Operation Manual

MODEL： *STH-75*

NAME： *PNEUMATIC HAMMER*

RAM WEIGHT: 75 *KGS*

FULL BLOWS MIN: *210*

ANYANG ST FORGING

MACHINERY MANUFACTURE CO.,LTD

Catalogue

SAFE OPERATION OF HAMMER

The following points must be strictly observed when using the hammer.

- Never, under any circumstances put hands on or around the die area of the hammer whilst it is running. Forging scale must be removed with a long handled brush.

-The hammer must be subject to your own risk assessment, including the use of personal protective equipment. Forging causes ejection of scale and hot material, so as a minimum approved eye & hearing protection must be worn.

-The hammer must be fitted with a full foot treadle guard. This is not supplied with the hammer as the design will vary greatly depending on the method of mounting the hammer

-The hammer must be fitted with the motor drive guard supplied

-The hammer is designed for the forging of hot metal. Forging material which is not at full heat will greatly reduce the life of the hammer. Hammering cold metal can cause the work piece or die blocks to shatter with risk of personal injury.

-The tapered keys locating the top & bottom dies and the sow block must be well fitted and driven tight. These must be checked every time the hammer is used.

-Loose tooling should not be used under the hammer, as an offset blow will cause the tooling & work piece to be violently ejected.

-The hammer must be situated on level ground in a well ventilated workshop. There area around the hammer must be kept clear and the floor in good condition to minimise the chances of tripping / slipping near the hammer.

SPECIFICATIONS OF HAMMER STH-75 75 KG

RATED WEIGHT OF TUP	75 KG
BLOW ENERGY:	1.00KJ
DIAMETER OF RAM CYLINDER	225 MM
DIAMTER OF PUMP CYLINDER	235 MM
NO. OF BLOWS PER MIN	210
BTM DIE FACE TO SLIDES	476 MM
TUP AXIS TO FRAME	330 MM
TOP DIE FACE	145MM x 100 MM
BTM DIE FACE	145MM x 100 MM
MAX DIA WORKED (M.S)	85 MM DIA
MAX SQUARE WORKED (M.S)	65 MM x 65 MM
WORKING HEIGHT (INCLUDE BASE)	915 MM
FLOOR SPACE (L x W)	1800 MM x 1750
HEIGHT	2220MM
MOTOR	3PH /7.5KW/960RPM
WEIGHT OF HAMMER:	2800 KG

CONSTRUCTION OF HAMMER

The hammer frame is of heavy cast iron construction. fig 1.a shows the general arrangement of the hammer:

