PORTABLE MACHINES FOR TRUEING PROPELLER SHAFTS AND PROPELLER SHAFT THREADS

The following particulars of machines devised at Simonstown are promulgated for information. In the event of similar requirements arising at other yards, machines of similar design may be manufactured locally.

SHAFT TRUEING MACHINE

This machine is intended for the machining in place of any fair sized shaft where there is no free end, e.g. on propeller shafting between forward end of "A" bracket and after end of outer stern tube.

The original purpose of this particular machine was for the reduction in diameter of the unworn forward end of a badly worn propeller shaft liner which was in the wake of the forward portion of the " A " bracket in a cruiser (H.M.S. *Hawkins*) : this work was necessary to avoid interference from the unworn part of the liner during the replacement of the rewooded bush in the " A " bracket.

For this work it proved entirely successful and enabled the shaft to be sufficiently machined very rapidly in place and thus avoided the necessity for withdrawal of the shaft.

More recently the machine has been used for machining three steel propeller shafts of a cruiser (H.M.S. *Nigeria*) which had all become severely worn and eroded in the wake of the rope guards on the forward sides of the " A " brackets.

It was desired to fit shrunk-on steel sleeves in accordance with A.F.O. 1462/45, but the external condition of these shafts was such that it was considered necessary first to machine them in order to obtain reasonably smooth landings on to which the sleeves could secure a firm grip by contraction after welding.

In these particular instances, machining was carried out simply and easily, and the test of sleeves after fitting showed these to have secured completely rigid grip and to be oil tight under a test pressure of 20 lb/sq. in.

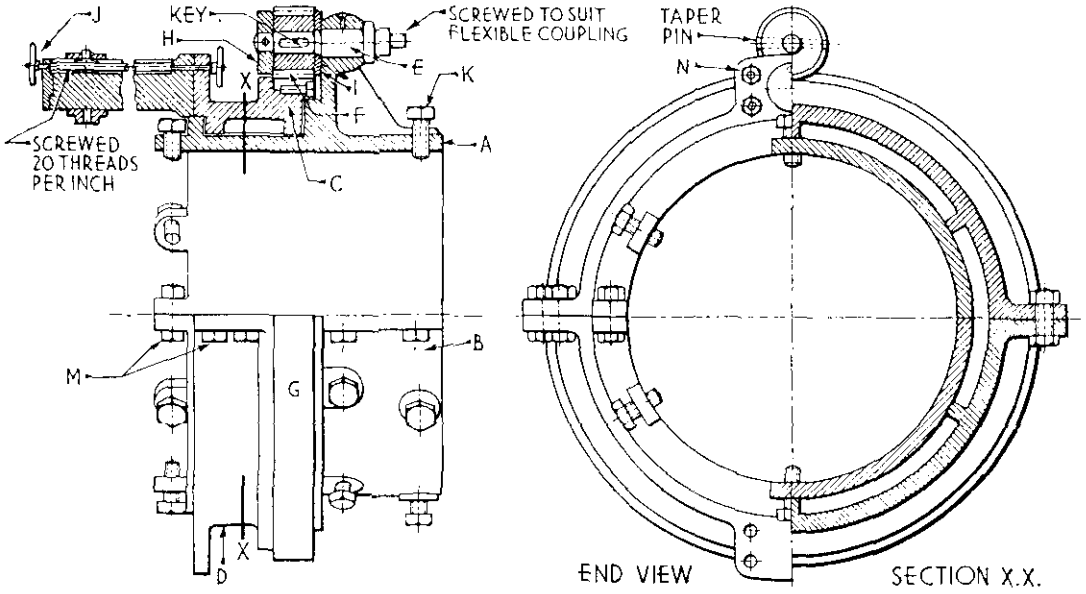
It will be noted that the machine as designed is capable of use on shafts of appreciable variation in diameter.

