

# **ZS1110、ZS1115**

# **DIESEL ENGINE**

## **OPERATION INSTRUCTION**

**THE PEOPLE'S REPUBLIC OF CHINA**



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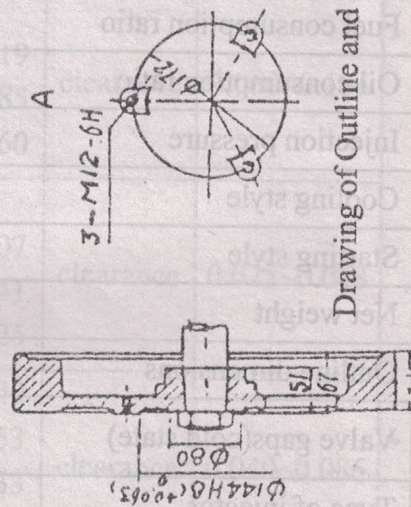
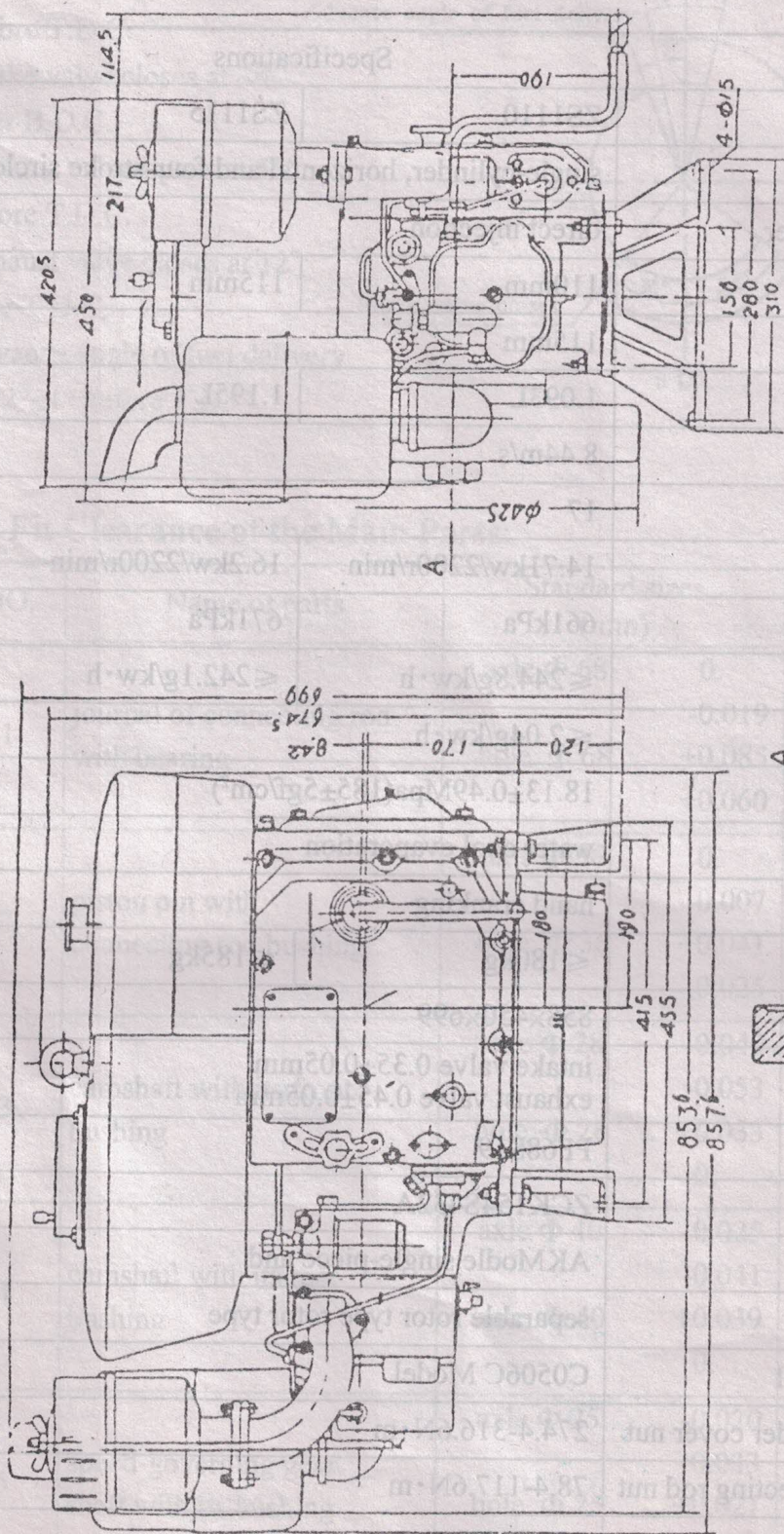
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Drawing of Outline and Installation Dimensions Of Diesel Engine.



# 1. Main specifications of the Diesel Engine

## 1.1 Technical Data

Item	Specifications	
Model	ZS1110	ZS1115
Type	single-cylinder, horizontal and four-stroke circle	
Type of combustion chamber	direct injection	
Cylinder bore	110mm	115mm
Piston stroke	115mm	
Piston displacement	1.093L	1.195L
Average speed of piston	8.44m/s	
Compression ratio	17	
Rated power	14.71kw/2200r/min	16.2kw/2200r/min
Average effective pressure	661kPa	671kPa
Fuel consumption ratio	$\leq 244.8\text{g/kw}\cdot\text{h}$	$\leq 242.1\text{g/kw}\cdot\text{h}$
Oil consumption ratio	$\leq 2.04\text{g/kw}\cdot\text{h}$	
Injection pressure	$18.13\pm 0.49\text{Mpa}(185\pm 5\text{gf/cm}^2)$	
Cooling style	water cool evaporation	
Starting style	hand cranking	
Net weight	$\leq 180\text{kg}$	$\leq 185\text{kg}$
Outline dimensions	858×450×699	
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	
Oil pump rotor type	separable rotor type rotor type	
Diesel oil filter body model	C0506C Model	
Tightening torque of cylinder cover nut	274.4-316.6N·m	
Tightening torque of connecting rod nut	78.4-117.6N·m	
Tightening torque of flywheel nut	295-350N·m	



## 1.2 Valve Timing

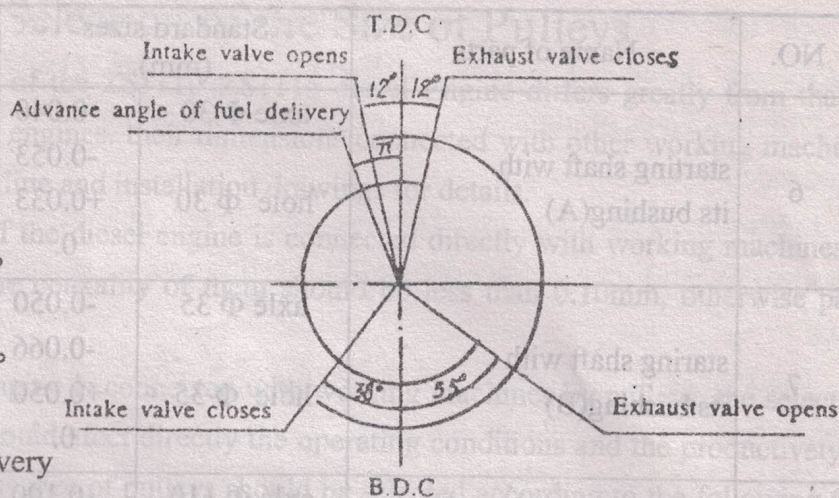
Intake valve opens at  $12^\circ$  before T.D.C.

Intake valve closes at  $38^\circ$  after B.D.C.

Exhaust valve opens at  $55^\circ$  before T.D.C.

Exhaust valve closes at  $12^\circ$  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 $\Phi 68$	0.	clearance 0.060~0.104
			-0.019	
		hole $\Phi 68$	+0.085 +0.060	
2	piston pin with connecting rod bushing	axle $\Phi 36$	0.	clearance 0.025~0.048
			-0.007	
		hole $\Phi 36$	+0.041 0.025	
3	camshaft with its front bushing	axle $\Phi 28$	-0.040	clearance 0.040~0.086
			-0.053	
		hole $\Phi 28$	+0.033 0.	
4	camshaft with its rear bushing	axle $\Phi 40$	-0.025	clearance 0.025~0.080
			-0.041	
		hole $\Phi 40$	+0.039 0.	
5	speed-governing gear shaft with its bushing	axle $\Phi 25$	-0.020	clearance 0.020~0.054
			-0.033	
		hole $\Phi 25$	+0.021 0.	