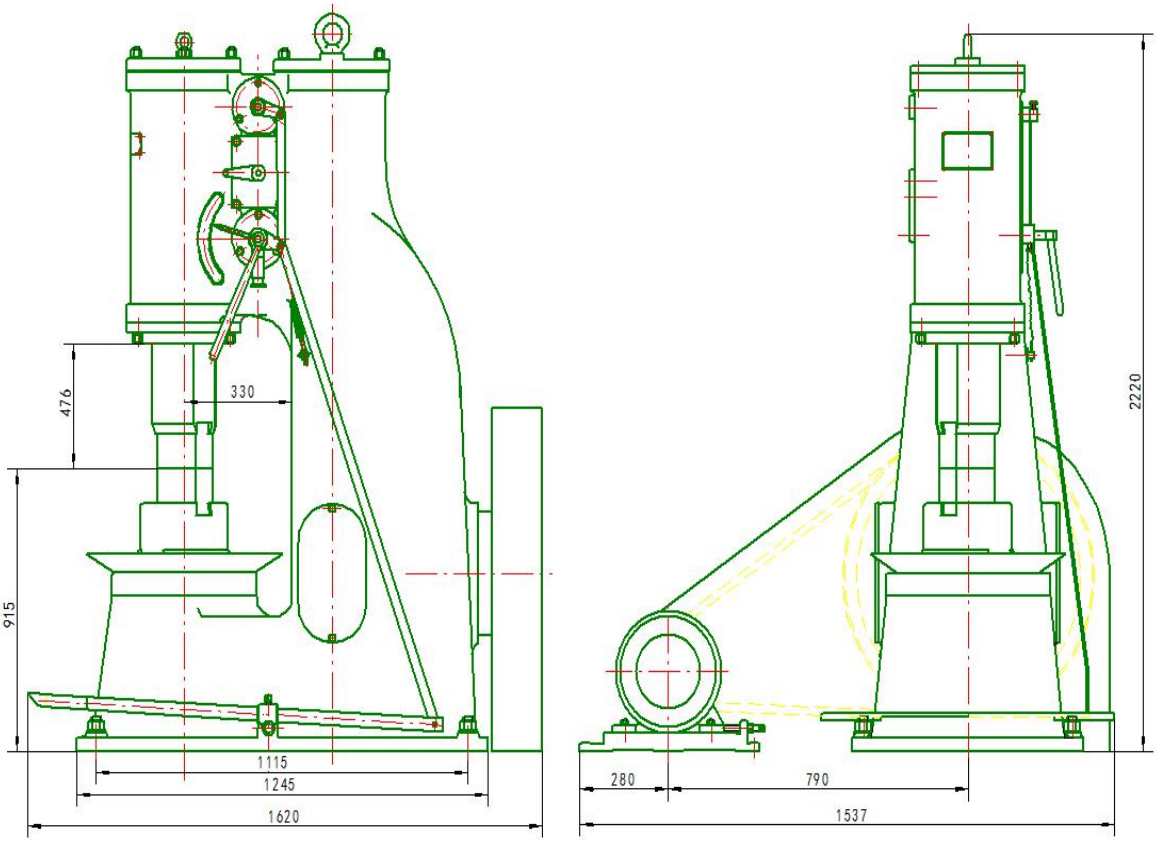


Fig 1.a SECTIONAL VIEW THROUGH HAMMER

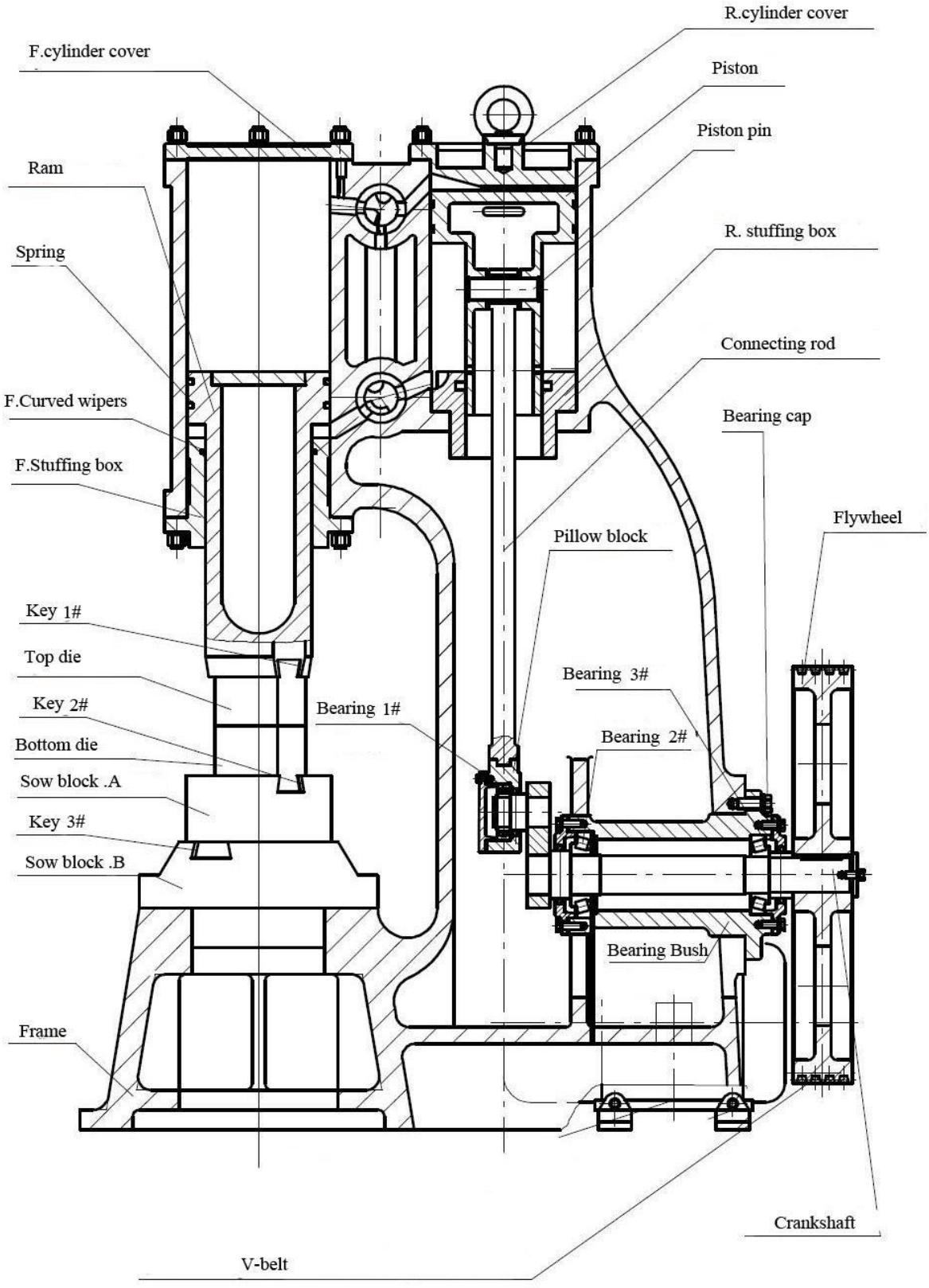


Fig 1.b HAMMER STRUCTURE

GENERAL DESCRIPTION OF OPERATING PRINCIPLE

The hammer is driven by the motor through qty 5 off 'v' belts. By means of the crankshaft and connecting rod the pump piston is moved up and down in the compressing (pump) cylinder at the back of the hammer.

By means of the air valves (controlled via hand and foot lever) the amount of air entering the ram cylinder can be controlled, allowing very light or heavy blows, or through practice a single blow can be delivered by a sharp 'tap' on the foot lever.

At 'full work' the pump piston and ram piston are directly connected via the air passages, thus the ram reciprocates the motion of the pump piston. (hence flywheel speed = 210 rpm / no of blows = 210 min^{-1})

RAM BUFFER DEVICE

The ram buffer prevents the ram colliding with the cylinder cover. It works by admitting compressed air to the top of the cylinder, providing a cushion of air. Fig 2. is a sectional view of the buffer, and a more detailed description of its operation.

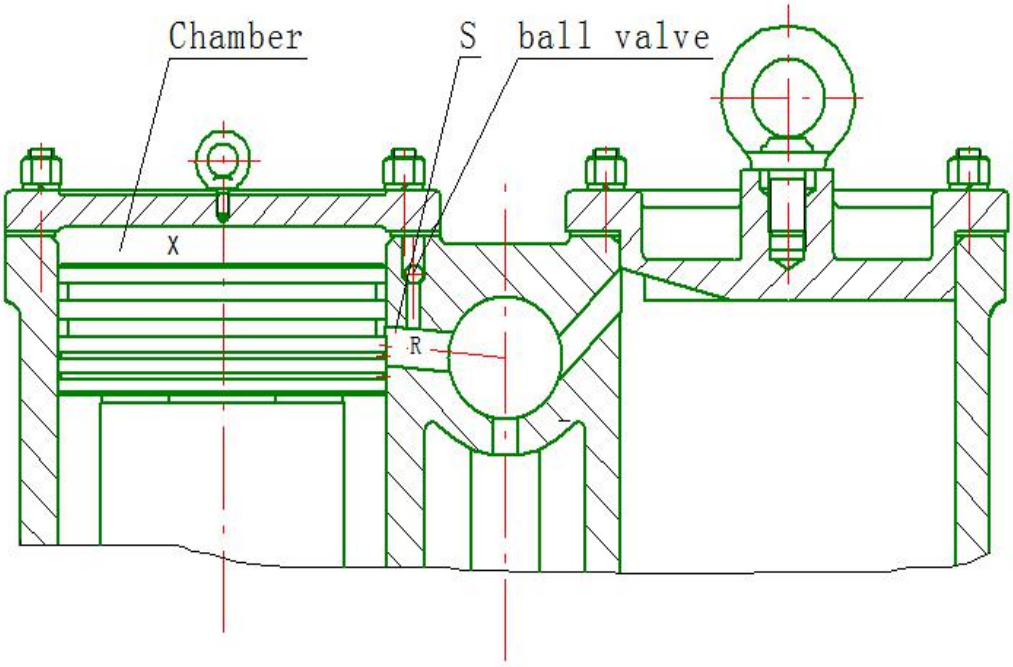


Fig 2.

When the tup reaches the upper edge of port 's' (air passage 'r') the void above the ram head (x) is sealed off, as the ram continues to rise the air in 'x' compresses and stops the tup rising.

A ball valve is fitted which when opened by the air pressure change from the pump piston opens void 'x' and allows the tup to be powered down. When the tup rises the valve closes, sealing void 'x' and allowing the air to compress on the upstroke preventing the ram striking the cover.

THE TUP

The tup is accurately guided through the stuffing box by the 2 flats down its length. The ram is set at 45 degrees to the centre line of the hammer to allow long bars to be forged.

The tup is hollow in the middle to allow a greater guide area for a given mass.

The top tool is located into the ram dovetail by a tapered key.

fig 3 shows a sectional view of the ram and top tool.

