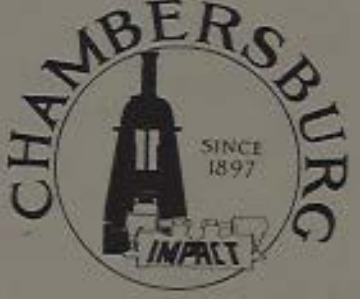
CHAMBERSBURG STEAM-DROP HAMMER



Instruction
Bulletin 126-L-5

CHAMBERSBURG ENGINEERING CO.
CHAMBERSBURG, PA.

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Printed in U.S.A. 2M265

INDEX

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STEAM DROP HAMMER

Installation, Operation, and Maintenance

INTRODUCTION

Steam Drop Hammers, utilizing the high velocity component of impact to accomplish their work, set up in themselves stresses and reactions which tend toward self destruction. To prevent untimely damage to the hammer and to secure the longest life and greatest production, it is necessary that correct installation, operation and maintenance procedures be strictly followed. To promote this end, these notes are prepared.

Misalignment is readily recognized as the greatest individual source of trouble. Every mechanic appreciates that impact blows when off center or delivered on non-parallel faces generate destructive forces and at the same time dissipate energy in non-useful channels. Proper power supply, proper lubrication and the maintenance of proper fits are all important. A suggested program of regular inspections is submitted, together with notes expanding the scheduled comments.

Part numbers, and names, notes and a lubricating diagram are consolidated in a typical assembly chart attached to the inside back cover.

RIGID CONSTRUCTION

Chambersburg Steam Drop Hammers are of the rigid type, that is, they are designed to maintain accurate alignment as a blow is struck. The rigid hammer is the development beyond the stage of early drop hammers, wherein the construction was adopted to permit such important members as frames to move freely at each blow, the movement reducing the stress in the member and preserving its life. Such tools were known as flexible hammers and the rigid hammer, which has superseded them, is a very much more massive and stronger structure and is more accurate in its production.

Currently, hammers are so constructed that the inevitable movement of one part with relation to others is guided so as not to disturb alignment. The frames, for instance, are seated on the anvil in such a manner that any reacting movement is vertical and still parallel, and that at the end of the movement the frames will be firmly seated again upon the anvil. While this movement is practically imperceptible to the eye and to touch, it occurs at every forceful blow. Appreciation of such reaction will give a clear understanding of the purpose of the inspections recommended later.

MAINTENANCE

ANVIL

In operation, care is necessary in protecting the anvil against the forces of expansion and contraction due to thermal changes. The following points cover the major considerations:

1. The practice of allowing hot forgings to pile up against the rear of an anvil, now rarely seen, will rapidly expand the anvil. To maintain a fit, the operator tightens the anvil cap key. When the forgings are removed and cooling occurs, an anvil so abused will generally split. When forgings are "cut off" and so impelled back of the anvil, a steel plate, leaned against the anvil so as to provide a generous air space, will permit accumulation of forgings without hazard to the anvil.
2. The failure to loosen anvil cap keys at the end of runs will likewise induce cracked anvils. The key should be loosened if the idle time will allow the anvil to cool and contract.
3. Upset anvil cap keys which bear only against the driven end will start local fractures which rapidly spread. Upset keys should be replaced.
4. Occasionally, anvil cap keys freeze in place and must be burned out with a torch. The key is exposed and a groove should be burned down the center of the key in such a manner that the walls of the key are not burned. Precautions against burning the anvil or heating it too much are necessary.
5. Redressing of the anvil cap seat should be done when each cap is replaced. No two caps will deform the same way and the redressing will increase cap and anvil life. Tool marks must not result from redressing.
6. When redressing frame seats alignment must be preserved and tool marks avoided.
7. It is best, when an anvil is removed from its foundation, that the timbers be renewed also.

Lubrication instructions should be followed to secure the maximum life of the frame seats. Care should be taken to remove scale from lubricator attachments before applying grease.

To preserve further the frame and anvil seats Chambersburg Hammers are provided with breather holes. Thus, when shock opens such joints clean air is sucked into the space rather than the scale laden atmosphere near the joint. The breather holes therefore must be kept clean. Their effectiveness may be tested with a flame at the opening as a blow is struck.

FRAME AND GUIDES

Chambersburg frame-to-anvil construction provides extremely large frame seats fitted with renewable flat steel liners so that frames can be parallel and centered without the necessity of frequent redressing. On each frame are machined faces about the guide where measurements can be made. Parallelism between the bottom and top should be held within .006″ when cold. Wearing plates #97 should be shimmed or replaced to maintain this limit. Wearing plates #172, 1721, 98 and 99 should be renewed when necessary to maintain the central position of the frames on the anvil. Frames are fit upon the anvil at the factory bearing at the four extreme points of each frame so that when cold, no point is open more than a tolerance of .002″ to .006″ depending on size.