NO.	Name of parts	Standard sizes (mm)		Kind of fit	Fit Clearance (mm)
6	starting shaft with its bushing(A)	axle $\Phi$ 30	-0.040	clearance	0.040~0.086
		hole $\Phi$ 30	-0.053 +0.033 0.		
7	starling shaft with its bushing(B)	axle $\Phi$ 35	-0.050	clearance	0.050~0.116
		hole $\Phi$ 35	-0.066 +0.050 0.		
8	piston skirt with sylinder liner	axle $\Phi$ 110	-0.190	clearance	0.190~0.255
		$\Phi$ 115 hole $\Phi$ 110	-0.220 +0.035 0.		
9	rocker arm shaft with guide bushing	axle $\Phi$ 16	0.	clearance	0.016~0.054
		hole $\Phi$ 16	-0.011 +0.043 +0.016		
10	intake valve stem with guide bushing	axle $\Phi$ 9	-0.040	clearance	0.040~0.084
		hole $\Phi$ 9	-0.062 +0.022 0.		
11	exhaust valve stem with guide bushing	axle $\Phi$ 9	-0.040	clearance	0.040~0.084
		hole $\Phi$ 9	-0.062 +0.022 0.		
12	open gap of the top piston ring	(in $\Phi$ 110/115 feeler)	+0.005 0.	clearance	0.40~0.60
13	open gap of the 2nd and 3rd piston rings	(in $\Phi$ 110/115 feeler)	+0.005 0.	clearance	0.25~0.45
14	open gap of the oil scraper ring	(in $\Phi$ 110/115 feeler)	+0.005 0.	clearance	0.25~0.45



## 2. Selection of the Size of Pulleys

As the appearance of the ZS1110, ZS1115 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 flying 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 would 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

### 3.1 Preparation 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.

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 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 take 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 of 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, 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

Loosen 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			△1*	
	clean and wash oil filter				△
	clean air filter				△2*
cooling water	check and fill water	△			
	drain out cooling water	△3*			
	clean water channel				△4*
other	adjust gaps of valves			△5*	
	check & tighten all important bolts & nuts				△
	check weariness of all moving parts				△

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	Warm up
(1) Diesel oil is frozen	Clean tank and pipe, replace diesel oil
(2) Water in diesel oil	Exhaust air and tighten all pipe joints
(3) Air in fuel pipe	Clean, grind and replace fuel jet, adjust injection pressure to $18.13 \pm 0.49 \text{ Mpa}$ ( $185 \pm 5 \text{ kgf/cm}^2$ )
(4) Troubles in injector: low injection pressure, needle valve blocked and carbon on jet	Replace fuel injection element
(5) fuel injection pump element worn	
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	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 $22^{\circ} \pm 1^{\circ}$ 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 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	Check diesel oil cock, clean oil filter and fuel pipe
(2) Fuel delivery of pump is bad	Repair or replace damaged parts of pump
(3) Troubles in injector	Refer to item 1.2.(4) of 5
2. Compression force in cylinder is small	Refer to item 1.3. of 5
3. Air filter clogged	Remove, clean or replace filter
4. Advance angle of fuel delivery is wrong	Adjust according to stipulation

## 5.3 Diesel engine stall

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



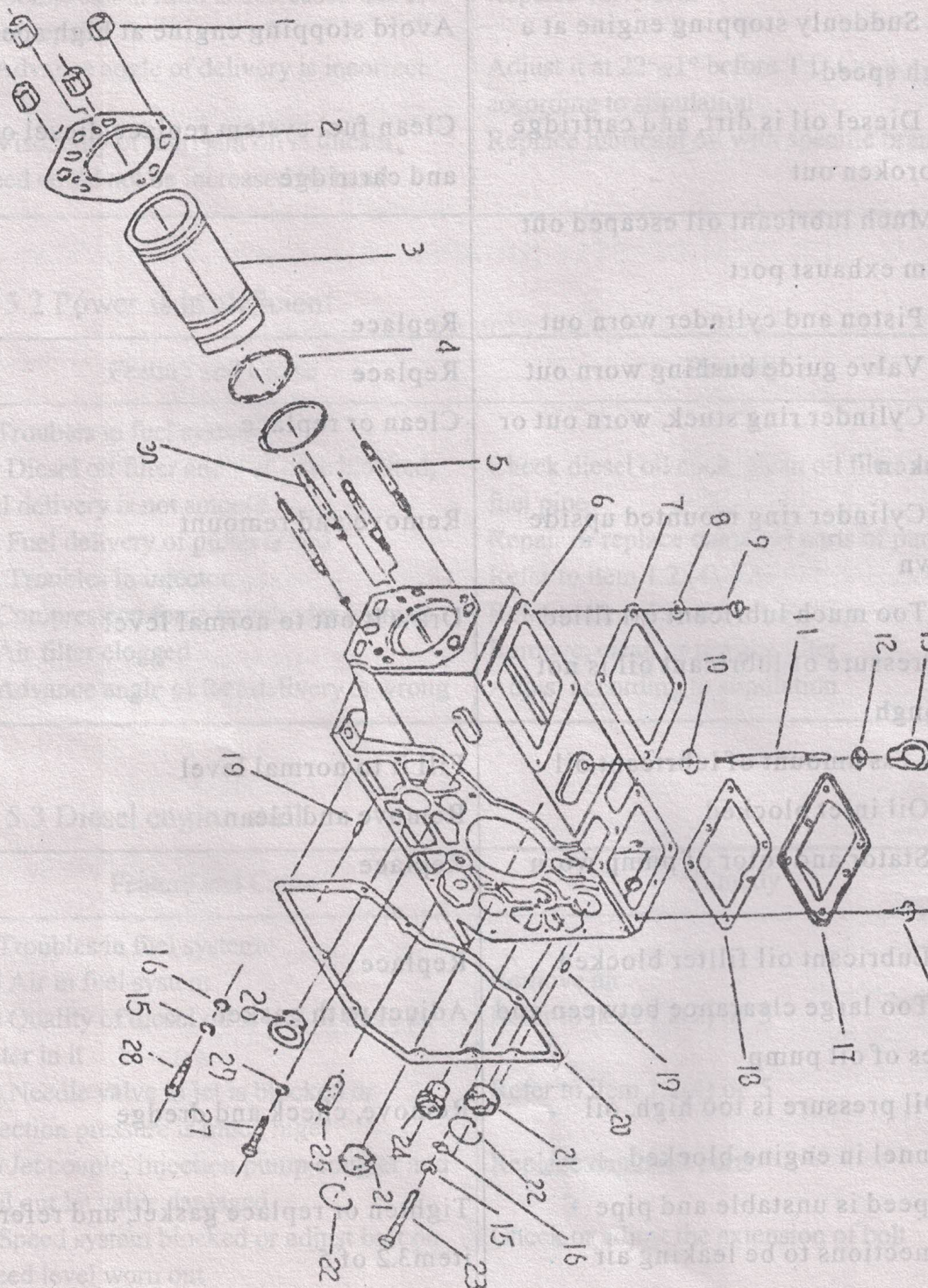
## 5.4 Others

Feature and Cause	Remedy
1. Fuel jet is often blocked	
(1) Suddenly stopping engine at a high speed	Avoid stopping engine at high speed
(2) Diesel oil is dirt, and cartridge is broken out	Clean fuel system replace diesel oil and cartridge
2. Much lubricant oil escaped out from exhaust port	
(1) Piston and cylinder worn out	Replace
(2) Valve guide bushing worn out	Replace
(3) Cylinder ring stuck, worn out or broken	Clean or replace
(4) Cylinder ring mounted upside down	Remove and remount
(5) Too much lubricant oil filled	Draw it out to normal level
3. Pressure of lubricant oil is not enough	
(1) Less amount of lubricant oil	Fill it to normal level
(2) Oil inlet blocked	Remove and clean
(3) Stator and rotor of pump worn out	Replace
(4) Lubricant oil filter blocked	Replace
(5) Too large clearance between end sides of oil pump	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 item 3.2 of 5



