



CHANG FA

ZS1115G DIESEL ENGINE OPERATION MANUAL

Changfa Power Machinery Co.,Ltd.

Changzhou, Jiangsu P.R.China

Certificate of Quality License
for export product

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Before operating, please read this Operation Instiuctions

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CHANGFA-ZS1115G DIESEL INSTRUCTIONS FOR USE

Preface

ZS1115G Diesel, a horizontal type, single-cylinder, double-roll and straightspurt diesel with the greatest power in China, has joined the Changfa diesel family as the newest product of the Company.

ZS1115G Diesel has a lot of advantages such as fine appearance, new construction, great power, steady operation, easy starting, low fuel and water consumption, wide co-ordination and convenient maintenance. In short, ZS1115G Diesel embodies two fine features-economy and reliability, both of which have achieved the advanced level of the 1990S. Having the same connective size for set-forming intallation and the same way of exporting power as S195, S1100 and some other diesels, ZS1115G Diesel is suitable for powering small four-wheel tractors and for driving agricultural irrigation and drainage pumps, as well as engineering machinery and ship-propulsion. It can also be used as a prime mover for small eleertical generators and agricultural processing machines.

Normal and reliable operation of this engine depends wpon a correct service and good maintenance which will prolong the life of the engine to the utmost. therefore, it is recommended that the operators, when operating the engine, pay spedial attention to the following:

1. A fuel of a specified grade is to be used, and before being poured into the fuel tank, it should be completely precipitated and thoroughly filtered. Any utensils used herein should be kept clean.

2. A lubricating oil of a specified grade is to be used, and must be kept clean and periodically changed.

3. The air filter must be frepuently cleaned and given a good maintenance, the oil in the filter must be periodically changed.

4. The engine is to operate under the boiling conditions 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 be allowed to go down below the mouyt of the funnel of the hopper.

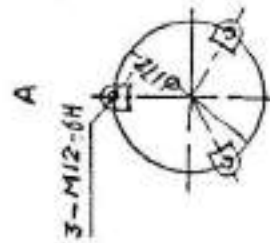
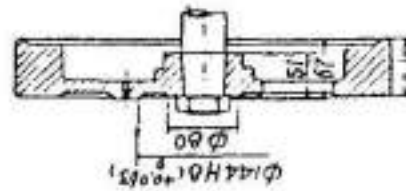
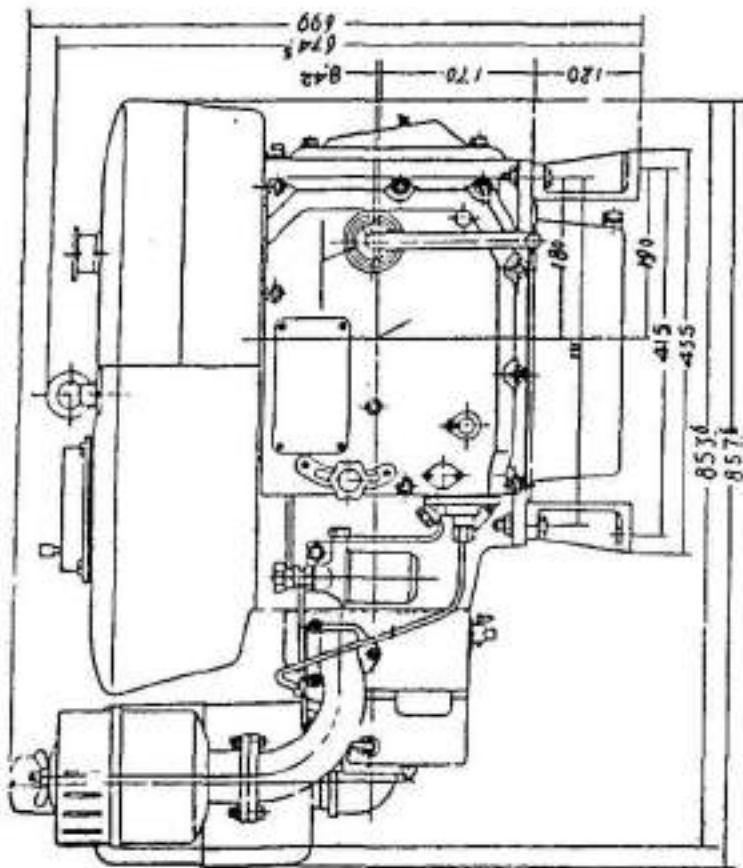
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Drawing of Outline and Installation Dimensions Of Diesel Engine.

1.Main specifications of the Diesel Engine

1.1 Technical Data

Item	Specifications
Model	Zs1115G
Type	single-cylinder,horizontal and four-stroke circle
Type of combustion chamber	direct injection
Cylinder bore	115mm
Piston stroke	115mm
Piston displacement	1.195L
Average speed of piston	8.44m/s
Compression ratio	17
Rated power	14.7kw/2200r/min
Average effedtive pressure	739.75Kpa
Fuel consumption ratio	$\leq 238\text{g/kw} \cdot \text{h}$
Oil consumption ratio	$\leq 1.47\text{g/kw} \cdot \text{h}$
Injection pressure	$18.13 \pm 0.49\text{Mpa}(185 \pm 5\text{kgf/cm}^2)$
Cooling style	water cool evaporation
Starting style	hand cranking
Net weight	$\leq 185\text{kg}$
Outline dimensions	$858 \times 450 \times 699$
valve gaps (cold state)	intake valve $0.35 \pm 0.05\text{mm}$ exhaust valve $0.45 \pm 0.05\text{mm}$
Type of injector	PF68S19
Type of injector coupler	ZCK154S432A
Type of injector pump	AKModle,single-piece and separable rotor type
Oil pump rotor type	rotor type
Diesel oil filter body model	C0506C Model
Tightening torque of cylinder cover nut	$274.4\text{-}313.6\text{N} \cdot \text{M}$
Tightening rorque of cnnectingrod nut	$78.4\text{-}117.6\text{N} \cdot \text{M}$
Tightening torque of flywheel nut	$295\text{-}350\text{N} \cdot \text{M}$

1.2 Valve Timing

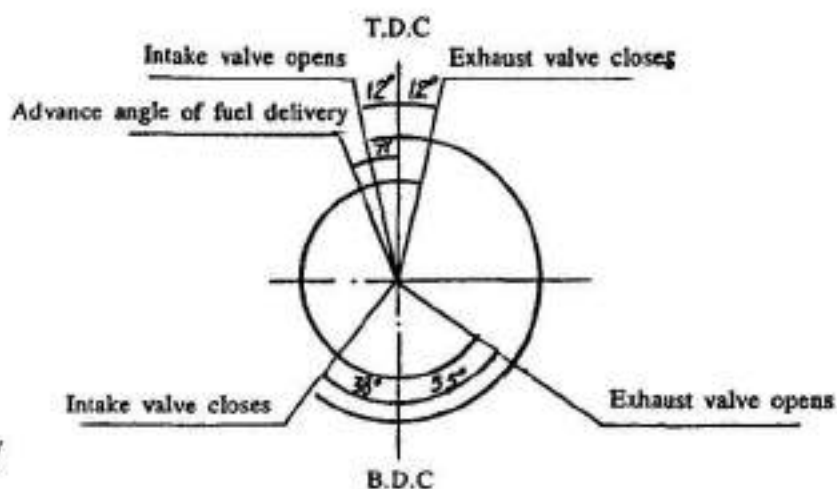
Intake valve opens at 12° before T.D.C

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

Exhaust valve opens 55° before T.D.C.

Exhaust valve closes at 12° after T.D.C.

Advance angle of fuel delivery at $22^\circ \pm 1^\circ$ before T.D.C.



1.3 Fit Clearance of the 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 hole ϕ 68	clearance	0.060~0.104
2	piston pin with connecting rod bushing	axle ϕ 36 hole ϕ 36	clearance	0.025~0.048
3	camshaft with its front bushing	axle ϕ 28 hole ϕ 28	clearance	0.040~0.086
4	camshaft with its rear bushing	axle ϕ 40 hole ϕ 40	clearance	0.025~0.080
5	speed-governing gear shaft with its bushing	axle ϕ 25 hole ϕ 25	clearance	0.020~0.054

NO.	Name of parts	Standard size (mm)		Kind of fit	Fit Clearance (mm)
6	starting shaft with its bushing(A)	axle ϕ 30	-0.040 -0.053 hole ϕ 30 +0.033 0.	clearance	0.040~0.086
7	starting shaft with its bushing(B)	axle ϕ 35	-0.050 -0.066 hole ϕ 35 +0.050 0	clearance	0.050~0.116
8	piston skirt with sylinder liner	axle ϕ 110	-0.190 -0.220 hole ϕ 110 +0.035 0	clearance	0.190~0.255
9	rocker arm shaft with guide bushing	axle ϕ 16	0. -0.011 hole ϕ 16 +0.043 +0.016	clearance	0.016~0.054
10	intake valve stem with guide bushing	axle ϕ 9	-0.040 -0.062 hole ϕ 9 +0.022 0	clearance	0.040~0.084
11	exhaust valve stem with guide bushing	axle ϕ 9	-0.040 -0.062 hole ϕ 9 +0.022 0	clearance	0.040~0.084
12	open gap of the top piston ring	(in ϕ 100 feeler)	+0.005 0.	clearance	0.40~0.60
13	open gap of the 2nd and 3rd piston rings	(in ϕ 100 feeler)	+0.005 0.	clearance	0.25~0.45
14	open gap of the oil scraper ring	(in ϕ 100 feeler)	+0.005 0.	clearance	0.25~0.45

2.Selection of the Size of Pulleys

As the appearance of the Changfa Brand ZS1115G diesel Engine differs greatly from that of S1100 and S195 diesel engines.their dimensions connected with other working machines are all the same,see outline and installation drawings for details.

When the flyiny of the diesel engine is connected directly with working machines.it must be assured that the coaxality of them should be less than 0.10mm,otherwise parts whould 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 125mm for user while its delivery from the factory.Special requirement may be submitted on request.

3.Operation and uses of the Diesel engine

3.1Preparation works

3.1.1Diesel 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.

Open the cock of the fuel tank.

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 GB5323:30#(No HC-14)lubricant oil is selected in summer and 20#(No HC-11 or HC 8)lubricant oil in winter.

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 impurities entering. When filling ,draw out the oil dipstick and fill clean lubricant oil into the oil sump.