In operation guide adjustment is needed to maintain the central position of the reciprocating part. Particular attention is needed at the start of runs so that compensation is properly made for the expansion which occurs as the hammer heats. The guides must be kept firmly seated to avoid pounding and distortion. To this end guide pullback studs must be kept taut, and the cushions thereon renewed as their elasticity is lessened due to impact and shock.

Guide clearance of the ram for operating should be .003″ on each guide of the smaller sizes and greater on the larger. The die notches must be parallel front to back within .004″ to .006″, depending on the length. The face of the ram should be parallel with the top of the anvil cap within the same limits to the four extreme points, depending on the length.

Lubrication instructions must be followed for reciprocating parts and for joints which are subject to wear from shock.

PISTON ROD

The life of a rod varies with forgings produced and cannot be predicted. Thin section forgings will usually break rods sooner than forgings of heavy section. Too much flash acts the same as thin section forgings. When jobs are changed and the resultant rod stresses are reversed due to different off center locations of the succeeding jobs, rod life is shortened. Rods on a given well centered, low carbon job will last several thousands hours. Rod life is shorter when alloy steels and alloys of aluminum are forged. Before starting a run the rod should be heated by placing bars heated to forging temperature adjacent to it on the top of the ram. This is particularly important in winter weather. When breakage seems premature the following invstigations are suggested:

1. **Work not centered.** See notes above. The unwarranted stresses of off center work shorten rod life. With a given off center die setting, rod failures will be similar in location and character.

2. **Ram not centered.** The ram can be adjusted, left to right, by means of the guides. If the ram is not in line with the cylinder when the dies are centered the same type of failure will occur as in 1.
3. **Ram lose in guides.** If no guides were provided, the rod would receive the entire stress due to ram deflection from off center work and it would last comparatively few blows. If clearance between guides and the ram is beyond normal requirements, the deflecting load is being forced unduly on the rod and premature breakage will be induced. The same effect will occur if the rod has driven in the ram sufficient to expand the center of the ram, for if the guides are set to clear such a high spot, the ram will rock in the guides with each blow.
4. **Rod bearing at top of ram socket.** If the bearing is at the top of the ram socket, which sometimes occurs when a replacement rod is installed, the deflection of the ram, due to off center work, is magnified in its effect on the rod, shortening rod life. The bearing should be at the point of the rod.
5. **Marks or abrasions on rod surface.** Regardless of the reason, any mark or abrasion on the rod surface forms a focal point for progressive fatigue fracture and shortens rod life. The cylinder gland must not be cocked nor score the rod.
6. **Hammer out of line.** Poor maintenance practice infrequently is encountered where proper tightening and cleaning of the tool is not accomplished. Misalignment can easily occur due to failure to renew frame to anvil wearing strips, frame to tie plate shims, glands, etc., imposing undue rod loads. In such a case other parts are usually abused.
7. **Improper shims.** If a rod requires reseating in the ram or is replaced, it is frequently necessary to use thin copper shims to compensate for the roughness of the used grip surface. Such shims must not result in misalignment nor in a top bearing.
8. **Improper forging practice.** Hitting cold flash shortens rod life. Too much stock causes undue flash and power expended on thin sections. If a preliminary operation requires more than normal stock displacement, it is more economical to use a greater number of rapid, light blows than few, hard, off center blows. Observation of a given forging sequence is often illuminating.
9. **Excessive driving in ram.** If the rod drives into the ram beyond normal not only is there danger of swelling the ram but also there is the hazard of the piston striking and damaging the cylinder bottom. The position of the rod must be checked by observing the distance from the end of the rod to the notch. If the rod drives more than ½" accurate records should be made and at ¾" drive the bushing should be replaced.

10. **Bent replacements.** Replacement rods should be suspended vertically in storage or so stored that they will not be subject to deflection of their long axis from their own weight and so take a permanent set out of line. When a rod is replaced or re-installed in the hammer, its alignment should be checked by easing it into the ram hole and observing any corrections necessary.
11. **Material, heat treatment and finish.** If replacement rods are purchased from other sources, they should be subjected to the same tight specifications and rigid inspection as our own. Replacement sources should be carefully selected.

PISTON HEAD

The piston head is a steel forging and is designed to be light in weight to prolong piston rod life. The piston rings are of heat-treated alloy steel and will give very long service.

