
11	Oil pump cover	S1110-09207	1
12	Washer	S195-01025	2
13	Pipe connection bolt	S195-09313	1
14	Oil strainer body with suction pipe	S195-09311	1
15	Oil strainer screen	S195-09320	1
16	Circlip	S195-09301	1

Fig. XII Gear Casing Assembly



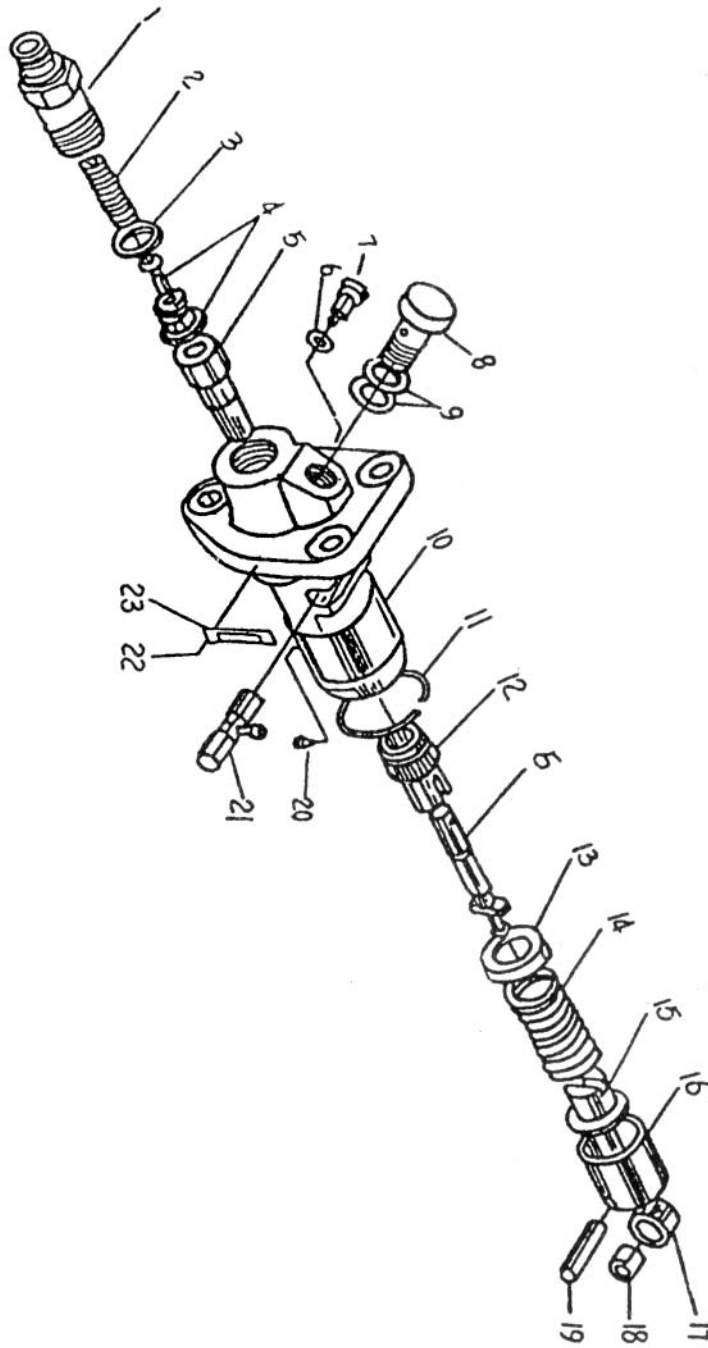
Gear Casing Assembly (Fig. XII)