The amount of filled oil should be about 2.5Kg. Check oil level with oil dipstick to see if the level is between two marking lines.

Note: The oil level should not be over the upper line when filling and below the bottom line when running normally.

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 is 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 this tank.

3.1.4 Remove air from fuel

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

3.2 Starting

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

3.2.1 Set the speed-control level knob at the ATART position on speed panel.

3.2.2 Open the decompression level 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 level and continue to crank the rocker arm with effort, the engine will start up running itself.

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

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.

3.3.3 It is normal that the cooling water is boiling when the engine is running.

Note: When the mark in float drops down to the inlet of the water tank, it 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.

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.

3.3.6 Stop the engine immediately if abnormal sound is heard when the engine is running, 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, the engine should go out itself.

Note: Stopping the engine with the decompression level is strictly prohibited.

3.4.3 Close the cock of the fuel tank

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.

3.4.5 Set the exhaust valve closed to prevent vapour or impurities entering into the cylinder. The method so as follows:

3.4.5.1 Turn the flywheel until it can not be turned

3.4.5.2 Open the decompression level to continue turning the flywheel until its mark of T.D.C. is directly against the mark on the water tank.

3.4.6 Emergency stop

Loopen the connecting nuts on high-pressure fuel pipe or open the decompressor 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	Priod(hours)			
		8	50	100	300
diesel oil	check and fill diesel oil clean and wash filling screen clean and wash filter screen and oil filter clean and wash fuel tank	△ △		△	△ △
Lubri cant oil	check and fill lubricant oil clean and wash filter replace with new oil and clean oil sump clean and wash oil filter clean air filter	△		△ △ 1*	△ △ 2*
cooling water	check and fill water drain out cooling water clean water channel	△ △ 3*			△ 4*
other	adjust gaps of valves check & tighten all important bolts & nuts check weariness of all moving parts			△ 5*	△ △

Notes:

1. Drain off dirt 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 being frozen.

4. Remove the water tank and fill hydrochloric 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. Check the gaps of valves in cold state every day. It should be 0.3-0.4mm for intake valve and 0.4-0.5mm for exhaust valve.

5. The method of trouble shooting 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 watertank
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 worn	Replace fuel injection element
3. Compression force in cylinder is small	
(1) Nuts on cylinder 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

Feature and Cause	Remedy
(6)Valve stem is blocked in guide bushing (7)Compression ratio is decreased due to more repairs 4.Advance angle of delivery is incorrect 5.Viscosity of lubricant oil is thicker,speed could not be increased by hand	Remove valve,wash valve and guide bushing with diesel oil Replace valve seat Adjust it at $22^{\circ} \pm 1^{\circ}$ before T.D.C. according to stipulation Replace lubricant oil with specific brand

5.2 Power is insufficient

Feature and cause	Remedy
1.Troubles 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 injector 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 item1.2.(4)of 5 Refer to item1.3.of 5 Remove,clean or replace filter Adjust according to stipulation

5.3 Diesel engine stall

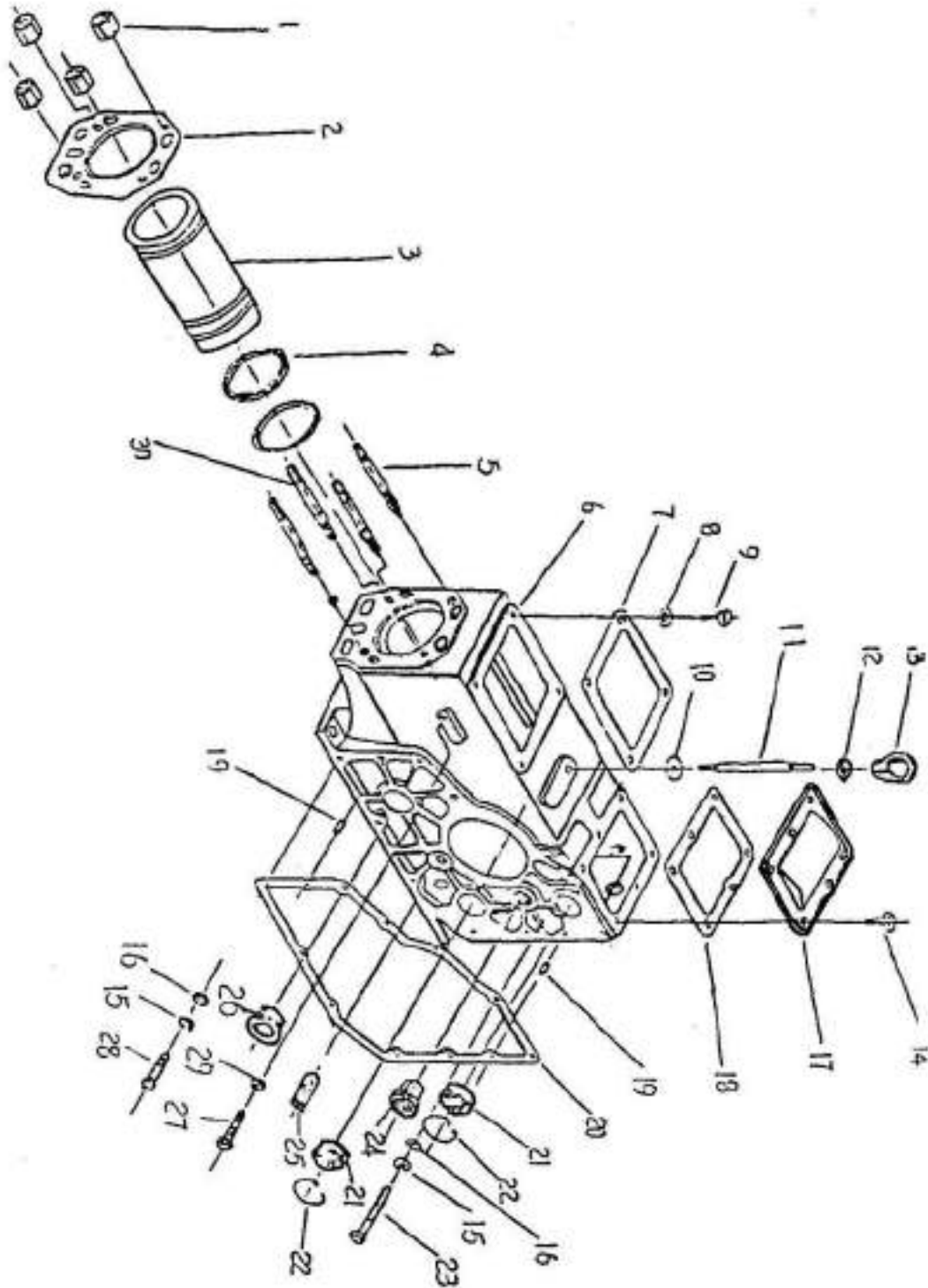
Feature and cause	Remedy
1.Troubles in fuel system (1)Air in fuel system (2)Quality of diesel oil is bad or there is water in it (3)Needle valve in jet is blocked or injection pressure is much higer (4)Jet coupler,injection pump coupler and fuel out let valve damaged 2.Speed system blocked or adjust bolt on speed level worn out	Remove air Refer to item 1.2(2) of 5 Refer to itim 1.2(4) of 5 Replace damaged parts Check or adjust the extension of bolt

5.4 Others

Feature and Cause	Remedy
1.Fuel jet is often blocked (1)Suddenly stopping engine at a high speed (2)Diesel oil is dirt,and cartridge is broken out	Avoid stopping engine at high speed Clean fuel system replace diesel oil and cartridge
2.Much lubricant oil escaped out from exhaust port (1)Piston and cylinder worn out (2)Valve guide bushing worn out (3)Cylinder ring stuck,worn out or broken (4)Cylinder ring mounted upside down (5)Too much lubricant oil filled	Replace Replace Clean or replace Remove and remount Draw it out to normal level
3.Pressure of lubricant oil is not enough (1)Less amount of lubricant oil (2)Oil inlet blocked (3)Stator and rotor of pump worn out (4)Lubricant oil filter blocked (5)Too large clearance between end sides of oil pump	Fill it to normal level Remove and clean Replace Replace Adjust with gasket
4.Oil pressure is too high,oil channel in engine blocked	Remove,check and dredge
5.Speed is unstable and pipe connections to be leaking air	Tighten or replace gasket,and refer item3.2 of 5