# PART TWO PARTS LIST WITH ILLUSTRATIONS

Fig. 1 Cylinder Block Assembly



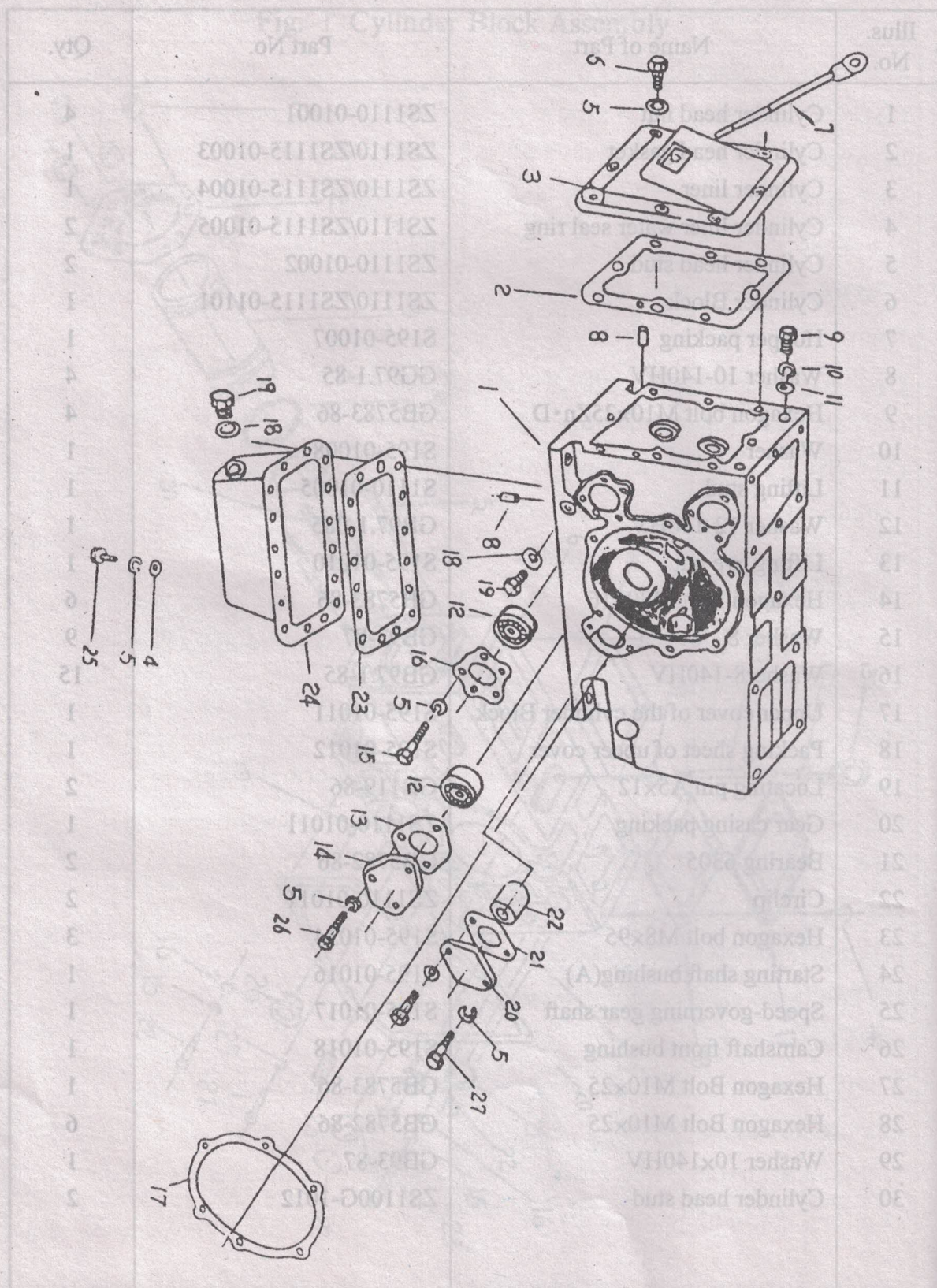


## Cylinder Block Assembly-1

Illus. No.	Name of Part	Part No.	Qty.
1	Cylinder head nut	ZS1110-01001	4
2	Cylinder head gasket	ZS1110/ZS1115-01003	1
3	Cylinder liner	ZS1110/ZS1115-01004	1
4	Cylinder liner water seal ring	ZS1110/ZS1115-01005	2
5	Cylinder head stud	ZS1110-01002	2
6	Cylinder Block	ZS1110/ZS1115-01101	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 upeer cover	S195-01012	1
19	Locating pin A5×12	GB119-86	2
20	Gear casing packing	ZS1110-01011	1
21	Bearing 6305	GB5782-86	2
22	Circlip	ZS1110-01011	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



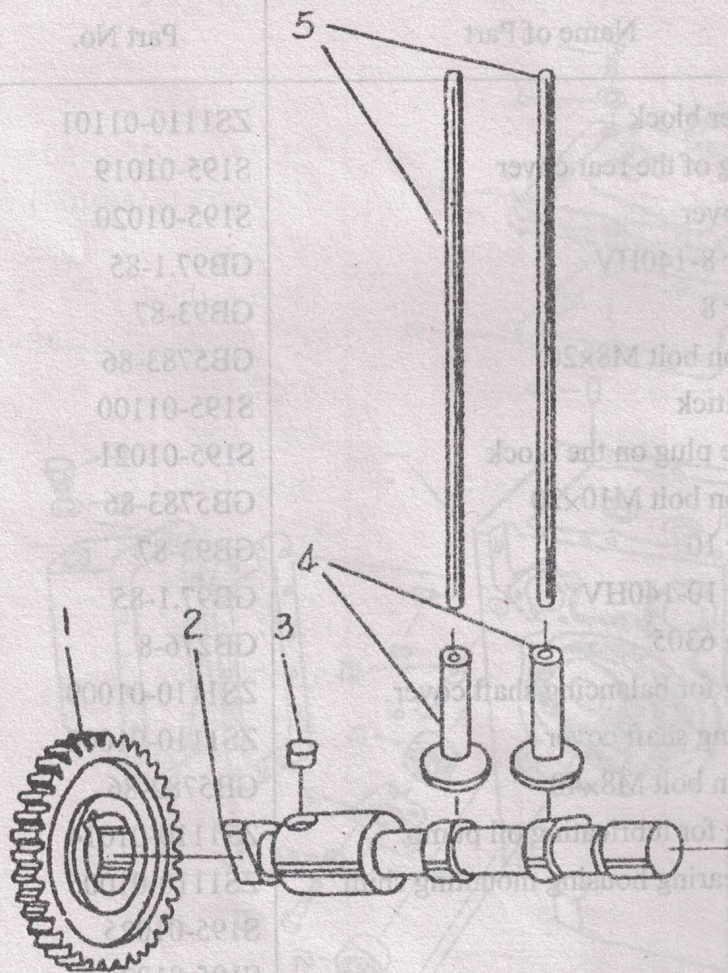


## Cylinder Block Assembly- 2

Illus. No.	Name of Part	Part No.	Qty.
1	Cylinder block	ZS1110-01101	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 M8x20	GB5783-86	8
7	Oil dipitick	S195-01100	1
8	Oil hole plug on the block	S195-01021	2
9	Hexagon bolt M10x20	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	ZS1110-01009	as required
14	Balancing shaft cover	ZS1110-01008	1
15	Hexagon bolt M8x40	GB5782-86	3
16	Packing for lubricating oil pump	ZS1110-01014	as required
17	Main bearing housing mounting shim	ZS1110-01006	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	ZS1110-01200	1
25	Hexagon M8x20	GB5783-86	16
26	Hexagon M8x20	GB5783-86	3
27	Hexagon M8x25	GB5783-86	2



# Fig.III Camshaft Assembly

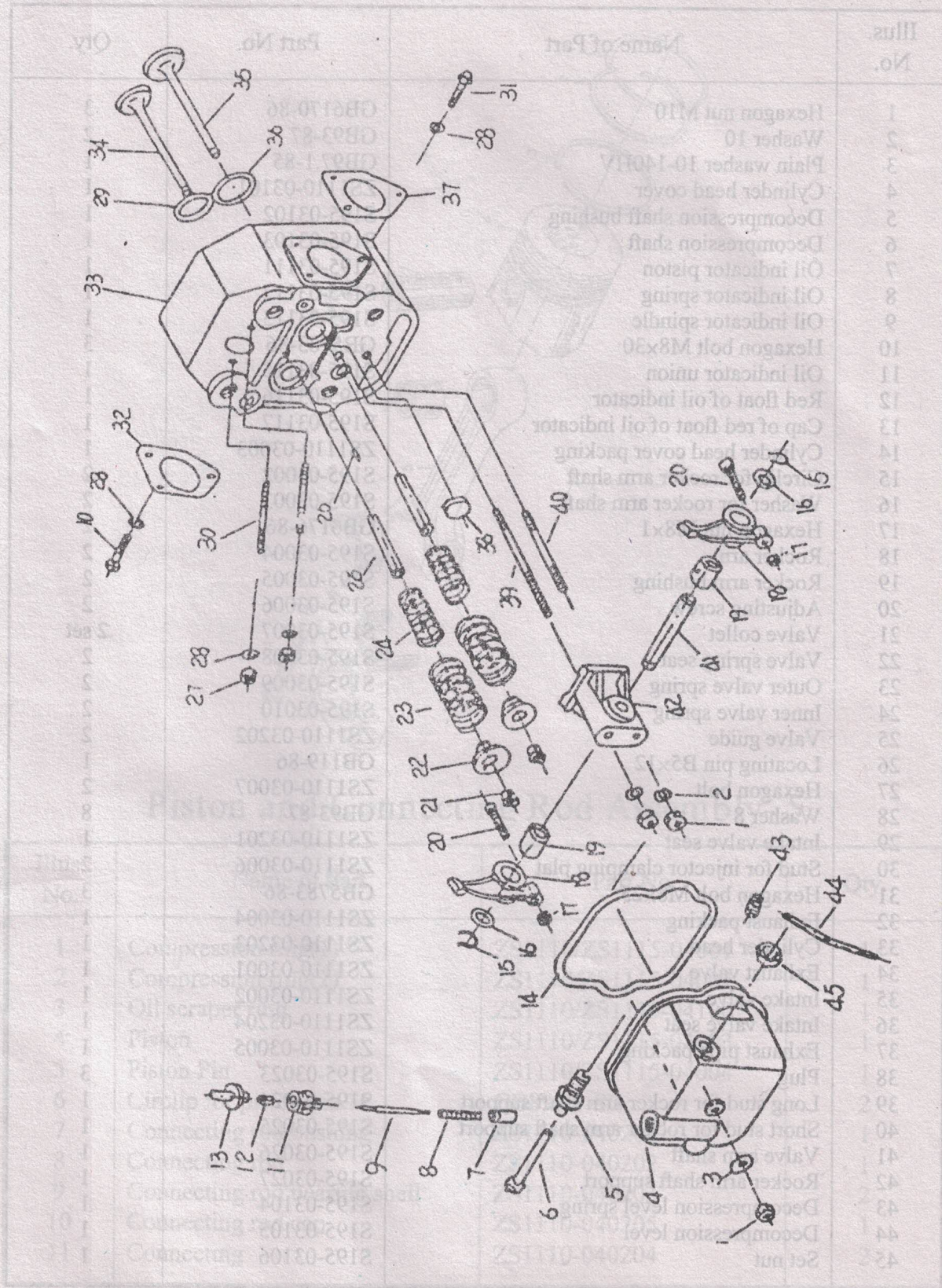


## Camshaft Assembly- 3

Illus. No.	Name of Part	Part No.	Qty.
1	Camshaf gear	S195-02001	1
2	Camshaft	ZS1110-02001	1
3	Flat key 10×16	GB1096-79	1
4	Valve tappet	S195-02004	2
5	Valve push rod	ZS1110-02002	2