It is not uncommon to remove a piston head from a broken piston rod and shrink the piston head on a new piston rod. Prior to re-using a piston head, check the piston rings and the ring grooves. The vertical clearance in the ring groove should not exceed .004". The ring slot must be maintained straight, as any bell-mouthing will permit the piston ring to cock and cut the cylinder wall.

In shrinking a piston head on a new piston rod, first remove the piston rings and examine the bore of the piston head to be sure it is clean and smooth. Heat the piston head to approximately 750° F. The head end of the piston rod is then inserted in the bore of the piston head so that the end of the rod is flush with the top of the piston head. In certain cases, the rod may extend through the head, making it necessary to cut off the rod flush with the top of the piston head.

Allow the head to air-cool, to shrink it securely on the end of the piston rod. When cool, the piston rings can again be assembled, and the unit is now available for quick replacement.

RAM

Ram life can be prolonged by intelligent avoidance of detrimental practices.

Dies of small seating area should be avoided as the die will drive into the face of the ram. Die changes involving different areas should only be made after remachining the ram face. Unless the ram face is properly maintained, matching will be most difficult and die failures frequent.

Care must be exercised in starting a run. The die heats and expands ahead of the ram. If this expansion is accomplished by a key driven

too tightly, fracture of the ram at the notch may be induced. If an upset key is used, full gripping pressure is likely at one end of the notch, also inducing ram fracture. Proper dowel bearing is another essential.

As the run continues, the ram temperature raises, the same expands and the guides must be adjusted accordingly. As the complete hammer heats and expands, the guides must be brought back by adjustment. The maintenance of proper clearance is important and was discussed under "Piston Rod". On completion of the run, the die key should be loosened to avoid fracture of the ram as the latter cools and shrinks. Rods drive in operation until a balance in stress is reached. Metal is displaced. On rare occasions the ram will expand at the drive point to an extent where guide parallelism is destroyed. The ram, in such instances, must be replaned.

To minimize stresses generated when off center work impinges the ram against the guides, it is necessary to maintain close clearances. This in turn requires proper attention to lubrication of the vees. Coincidently, it is good practice to lubricate the cam path.

There is real economy in using the best obtainable rams. It usually pays to have a spare ram so that redressing is accomplished without undue downtime. It is beneficial to maintain historic records of ram service.

A bleed hole is provided in the ram bore to drain any moisture or oil from around the rod. This hole must be kept open.

ANVIL CAP

The anvil cap is the secondary impacting component of the Chambersburg Hammer. The Chambersburg construction provides the cap to be wedged into the anvil in such a manner as to give it added support. With respect to selection of material and manufacture, the cap is governed by the same considerations as given the ram. The same operating care to secure long service should be accorded both the ram and cap.

When a cap is replaced, the anvil should be redressed to assure proper seating and so to avoid possible cap fractures.

POWER

The power supply should be ample and delivered thru ducts that are free from obstructions. Best practice is to have the power supply pressure higher than hammer operating pressure, and equip each feed line or group feed with a pressure reducing valve or automatic regulating valve. Standard Chambersburg hammers are designed to operate at 100 lbs. per sq. in. Steam pressures are sometimes run up to 110 lbs., and air pressures are frequently dropped to 80 lbs. These represent

the maximum range that should be permitted without specially designed cylinders, but in no case should a variation of more than a few pounds exist in a selected operating pressure.

The fluid supply must be dry and free from foreign matter. Proper separators and traps or drains in the system are essential.

The difference in pressure between inlet and exhaust should not exceed 95 lbs. and the exhaust line should contain no obstruction that would increase the exhaust pressure. The exhaust line must be free of loops and below the bottom of the cylinder so as to provide adequate drainage. Chambersburg's patented cylinder construction is unique in that the cylinders are self-draining and require no drain cocks or similar devices. If condensate were permitted to collect in the cylinder and freezing temperatures occurred, cracked cylinders would be certain.

Both supply and exhaust lines should be supported independently of the hammer, and so constructed as to be unimpaired by shock or vibration. The cylinder connection should not be used as a support as such practice will induce leaks in the connecting gland and require excessive maintenance.

Steam lines within contact range of employees should be covered with insulation to prevent hazard. Supply lines, properly supported, should be insulated for economic reasons.

A stop valve must be installed in the feed line within convenient reach of the operator, or with convenient and positive means of opening and closing provided.

To discourage freezing tendencies induced by rapid expansion of air in air operated hammers Chambersburg cylinders are built with oversized exhaust passages which do not reverse the flow.