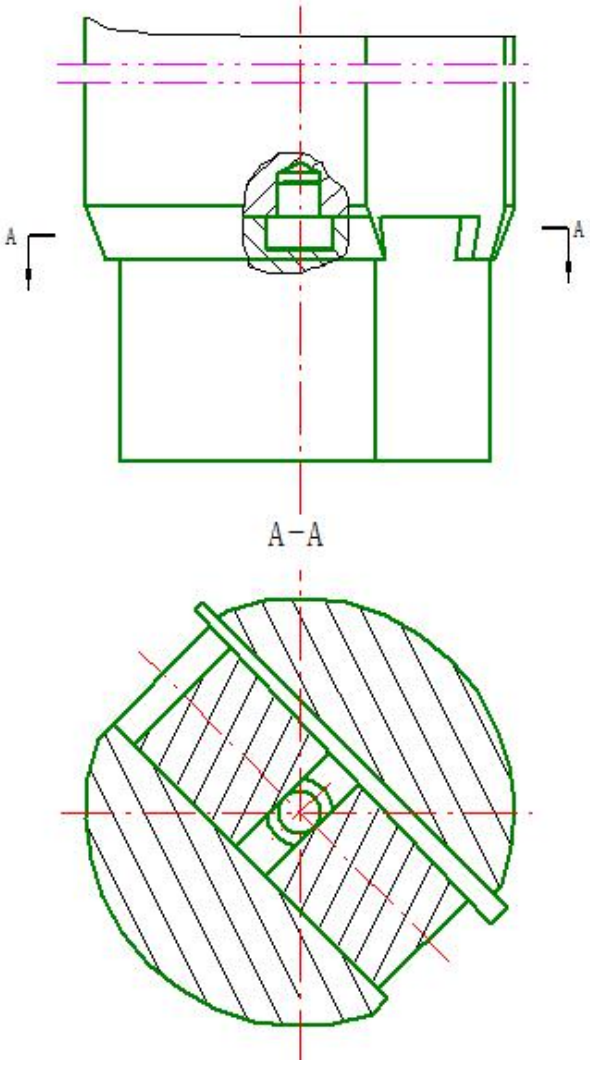


Fig. 3 - sectional view through ram

STUFFING BOX & RAM GUIDES

The stuffing box contains 4 x radial packing pieces to reduce air leakage round the ram. The packings are secured with a spring to ensure contact with the ram. A section through the stuffing box can be seen in fig 4.

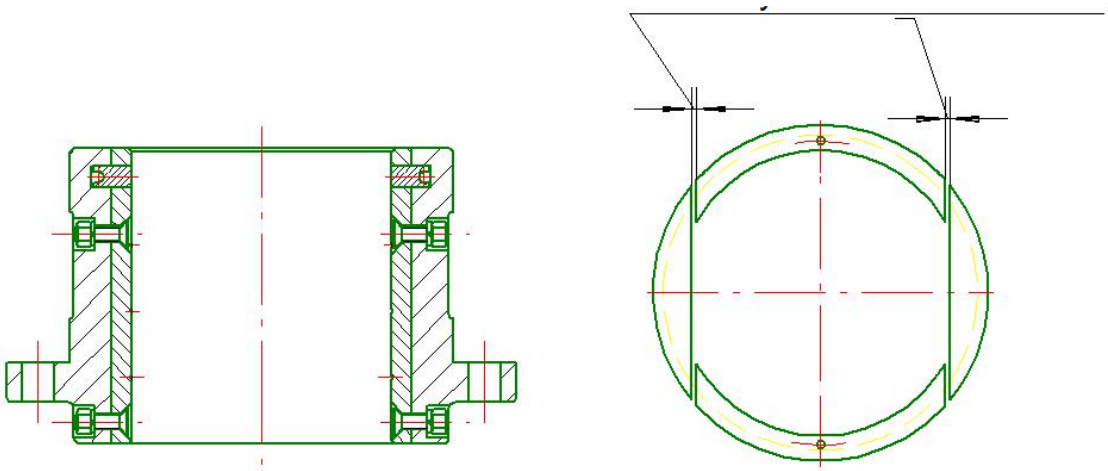


Fig 4 section through stuffing box

PUMP PISTON GUIDE / GLAND

The pump piston guide / gland contains 4 x radial packing pieces to reduce air leakage round the piston. The packings are secured with a spring to ensure contact with the ram. A section through the pump piston gland can be seen in fig 5.

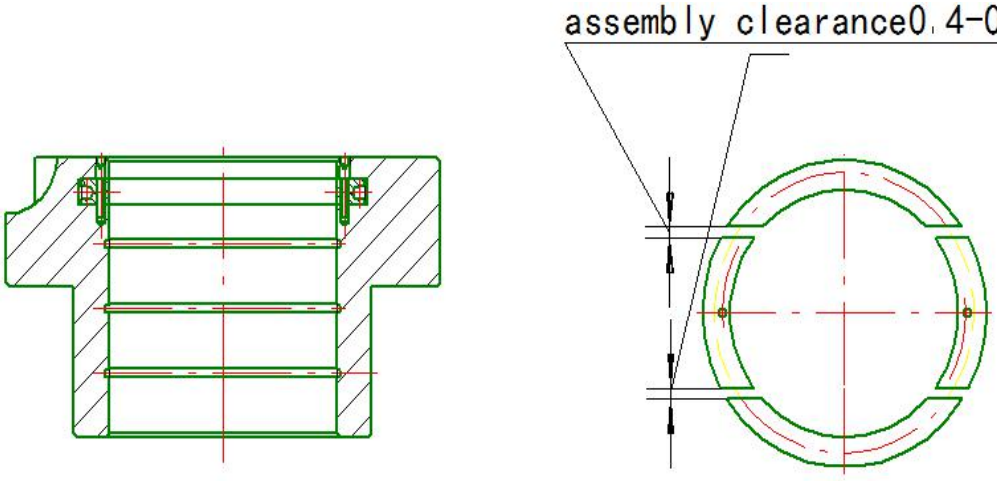


Fig 5 section through pump piston gland

AIR SUPPLIMENT MECHANISM

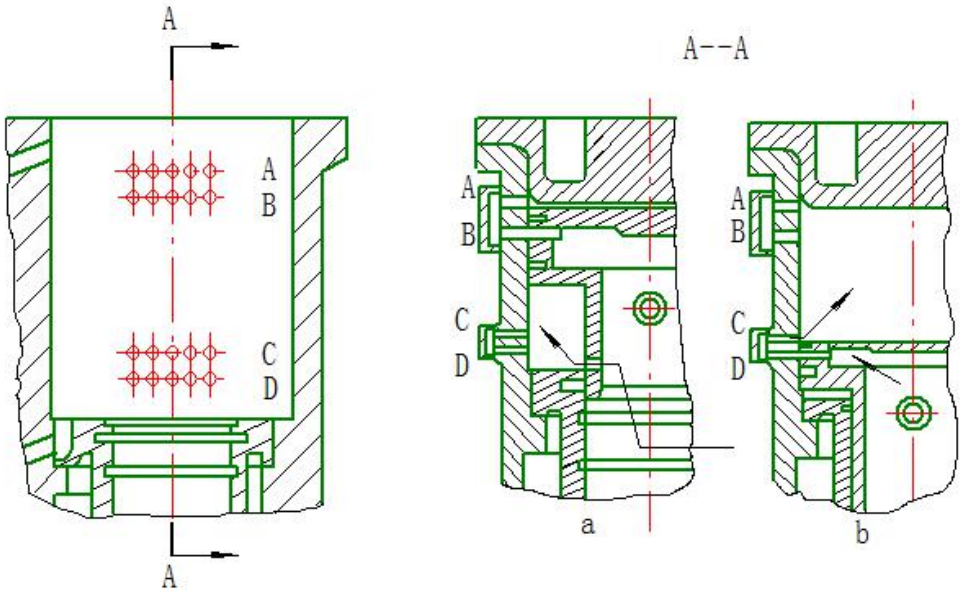
Due to air leakage when the hammer is running it requires supplemental air. This is achieved as described below & illustrated in fig 6.