# Fig. IV Cylinder Head Assembly



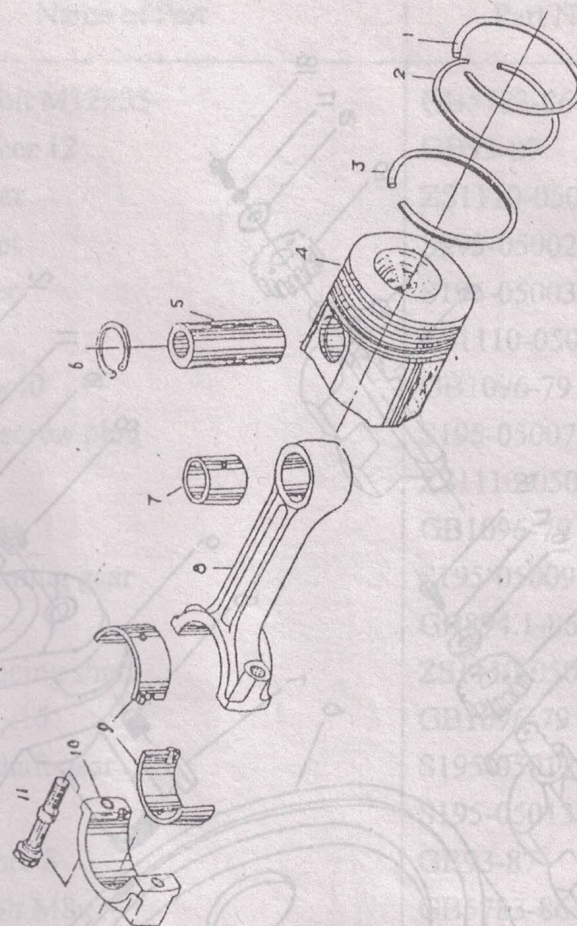


## Cylinder Head Assembly- 4

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	ZS1110-03101	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	ZS1110-03003	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	ZS1110-03202	2
26	Locating pin B5×12	GB119-86	1
27	Hexagon bolt	ZS1110-03007	2
28	Washer 8	GB93-87	8
29	Intake valve seat	ZS1110-03201	1
30	Stud for injector clamping plat	ZS1110-03006	2
31	Hexagon bolt M8×25	GB5783-86	3
32	Exhaust packing	ZS1110-03004	1
33	Cylinder head	ZS1110-03203	1
34	Exhaust valve	ZS1110-03001	1
35	Intake valve	ZS1110-03002	1
36	Intake valve seat	ZS1110-03204	1
37	Exhaust pipe packing	ZS1110-03005	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

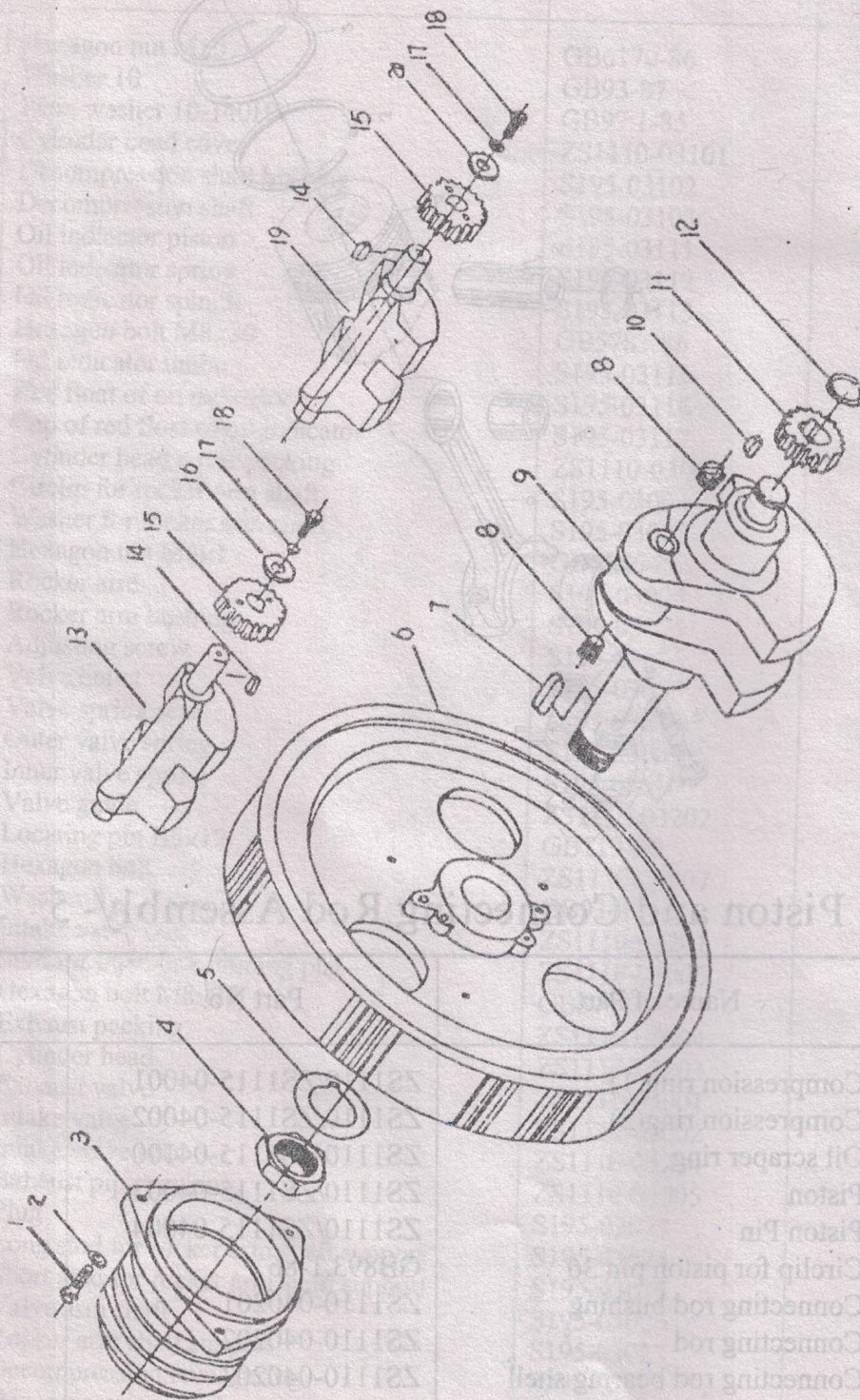


## Piston and Connecting Rod Assembly- 5

Illus. No.	Name of Part	Part No.	Qty.
1	Compression ring(1)	ZS1110/ZS1115-04001	1
2	Compression ring(2)	ZS1110/ZS1115-04002	1
3	Oil scraper ring	ZS1110/ZS1115-04100	1
4	Piston	ZS1110/ZS1115-04003	1
5	Piston Pin	ZS1110/ZS1115-04004	1
6	Circlip for piston pin 36	GB893.1-86	2
7	Connecting rod bushing	ZS1110-040201	1
8	Connecting rod	ZS1110-040202	1
9	Connecting rod bearing shell	ZS1110-040203	2
10	Connecting rod cap	ZS1110-040205	1
11	Connecting	ZS1110-040204	2