BORE

The lined cylinder itself, identified as the "bore," is subject to side wall impact of the piston due to off center work, and to wear from sliding contact with the piston rings. Properly lubricated, the walls should wear to a glass-like smoothness.

Periodic inspection of piston rings and cylinder walls is desirable. Piston rings are made of carefully selected, alloy steel, heat treated and ground to size.

The ring slots must be maintained straight, as any bell mouthing will permit rings to cock and cut the wall. Rings should be renewed as their springiness is exhausted by fatigue shock.

Since the ram of the Chambersburg Hammer releases its energy near the bottom of the stroke, greater wear of the wall occurs towards the bottom of the bore. When the wear enlarges the diameter so that excess leaking occurs around the piston, the liner should be replaced.

PISTON VALVE

The piston valve must fall freely by gravity. As the valve wears, leakage increases and as it becomes excessive a new valve should be installed and lapped in. It may be also necessary, at less frequent intervals, to replace the valve cage. At such time the steam chest bore should be checked. Hammer action will eventually distort the bore until the lower part of the cage has no bearing and leakage is present. In such cases the chest should be rebored and a matching cage installed.

THROTTLE VALVE

The throttle valve is self seating and requires practically no attention. Its return from the open position is aided by a spring.

When erecting or renewing the throttle valve care is needed to see that it is not placed 180° around. When properly installed in the closed position, the land covers the passage toward the bore.

VALVE GEAR

All fulcrums must be kept tight and all bearings properly fitted. If sloppiness is permitted, not only is power wasted, but operating control is hampered.

Wear points on the valve gear require manual lubrication daily.

CAM

The cam on the Chambersburg Steam Drop Hammer is a one-piece forging which entirely eliminates steam or air waste caused by the ordinary two-piece construction. It is formed to meet an average condition of operating pressure, die weight, die height and normal stroke. Very frequently conditions within a shop do not conform to the standards to which the cam is formed. Before the hammer is put into operation, it should be tested for effective treadling, proper hold-down, and proper control of short, bottom strokes without repeating. If the ram will not hold-down and follow the treadle, it is probable that the cam needs "straightening." To do this, the cam should be heated at X with a torch and Y advanced in a clockwise direction in small increments until proper treadle action is obtained (see chart).

INSTALLATION AND OPERATION

FOUNDATION

The foundation should be constructed in accordance with the Chambersburg Engineering Company foundation plan, modified to suit local conditions of the ground. The anvil should not be placed upon the foundation until the concrete has had two weeks to set, and the Hammer should not be operated in less than four weeks after the date of pouring the foundation.

The hammer when installed should be vertical and if the foundation is level and all component parts are properly assembled a plumb-bob, suspended from the center of the cylinder bore, should come to rest over the center of the anvil cap. Any deviation from vertical will result in a loss of energy and an unbalance of the forces of the hammer.

The specified timbers must be installed horizontally. Vertical timbers have practically no shock absorbing characteristics.

ERECTING

Each machine is completely erected and thoroughly tested under pressure before shipment. The valves are properly set and do not leak. The guides are correctly adjusted and the ram has the proper amount of clearance. The ram and anvil cap line up correctly and if the machine is properly set up, packed and piped, it will work satisfactorily without any further adjustments or changes. All parts should be thoroughly cleaned and oiled. The parts can be readily identified by reference to the chart at the back of these instructions.

TO START AND SET THE HAMMER

Blow out the Cylinder thoroughly to remove the grit, dirt, etc. See that Cylinder, pc. 8, is generously oiled with a good grade of cylinder oil, before placing Safety Cylinder Cover, pc. 9. Fill the Oil Pump, pc. 83, with proper oils. Cam, pc. 36, incline on Ram, pc. 5, and the Piston Rod, pc. 6, should be lubricated with a combination of cylinder oil, white lead and graphite. On all other working parts, a good grade of machine oil or grease should be used.

In starting the Hammer, when operating with steam, allow it to become thoroughly warm before trying to operate. The Main Valve Stem, pc. 62, should not be packed too tight, as it holds against exhaust pressure only and if the Piston Valve, pc. 10, does not drop freely at first, pull it down by hand until the cylinder becomes heated. In setting the Hammer, the Cam Lever, pc. 31, should be horizontal, and its Turnbuckle so adjusted that its vertical connection, pc. 90, is taut with the Treadle up against its stops. The Turnbuckle on Throttle Valve Connection Rod, pc. 100, should then be so adjusted that the Ram, pc. 5, will raise slowly from Anvil, pc. 1, to about three-quarter stroke. The Treadle should then be operated cautiously, so that the Hammer will run automatically to work the water out of the Cylinder, and, also to ascertain the full height of the stroke. Practice the effect of the different positions of the Foot Treadle with a moderate amount of steam or air, and strike a few good blows downward to jam the piston rod in the taper hole of the Ram, as the JAM OF THE TAPER IS THE REAL HOLD. Place a wooden block with grain horizontal and higher than the minimum die height shown on the Foundation Print on the Anvil Cap to prevent injuring it and to pro-

tect the bottom of the Cylinder. Always be careful not to have the Throttle too far open when starting.

