## MACAUTO STEAM TRAPS.

This type of steam trap was introduced into the naval service in about the year 1926, and has been the subject of conflicting reports, the majority of which, however, appear to agree that (1) such traps do work well on occasion; (2) some form of handoperated by-pass is desirable in positions where intermittent floods of drainage are experienced; and (3) they are difficult to set unless the end of the discharge pipe is visible from the trap itself; this, of course, applies to any trap. Arrangements are being made to make the necessary alterations to meet (2) and (3).

The following remarks on the adjustment and operation of these traps have been received from one of H.M. Ships; it should be noted that the suggestions and opinions expressed are those of the author, any information confirming or modifying them would be appreciated :---

These notes embody the results of over two years' practical experience with Macauto steam traps, and it is hoped that they may be of assistance in making a practical success of this small and convenient fitting, observing, however, that it is not felt that they constitute by any means the last word to be said on the subject.

Early experience was that these traps could not be relied upon, there being frequently no evident reason for their failure, while their adjustment involved skilled attention that could ill be spared. Careful investigation showed, however, that failures were due to :---

- (1) Dirt, etc., preventing proper tightness of the ball valve, or causing it to remain on its seating.
- (2) Defective cartridges.
- (3) Improper adjustment.

The remedy for the first of these is obvious, and fortunately it is probably not a common type of defect. In cases, however, where accumulations of dirt are abnormally great it was found that prolonging the drain pipe into the interior of the associated casting or fitting was of service in extending the periods between successive cleanings of the trap.

**Defective Cartridges.**—The cartridge consists of a thin corrugated cylinder made of bronze alloy, the ends being closed by brass caps silver soldered in place. Each of these caps is provided with a small brass spigot, one being integral with and the other screwed into the respective cap. The cylinder is strengthened to some extent by heavy gauge bronze wire wound in the corrugation, and is completely filled with oil of such characteristics that when the cartridge is at steam temperature its expansion will be sufficient to cover the working lift of the ball valve.

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The defects to which cartridges are specially liable are :---

(a) "Crippling" due to the application of excessive axial loads. It has been found that proper adjustment cannot be made if cartridges are bent quite a small amount. Bent cartridges can, however, be straightened sufficiently to give satisfactory results by rotating them in a lathe and hammering gently (cold) between blocks of wood.

> One method that has been successful in rendering usable a badly "crippled" cartridge, is to fit a perforated brass sleeve over the article; the sleeve is made to fit tightly on the lower cap, while being free around the upper one. Proper adjustment can be made after the cartridge has bent sufficiently to bear against the internal surface of the sleeve.

(b) Leakage, either at the screwed spigot, at the soldered joints between cylinder and caps, or at cracks or punctures in the cylinder itself. It is essential that the cartridge should be full, otherwise the requisite expansion will not be obtained. A leaky cartridge can be emptied, repaired and refilled. Service Special Mineral Oil has been found a satisfactory make-up for the small quantities of oil necessary to completely fill the cartridge, but obviously the extent to which this can be used without affecting the designed expansion is very limited.

**Adjustment.**—It is essential for proper adjustment that the discharge from the trap shall be visible, and where necessary, it will be found worth while breaking a joint on the outlet side of the trap while adjustments are being made. The following method has been found to be the best of several tried; in any case, it is desirable to restrict the work of adjustment to a few trained ratings, the traps normally being kept locked :—

- (a) Close drain cock or valve leading to trap; then break a joint on the outlet pipe close to the fitting.
- (b) Unscrew the lock-nut and loosen the adjusting screw till the cartridge is quite free.
- (c) Allow a small quantity of steam to blow through the trap for some moments till the latter is thoroughly hot. Then tighten down carefully on the adjusting screw till the cartridge can be "felt."
- (d) Gradually open out steam to the trap till the drain cock or valve is wide open, at the same time retaining the "feel" of the cartridge by means of the adjusting screw; the latter may have to be slackened back slightly during this process.

(e) A very slight increase in pressure upon the cartridge by means of the adjusting screw should be sufficient to stop all flow of steam, though if water is present in any appreciable quantity when the adjustment is being made, no attempt should be made to screw down sufficiently to close the ball valve. It is very desirable to cause the trap to work by pouring cold water over it immediately after adjustment. When this is done it will frequently be found that the trap will not shut off tight at once but will dribble slightly; an excellent setting can then be achieved if the adjusting screw is tightened just enough to stop the dribble. These difficulties will not arise if the trap can be supplied with reasonably dry steam during the adjusting process.

The chief points to be remembered are that the cartridge should be thoroughly heated with dry steam before any compression is put upon it by the adjusting screw, and further, that the axial load on the cartridge under such conditions must not be sufficient to cause " crippling."

If difficulty is found in obtaining steam-tightness with a reasonable load on the cartridge, this should be replaced temporarily by a distance piece and the condition of the valve tested by forcing the adjusting screw hard down.

The working of the trap depends upon temperature difference and no lagging should therefore be fitted. It will sometimes be found that the desired results are not obtained, despite the fact that the trap itself is working properly. Thus it may happen that although a particular trap can be made steam tight without undue pressure of the adjusting screw, it will not operate; this may be due to the trap being placed in such a hot position that the cartridge is always sufficiently expanded to keep the ball-valve closed. The converse of this occurs when a trap cannot be made to "shut off" (although the ball valve, etc., is in good condition) owing to the condensation occurring in the drain pipes leading *to* the trap; this type is especially annoying and usually leads to many bent cartridges—remedy is to put trap closer to steam pipe, or to fit a larger trap.

In conclusion, it is desired to stress that each case of continued faulty or erratic operation requires individual consideration; if the ball valve, cartridge and other parts are demonstrably in good condition the trap should "work" (*i.e.*, the ball valve will be tight in the presence of steam and will be fully lifted when water is passing) although its capacity may not be suited to the prevailing circumstances.