Fig. VI Flywheel Crankshaft and Balancing Mechanism



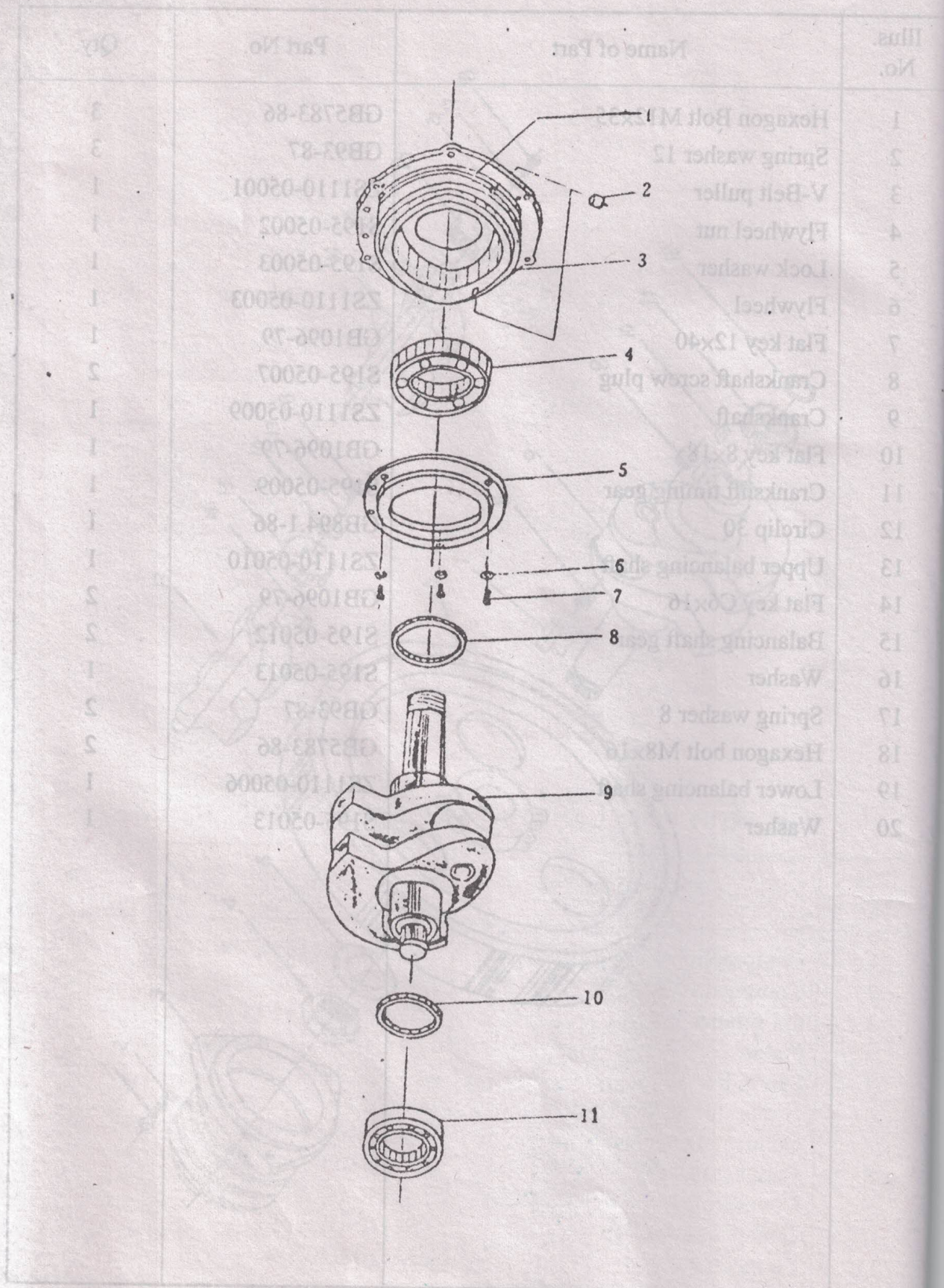


# Flywheel Crankshaft and Balancing Mechanism- 6

Illus. No.	Name of Part	Part No.	Qty.
1	Hexagon Bolt M12x35	GB5783-86	3
2	Spring washer 12	GB93-87	3
3	V-Belt puller	ZS1110-05001	1
4	Flywheel nut	S195-05002	1
5	Lock washer	S195-05003	1
6	Flywheel	ZS1110-05003	1
7	Flat key 12x40	GB1096-79	1
8	Crankshaft screw plug	S195-05007	2
9	Crankshaft	ZS1110-05009	1
10	Flat key 8x18	GB1096-79	1
11	Crankshaft timing gear	S195-05009	1
12	Circlip 30	GB894.1-86	1
13	Upper balancing shaft	ZS1110-05010	1
14	Flat key C6x16	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 M8x16	GB5783-86	2
19	Lower balancing shaft	ZS1110-05006	1
20	Washer	S195-05013	1



Fig.VII Flywheel Crankshaft and Balancing Mechanism



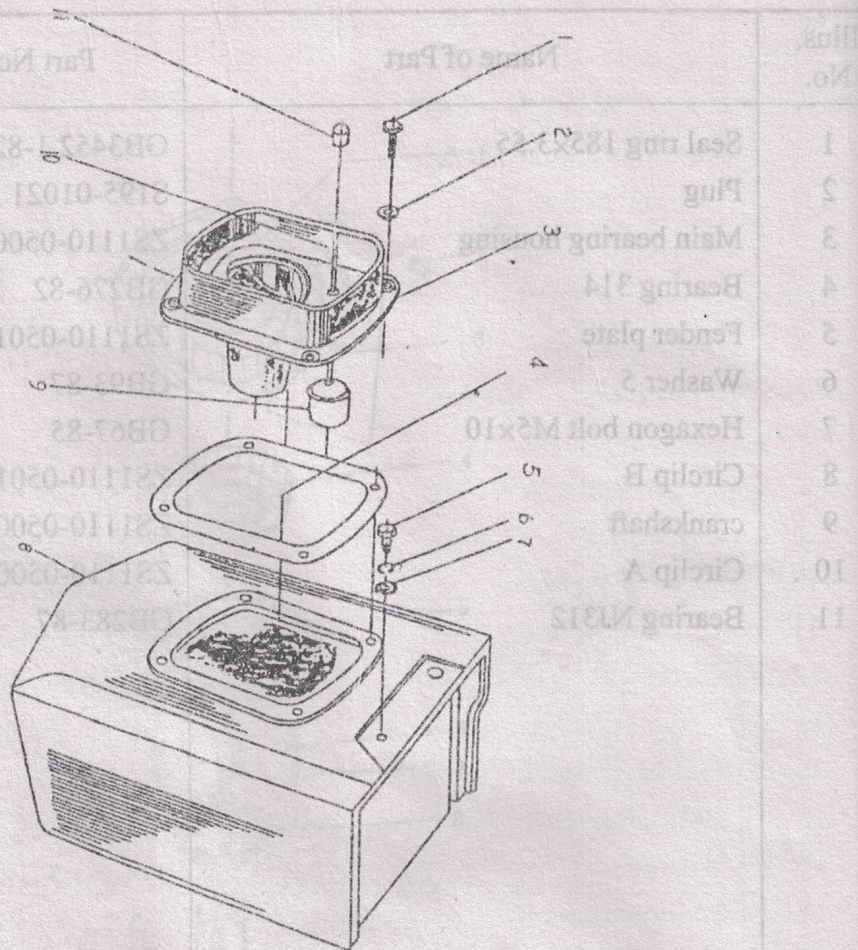


# Flywheel Crankshaft and Balancing Mechanism- 7

Illus. No.	Name of Part	Part No.	Qty.
1	Seal ring 185x3.55	GB3452.1-82	1
2	Plug	S195-01021	2
3	Main bearing housing	ZS1110-05005	1
4	Bearing 314	GB276-82	1
5	Fender plate	ZS1110-05012	1
6	Washer 5	GB93-87	3
7	Hexagon bolt M5x10	GB67-85	3
8	Circlip B	ZS1110-05014	1
9	crankshaft	ZS1110-05009	1
10	Circlip A	ZS1110-05007	1
11	Bearing NJ312	GB283-87	1



