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Love, R. J.

"Cold-Rolled Fillets" Engineering, V. 174, Aug. 8, 1952, p.164

In a series of tests conducted by the Motor Industry Research Association, a process was devised for strengthening fillets by cold-rolling with steel balls. The process was used on cast crankshaft specimens made of flake-graphite iron, and the results of fatigue tests show that cold rolling the fillets increased the limiting stress of the crankshafts by 60% for reversed bending and by 80% for "one way" loading.

The method of rolling was to use three balls equally spaced around the fillet and held in place by a loading ring. The ring was assembled on the crankpin and the loads were applied through four coil springs that were compressed by means of a screw attachment. The load chosen was such as would produce a small but detectable deformation in the fillets, approximately .003". The small ridge of metal formed by this operation at the junction of the fillet and journal was removed by a simple polishing operation.

The author maintains that the cold-rolled fillets are clearly superior to those produced by conventional means, since, apart from the beneficial cold-working effect, they are very smooth, truly circular, and of closely controlled radius. The author also states that similar, or even better results can be expected on steel parts since steel is known to react favorably to cold-rolling.

(C. F. Horvat, abstractor)

COLD-ROLLING OF FILLETS.

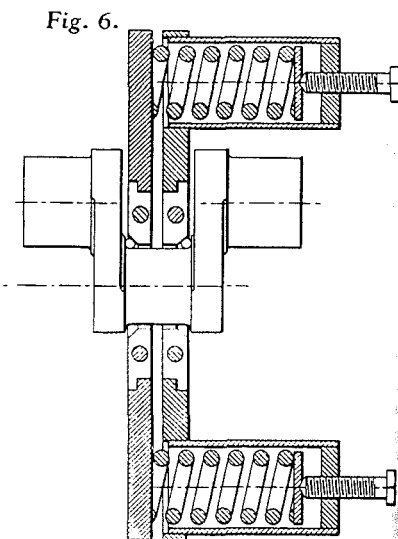
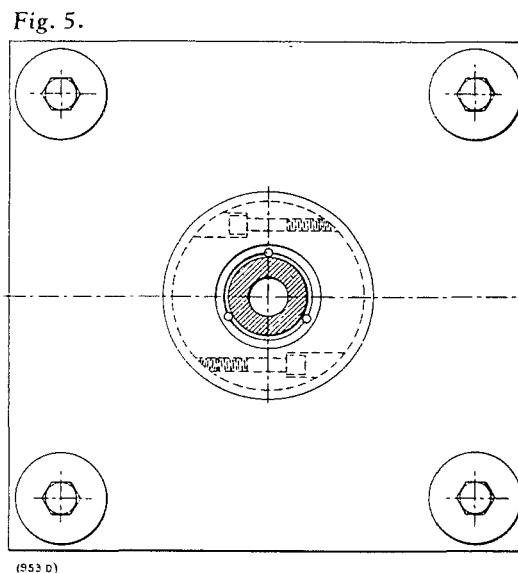
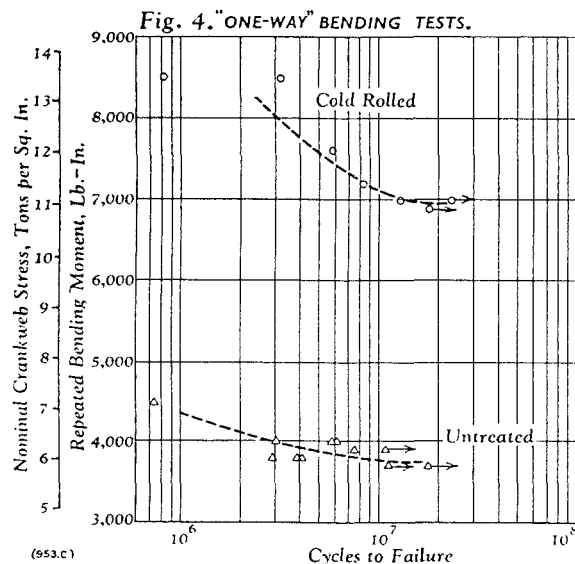
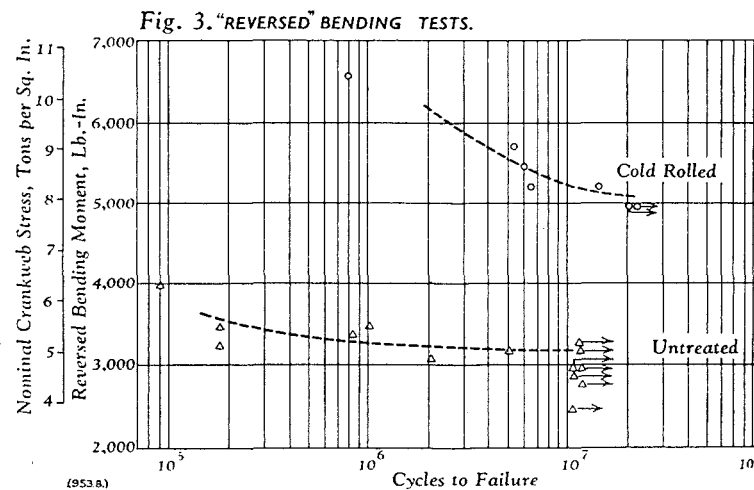
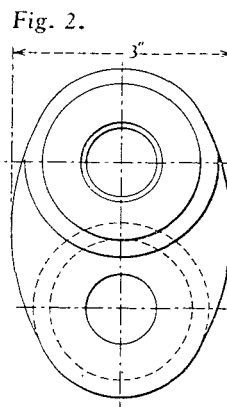
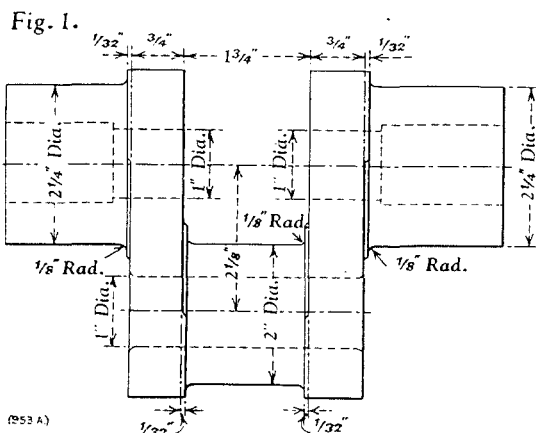