NORMAL POSITION OF RAM

The Normal position of the Ram, pc. 5, when steam is on the Hammer, is within 6" of the extreme top of the stroke.

TO CONTROL THE BLOWS OF THE RAM

A single downward push on the Treadle will cause the Ram, pc. 5, to strike a single blow and return. If the Treadle is held down, the Ram, pc. 5, will descend with full force and remain in its lowest position, but will return to its upper position when the Treadle is released. A steady pressure on the Treadle will cause a succession of blows as long as the Treadle is held in the proper position by the foot; that is, unless the Treadle is depressed too far (see Cam, page 8).

A WARNING MARK "V"

A warning mark "V", on the Frames, pc. 7R & 7L, is placed in line with the top of the Ram when the Piston, pc. 6001, is in its lowest working position. The clearance from the under side of the Piston Head, pc. 6001, to the bottom of the Cylinder, pc. 8, is 1½" up to and including the 6,000 Lb. Hammer. Above 6,000 Lb. Hammer size the clearance is 2½". These marks are placed when the Hammer is tested, but the Rod, pc. 6, will drive into the Ram, pc. 5, when the Hammer is operated. It is, therefore, essential that the position of the Piston Rod, pc. 6, with relation to the Safety mark, be checked regularly; particularly when the hammer is first started. This check may be made by measuring the distance from the top of the Die Notch in the Ram to the bottom of the taper on the Piston Rod. After the Piston Rod, pc. 6, drives into the Ram, pc. 5, to such an extent as to endanger the Cylinder, pc. 8, the Rod should be removed, and a new bushing, pc. 5001 should be inserted in the Ram.

TO REGULATE THE FORCE OF THE BLOW

To regulate the force of the blow, the position of the Throttle Valve, pc. 17, is changed by altering the length of the Throttle Valve Connection Rod, pc. 100, by its Turnbuckle, which adjusts the amount of steam going to Cylinder.

Practice will soon teach the correct adjustments which regulate the stroke and the force of the blow. The Throttle Valve, pc. 17, rarely requires adjustment after the first setting, that is, if the Turnbuckle is set so as to give the proper amount of steam to keep the Ram in position at the top of its stroke, the hammer will get plenty of steam when the Treadle is pushed downward.

The Control Lever, pc. 1051 inserted between the Foot Treadle and the Turnbuckle on Throttle Valve Connection Rod, pc. 100, is for shutting

down the hammer whenever desired without disturbing adjustments. Lifting this Hand Lever, pc. 1051, closes Throttle Valve, pc. 17, and hammer comes to rest.

PISTON VALVE

When your Steam Drop Hammer was shipped, the Piston Valve, pc. 10, was correctly set and indicated by punch marks on top of the Valve Stem, pc. 62. The inset drawing on the parts list at the back of this bulletin shows the correct setting of the Piston Valve, pc. 10, and the clearances that are to be maintained to insure the most efficient operation of the hammer.

Incorrect travel can generally be traced to wear in the valve linkage. If so, the linkage should be checked and necessary parts replaced.

Note: Replacement Valve Stems, pc. 62, shipped from the factory are not punch marked to indicate valve travel. You must do this after installing the stem.

THROTTLE VALVE

The Throttle Valve, pc. 17, is properly set in the closed position when the stenciled arrows on the Stuffing Box, pc. 18, and Throttle Arm, pc. 125, are in line.

TO ADJUST THE GUIDES

The vertical Guide Adjusting Shoes, pc. 30, are regulated from the pocket in the Frame above the Guide Pocket. Adjustment in the position of the Guide Shoes, pc. 30, is made by withdrawing Lock Pin, pc. 115, against its spring and by turning spool, pc. 130. Adjustment is made to the shoes in a vertical plane. Rotating the Adjustment Spool, pc. 130, in a clockwise direction will raise the Guide Shoes, pc. 30, permitting withdrawal of the Guide, pc. 29, into the Frame. Rotating the Spool in a counter clock-wise direction lowers the vertical Guide Shoe, pc. 30, and causes the Guides, pc. 29, to project further from the Frame. Loosen Guide Clamp Studs, pc. 70, and pc. 71, before adjusting Guide Shoes, pc. 30. Adjust Guide Shoes, pc. 30, equally on both Guides to keep Piston Rod, pc. 6, plumb. Guide Clamp Studs must always be kept tightened during operation.