PART TWO PARTS LIST WITH ILLUSTRATIONS

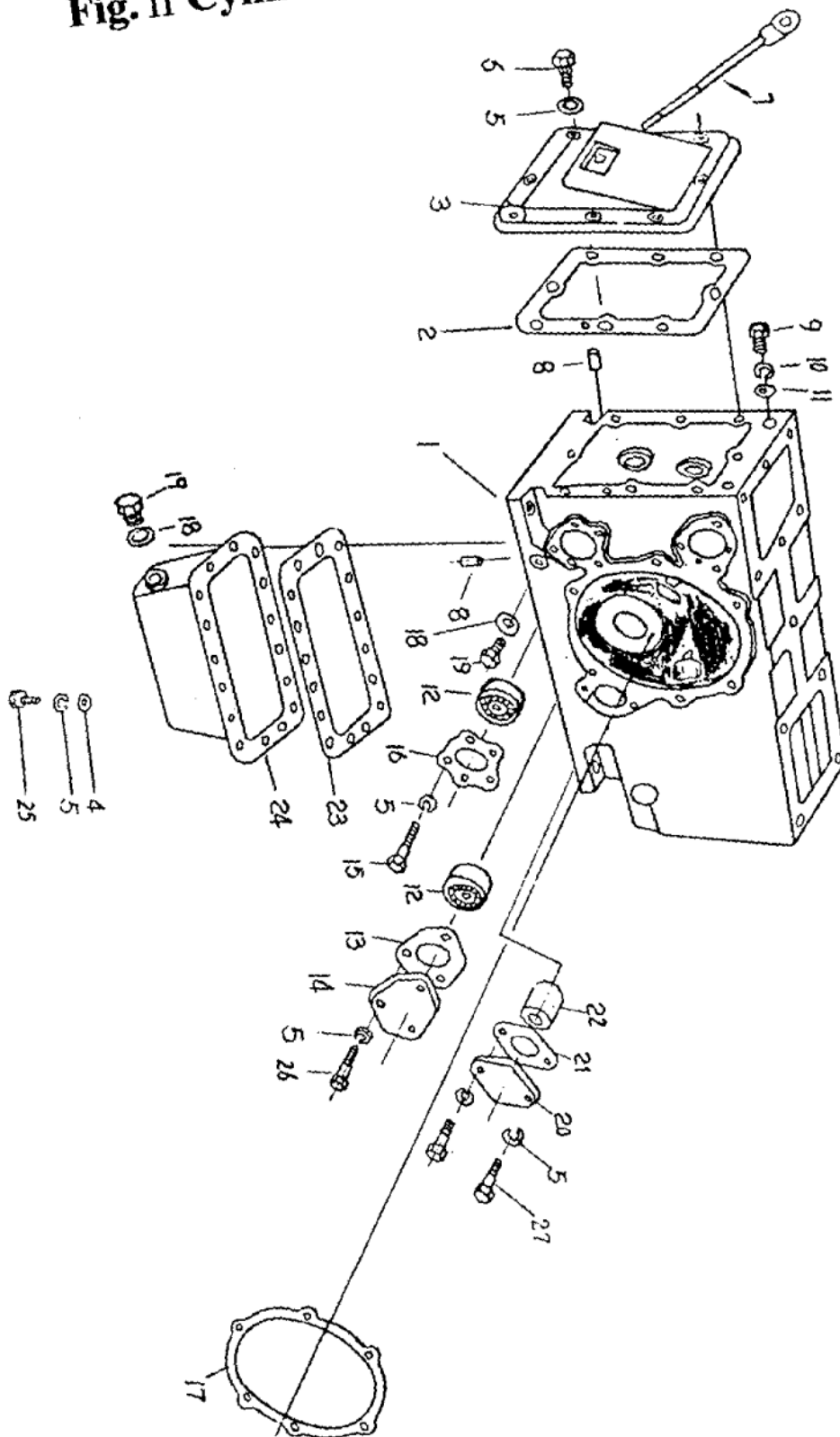
Fig. 1 Cylinder Block Assembly



Cylinder Block Assy-1

Illus. No.	Name of part	Part No.	Qty.
1	Cylinder head nut	ZS1110G-01001	4
2	Cylinder head gasket	ZS1115G-01003	1
3	Cylinder liner	ZS1115G-01004	1
4	Cylinder liner water seal ring	ZS1110G-01005	2
5	Cylinder head stud	ZS1110G-01002	2
6	Cylinder Block	ZS1115G-01001	1
7	Hopper packing	S195-01007	1
8	Washer 10-140HV	GG97.1-85	4
9	Hexagon bolt M10 × 25Zn • D	GB5783-86	4
10	Washer	S195-01008	1
11	Lifting stud	S1110-01005	1
12	Washer 12-140HV	GB97.1-085	1
13	Lifting eye nut	S195-01010	1
14	Hexagon Bolt M80 × 16	GB5783-86	6
15	Washer 8	GB93-87	9
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 A5 × 12	GB119-86	2
20	Gear casing packing	ZS1110G-01011	1
21	Bearing 6305	GB5782-86	2
22	Circlip	ZS1110G-01011	2
23	Hexagon bolt M8 × 95	S195-01034	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	GB5783-86	1
28	Hexagon Bolt M10 × 25	GB5782-86	6
29	Washer 10 × 140HV	GB93-87	1
30	Cylinder head stud	ZS1100G-1012	2

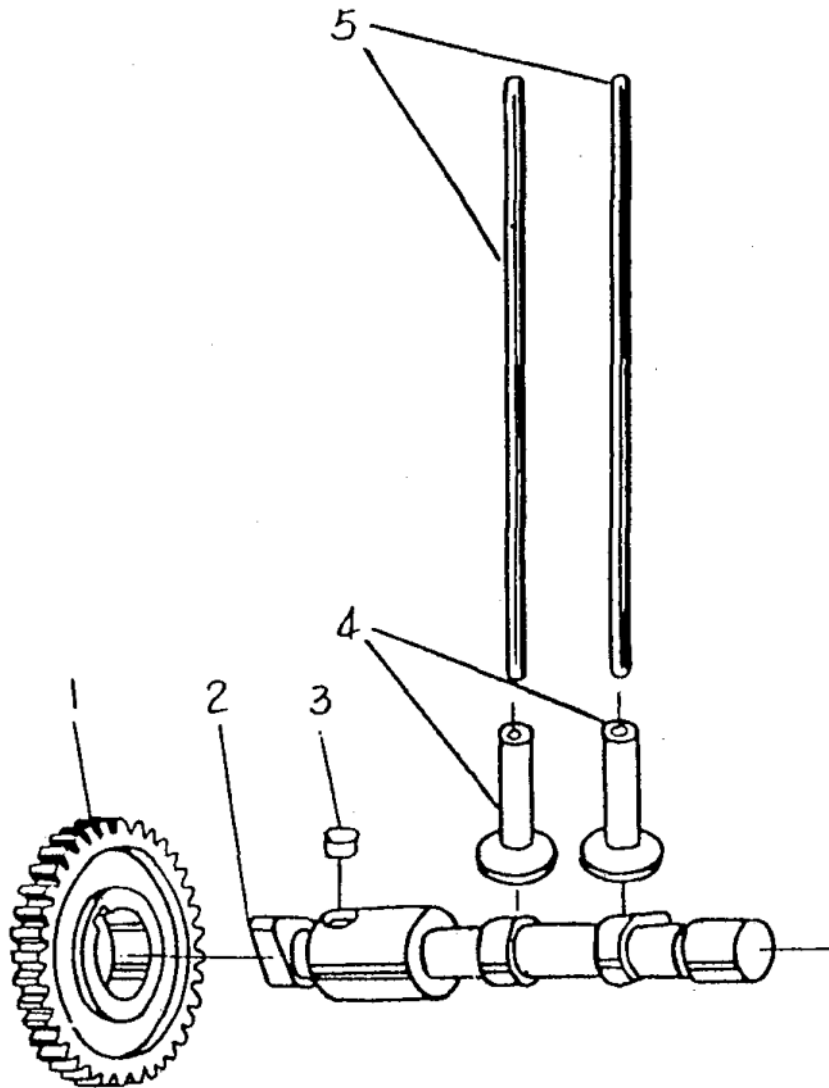
Fig. II Cylinder Block Assembly



Cylinder Block Assembly-2

Illus. No.	Name of Part	Part No.	Qty.
1	Cylinder block	ZS1115G-01101	1
2	Packing of the rear cover	S195-01019	1
3	Rear cover	S195-01020	1
4	Washer 8-140HV	GB97.1-85	16
5	Washer 8	GB93-87	38
6	Hexagon bolt M8 × 20	GB5783-86	8
7	Oil dipitick	S195-01100	1
8	Oil hole plug on the block	S195-01021	2
9	Hexagon bolt M10 × 20	GB5783-86	2
10	Washer 10	GB93-87	2
11	Washer 10-140HV	GB97.1-85	2
12	Bearing 6305	GB276-8	2
13	Packing for balancing shaft cover	ZS1110G-01009	as required
14	Balancing shaft cover	ZS1110G-01008	1
15	Hexagon bolt M8 × 40	GB5782-86	3
16	Packing for lubricating oil pump	ZS1110G-01014	as required
17	Main bearing housing mounting shim	ZS1110G-01006	1
18	Washer	S195-01025	2
19	Plug	S195-01026	2
20	Camshaft cover	S195-01030	1
21	Packing for comshaft cover	S195-01031	1
22	Camshaft rear bushing	S195-01032	1
23	Packing for oil sump	S195-01033	1
24	Oil sump	ZS1110G-01200	1
25	Hexagon M8 × 20	GB5783-86	16
26	Hexagon M8 × 20	GB5783-86	3
27	Hexagon M8 × 25	GB5783-86	2