No.	Name of Part	Part No.	Qty.
1	Gear casing	S1110-10001	1
2	Oil seal ring		
3	Packing for fuel priming handle bushing	S195-10404	1
4	Fuel priming handle bushing	S105-10405a	1
5	Plug	S195-10408	1
6	Fuel limiter packing	S195-10002	1
7	Fuel limiter	S1110-10200	1
8	Screw M6×20	GB67-85	1
9	Washer 6	GB93-87	12
10	Washer 6-140HV	GB97.1-85	11
11	Screw M6×10	GB67-85	11
12	Name plate	S1110-10002	1
13	Speed-control lever knob	S195-10200a	1
14	Washer 8-140HV	GB97.1-85	2
15	Speed indicating panel	S1110-10005	1
16	Governor forks shaft	S1110-10122	1
17	Governor arm	S195-10102	1
18	Washer 8	GB93-87	4
19	Nut M8	GB6170-86	4
20	Governor spring	S195-10103	1
21	Adjusting screw	S195-10104	1
22	Nut M6	B6170-86	2
23	Speed-control lever shaft	S195-10105	1
24	Bolt M8×40	GB5783-86	1
25	Speed-control lever shaft	S195-10106	1
26	Grankcase ventilator	S195-10600	1
27	Button head cap screw	S195-10007	as required
28	Fuel injection pump mounting bolt	S195-10004	3
29	Starting gear	S195-10302	1
30	Starting gear shaft	S195-10303a	1
31	Starting gear shaft bushing (B)	S195-10010	1
32	key 8×18	GB1096-79	1
33	Governor gear shaft	S1110-10105b	1
34	Governor gear bushing	S1110-10104b	1
35	Governor gear	S1110-10103	1
36	pin A3×8	GB119-86	2
37	Spacer of flying block	S1110-10133a	1
38	Shaft of flying block	S1110-10132a	2
39	Flying block	S1110-10131a	2
40	Bolt M8×16	GB5783-86	2
41	Governor shaft	S1110-10103b	1
42	Steel ball Φ 6	GB308-84	1
43	Nut M10×1	GB6173-86	1
44	Adjusting screw	S1110-10101	1
45	Taper pin Φ 4×25	GB117-86	1
46	Governor fork	S1110-10121	1
47	Adjusting washer	S195-10113	as required
48	Circlip 25	GB894.1-86	1

Intake System (Fig. XIII)

No.	Name of Part	Part No.	Qty.
1	Wing nut M6	GB62-88	2
2	Washer 6	GB96-85	2
3	Air filter cover	K1112QNX-2000	1
4	Rubber packing	K1112QNX-0002	1
5	Air filter cartridge	K1212P-1000	1
6	Intake pipe and its accessories	S1110-11001	1
7	Air filter sleeve		1
8	Dirt bag	K1112QNX-0005	1
9	Clamp	K1112QNX-0004	1
10	Screw M5×16	GB66-85	1
11	Nut M5	GB39-88	1
12	Air filter body, complete	K1212QNX-3000	1
13	Seal ring	K1212QNX-0003	1

