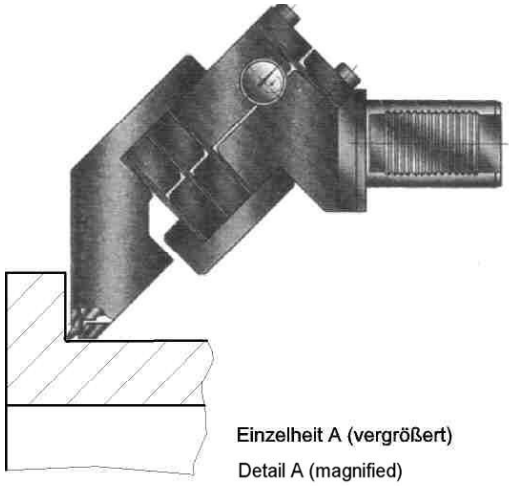
4. Components of engines and gearboxes

Valves of combustion engines are subject of high dynamic as well as thermal loads in the area of the valve shaft and in the transition radius from shaft to the disk. This in combination with the notch effect of machining marks or marks of fretting can lead to material fatigue and corresponding fatigue rips. Deep rolling with hydrostatic tool HG13 increased fatigue strength to the 2.5 fold value (Fig.4 –1).

Fig. 4-1: deep rolling of valves for diesel engines

Cylinder liners of diesel engines are clamped between cylinder head and cylinder housing by means of a collar. A small fillet radius with a considerable notch effect is located between the collar and the cylindrical outside diameter. It leads to high stress concentrations under operation loads. Therefore, material fatigue frequently appears in this area. Deep rolling with mechanical tools EF 45 solved this problem (Fig. 4-2). A floating roller is arranged in same manner as this is done in deep rolling machines for crankshafts for long period of time. This provides an even distribution of the rolling force in the fillet and evens out production tolerances and positioning errors at the same time.



The **small transition radius** between the cylinder and the bottom of **cavities** in the cylinder housings forms a critical notch. Mechanical tools (Fig. 4-3) with three floating rollers are used for deep rolling of the critical area. The rolling force is transferred over a spring integrated in the tool.

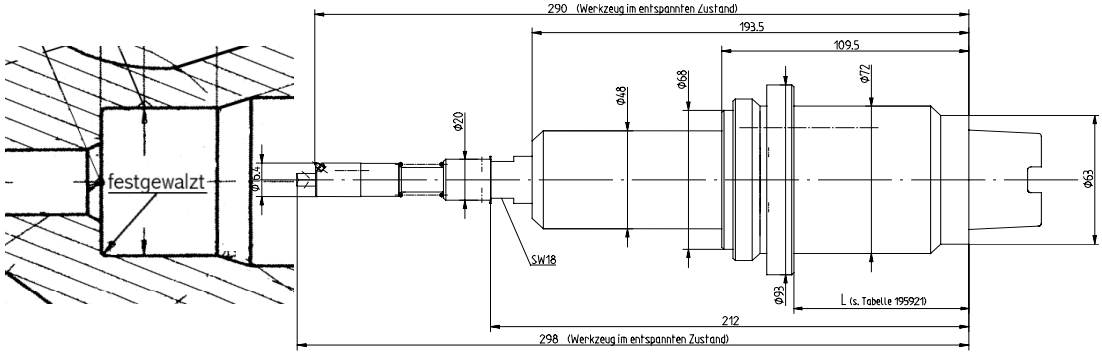


Fig.4-3: Deep rolling of the ground radius in the cavity

By measurement of the spring deflection,
the rolling force is measured indirectly. The measurements are transferred wireless to the measuring instrument over a radio transmitter installed in the tool. This way, measurement and real time record of the rolling force are guaranteed during the process.

Straight or curved fillets in **housings of engines or gearboxes** are deep rolled with hydrostatic deep rolling tools with linear movement in the plunge-in method(Fig.4-4). Also here, the hydrostatic tracking system provides a precisely controlled rolling force, proportional to the fluid pressure and compensates automatically for manufacturing tolerances.

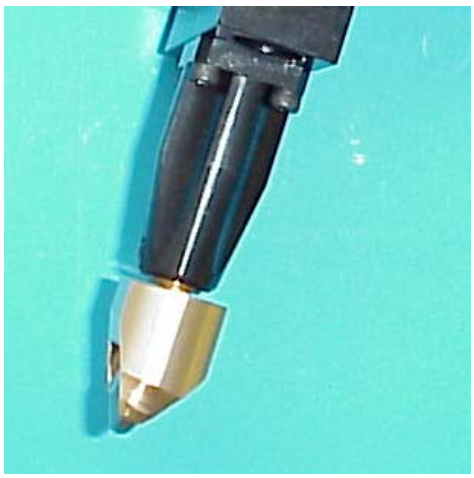


Fig. 4-4: tool for fillets in housings

Crankshafts of combustion engines: crank shafts for small, for instance one-cylinder-engines are manufactured in low quantities. They are preferably deep rolled on the lathe with deep rolling tools according Fig.4-5. Engines for passenger cars and trucks are produced in high numbers and therefore deep rolled on special machines. ECOROLL delivers the necessary rollers for these machines in a proven quality for 20 years.

Big crankshafts for marine engines or stationary industry diesel engines can be deep rolled with hydrostatic tools HG13 (similar to the above valve application Fig. 4 -1).