Two rows of holes are drilled in the pump cylinder, at the bottom and top of the piston travel and a notch at the top of the piston. The air supplement has two stages.

1) When the piston is at top dead centre the row of holes 'A' is at the upper edge of the piston, and aligned with holes 'B' and the piston notch. The supplemental air enters the piston through holes 'AB' connected to atmosphere.

Additionally a circle of holes in the lower potion of the piston open to atmosphere to make up the air. There is then enough air to compress on the down stroke of the piston.

2) When the piston is at bottom dead centre the holes 'D' align with those on the piston, the air can then pass through to the upper chamber from 'C' giving enough air to compress on the upstroke.



a) Piston at T.D.C b) Piston at B.D.C.

Fig 6. Air supplement.

PUMP PISTON & CONNECTING ROD ASSEMBLY

The piston, connecting rod, bearing bush and trunk pin are held together with a spring ring - This prevents axial displacement of the trunk pin. The trunk pin is prevented from rotating by a locking pin. (see Fig.7)

It is imperative that the oil holes are aligned to allow correct lubrication of the bearing & trunk pin.

A 'v' slot on the outer face of the piston stores the lubricating oil which can then flow to the trunk pin and bearing.

If the piston has to be removed from the hammer pay special attention on reassembly that the side of the piston with the lubrication notch lines up with the air holes.(check by ensuring air leakage when piston approaches T.D.C)

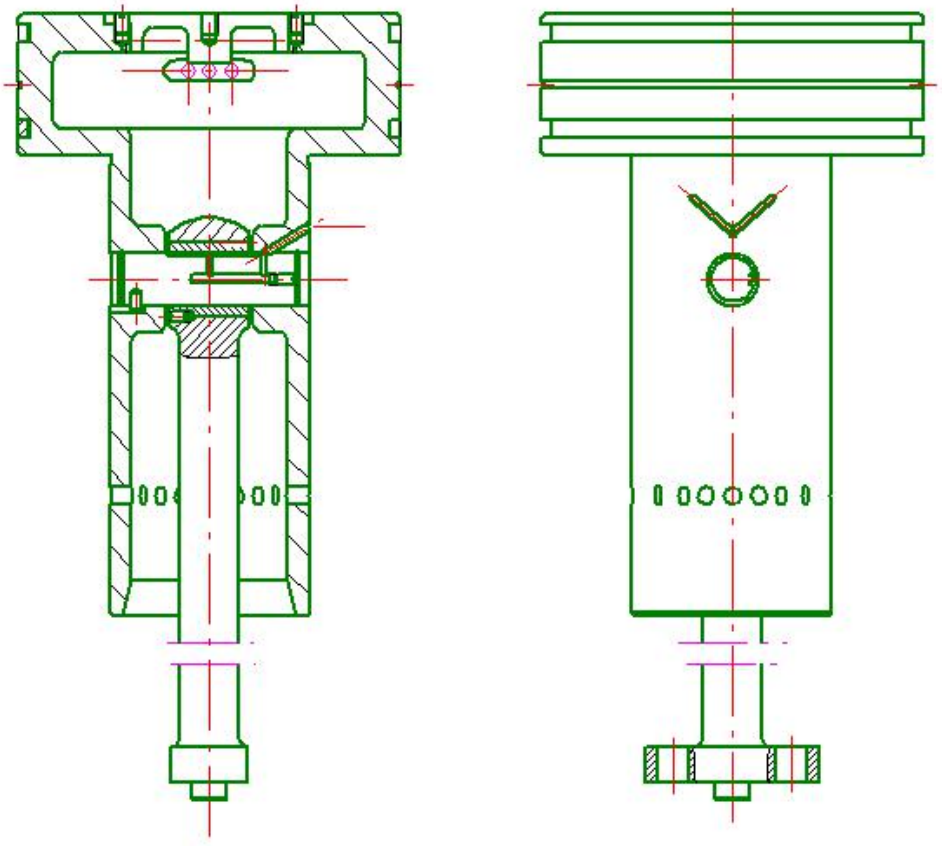


Fig.7 Sectional view of pump piston & con rod.

CRANK SHAFT / FLYWHEEL & BIG AND BEARING ASSEMBLY

The rotary motion of the flywheel is converted to the reciprocating motion for the pump piston via the crank shaft.

The crankshaft runs in two roller bearings protected by grease seals / lubricated via grease nipples (see lube section).

The 'big end' bearing is a double row radial roller bearing, lubricated via grease nipple.