TO GET PISTON ROD OUT OF RAM

Raise the Ram, pc. 5, to the top of its stroke. Secure a Steel Pin in the center hole in the under side of the Ram, pc. 5, against the bottom of the Piston Rd, pc. 6. Allow the Ram, pc. 5, to drop and the Pin will drive the Piston Rod, pc. 6, out. Care must be taken to protect Anvil Cap, pc. 2, and to see that Ram does not go below Safety Marks on Frames, pc. 7R and 7L.

If the rod cannot be driven from the ram, it is necessary to burn it off above the ram and bore it out.

TO INSTALL A PISTON ROD

1. Close Throttle Valve with Throttle Control, pc. 1051.
2. Check cylinder bore to be sure that it is clean and lightly oiled.
3. Check Ram Bushing, pc. 5001, to be sure it is clean and insert in Ram, pc. 5.
4. Be sure Piston Rod, pc. 6, is clean along the taper. Lower piston rod assembly through the cylinder. Drop the Piston Rod, pc. 6, from its hightest position into the bushing. Raise Ram slowly and drop on die or timber. Repeat several times until rod is firmly seated.

PISTON ROD PACKING

The Piston Rod is packed with a "V" type of packing. The Stuffing Box is generously proportioned so that adjustment of the packing will not often be required. Piston Gland, pc. 23, should not be pulled in tight; packing works best when glands are only "hand tight".

WARNING: Excessive tightening of the packing will—

1. Create unnecessary drag on the rod, thus causing hammer to lose striking energy.
2. Cause premature failure of the packing.

TO REMOVE RAM FROM HAMMER

Remove Piston Rod, pc. 6, from Ram, pc. 5, as instructed on Page 11. Remove Cylinder Cover, Unit 9, and draw Piston, pc. 6 to the top of the Cylinder by lifting with an Eye Bolt inserted in the top of the Piston Rod, pc. 6. Raise Ram, pc. 5, above Guides, pc. 29, and remove from Hammer either at front or back.

FRAME TO ANVIL STUDS

Spring, pc. 136, and 1361 on Studs, pc. 151 and 152, should not be fully compressed, but should be drawn down with clearance between coils to permit slight vertical movement of the Frames when the blow is struck. Frame to Anvil Stud Keys, pc. 154 and 1541, may be removed by removing the Hex Nut at the top of Stud, pc. 151 and 152, permitting the Stud to drop in its bored hole leaving clearance in the slot for the Key, pc. 154 and 1541, to be removed.

REPLACEMENTS

When ordering, please give the size of Hammer, Serial Number and Name and Part Number of the replacement parts desired. The serial number will be found stenciled on the front of the Ram, pc. 5, the right side of Anvil, pc. 1, and Cylinder, pc. 8.

LUBRICATION

General Lubricating Advice

Regularity in lubricating the various parts of Steam Drop Hammers is very essential to efficient, economical operation. The presence of a lubricating film on bearing surfaces helps to cushion the jar occurring with each blow, and lack or failure of this protecting film is likely to cause early damage to the bearing surfaces. It should always be kept in mind that cost of applying correct lubricants at the proper interval is only a small fraction of the expense which may be incurred if this is not one done regularly and faithfully. Any practice of applying more lubricant with the idea of lubricating less often is directly contrary to effective oiling, and will obviously increase the likelihood of parts running dry should the lubricating interval be considerably prolonged.

Dust and dirt are usually present in plentiful quantities in the average forge shop. It is very desirable not to permit this abrasive matter to get between the bearing surfaces. For this reason, suitable precautions should be taken when filling the cylinder lubricator, so that dirt is not permitted to enter. Gun fittings should be wiped off before application and oil holes kept free of accumulations which might permit the lubricant to carry dirt inside the bearings. Furthermore, we recommend that oil containers be kept off the floor of the shop and preferably stored in a separate closed room with covers tight when not in use.

Lubrication points are indicated on the line drawing in the back of the bulletin.

(A) Automatically Lubricated Parts

The Motor Driven Lubricator, pc. 83, provides all lubrication necessary for the guides, cylinder, pc. 8, and valves, pc. 17 and 10. It should be filled with the proper lubricants as needed, approximately every six hours of operation. The lubricants to be used are specified below.