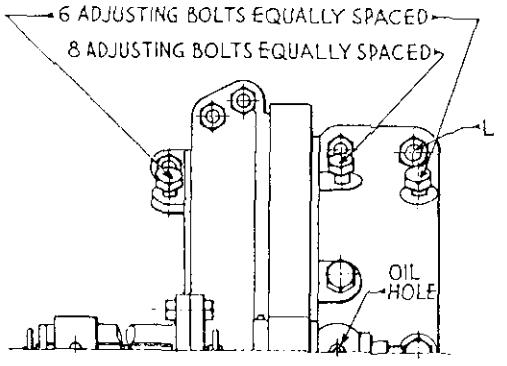
DESCRIPTION

The machine is of simple design and is, of necessity, made in two halves to permit of assembly around the shaft. It comprises

Cast Iron Body. This is made in halves which are assembled around the shaft to be machined and then secured together along a horizontal joint by bolts.

The whole body is then roughly centred and aligned by means of set bolts.





ITEM	DESCRIPTION	ITEM	DESCRIPTION
A	UPPER HALF OF SPLIT RACE	H	LOCKING COLLAR
B	LOWER HALF OF SPLIT RACE	I	DISTANCE WASHER
		J	TOOL BAR
C	UPPER HALF OF SPLIT ROTATING SLEEVE	K	$\frac{3}{4}$" ADJUSTING BOLT
D	LOWER HALF OF SPLIT ROTATING SLEEVE	L	$\frac{3}{4}$" CLAMPING NUT AND BOLT
		M	$\frac{5}{8}$" CLAMPING NUT AND BOLT
E	DRIVING SHAFT	N	$\frac{1}{2}$" SECURING NUT AND BOLT
F	PINION		
G	GEAR WHEEL		

SHAFT TRUEING MACHINE—SKETCH

Gunmetal Rotating Member. Also made in halves and secured around the groove in cast iron body by bolts similarly to the body.

On the rotating member is mounted the rack, secured by cheese headed screws, both axially and radially.

This member is also provided with bases for securing the Tool Bar and for mounting a suitable counterbalance weight diametrically opposite to it.

The tool bar is a round steel bar fitted with an ordinary striker star feed mechanism to give axial movement to the tool head in either direction.

The driving pinion is mounted on a bracket which is integral with the upper half of the Cast Iron Body.

Motive power is provided by means of a pneumatic reversible geared type drilling machine which transmits through a flexible coupling to the pinion shaft.

Setting up. After assembly and rough adjustment, the final setting up and alignment concentric with and parallel to shaft axis is effected by adjustment of the bolts, until rotation of the tool shows setting is correct.

Capacity. The machine shown was found to reduce the diameter of a $14\frac{1}{2}$ in shaft by $\frac{1}{8}$ in over a width of 12 in. in about 10 hours.