GREASE POINTS**

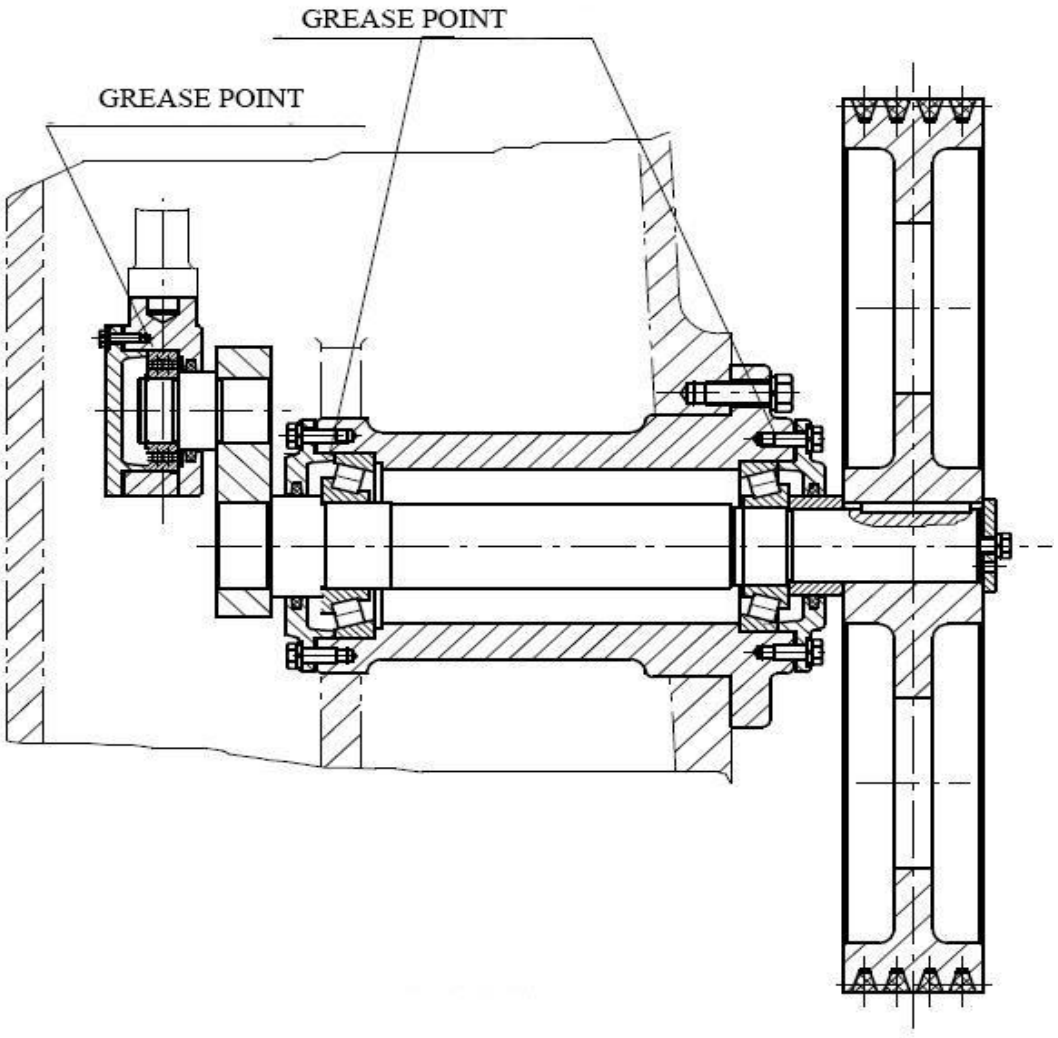


Fig.8 SECTIONAL VIEW OF FLYWHEEL AND CRANK SHAFT

HAMMER CONTROLS

The hammer is controlled by two horizontal rotary air valves actuated by the hand or foot lever. Fig.9 shows the control positions.

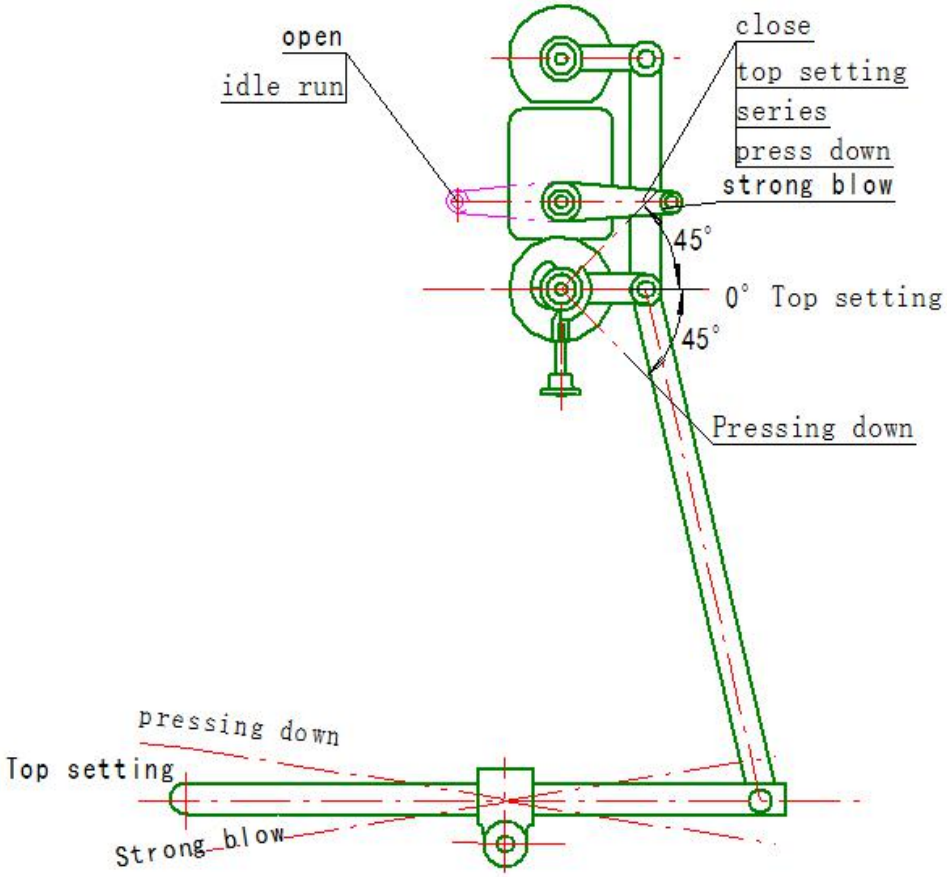
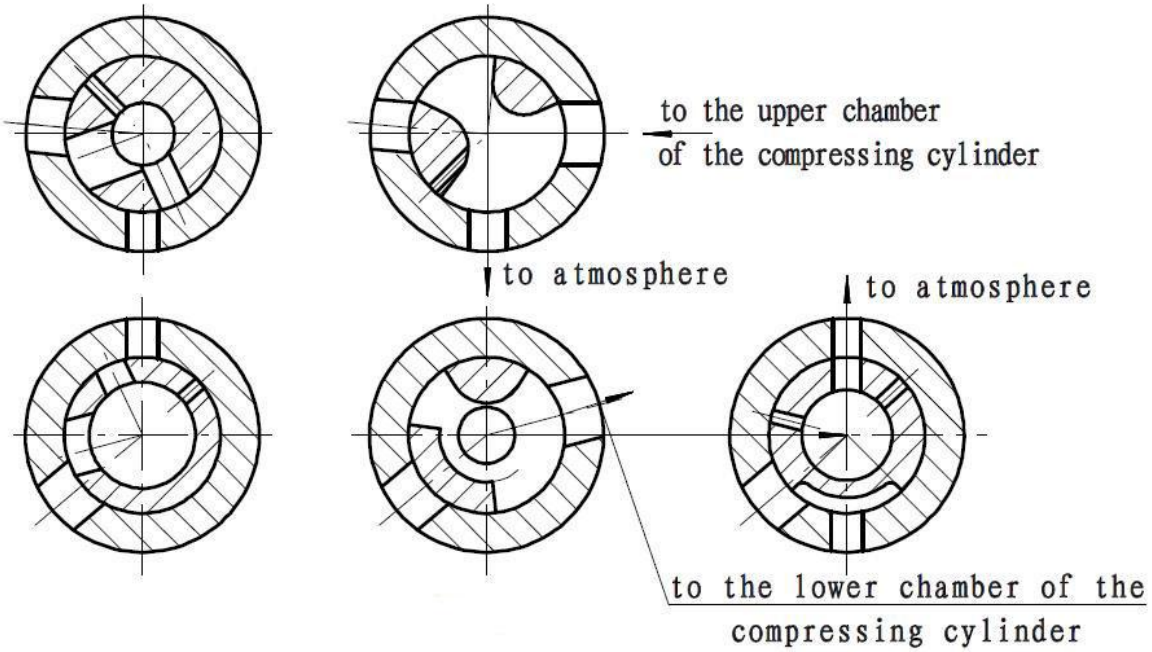


FIG.9 CONTROL POSITIONS.