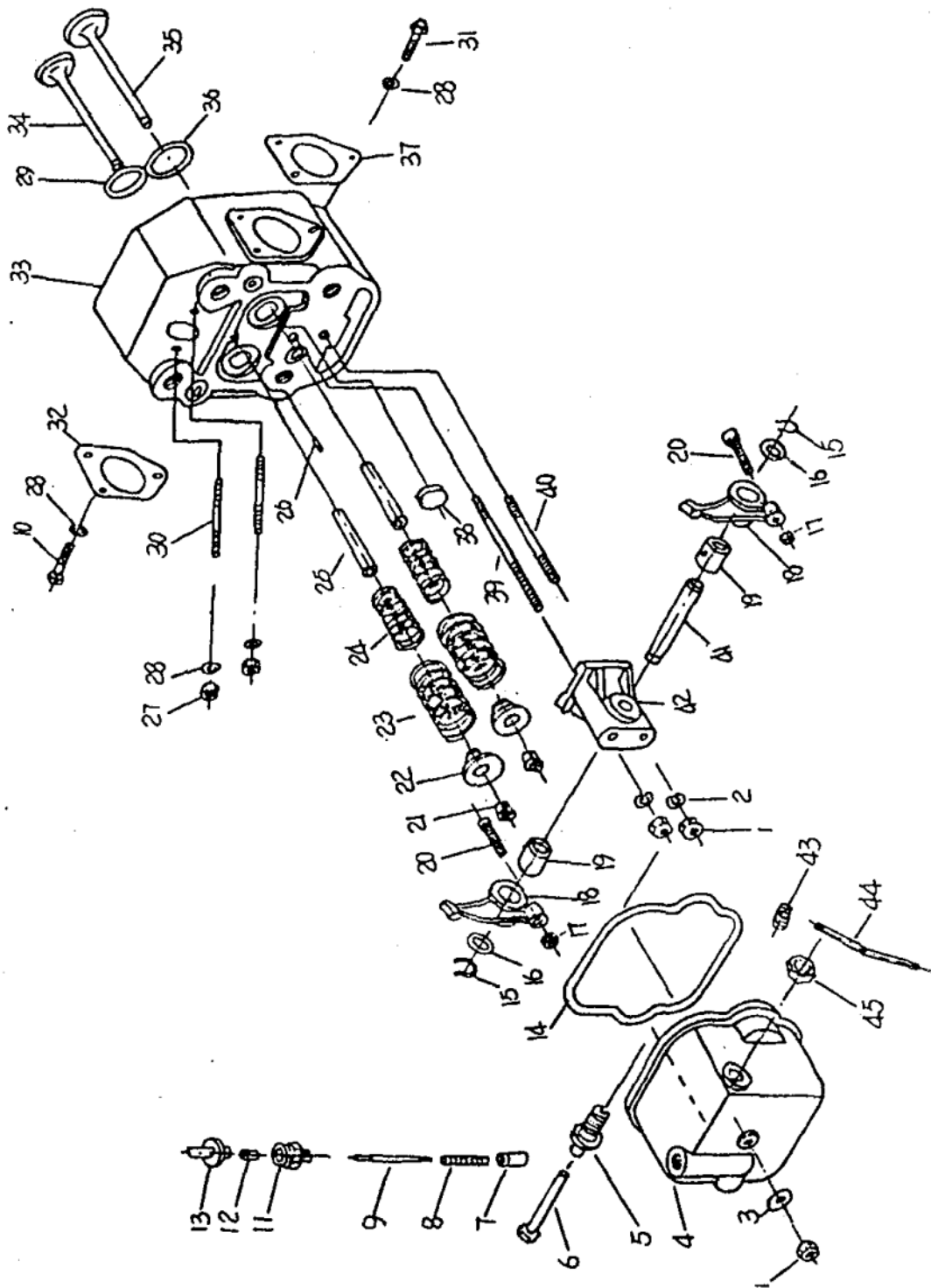
Fig. III Camshaft Assembly



Camshaft Assembly-3

Illus. No.	Name of Part	Part No.	Qty.
1	Camshaf gear	S195-02001	1
2	Camshaft	ZS1110G-02001	1
3	Flat key 10 × 16	GB1096-79	1
4	Valve tappet	S195-02004	2
5	Valve push rod	ZS1110G-02002	2

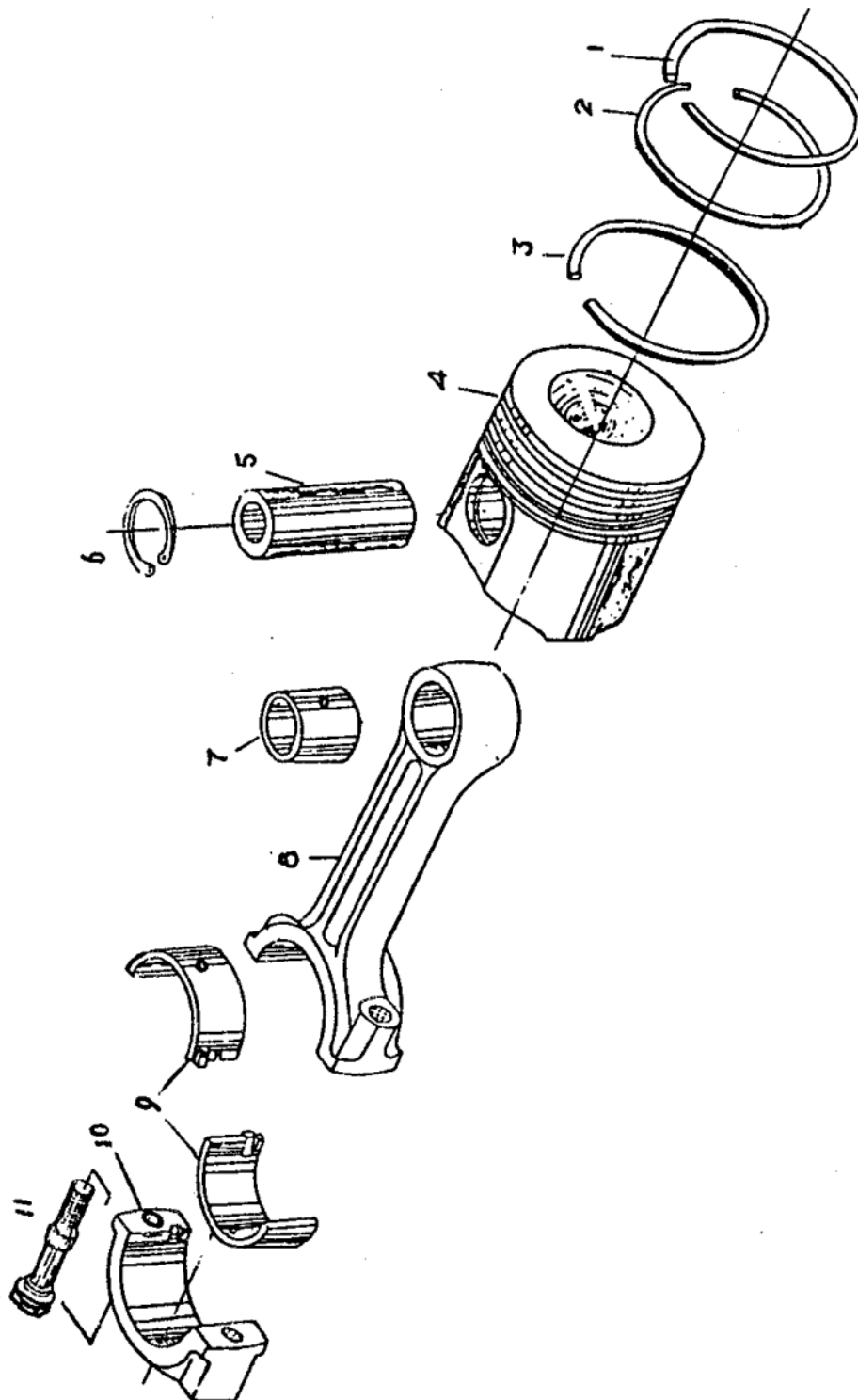
Fig. IV Cylinder Head Assembly



Camshaft Head Assembly-4

Illus. No.	Name of Part	Part No.	Qty.
1	Hexagon nut M10	GB6170-86	3
2	Washer 10	GB93-87	2
3	Plain washer 10-140HV	GB97.1-85	1
4	Cylinder head cover	ZS1110G-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	1
10	Hexagon bolt M8 × 30	GB5783-86	3
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	ZS1110G-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	GB6176-86	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	2 set
22	Valve spring seat	S195-03008	2
23	Outer valve spring	S195-03009	2
24	Inner valve spring	S195-03010	2
25	Valve guide	ZS1110G-03202	2
26	Locating pin B5 × 12	GB119-86	1
27	Hexagon bolt	ZS1110G-03007	2
28	Washer 8	GB93-87	8
29	Intake valve seat	ZS1110G-03201	1
30	Stud for injector clamping plate	ZS1110G-03006	2
31	Hexagon bolt M8 × 25	GB5783-86	3
32	Exhaust packing	ZS1110G-03004	1
33	Cylinder head	ZS1110G-03203	1
34	Exhaust valve	ZS1110G-03001	1
35	Intake valve	ZS1110G-03002	1
36	Intake valve seat	ZS1110G-03204	1
37	Exhaust pipe packing	ZS1110G-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	Valve arm shaft	S195-03026	1
42	Rocker arm shaft support	S195-03027	1
43	Decompression level spring	S195-03104	1
44	Decompression level	S195-03105	1
45	Set nut	S195-03106	1

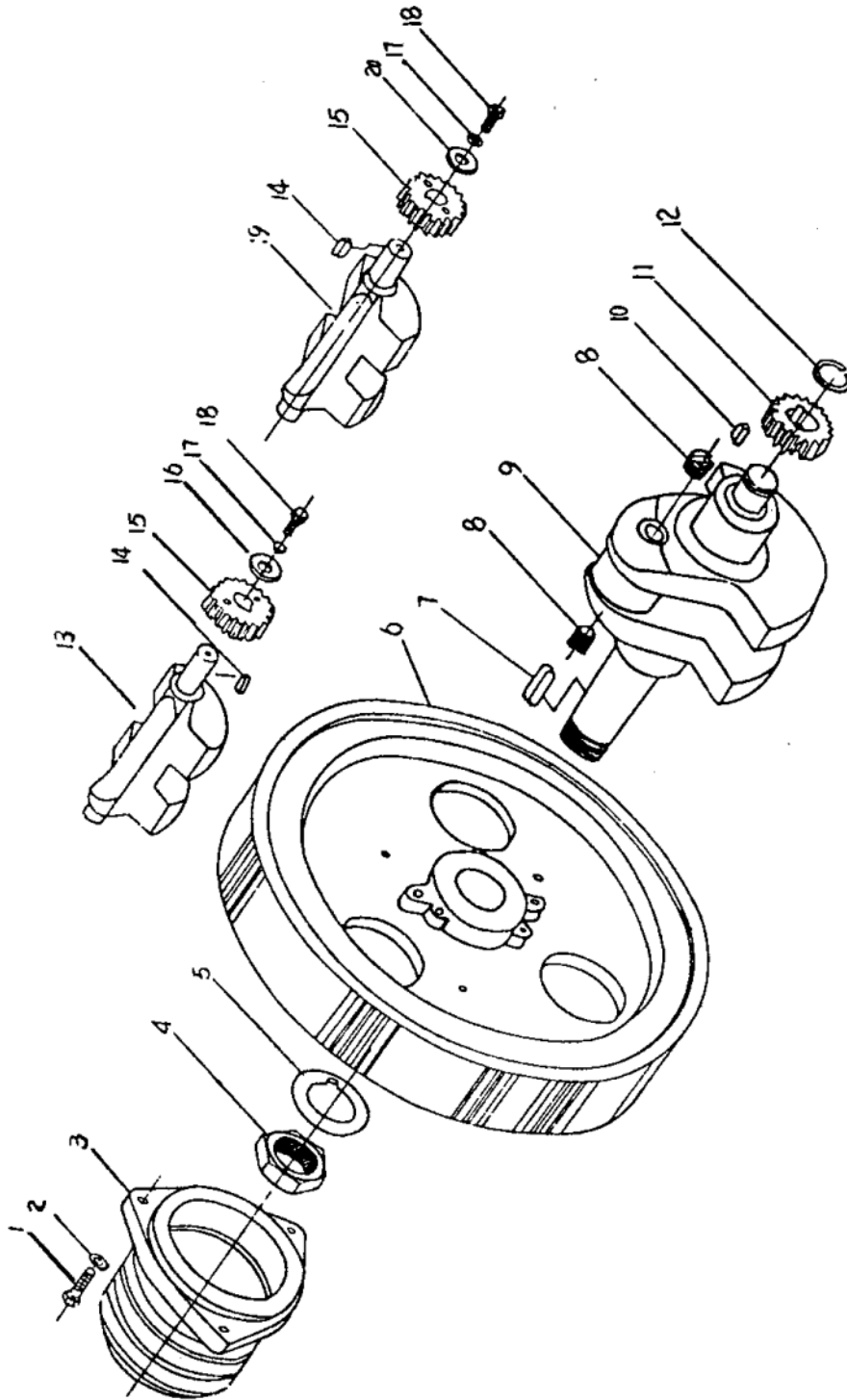
Fig. V Piston and Connecting Rod Assembly