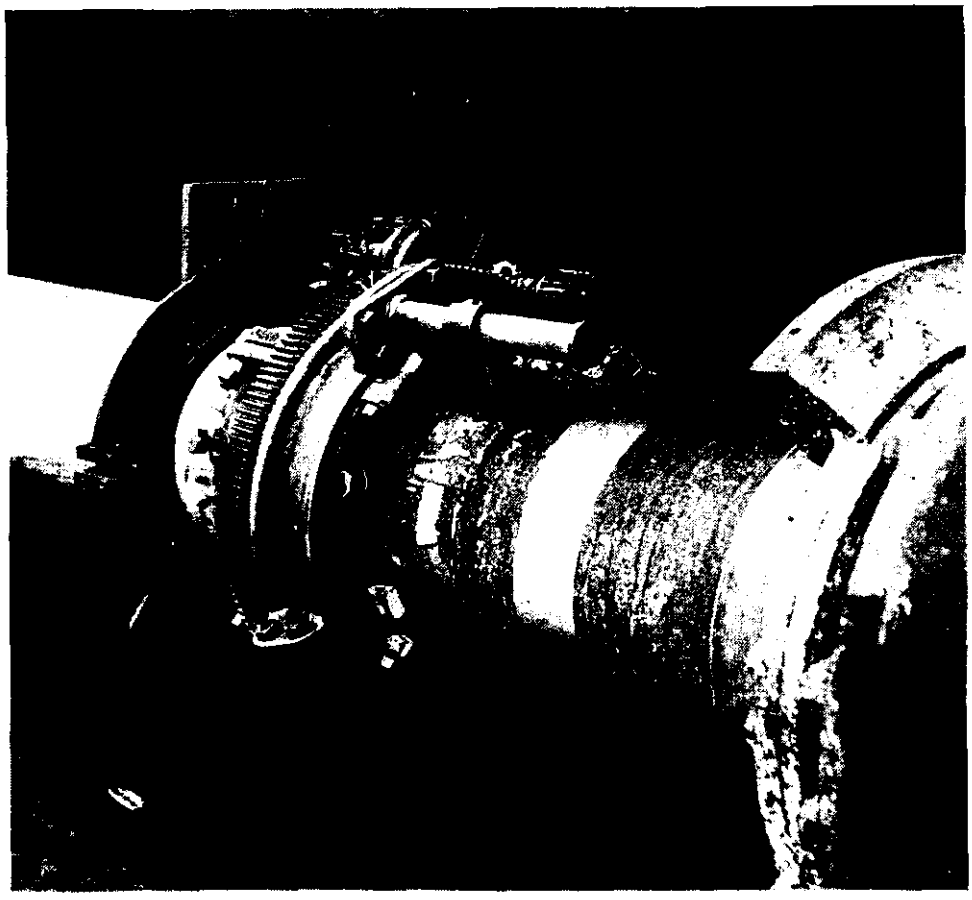


FIG. 1

Operation. Fig. 1 shows the machine in operation on the propeller shaft of a cruiser (H.M.S. *Nigeria*).

The ring clamp on the left-hand side is merely to serve as a base for securing the drill motor.

The flexible coupling can be seen above the fixed cast iron body and the star wheel for tool feed above the body of the rotating member, at the bottom of which counterbalance weight is visible.

The wooden wedges at either end of the fixed body are merely to damp out any vibration which might tend to slacken the adjusting set bolts.

Condition of shaft surface should be noted.

The forward end of " A " bracket is just visible on the right-hand side.

TAIL SHAFT RETHREADING MACHINE

The following circumstances led to the designing of this machine.

In 1943 H.M.S. *Hawkins* was docked at Simonstown during the course of her refit and it was found that the port inner propeller nut was loose and capable of being tightened $\frac{3}{4}$ of a turn past the stop mark. On investigation it was found that the nut was actually $\frac{1}{8}$ in. in diameter larger than the mating

shaft end. The shaft end was in a very bad state with more than 50% of the threads corroded away and those that remained distorted, irregular in diameter and of little effect.

Spare nuts of standard dimensions would have been of no use on this shaft and, in any case, there were none, so it was imperative that something be done quickly (*a*) to release the dock for other vessels and (*b*) to effect an efficient repair in the minimum time.

A machine was accordingly devised to carry out the work of recutting the threads *in situ*. The machine proved to be a success, requiring no initial adjustments or modifications. The whole job was completed in 72 hours from the time of rigging up to the time of dismantling during which time the shaft had been reduced by over 3 in. in diameter and full threads of correct form and pitch re-cut on a shaft 11½ in. dia., 4 t.p.i. and 12 in. length of thread.

Subsequently two other shafts were repaired in a similar manner in H.M.S. *London* (the Port Inner and Outer shafts) and on these the time required for repair was reduced to 48 hours per shaft.

The cutting speed of this machine is 3 or 4 times faster than when screw cutting on a lathe and it should be noted that, with its use, it is possible to recut threads on a shaft without removing the propeller.

DESCRIPTION

The machine comprises :

The Locating Flanged Adaptor which is a cast iron or steel member used to secure the whole machine to the damaged shaft.