NEUTRAL / START POSITION & CLAMP DOWN

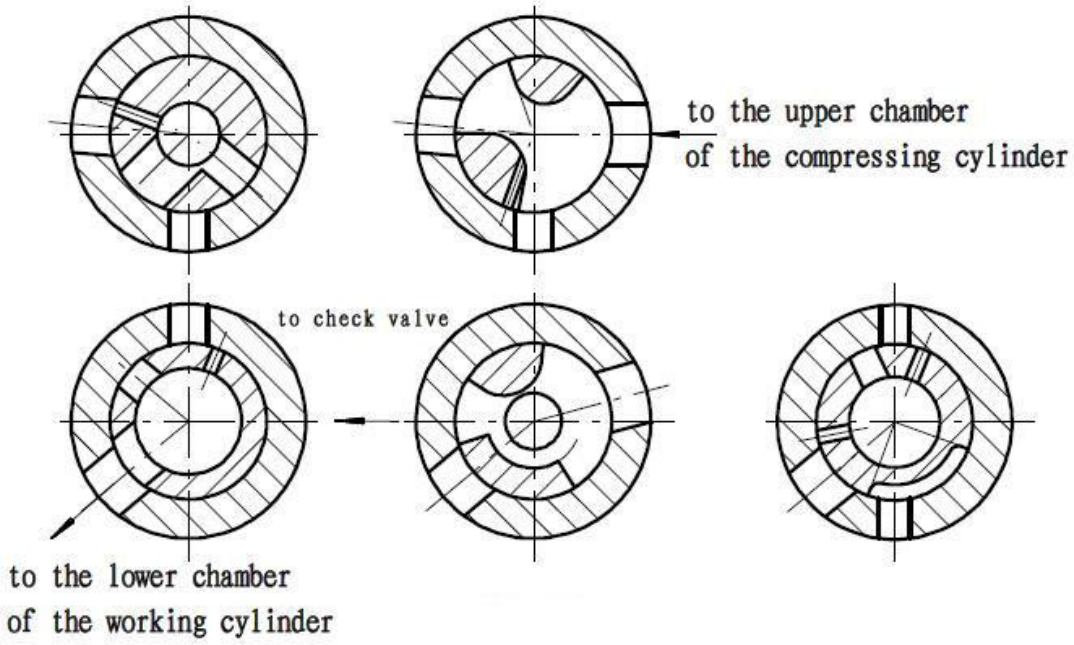
The hammer is fitted with a removable dowel pin which arrests the control lever in the 'Neutral' position.

The dowel pin should be removed if the hammer is required to 'clamp down'. The weight of the ram with the hammer in neutral position is sufficient to hold smaller forgings if the tong position needs to be changed.



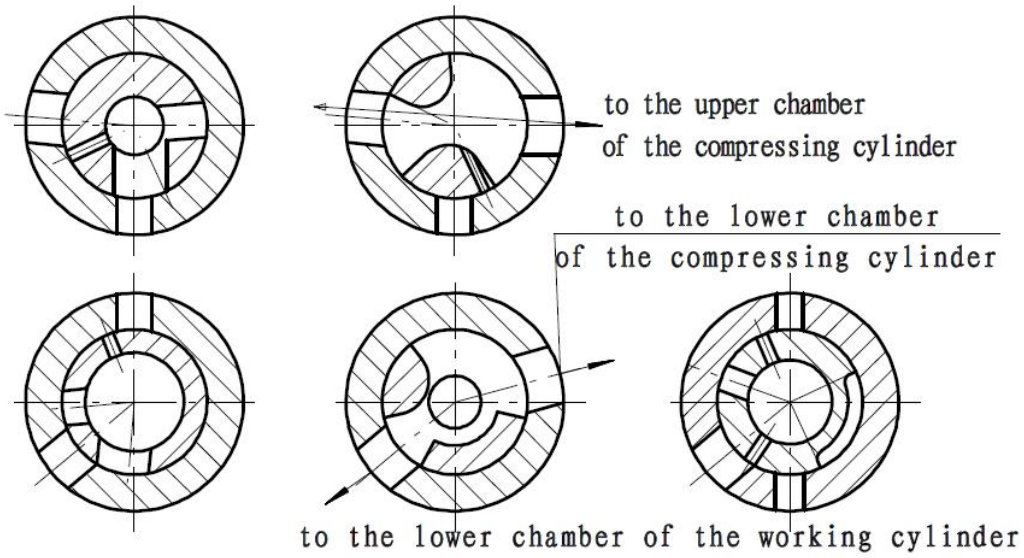
TOP SETTING

When the control lever is moved from neutral to top setting (high pressure hold up) a latch pin will arrest the hand lever in this position.
The ram will be held at the top of its stroke.



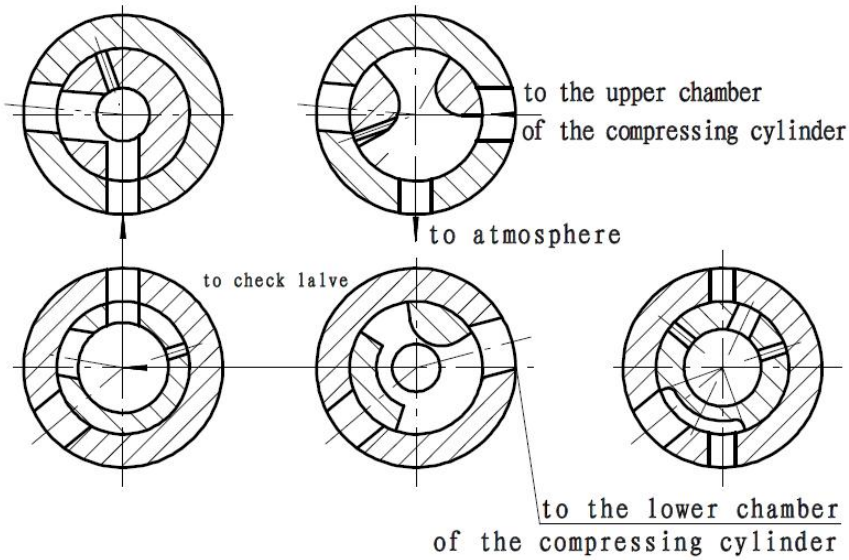
SERIES BLOW

When the control lever is moved from top setting position the hammer will start to strike automatic blows.
The blows become progressively heavier as the lever is depressed.
When the control lever is released the ram will return to the 'Top Setting' position.



SINGLE BLOW

A single blow can be struck by sharply depressing the foot lever and releasing. It can take a little practice to strike single blows consistently.



RUNNING THE HAMMER

Ensure that the hammer is in 'Neutral' & pump the handle on the oil pump to prime it. The hammer can then be started.

The hammer should be left in the 'Neutral' position between forging jobs (ram at rest). The hammer should not be left in the 'Top setting' position for prolonged periods of time.

The hammer can be swung up to 'Top setting' with the foot lever very quickly on approaching the hammer with the work piece.

Leaving the hammer in 'Top setting' position will increase wear on the hammer, increase power consumption and increase heat build up in the hammer.

The hand / foot lever should be operated smoothly. Sudden movements of the hand / foot lever can cause the ram head to strike the inside of the ram cylinder cover.