# Fig.VIII Hopper Assembly

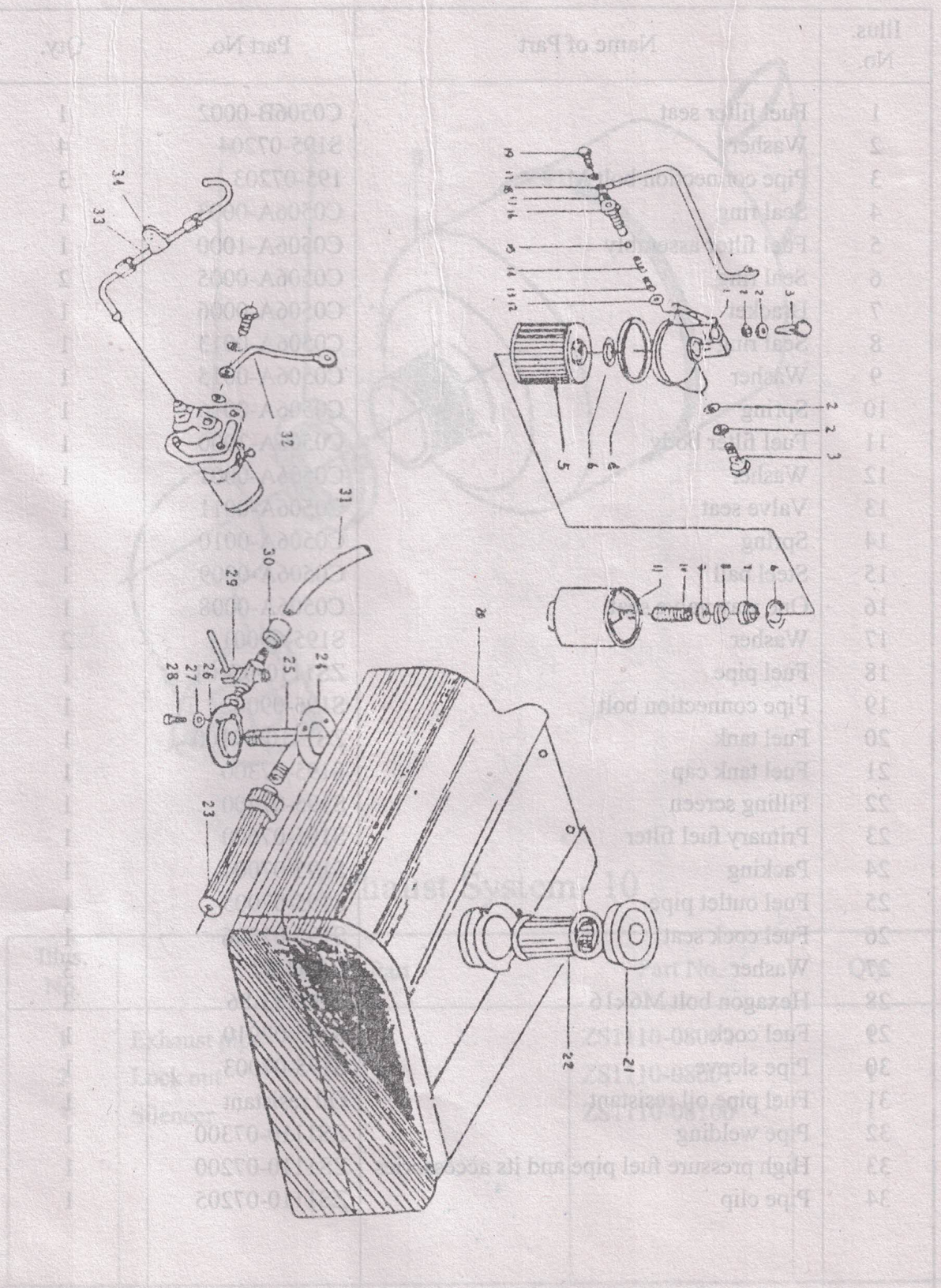


## Hopper Assembly- 8

Illus. No.	Name of Part	Part No.	Qty.
1	Hexagon bolt M8x20	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 M8x16	GB5783-86	1
6	Washer 8	GB93-87	1
7	Washer 8-140HV	GB96-85	1
8	Hopper	ZS1110-06001	1
9	Float	S195-06203	1
10	Float stem	S1110-06101	1
11	Red indicating ball	S195-06202	1



## System



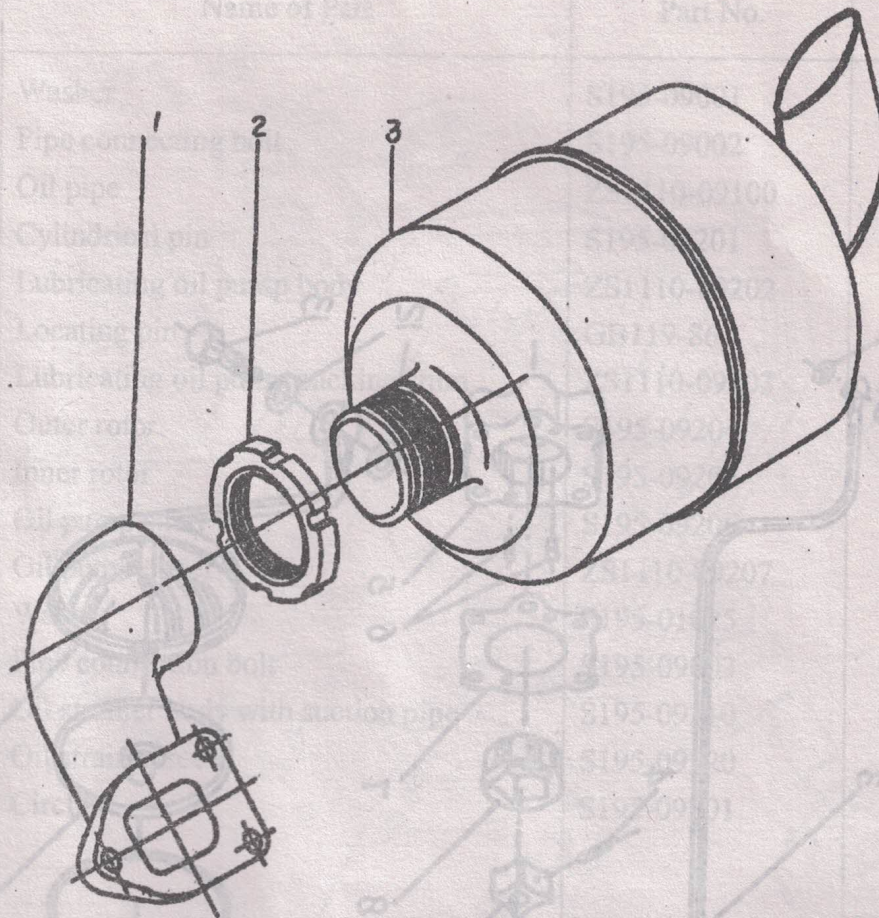


## Fuel System- 9

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	C0506A-0011	1
14	Spring	C0506A-0010	1
15	Steel ball	C0506A-0009	1
16	One way valve seat	C0506A-0008	1
17	Washer	S195-09001	2
18	Fuel pipe	ZS1110-07401	1
19	Pipe connection bolt	S195-09002	1
20	Fuel tank	ZS1110-07100	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	ZS1110-07300	1
33	High pressure fuel pipe and its accessories	ZS1110-07200	1
34	Pipe clip	ZS1110-07205	1



# Fig. X Exhaust System

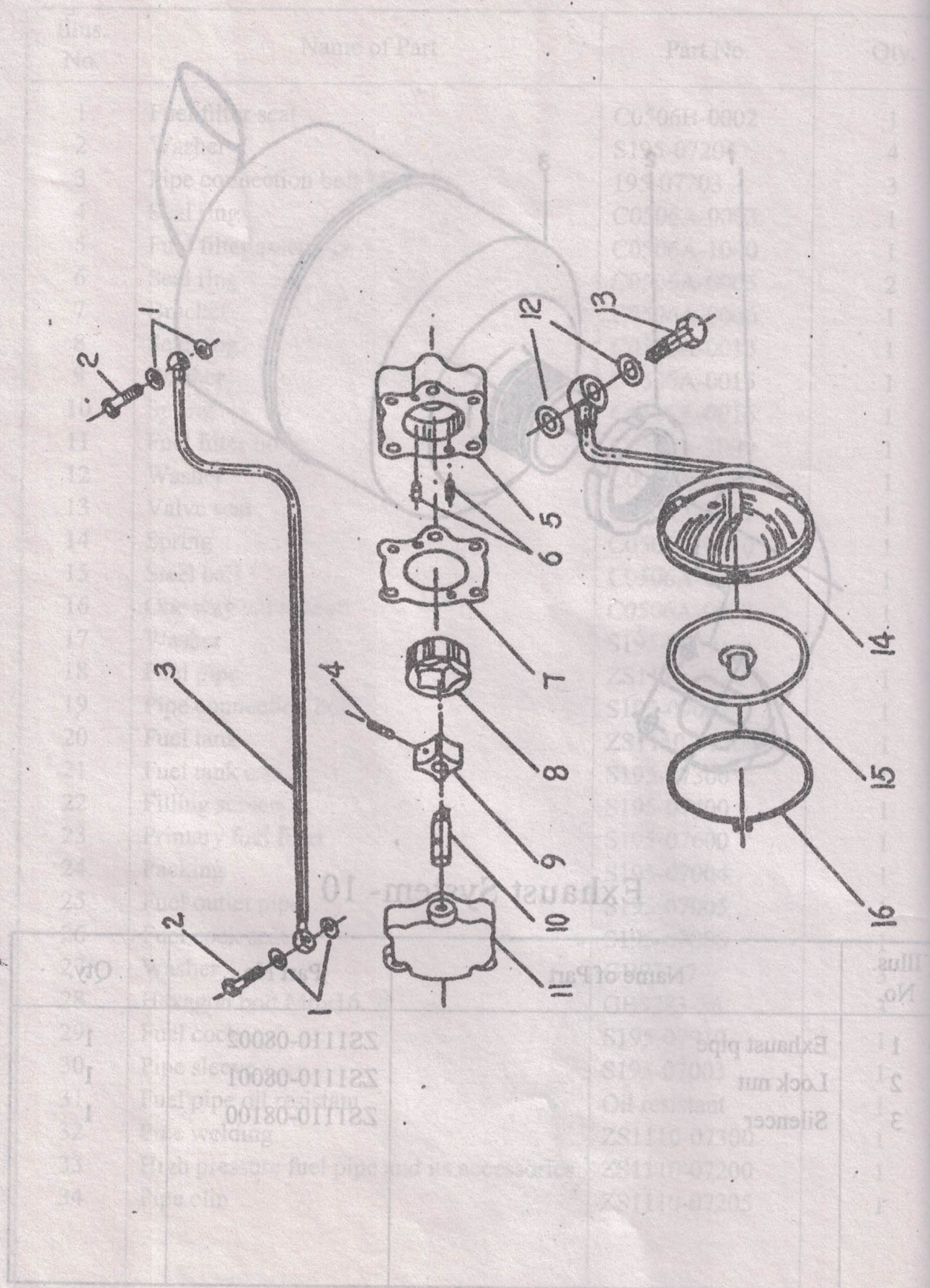


## Exhaust System- 10

Illus. No.	Name of Part	Part No.	Qty.
1	Exhaust pipe	ZS1110-08002	1
2	Lock nut	ZS1110-08001	1
3	Silencer	ZS1110-08100	1