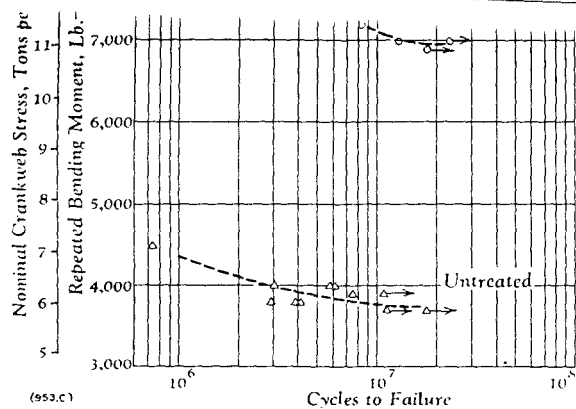
Fig. 7. PROFILE OF FILLET BEFORE AND AFTER ROLLING, X12.5

COLD-ROLLED FILLETS.

By R. J. LOVE, Wh.Sc., A.M.I.Mech.E.

It is well known that the fatigue strength of many engineering components is determined by the strength at some "critical" section—a notch or stress concentration; therefore, processes which may be used for local strengthening are of great

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It is well known that the fatigue strength of many engineering components is determined by the strength at some "critical" section—a notch or stress concentration; therefore, processes which may be used for local strengthening are of great interest. This is especially true at the present time when there is a necessity to use lower-alloy materials. Small modifications to design and treatment may produce strength increases which more than compensate for the reduction of strength that would otherwise result from using materials which are basically of less strength.

At the laboratory of the Motor Industry Research Association, a process devised for strengthening fillets, consisting of cold-rolling with steel balls, has given striking results. It was used, in fact, on cast crankshaft specimens, of the type illustrated in Figs. 1 and 2, herewith, the material being a flake-graphite iron which is in current use for the production of a wide variety of crankshafts. Fatigue-test results are given in Figs. 3 and 4, showing that, under reversed bending, the cold rolling has increased the limiting stress of crankshafts by 60 per cent., and that, under "one-way" loading, the increase of strength is as much as 80 per cent. The two kinds of loading were investigated because a crankshaft in service is probably subjected to a loading intermediate between these two conditions. These considerable strength increases have been achieved without any significant change of fillet radius.

The method of rolling was to use three balls equally spaced round the fillet and held in place by a loading ring with an internal 45-deg. chamfer. When rolling crankpin fillets, the loading rings were, of course, split and assembled on the crankpin.