Piston and Connecting Rod Assembly-5

Illus. No.	Name of Part	Part No.	Qty.
1	Compression ring (1)	ZS1115G-04001	1
2	Compression ring(2)	ZS1115G-04002	1
3	Oil scraper ring	ZS1115G-04100	1
4	Piston	ZS1115G-04003	1
5	Piston Pin	ZS1115G-04004	1
6	Circlip for piston pin 36	GB893.1-86	2
7	Connecting rod bushing	ZS1110G-04201	1
8	Connecting rod	ZS1115G-04202	1
9	Connecting rod bearing shell	ZS1110G-04203	2
10	Connecting rod cap	ZS1115G-04205	1
11	Connecting	ZS1110G-04204	2

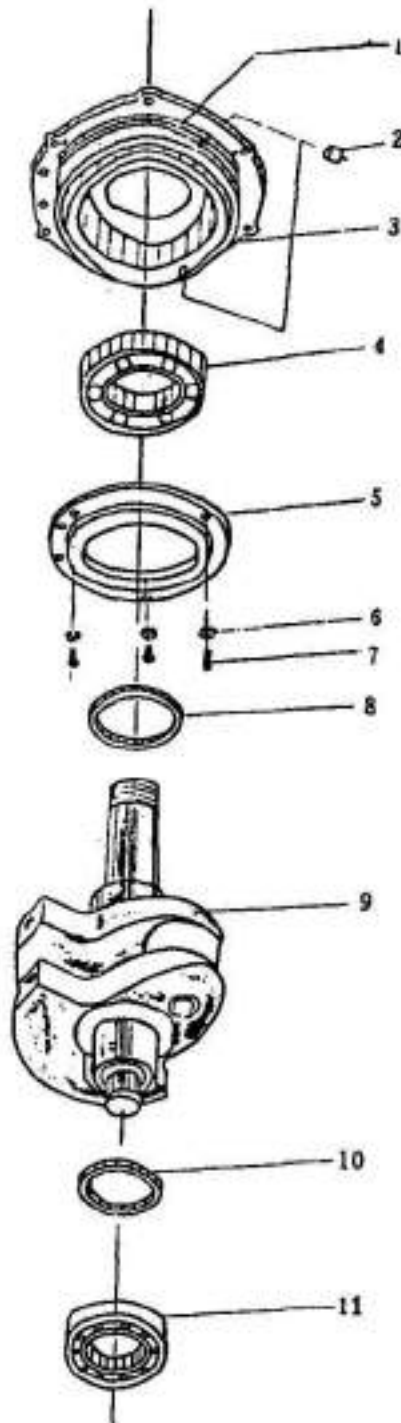
Fig.VI Flywheel Crankshaft and Balancing Mechanism



Flywheel Crankshaft and Balancing Mechanism-6

Illus. No.	Name of Part	Part No.	Qty.
1	Hexagon Bolt M12 × 35	GB5783-86	3
2	Spring washer 12	GB93-87	3
3	V-Belt puller	ZS1110G-05001	1
4	Flywheel nut	S195-05002	1
5	Lock washer	S195-05003	1
6	Flywheel	ZS1110G-05003	1
7	Flat key 12 × 40	GB1096-79	1
8	Crankshaft screw plug	S195-05007	2
9	Crankshaft	ZS1115G-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	ZS1110G-05010	1
14	Flat key C6 × 16	GB1096-79	2
15	Balancing shaft gear	S195-05012	2
16	Washer	S195-05013	1
17	Spring washer 8	GB93-87	2
18	Hexagon bolt M8 × 16	GB5783-86	2
19	lower balancing shaft	ZS1110G-05006	1
20	Washer	S195-05013	1

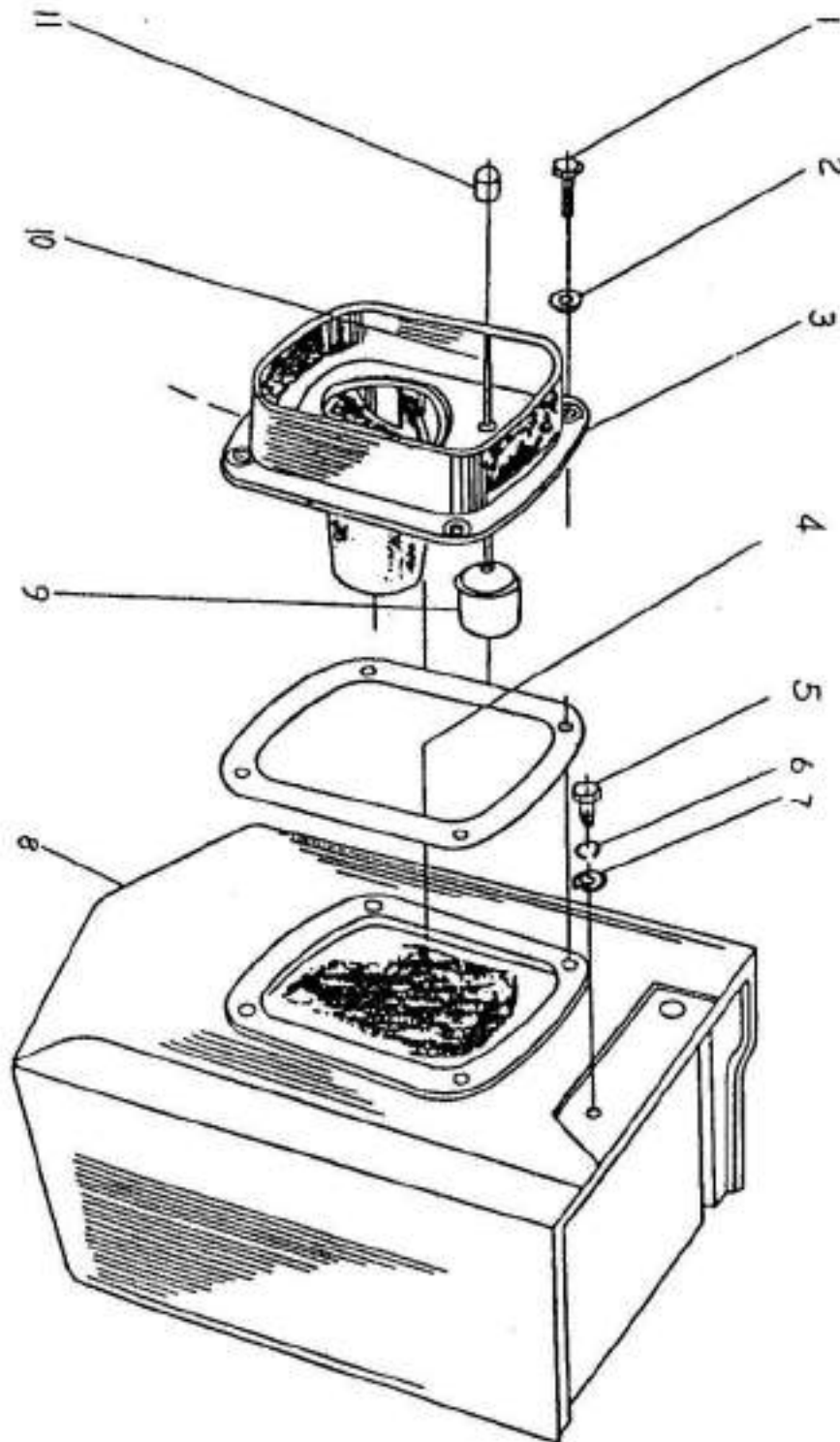
Fig.VII Flywheel Crankshaft and Balancing Mechanism



Flywheel Crankshaft and Balancing Mechanism-7

Illus. No.	Name of Part	Part No.	Qty.
1	Seal ring 185 × 3.55	GB3452.1-82	1
2	Plug	S195-01021	2
3	Main bearing housing	ZS1110G-05005	1
4	Bearing 314	GB276-82	1
5	Fender plate	ZS1110G-05012	1
6	Washer 5	GB93-87	3
7	Hexagon bolt M5 × 10	GB67-85	3
8	Circlip B	ZS1110G-05014	1
9	crankshaft	ZS1115G-05009	1
10	Circlip A	ZS1110G-05007	1
11	Bearing NJ312	GB283-87	1