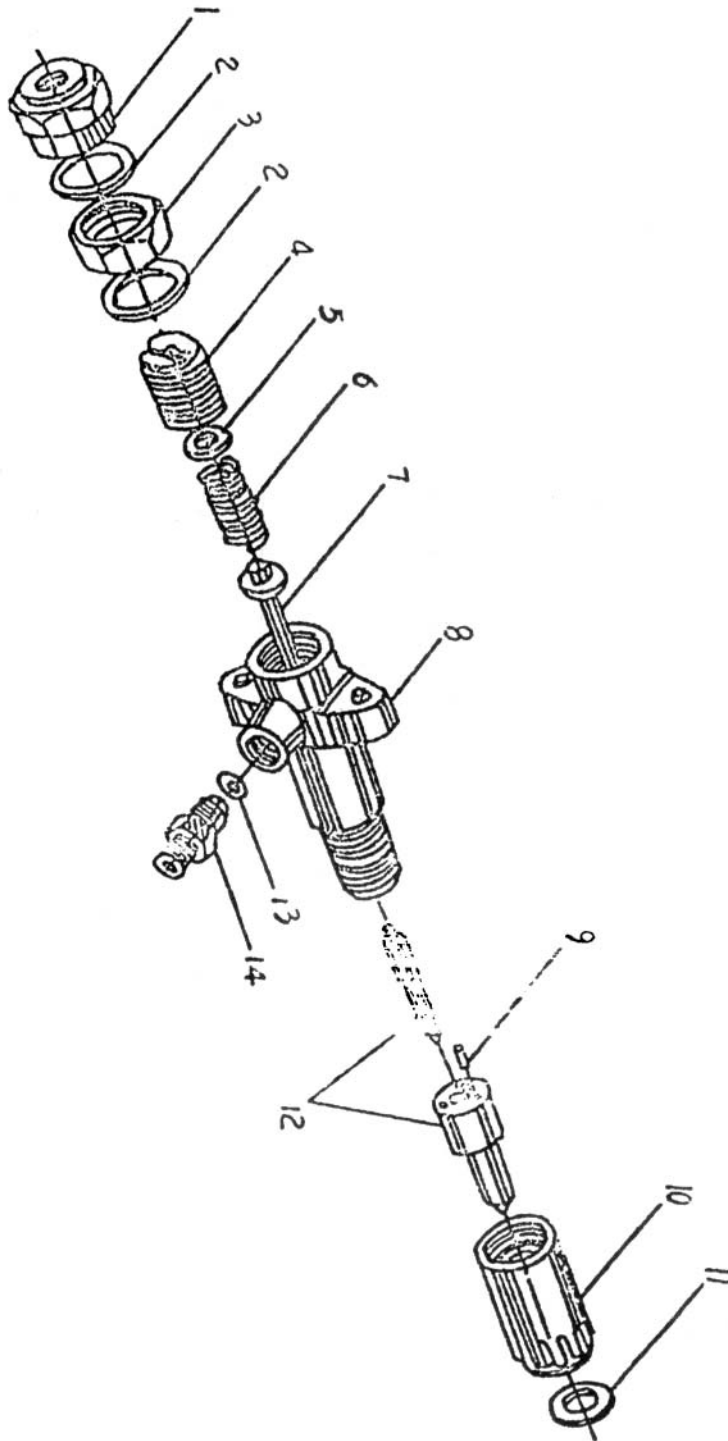
Fig. XIV Fuel Injection Pump



Fuel Injection Pump (Fig. XIV)

No.	Name of Part	Part No.	Qty.
1	Delivery valve holder		1
2	Delivery valve spring		1
3	Delivery holder packing ring		1
4	Delivery valve with seat		1
5	Pump elemen(Plunger and barrel)		1
6	Waster		1
7	Retaining screw		1
8	Fuel inlet pipe connecting screw		1
9	Sealing washer		2
10	Pump body		1
11	Circlip		1
12	Adjusting gear		1
13	High spring seat		1
14	Plunger spring		1
15	Lower spring seat		1
16	Tappet		1
17	Roller bushing		1
18	Roller		1
19	Roller pin		1
20	Guide pin		1
21	Gear-rod		1
22	rivet 1.6×5		
23	Name plate		

Fig. XV Fuel Injector Assembly



Fuel Injector Assembly (Fig. XV)

No.	Name of Part	Part No.	Qty.
1	Cap nut A		1
2	Washer		2
3	Nut		1
4	Adjusting screw		1
5	Washer		1
6	Spring		1
7	Needle valve spindle		1
8	Nozzle holder		1
9	Locating pin		1
10	Cap nut B		1
11	Washer		1
12	Nozzle body (with needle valve)		1
13	Washer		1
14	Connecting bolt		1

Parts of ZS1115 different Diesel Engine

No.	Name of Part	Part No.	Qty.
1	Cylinder liner	S1115-01001	1
2	Cylinder head gasket	S1115-01003	1
3	Cylinder Liner water seal ring	S1115-01005	2
4	Cylinder block	S1115-01101	1
5	Piston pin	S1115-04004	1
6	Piston	S1115-04003	1
7	Piston ring (1)	S1115-04001	1
8	Piston ring (2, 3)	S1115-04002	1
9	Connecting Rod	S1115-04202	1
10	Connecting Rod cap	S1115-04205	1
11	Belt pulley	S1115-05001	1
12	Flywheel	S1115-05003	1

Tools List

Accompanying with ZS1110/ZS1115 Diesel Engine

No.	Name	Qty.
1	30 hexagon spanner	1
2	60 hexagon spanner	1
3	double ended spanner 10×13	1
4	double ended spanner 16×18	1
5	double ended spanner 21×24	1
6	valve mount and dismount tool	1
7	socket wrench	1
8	puller	1
9	starting handle	1
10	feeler	1
11	6" screw driver	1
12	Lapping paste (140#)	1
13	bolt M8×60 (used to pull gear of balance shaft)	2
14	bolt M10×85 (used to pull flywheel)	2

Spare Parts Accompanying with ZS1110/ZS1115 Diesel Enging

No.	Name	Part No.	Qty.
1	cylinder cover gasket	S1110-01003	1
2	exhaust pipe packing	-03004	1
3	valve lock clipper	S195-03007	2 sets
4	top cylinder ring	S1110-04001	1
5	2nd, 3rd cylinder rings	-04002	2
6	spiral spring oil ring	-04100	1
7	diesel filter body	S195-07600	1
8	filter	C0506A-1000	1
9	nozzle body (needle valve)	Z15B(ZCK15S432A)	1
10	outer valve spring	S195-03009a	2
11	inner valve spring	S195-03010	2