# Fig.XI Lubrication System



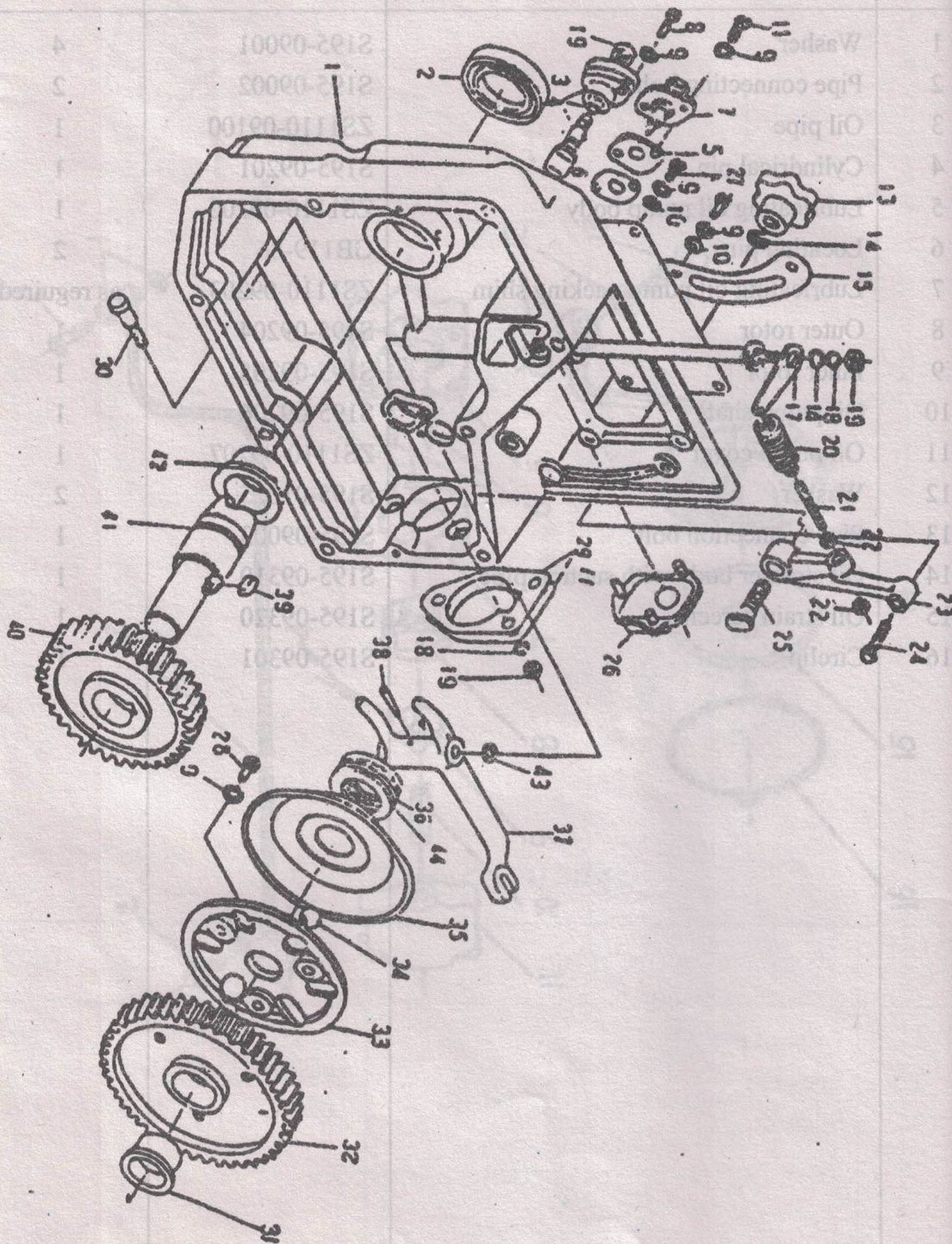


# Lubrication System- 11

Illus. No.	Name of Part	Part No.	Qty.
1	Washer	S195-09001	4
2	Pipe connecting bolt	S195-09002	2
3	Oil pipe	ZS1110-09100	1
4	Cylindrical pin	S195-09201	1
5	Lubricating oil pump body	ZS1110-09202	1
6	Locating pin	GB119-86	2
7	Lubricating oil pump packing shim	ZS1110-09203	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	ZS1110-09207	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
24	Washer	S195-01025	2
25	Fixed screw	S195-01025	2
26	Breathing pipe connection	S195-01025	2
27	Washer	S195-01025	2
28	Washer	S195-01025	2
29	Washer	S195-01025	2
30	Washer	S195-01025	2
31	Governor gear bearing	S195-10111	1
32	Governor gear	S195-10111	1
33	Governor ball spacer	S195-10111	1
34	Steel ball	S195-10111	6
35	Governor ball race	S195-10111	1
36	Single direction thrust ball bearing	S195-10111	1
37	Governor fork	S195-10111	1
38	Taper pin 4x15	S195-10111	1
39	Flat key 8x8	S195-10111	1
40	Starting gear	S195-10111	1
41	Starting gear shaft	S195-10111	1
42	Starting gear shaft bushing(B)	S195-10111	1
43	Adjusting washer	S195-10111	as required
44	Packing for governor ball race	S195-10111	as required



# Fig.XII Gear Casing Assembly





# Gear Casing Assembly- 12

Illus. No.	Name of Part	Part No.	Qty.
1	Gear casing	ZS1110-10001	1
2	Oil seal ring $\Phi 35 \times 58 \times 12$		1
3	Packing for fuel priming handle bushing	S195-10404	1
4	Fuel priming handle bushing	S195-10400	1
5	Plug	S195-10003	1
6	Fuel limiter packing	S195-10002	1
7	Fuel limiter	ZS1110-10200	1
8	Screw M6x20	GB67-85	1
9	Washer 6	GB93-87	8
10	Washer 6-140HV	GB97.1-85	9
11	Screw M6x16	GB67-85	2
12	Screw Name plate	ZS1110-10002	1
13	Speed control level kNo.b	S195-10200	1
14	Washer 8-140HV	GB97.1-85	2
15	Speed indicating	ZS1110-10003	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	ZS1110-10138	1
21	Adjusting screw	S195-10104	1
22	Hexagon nut M6	GB6170-86	2
23	Speed control level	S195-10105	1
24	Hexagon bolt M8x40	GB5783-86	1
25	Fixed screw	S195-10106	1
26	Breathing pipe connection	S195-10500	1
27	Button head cap screw	M6x12 GB67-85	6
28	Button head cap screw	M6x18 GB67-85	6
29	Shim for fuel injection pump	S195-10007	as required
30	Fuel injection pump mounting bolt	ZS1110-10004	3
31	Governor gear bushing	S195-10107	1
32	Governor gear	S195-10108	1
33	Governor ball spacer	S195-10109	1
34	Steel ball	$\Phi 16$	6
35	Governor ball race	S195-10102	1
36	Single direction thrust ball bearing	S1106 GB301-64	1
37	Governor fork	S195-10111A	1
38	Taper pin 4x25	GB117-86	1
39	Flat key 8x6	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

This diagram shows an exploded view of a mechanical assembly. The components are numbered 1 through 12. The assembly consists of a main cylindrical housing (1) with a flange (2) at the top. Inside the housing, there is a central shaft (3) with a pin (4) and a spring (5). A cover (6) with a gasket (7) fits over the top of the housing. A bracket (8) is attached to the side of the housing. A screw (9) is used to secure the bracket. A nut (10) is used to secure the spring. A washer (11) is used to secure the pin. A pin (12) is used to secure the spring.