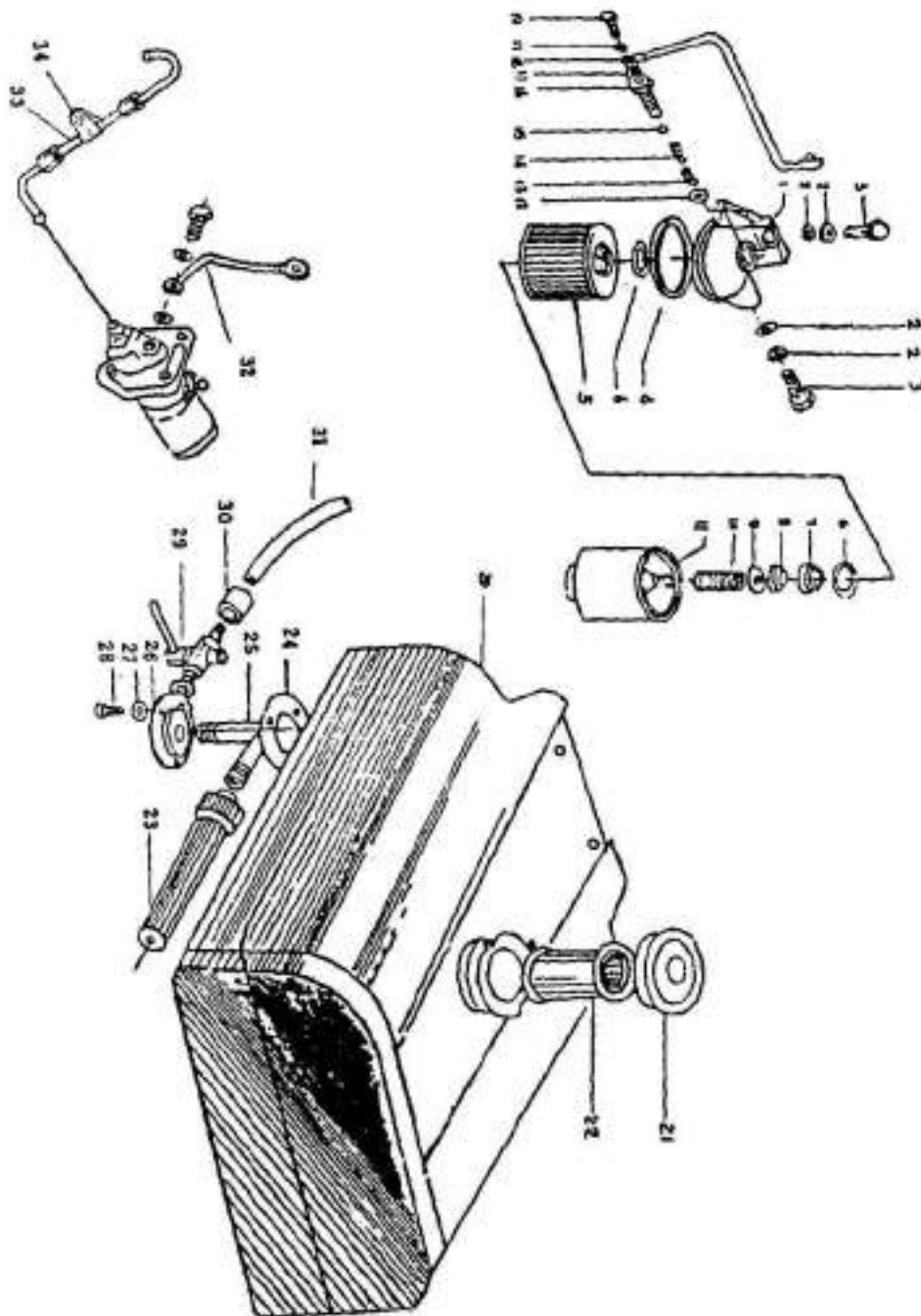
Fig. VIII Hopper Assembly



Hopper Assembly-8

Illus. No.	Name of Part	Part No.	Qty.
1	Hexagon bolt M8 × 20	GB5783-86	4
2	Washer 8-140HV	GB97.1-85	4
3	Funnel	S195-06103	1
4	Packing for funnel	S195-06001	1
5	Hexagon bolt M8 × 16	GB5783-86	1
6	Washer 8	GB93-87	1
7	Washer 8-140HV	GB96-85	1
8	Hopper	ZS1110G-06001	1
9	Float	S195-06203	1
10	Float stem	S1110-06101	1
11	Red indicating ball	S195-06202	1

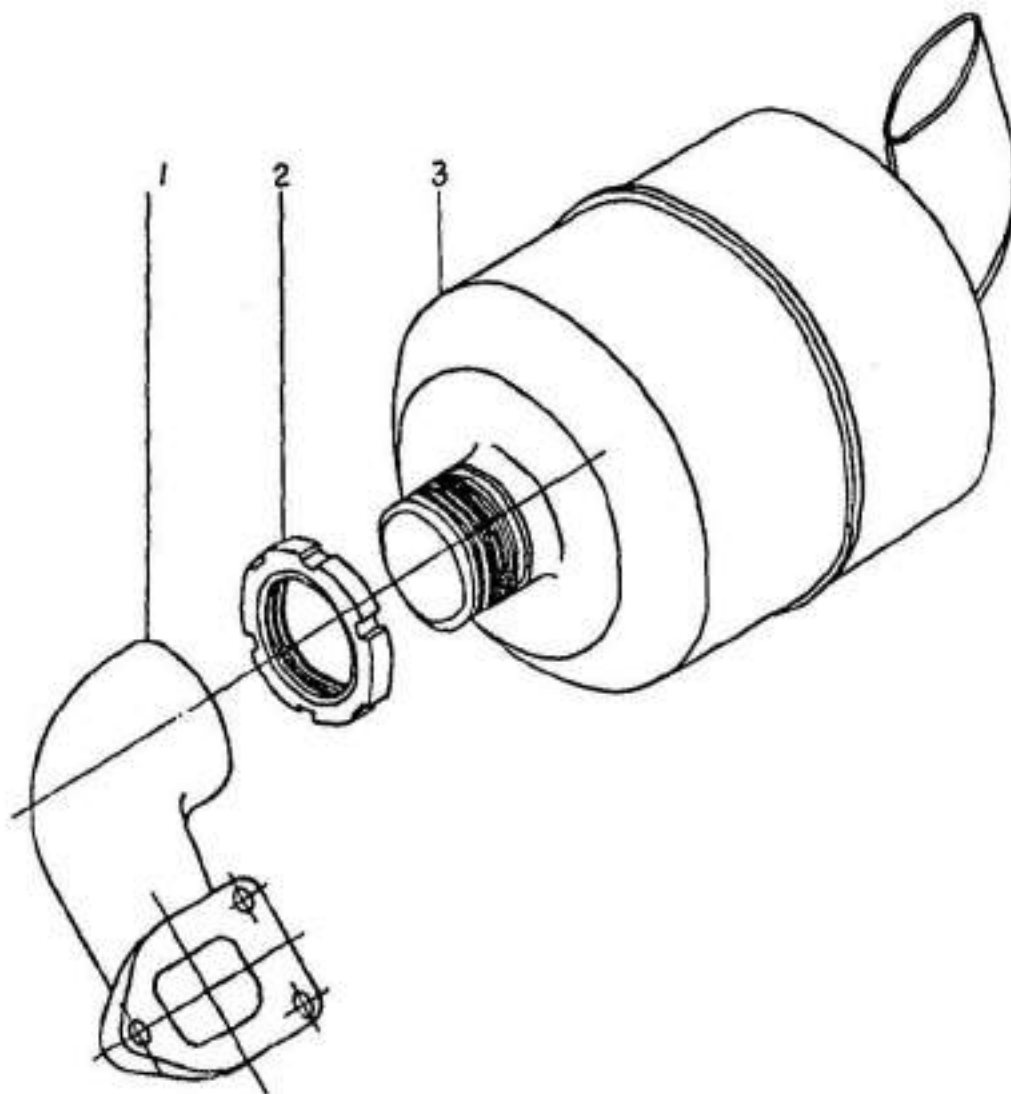
Fig. IX Fuel System



Fuel System-9

Illus. No.	Name of Part	Part No.	Qty.
1	Fuel filter seat	C0506B-0002	1
2	Washer	S195-07204	4
3	Pipe connection bolt M12	195-07203	3
4	Seal ring	C0506A-0003	1
5	Fuel filter assembly	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	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 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	GB93-87	3
28	Hexagon bolt M6 × 16	GB5783-86	3
29	Fuel cock	S195-07910	1
30	Pipe sleeve	S195-07003	1
31	Fuel pipe oil resistant	Oil resistant	1
32	Pipe welding	ZS1110G-07300	1
33	High pressure fuel pipe and its accessories	ZS1110G-07200	1
34	Pipe clip	ZS1110G-07205	1

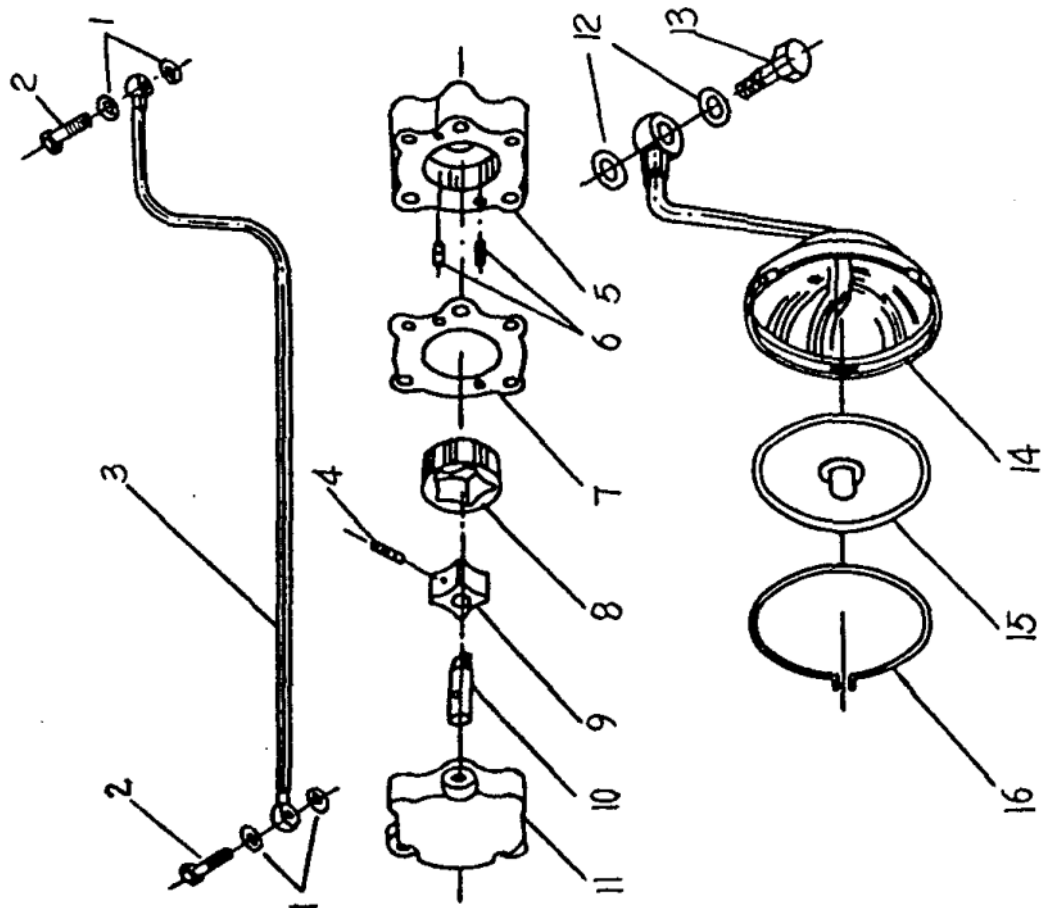
Fig. X Exhaust System



Exhaust System-10

Illus. No.	Name of Part	Part No.	Qty.
1	Exhaust pipe	ZS1110G-08002	1
2	Lock nut	ZS1110G-08001	1
3	Silencer	ZS1110G-08100	1

