



## XXX. On a non-leaking glass tap

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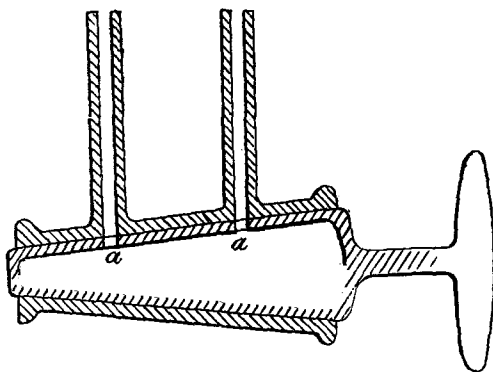
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XXX. *On a Non-leaking Glass Tap.**By A. P. CHATTOCK\*.*

IT is a comparatively simple matter to prevent the leakage of gas between the inside of a glass tap and the atmosphere; careful grinding and greasing being usually sufficient without the additional security of mercury traps outside the ends of the plug. But to prevent the passage of gas from one side of the plug to the other is not so easy.

As is well known, when the plug revolves the edges of the hole bored through it tend to remove part of the grease, and thus to leave a trace in the latter which is only too likely to connect the opposite sides of the tap; and this result, though rendered less likely, is not by any means certainly prevented by boring the hole obliquely.

An ingenious tap, in which the plug is hollow and contains mercury, was described by Dr. Milner in this Magazine (July 1903, p. 78). His tap requires no grease, and absolutely prevents the passage of gas past the plug; but this is in one direction only; and the tap is besides somewhat elaborate. It is the object of this communication to show that by a modification of Dr. Milner's idea it is possible to construct a simple tap which shall prevent the passage of gas in either direction, provided the ordinary use of grease is permissible.



The figure shows the arrangement in section, the mercury being marked black. It will be seen that if a leak occurs the gas may get into the plug; but it cannot get out again when the holes *a*, *a* are below the mercury.

\* Communicated by the Author.

Several of these taps, constructed by Messrs. Baird and Tatlock, have been in use for some time in the writer's laboratory with very satisfactory results. The only case in which trouble may occur is in opening connexion between vessels containing gases at very different pressures, as there is then a chance of blowing the mercury out of the tap; but this is quite easy to avoid by opening the tap slowly.

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XXXI. *Tensile Overstrain and Recovery of Aluminium, Copper, and Aluminium-Bronze.* By ARTHUR MORLEY, *M.Sc.*, Professor of Applied Mechanics, University College, Nottingham, and G. A. TOMLINSON, *B.Sc.*\*

[Plate VII.]

THE limits of tensile stress within which the strain entirely disappears with the removal of the stress are usually called the elastic limits. For most hard metals this range of stress is considerable, and the strain takes place very quickly, and disappears quickly after the removal of the stress. In the case of some other metals such as aluminium and copper, the range is smaller and above it some of the strain appears slowly, the material showing the effect of "creeping" for long intervals of time after the first application of the stress.

The limits within which the strain produced is proportional to the stress are, for most metals, the same as the limits of elasticity just defined. The range of proportionality of strain to stress in aluminium as measured by a good tensile extensometer is small: from very low loads (usually much below 2 tons per square inch) the strain is found to increase more quickly than the stress provided sufficient time is allowed for the strain to develop. The stretch modulus (Young's) of elasticity usually quoted for aluminium is obtained from the average rate of strain over a moderate range of stress.

Although for moderate loads the strains increase out of proportion to the stress, it is found that two tests on the same piece of material made with a short interval between them give practically identical readings of strain, provided the material has not been "overstrained," that is strained beyond the yield point,—a stress considerably above the elastic limit, and not sharply defined in aluminium—at which the material stretches at an enormously greater rate than below it, and above which the yielding is mainly plastic. After overstraining, however, the material behaves very differently under the action of small loads, the strains

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