The Lubricator, pc. 83, is supplied with three compartments—

1. **Frame Lubricant**—The filler cap of the compartment which supplies oil to the Frame Guides is painted yellow and should be filled with Shell Macoma 78 heavy oil, or equal, whether operating the hammer on steam or air.
2. **Cylinder Lubricant**—The other compartment, which supplies oil to the Cylinder, Valves should be filled with the following lubricant—
    1. **For Air Operation (Cold Air System)** —Shell Clavus Oil J-37, or equal.

2. **For Air Operation (Hot Air System)**
—Mobil DTE Oil No. 105, or equal.

3. **For Steam Operation**
—Shell Nassa Oil J-78, or equal.

Small regulating screws on the lubricator control the flow of oil and should be adjusted to suit your requirements.

When the hammer is new, the lubricator should be adjusted to feed a liberal quantity of oil to the air inlet and to the guides for the first 50 hours until the valve, cylinder, and guide surfaces are worn in. Then the rate of flow may be adjusted to suit normal conditions.

Operating conditions (particularly with steam or a hot air system) affect the amount of oil required, and hammers of the same size may often require widely different rates of feed.

When operating with steam or a hot air system, there is opportunity for condensation, particularly if the piping to the hammer is long or operation is intermittent. It is important that no marked amount of water be permitted to enter the cylinder as lubrication will then be destroyed and the cylinder walls likely to be cut by the piston rings. It is always good practice to install a trap in the supply line near the hammer where the condensate may be caught and drawn off.

The Lubricator should be inspected frequently to see that it is feeding properly. If the hammer is to be shut down for any length of time, it will be found beneficial to increase the rate of flow of oil to the air inlet for a short time before stopping so that there is a good coating of oil on all the internal surfaces, which will retard rust formation.

If the Steam Drop Hammer has been out of service for any length of time, the lubricator should be actuated a few times by the hand crank in order to prime the oil line and insure adequate lubrication during the start-up period.

The hammer should never be run without first turning on the lubricator.

(B) Hand Lubricated Parts

The following should be lubricated regularly in accordance with the schedule shown on the drawing at the back of the bulletin.

Grease—Tie Plate to Frame Seats—Four Fittings
Frame to Anvil Seats—Twelve Fittings
Frame Guides—Two Fittings
Valve Linkage—Six Fittings
Treadle Linkage—Twelve Fittings

Oil —Main Valve Operating Mechanism—Two Points

Plain Bearings with Pressure Fittings

There are a number of plain bearings on the hammer which are equipped with pressure fittings and require application of grease once each eight-hour shift. Fittings should be wiped off before pressure gun is applied and sufficient grease pumped in until some shows at bearing ends. With this type a completely filled bearing is beneficial because the lubricant acts to exclude any dirt or grit in the air. Shell Darina Grease 2, or equal, is also rcommended for these parts.

Hand Oiled Bearings

Oil lubricated bearings as indicated on the diagram should be given a shot of oil each eight-hour shift. Points where the oil is introduced should be kept clean of dirt or scale in order that abrasive matter may not be carried inward with the lubricant.

A good grade of heavy bodied oil, such as Shell Macoma Oil 82, or equal, is recommended for hand oiled bearings. The oil should have good body and adhesive qualities to properly protect the bearing surfaces against the shock pressures developed with each hammer blow. Ordinary machine oil is entirely too light in body and not at all suitable for demands of hammer service.

Any practice of applying more lubricant with the idea of lubricating less often will increase the danger from waste lubricant and at the same time may cause the parts to run dry if the interval between applications is considerably prolonged. The hammer operator should always keep this fact in mind when performing his daily rounds of lubrication.

Regularity in servicing the requirements of Steam Drop Hammers is very essential because lack of lubricant may quickly damage bearings due to the jar occurring with each blow of the hammer. The cost of lubrication is only a small fraction of the expense which may be incurred if not done regularly and thoroughly.

MAINTENANCE SCHEDULE

The attached schedule of maintenance should be adapted to each shop. In place of the "instructions", the inspector can enter his remarks. The data should be summarized on suitable records maintained for each individual piece of equipment. Such records not only will help control maintenance, but should serve as a valuable contribution in the management's plans for the accumulation of Depreciation Reserves.