After a period of use the hammer will get very hot to the touch. When the hammer is very hot it may emit a small amount of smoke from round the ram when in the 'Top setting' position. This is normal and does not affect the hammers performance.

The forging should always be done as close to the centre of the pallets as possible to reduce wear caused by offset loading.

The hammer should be in the 'Neutral' position when stopped.

The blow control of the hammer will improve with use as the components 'bed'. After 20 hours use the hammer will be fully run in.

LUBRICATION

The hammer is fitted with a 'self-absorbing' oil pump. (Fig.14)

The oil pump should be primed by pumping the handle several times before starting the hammer. (hold the lever for a couple of seconds at each extreme whilst pumping it)

Once the hammer is started the lubrication is automatic, the oil is drawn into the cylinders by the negative air pressure. the sight feed should 'drip' all the time the hammer is running.

The oil feed can be adjusted by the needle valve install on the pump. The sight feed should be adjusted to approx 6 - 8 drops min for normal use.

The oil pump will not work if overfilled, the level should between the two pointers.

Excess oil will accumulate in the sump of the hammer, and can be drained via the tap at base of hammer.

The oil should be a good quality machine oil with a viscosity between 60# and 80#

The oil should be topped up when it is half way down the sight glass. Failure to do this will result in air being drawn into the oil lines stopping the lubrication.

The Crank & big end bearings should be lubricated at least once a month (depending on hammer usage) with a good quality automotive bearing grease.

The hammer ram should have a film of oil on its surface during use. Oil will seep from around the ram & guide box when the hammer is left after use. This is normal. * NOTE *The excess oil should only be wiped away when the hammer is switched off.

If the oil leakage round the ram is excessive the lubrication can be reduced by means of the adjusting needle valve.

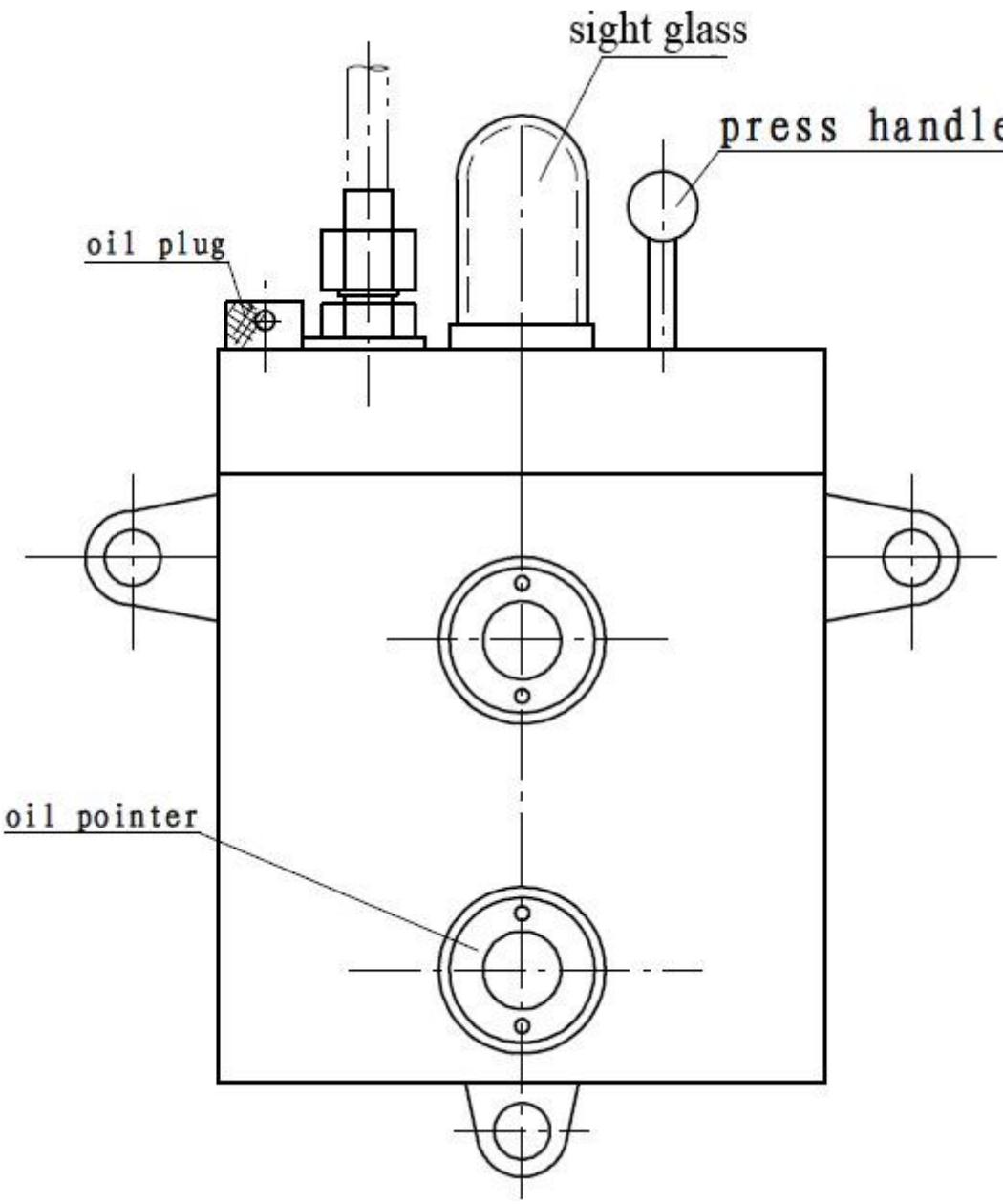


Fig.14 - Oil pump

MAINTENANCE

Routine inspection and maintenance of the hammer will prolong its service life and ensure its operating efficiency.

A new hammer must be inspected after the first 2 weeks operation. It is imperative to check that all bolts and fasteners are tight and secure.

The bolts holding the big end bearing cap in place should be checked for tightness, and that the split pins are in place whenever the bearings are lubricated.

If there is any noticeable change in the operation of the hammer, or the hammer sounds different when running this should be investigated immediately.

If any cracks are observed the hammer must not be used until these have been repaired.

The taper keys should be well fitting and driven in tight whilst the hammer is cold. badly fitted keys will cause damage to the ram and sow dovetails.

FOUNDATION PLAN

The diagram below (fig 15)shows the bolt centers for holding the hammer and motor down.