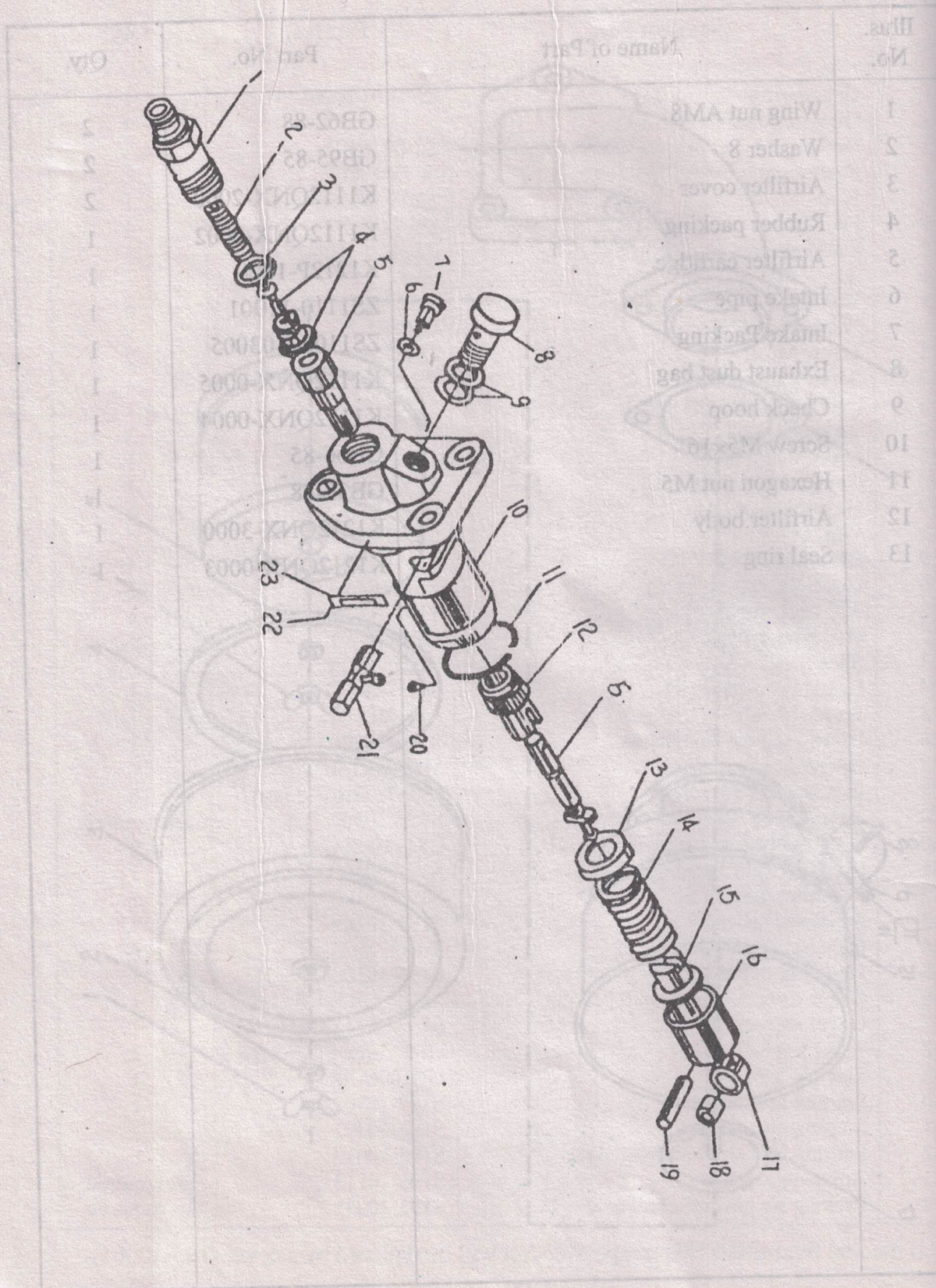


# Intake System- 13

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	K1212P-1000	1
6	Intake pipe	ZS1110-11001	1
7	Intake Packing	ZS1100G-03005	1
8	Exhaust dust bag	K1112QNX-0005	1
9	Check hoop	K1112QNX-0004	1
10	Screw M5×16	GB66-85	1
11	Hexagon nut M5	GB39-88	1
12	Airfilter body	K1212QNX-3000	1
13	Seal ring	K1212QNX-0003	1



# Fig. X IV Fuel Injection Pump



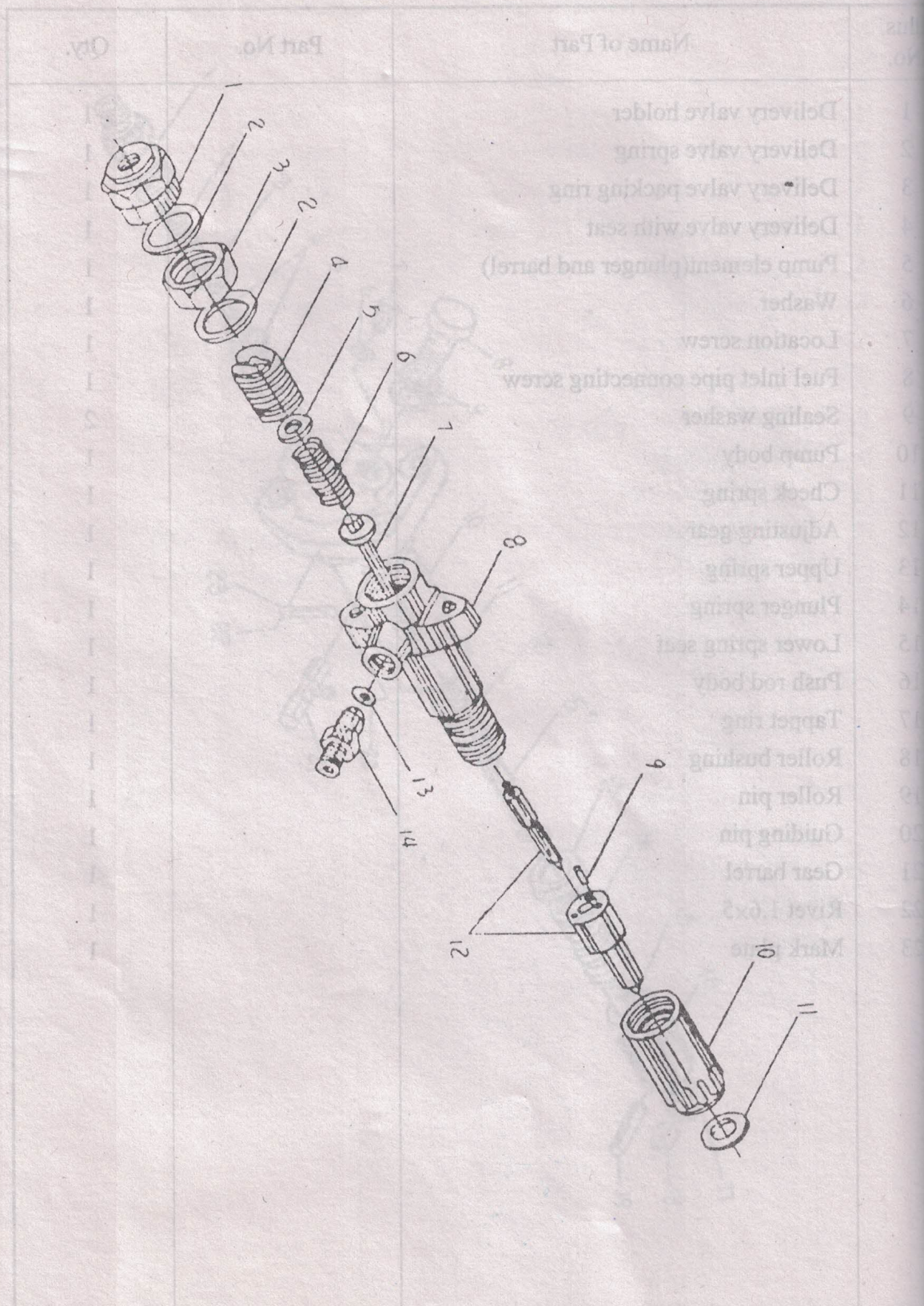


# Fuel Injection Pump- 14

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 1.6x5		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 II List of Spare Parts Supplied with the Engine			
No.	Name of part part	Unit	Quantity
1	Cylinder head gasket	piece	1
2	Piston rings	set	1
3	Fuel filter element	piece	1



## Appendix I List of Tools Supplied with the Engine

No.	Name	Quantity
1	Hexagon wrench 60(special wrench for flywheel nut)	1
2	Hexagon wrench 27(special wrench for cylinder head nuts)	1
3	Double-open-end wrench 13×16	1
4	Double-open-end wrench 18×21	1
5	Feeler gauge(for measuring and adjusting valve clearance)	1
6	Starting handle	1
7	Special wrench for connecting rod bolts	1
8	Bridge of puler(for dismantling flywheel and balancing shaft gears)	1
9	Valve lapping tool, complete	1
10	Screw driver 6"	1
11	Lapping paste	1
12	Screw AM6×30 GB67-85(for removing flywheel key from crankshaft)	1
13	Bolt M8×60 GB5782-86(for dismantling balancing shaft gears)	2
14	Bolt M10×85 GB5782-86(for dismantling flywheel)	2

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

No.	Name of spare part	Unit	Quantity
1	Cylinder head gasket ZS1110/ZS1115-01003	piece	1
2	Piston rings ZS1110/ZS1115-04001,04002,04100	set	1
3	Fuel filter element C0506A-1000	piece	1