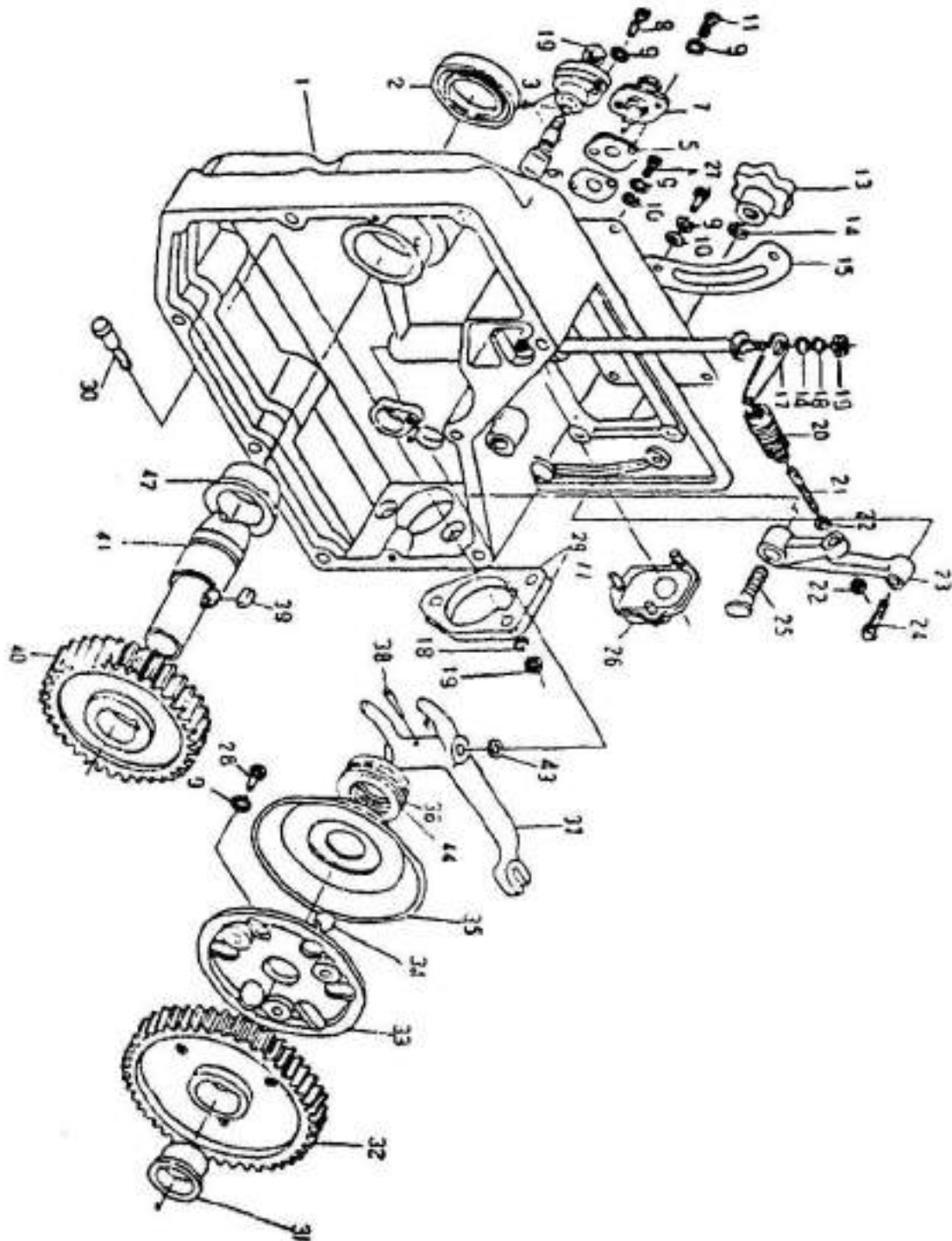
Fig. XI Lubrication System



Lubrication System-11

Illus. 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-09202	1
6	Locating pin	GB119-86	2
7	Lubricating oil pump packing shim	ZS1110G-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	ZS1110G-09207	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	Circlip	S195-09301	1

Fig. XII Gear Casing Assembly

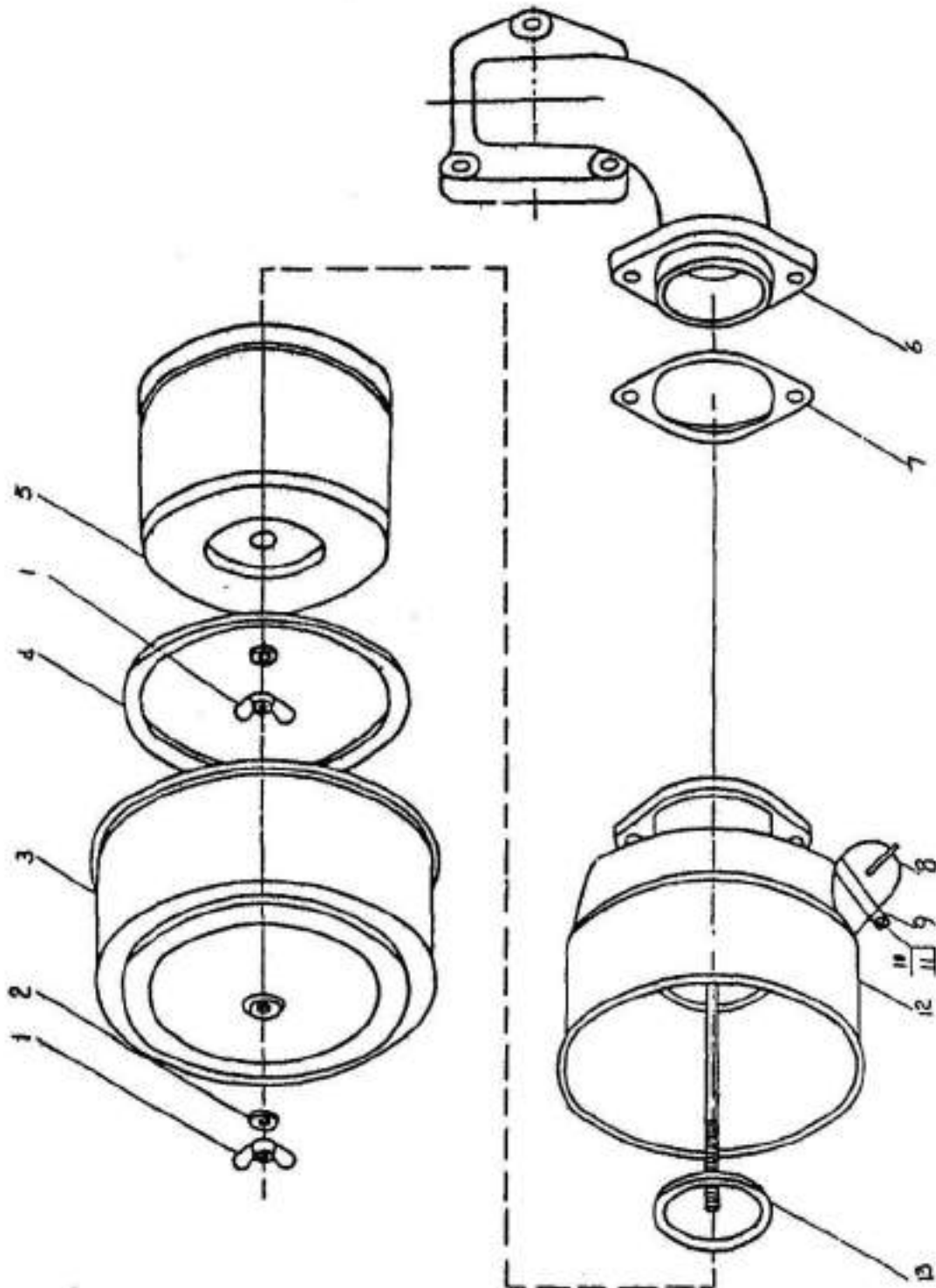


Gear Casing Assembly-12

Illus. No.	Name of Part	Part No.	Qty.
1	Gear casing	ZS1110G-10001	1
2	Oil seal ring ϕ 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	Plug	S195-10003	1
6	Fuel limiter packing	S195-10002	1
7	Fuel limiter	ZS1110G-10200	1
8	Screw M6 $\times$ 20	GB67-85	1
9	Washer 6	GB93-87	8
10	Washer 6-140HV	GB97.1-85	9
11	Screw M6 $\times$ 16	GB67-85	2
12	Screw Name plate	ZS1110G-10002	1
13	Speed control level kNo.b	S195-10200	1
14	Washer 8-140HV	GB97.1-85	2
15	Speed indicating	ZS1115G-10003	1
16	Governor fork shaft panel	S195-10101	1
17	Governor arm	S195-10102	1
18	Washer 8	GB93-87	4
19	Hexagon nut M8	GB6170-86	4
20	Governor spring	ZS1110G-10138	1
21	Adjusting screw	S195-10104	1
22	Hexagon nut M6	GB6170-86	2
23	Speed control level	S195-10105	1
24	Hexagon bolt M8 $\times$ 40	GB5783-86	1
25	Fixed screw	S195-10106	1
26	Breathing pipe connection	S195-10500	1
27	Button head cap screw	M6 $\times$ 12 GB67-85	6
28	Button head cap screw	M6 $\times$ 18 GB67-85	6
29	Shim for fuel injection pump	S195-10007	as required
30	Fuel injection pump mounting bolt	ZS1110G-10004	3
31	Governor gear bushing	S195-10107	1
32	Governor gear	S195-10108	1
33	Governor ball spacer	S195-10109	1
34	Steel ball	ϕ 16	6
35	Governor ball race	S195-10102	1
36	Single direction thrust ball bearing	51106 GB301-64	1
37	Governor fork	S195-10111A	1
38	Taper pin 4 $\times$ 25	GB117-86	1
39	Flat key 8 $\times$ 6	GB1096-79	1
40	Starting gear	S195-10302	1
41	Starting gear shaft	S195-10303	1
42	Starting gear shaft bushing(B)	S195-10010	1
43	Adjusting washer	S195-10113	as required
44	Packing for governor ball race	S195-10031	as required

Note: If the fuel limiter (No.7) is not provided, it will be replaced by a cover (195-10003)