NOTE THE MOUNTING BOLTS FOR THE MOTOR SLIDE RAILS SHOULD BE MARKED OUT / DRILLED FOR ON ASSEMBLY TO ENSURE CORRECT TENSION CAN BE OBTAINED IN THE 'V' ROPES

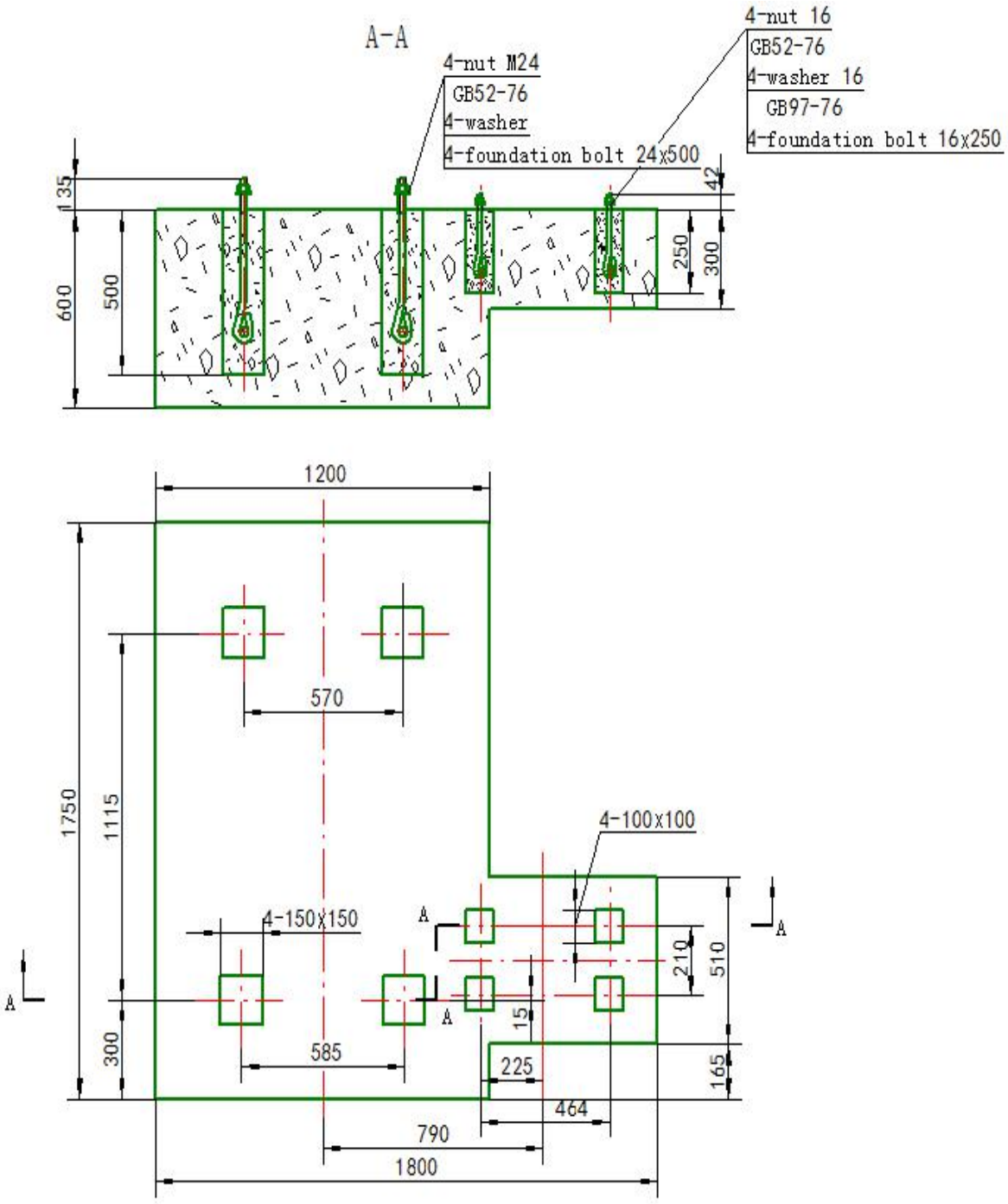


fig 15) plan view of foundation

NOTES ON INSTALLING THE HAMMER

The height of the base should be selected to suit personal preference.

The base can be made in many ways.

The simplest is a cast concrete plinth as shown in the sketches. The outside dimensions of the plinth should be varied to suit local ground conditions. It is far easier to extend the foot lever downwards to a comfortable height if the plinth width is kept the same size as the hammer base plate.

If the whole foot pedal assembly is lowered it will be necessary to extend the length of the control linkage. This may then need additional bracing to reduce flex.

The foot pedal can be left in its factory position and a simple 'drop down' extension welded to it In the desired position.

The hammer can alternatively be raised up in the following ways

-Mounted on firmly secured heavy timbers (such as rail sleepers)

-Mounted on a heavy steel fabricated box filled with sand to attenuate vibration.

A sheet of 5 / 10 mm thick 'marine' grade plywood should be placed between the hammer and its base to take up any irregularities in the mounting face.

If additional weight is added to the footlever the spring may need to be uprated to allow prompt return of pedal.

However the foot lever is mounted to the base it must be fitted with a guard to prevent accidental operation of the hammer.

6mm steel plate is ideal to manufacture the guard from.

The motor is best mounted to the right of the hammer (when viewed from front) this

prevents scale dropping on the motor when forging long bars.

The guard is cut out for the motor mounted in this position.

Ensure the flywheel rotates in the correct direction. (this is marked on the flywheel guard)

The motor should be connected by a qualified electrical, and the 'start / stop' control situated close to the hammer.

Motor cables should be covered with steel conduit or similar to prevent damage from dropped forgings or hot scale.

A baffle or air filter placed over the inlet / exhaust behind the flywheel will reduce the noise omitted by the hammer considerably. If this is done care should be taken not to 'suffocate' the hammer which will cause overheating.

TROUBLE SHOOTING

SYMPTOM:

The ram collides with the cylinder top cover at the top of stroke:

POSSIBLE CAUSE:

The buffer ball valve is not seating correctly preventing the buffer working correctly.

The Gasket sealing the top cylinder cover is leaking, preventing the buffer air compressing sufficiently.

The hammer is being switched from light to heavy blow to quickly.

SYMPTOM

The ram is not raising high enough & insufficient blow energy

POSSIBLE CAUSE:

The compressing (pump) piston holes are out of alignment resulting in insufficient supplemental air.

The piston rings are not sealing properly or are worn. - Replace.

The ram guides are worn allowing excess air leakage. - shim out or replace.

The packings on the stiffing box & pump piston guide are excessively worn & need replacing.

SYMPTOM

The tool locating dovetails crack

POSSIBLE CAUSES:

Badly fitted taper keys

Hammering cold material

Insufficient radius causing stress raisers

Pallets to hard.

Fitting a cold key into a warm ram

Dies are out of alignment, or have been used excessively for offset forging.

WEARING PARTS LIST

No	Partno	Name	Material	Quantity	Remark
1	205	Bottom die	45	1	
2	211	Bottom die wedge	45	1	
3	204	Top die	45	1	
4	208	Top die wedge	45	1	
5	217	Guide plate	HT200	2	
6	216	Tup rod packing ring	HT200	2	
7	218	Tup rod packing ring	HT200	2	
8	307	Bushing	ZQSn6-6-3	1	
9	310	Tup rod packing ring	HT200	2	
10	311	Tup rod packing ring	HT200	2	

STANDARD PARTS LIST

No	Model	Name	Specification	QTY	Remark
1	3609	Double row,radial roller bearing	45×100×36	1	
2	42313	Single row,radial roller bearing	65×140×33	1	
3	42614	Single row,radial roller bearing	70×150×51	1	
4	B type	Triangular belt	L＝3450	5	