Part	*Inspection Required*	*Instructions*
HAMMER	Weekly	Clean Scale and Dirt away from all joints and wipe down from Top to Bottom.
Vertical Alignment and Foundation	1000 Hrs.	Check with Plumb-bob (See Page 8). If Top of Cylinder is out of line more than 1/8" per foot of height reset Foundation Timbers.
ANVIL		
Key, pc. 47	Daily	Must not be upset, sprawled, cracked or checked.
Breather and Bolt Holes	200 Hrs.	Must be kept open and free of scale and dirt.
Anvil Cap, pc. 2	Daily	Check for cracks, die seating, key and dowel defects.
FRAMES, pc. 7L and 7R and Guides, pc. 29 Parallelism	Weekly	Check at [A] (see drawing) for Frames.
Wearing Plates pc. 97, 98, 9801, 9901, 172 and 1721	Weekly	Check clearance between Plates and Frames and Anvil. If worn, shim up or replace Plates.
Tie Plate Shims, pc. 132	200 Hrs.	Check that each pack of shims is firm and bolted together. Replace any broken shims.
Adjustment	Daily	Check that Adjusting Spool Lock Pins and Studs are tight, cushions elastic, Guide Adjusting Bolts Pc. #110 are not broken.
PISTON ROD pc. 6	Daily	Check for drive of Rod in Ram. Make sure Rod is tight and not working in Ram. See Page 3 (Clearances of Piston in Bore vary proportionately from approximately .003 per inch of diameter for the smallest sizes to approx. .0025 for the largest sizes.)
Rings, pc. 41	100 Hrs.	Must be loose in Grooves and clean. Replace broken rings.
Gland, pc. 23	Daily	Must be pulled up square, not binding on Rod. Stud Nuts tight, but not pulled up to prevent Packing functioning.
RAM, pc. 5	Weekly	V's and cam track well slushed and not scored. Die notch not broken out, seated or cracked. Piston Rod tight. Face of Ram parallel with Sow Block. Bleed Hole open.
CYLINDER, pc. 8	Daily	With Hammer idling, listen for loose Rings, Liner or scraping. If unusual noise is heard, remove Cover and correct cause. See Page 7.
POWER	Daily	Dry and free of foreign bodies, lines not restricted. Separators and drains must be open. (See Power, Page 6).
BORE	200 Hrs.	Check that bore is well lubricated, clean and not scored. If worn or out of round excessively (1/8" is considered excessive) Liner should be replaced. See Page 7.
PISTON VALVE, pc. 10	1000 Hrs.	Check clearances to inset drawing at rear of this Bulletin.
THROTTLE VALVE, pc. 17	1000 Hrs.	Check bore of Valve Bushing. If worn to prevent proper seating and shut-off, replace. See Page 11.
VALVE GEAR	Weekly	Check all control gear and eliminate lost motion. See Page 8. Check that all Cotter and Taper Pins are in place and properly locked.
CAM, pc. 36	Weekly	Check for lost motion on Cam Lever, pc. 31. Shape to suit conditions. See Page 8.
BOLTS	Daily	See Frame to Anvil Studs Page 12. Bolt Nuts should be pulled down to compensate for stretch as it occurs. Make sure spring coils are at least 1/32" apart and cotter keys are in place.
LUBRICATION	Twice a Day	Check that reservoir of Automatic Lubricator, pc. 83, is filled, pumps functioning properly, and delivery lines are open. See Page 13.

CHAMBERSBURG ENGINEERING COMPANY **Bulletin 126-L-5**
Steam Drop Hammer

Changed Part Numbers

February 1, 1960

Old Part No.	*New Part No.*	*Part Name*
1-1	1001	Anvil Base
5-1	5001	Ram Bushing
6-1	6001	Piston Head
8-1	8001	Cylinder Liner
9-1	9001	Cylinder Cover Lid
9-2	9002	Plunger
9-3	9003	Pipe Gland
9-5	9005	Flanged Pipe
9-6	9006	Plunger Rings
9-7	9007	Cylinder Cover Gasket (Upper)
9-8	9008	Cylinder Cover Gasket (Lower)
36-1	3601	Cam Coupling
98-1	9801	Wearing Plate (L. H. Rear)
99-1	9901	Wearing Plate (L. H. Front)
104-17	1047	Turnbuckle
104-18	1048	Turnbuckle Lock Nuts
104-19	1049	Turnbuckle (For 16,000 lbs.-Up)
105-1	1051	Throttle Control Handle
105-2	1052	Throttle Control Conn. (Upper)
105-3	1053	Throttle Control Conn. (Lower)
136-1	1361	Frame to Anvil Stud (Left Hand)
153-1	1531	Cyl. to Frame Studs (Left Hand)
154-1	1541	Frame to Anvil Stud Keys
155-1	1551	Frame to Anvil Stud Washers
172-1	1721	Wearing Plates

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