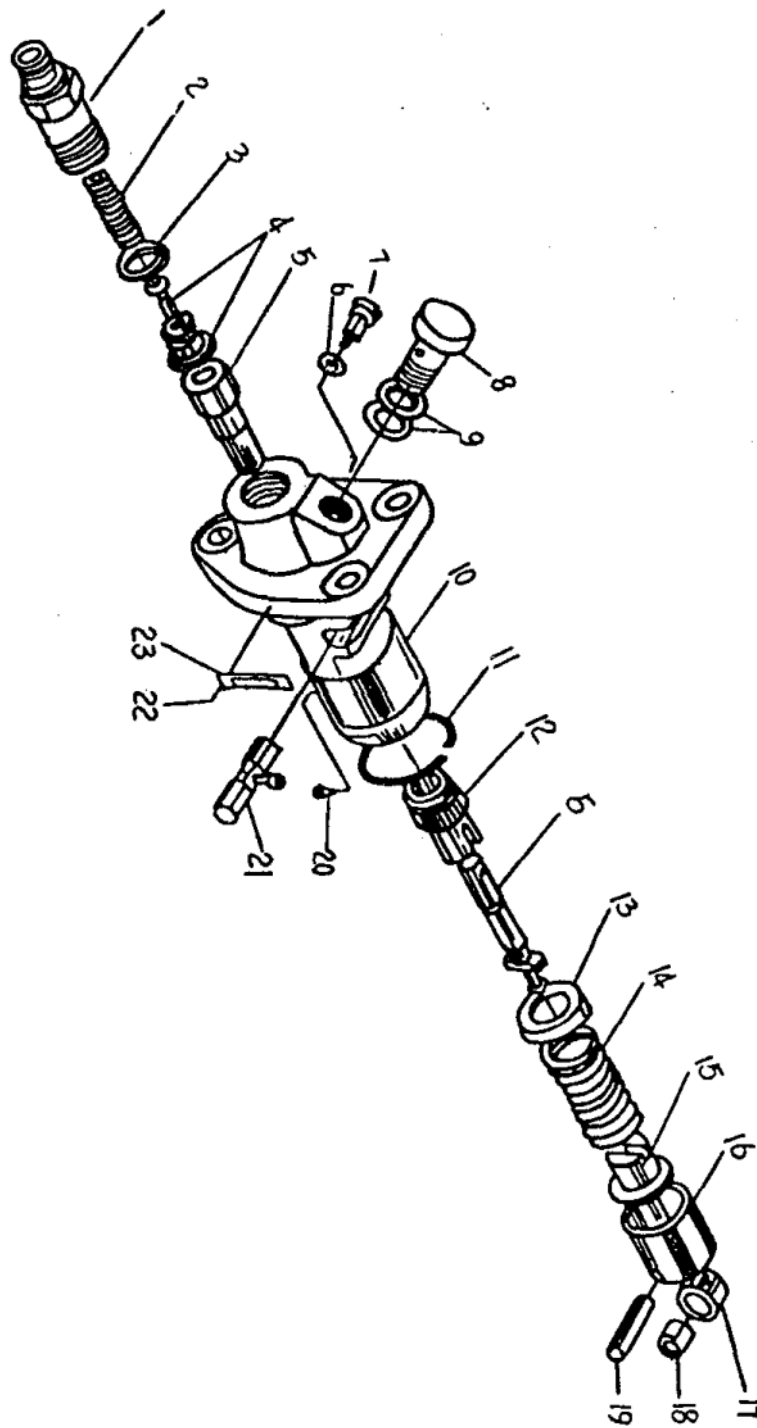
Fig. XIII Intake System



Intake System-13

Illus. No.	Name of Part	Part No.	Qty.
1	Wing nut AM8	GB62-88	2
2	Washer 8	GB95-85	2
3	Airfilter cover	K1112QNX-2000	2
4	Rubber packing	K1112QNX-0002	1
5	Airfilter cartidge 滤芯部件	K1212P-1000	1
6	Intake pipe	ZS1110G-11001	1
7	Intake Packing	ZS1100G-03005	1
8	Exhaust dust bag 排尘袋	K1112QNX-0005	1
9	Check hoop 卡箍	K1112QNX-0004	1
10	Screw M5 × 16	GB66-85	1
11	Hexagon nut M5	GB39-88	1
12	Airfilter body 下壳部件	K1212QNX-3000	1
13	Seal ring	K1212QNX-0003	1

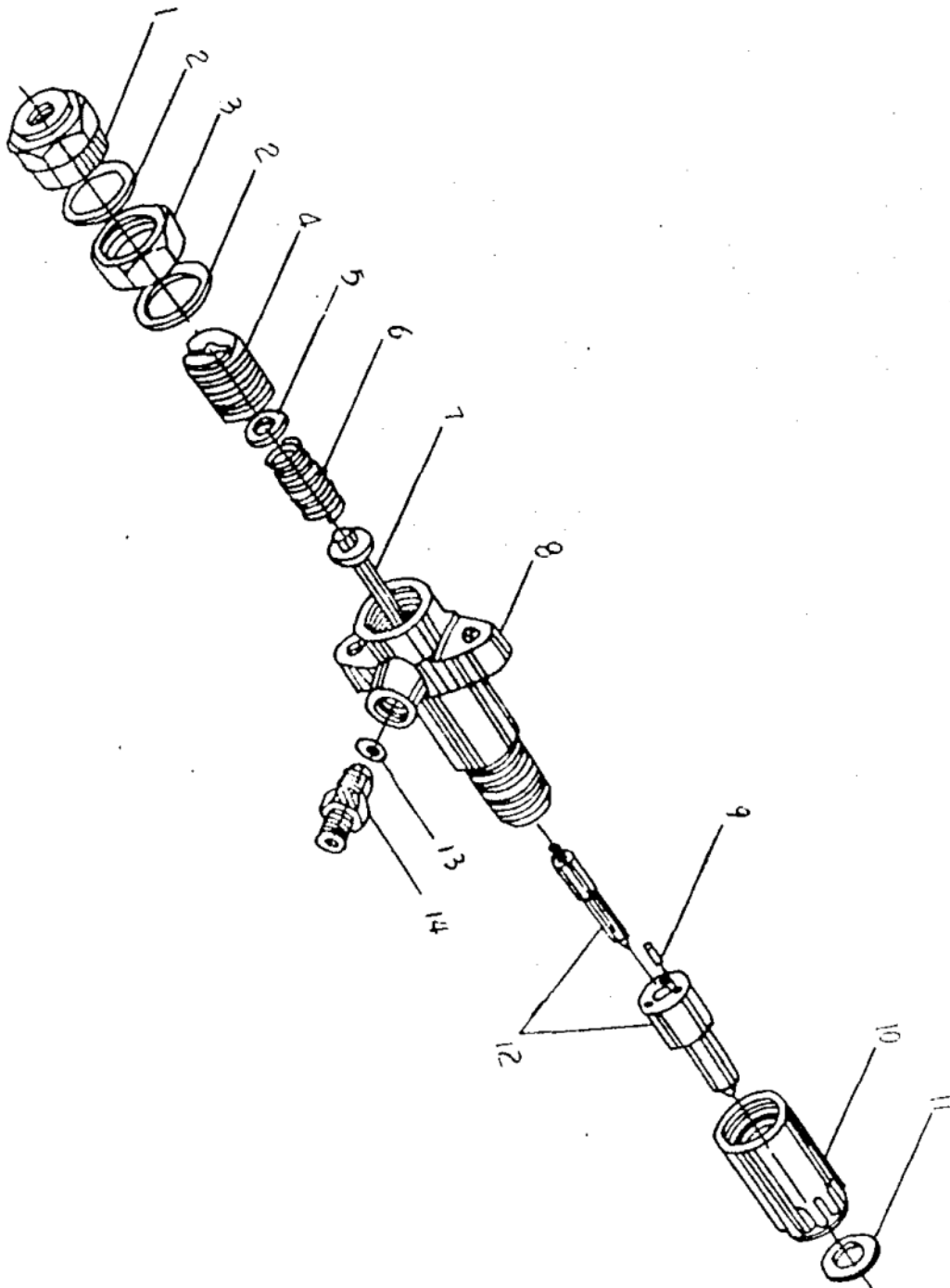
Fig. X IV Fuel Injection Pump



Fuel Injection Pump-14

Illus. No.	Name of Part	Part No.	Qty.
1	Delivery valve holder		1
2	Delivery valve spring		1
3	Delivery valve packing ring		1
4	Delivery valve with seat		1
5	Pump element(plunger and barrel)		1
6	Washer		1
7	Location screw		1
8	Fuel inlet pipe connecting screw		1
9	Sealing washer		2
10	Pump body		1
11	Check spring		1
12	Adjusting gear		1
13	Upper spring		1
14	Plunger spring		1
15	Lower spring seat		1
16	Push rod body		1
17	Tappet ring		1
18	Roller bushing		1
19	Roller pin		1
20	Guiding pin		1
21	Gear barrel		1
22	Rivet 1.6 × 5		1
23	Mark plate		1

Fig. X V PF68S19 Fuel Injector



PF68S19 Fuel Injector-15

Illus. No.	Name of Part	Part No.	Qty.
1	Protect cap		1
2	Washer		2
3	Cap nut		1
4	Adjusting nut		1
5	Washer		1
6	Adjusting spring		1
7	Stiff rod		1
8	Nozzle body		1
9	Locating pin		1
10	Lock nut		1
11	sealing washer		1
12	Nozzle body(with needle valve)		1
13	Washer		1
14	Fuel inlet pipe connecting screw		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	Lapping paste	1
9	Screw AM6 × 30 GB67-85 (for removing flywheel key from crankshaft)	1
10	Bolt M8 × 60 GB5782-86 (for dismantling balancing shaft gears)	2
11	Bolt M10 × 85 GB5782-86(for removing flywheel key)	2

Appendix II List of Spare Parts Supplied With the Engine

NO.	Name of spart part	Unti	Quantity
1	Cylinder head gasket ZS1115G-01003	piece	1
2	Prison rings ZS1115G-04001,04002,04100	set	1
3	Pump element(plunger & barrel) Z15B(ZCK15S432A)	set	1
4	Oil seal for crankshaft PG50 × 80 × 12	piece	1
5	Water seal ring for cylinder liner ZS1110G-1005	piece	2