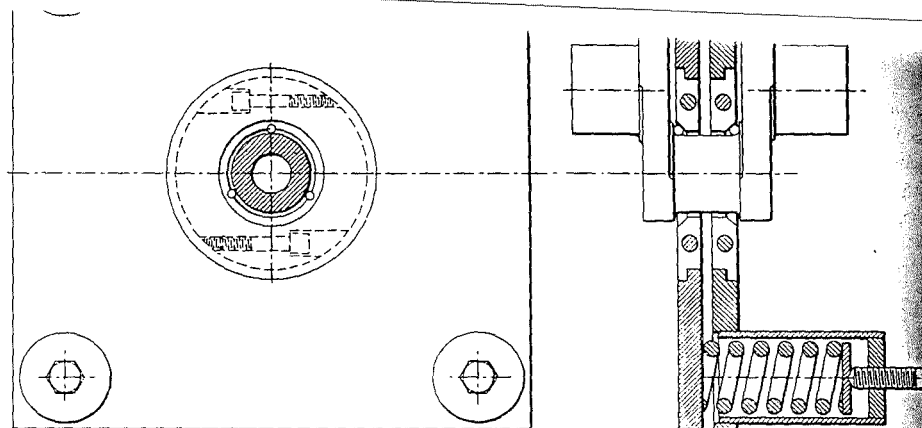
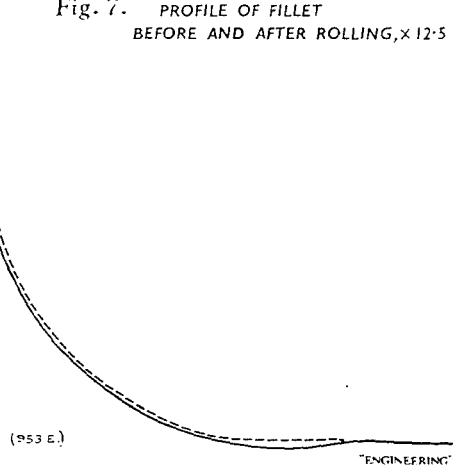


Fig. 7. PROFILE OF FILLET BEFORE AND AFTER ROLLING, X 12.5



It was possible to roll both the fillets at the same time, the rings being loaded endwise by a simple device containing four coil springs, illustrated in Figs. 5 and 6, herewith, and this could be rotated readily by hand when under load. It was found desirable to rotate the loading rig only a few times, since, if many turns were used, in an attempt to obtain sufficient rolling when using light loads, the surface began to crumble rapidly. The load chosen was such as would produce a small but detectable deformation of the fillet, and this was achieved when the rings were subjected to a load of one ton; the load pressing each of the $\frac{1}{4}$ -in. diameter balls into the fillet = $1 \times \frac{1}{3} \times \sqrt{2}$ tons. The rig was given two revolutions, in which case each ball makes approximately one revolution of the fillet.

The deformation produced, about 0.003 in., is indicated in Fig. 7, herewith. The fillets are

clearly much superior to those produced by conventional methods, since, apart from the beneficial cold-working effect, they are very smooth, true circular and of great importance in production of closely controlled radius. However, to ensure that the surface is rolled uniformly, the fillet must be machined to a reasonable degree of accuracy of form and size before it is rolled. The rolling may produce a small ridge of metal (about 0.0005 in., in the present case) at the junction of the fillet and the journal, but this can be removed by a simple polishing operation. The process, which has been demonstrated to be beneficial when used on high-duty cast iron, can be expected to give similar, if not better, results on steel parts also, since steel is known to react very favourably to cold rolling.

INSTITUTION OF HEATING AND VENTILATING ENGINEERS.—The bronze medal of the Institution of Heating and Ventilating Engineers, 75, Eaton-place, London, S.W.1, has been awarded to Mr. R. A. Rose, A.M.I.H.V.E., for his paper on "Heating by Means of Tetra-Cresyl Silicate."

LOCAL AUTHORITIES AND SCRAP SALVAGE.—A circular has been sent by Mr. Harold Macmillan, Minister of Housing and Local Government, to local authorities in England and Wales, requesting them to review their salvage arrangements to ensure that as much iron and steel scrap as can be recovered commercially is collected from all available sources. It is pointed out, in the circular, that local authorities as users of steel for housing and other applications, will realise how urgently every ton of scrap is needed at present. Details of the current prices for scrap are given in the circular.

* *Stressing Axles and Other Railroad Equipment by Cold Rolling*, by O. J. Horgner. Amer. Soc. for Metals Symposium on Surface Stressing of Metals, February, 1946. pages 85-142.