In the case of a hollow tail shaft, this is conveniently done by removing the end plug and screwing into it the flanged adaptor which has been made and screwed externally to suit.

The Fixed Lead Screw or Former which is a long cast iron piece, screwed externally to match the handing and pitch (not diameter) of the damaged threads of tail shaft (right handed and of 4 t.p.i. in this instance, as in most tail shafts) and provided with a flange at its forward end to mate with the flange of adaptor to which it is secured by bolts.

The Tool Bar Carriage or Saddle Nut. This is a long lantern-shaped gun-metal casting, screwed internally at its forward end to match with the external thread of lead screw ; it is also split at this end to allow for adjustment on the mating threads of lead screw and to permit elimination of back lash.

It carries on the outside of its forward end projections to accommodate the the tool bar and its corresponding balance bar opposite.

At the rear end of the carriage nut is accommodated an internal toothed rack and its mating epicyclic gearing which is carried on gear plate and pins. The plate is held from revolving by means of the lever.

Drive is provided from a slow running geared reversible pneumatic drilling machine, operating on Dockyard compressed air at 80/90 lb/sq. in., which drives, through a flexible coupling, the internal shaft and the pinion of the epicyclic gear.

The internal shaft is carried on through the gear plate and runs in bearing plates and bushes.

The tool bar is carried on a projection from the carriage, which has suitable provision for traversing the tool bar to enable the pitch of the tool to be adjusted laterally to the track of the thread to be recut. Vertical feed is applied at the tool grip.

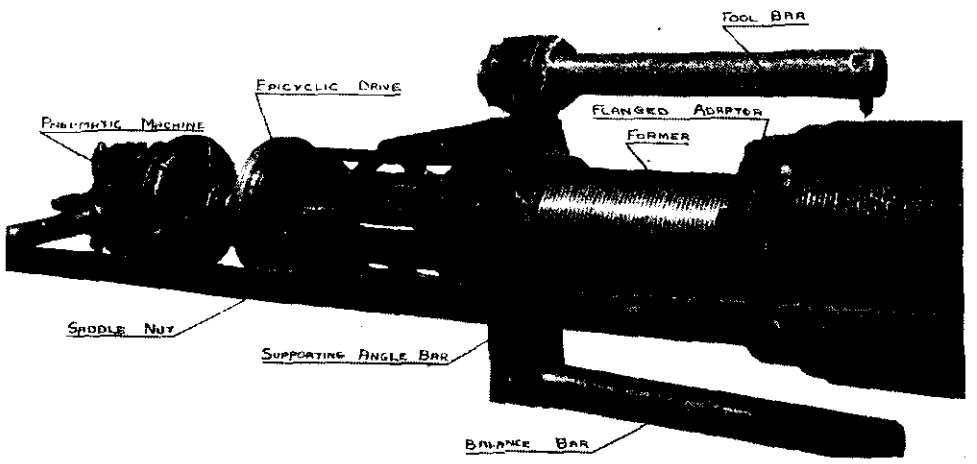


FIG. 2

Operation. Fig. 2 shows the machine rigged for operation on the tail shaft of a Cruiser.

The long angle bars on either side were provided merely to carry the pneumatic machine for driving the apparatus and to eliminate vibration. They also formed a convenient fixed support against which the lever of the epicyclic gear could rest.

The after ends of the bars were steadied by shores from staging in the Dock.

The following tools were employed as work progressed :—

(*a*) Right-handed half screwing.
(*b*) Left-handed half screwing.
(*c*) Plain wide front to remove tops of threads.
(*d*) Full shape screwing tool.
(*e*) Chaser for final finishing and forming.

It was found possible to take cuts of 5/1000 in for the whole depth of the thread on one side of the thread at a time.

Two mechanics were employed—one to operate the machine and the other to adjust and set the various tools.

In the cases of Cruisers (" *Hawkins* " and " *London* "), on which this method was employed, nuts were repaired by fitting an internal bush, screwed, shrunk and pinned in, which was then bored out and screwed internally to match the repaired shaft.