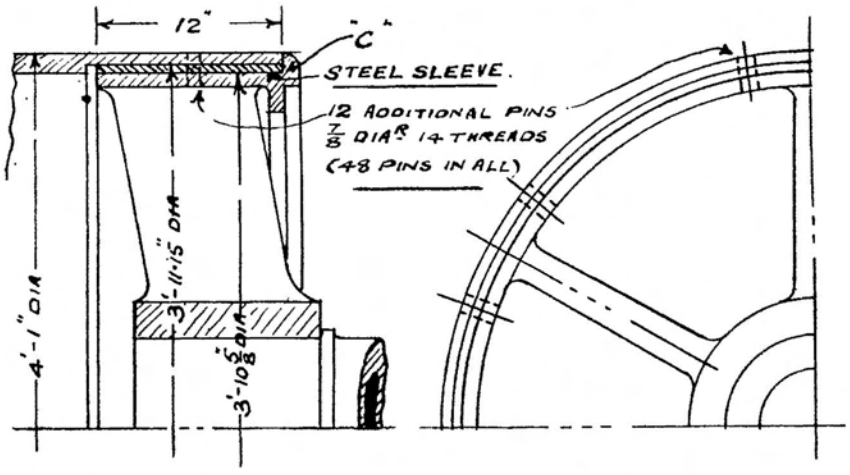
REPAIR OF TURBINE ROTOR.

The somewhat unusual case where the attachment between the forward wheel and the drum of an L.P. turbine of an "M" class T.B.D. (fitted with the three-shaft arrangement of machinery with Parsons turbines), became loose on Service, affords an interesting example of a quick repair. Examination, when hot, showed that clearance up to about 10 thousandths of an inch existed between the drum and the wheel rim in two places extending about 18 inches around the circumference. On opening up the turbine and examining the rotor cold, it was found that the circumferential collar at the forward end of the wheel, marked C in the sketch, was close to the drum at the top, but open at the middle line about 25 thousandths, which would represent 50 thousandths at the bottom.



The rotor was turned round in its bearings, and in every position the collar butted the drum at the top, indicating that the turbine wheel was slack in the drum and that the securing pins had failed. On removing the wheel in the shops it was found by careful measurement to be from 8 to 10 thousandths slack in the drum.

It was decided to carry out the repair by reducing the diameter of the wheel rim somewhat and boring out the drum slightly, thus permitting a steel liner to be shrunk on the wheel rim, the liner being made up from $\frac{1}{2}$-in. plate, with a welded joint, turned down to the required thickness. The shrinkage allowed for fitting the liner upon the rim was 30 thousandths, and it was further secured to the wheel rim by several $\frac{3}{8}$-in. pins.

The wheel and the spindle were then put into the lathe, and the rim turned down to the dimensions required. The rotor drum was similarly treated, the forward end being supported in a stay; the diameter of bore was arranged to be such as to provide for a shrinkage of 45 thousandths. The holes in the drum for the securing pins were increased from $\frac{3}{4}$-in. diameter to $\frac{7}{8}$ in., fitted with fine threads, and 12 additional $\frac{7}{8}$-in. diameter pins were provided in the positions indicated.

After assembly, the rotor was put into the lathe and found to be out of truth at the forward end by 13 thousandths, and at the main bearing by 4 thousandths. The spindle was then turned true to the drum, being thus reduced by 5 thousandths in diameter at the main bearing journal; the cone at the forward end of the spindle (cruising turbines were fitted forward of the L.P. turbines) had also to be slightly reduced in diameter to bring it true with the drum, the result being that when the claw-piece of the flexible coupling was refitted it took up a position 3/16 in. aft of its original position. This difference was machined off, the after end of the claw piece and a plate of the same thickness was fitted to the forward end.

Subsequent to reblading and tipping, the static balance was found to be $1\frac{1}{2}$ lbs. out, and this was corrected by tapping two of the lightening holes in the connecting piece between the astern and ahead drum and screwing in pieces of tube, the ends being riveted over.

The machinery finally carried out a basin trial and a trial at sea at revolutions up to 640 per minute with satisfactory results, no unusual vibration being observed.