Evidently a small increase of efficiency of jet, boiler or fluid may have cumulative effects of considerable moment in reducing operating costs. Some idea of the trends in performance may be gathered from the accompanying table compiled by my associate, Mr. F. M. Jenner, for pumps of laboratory size that have been introduced during the past twenty years.

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[3] Burch, C. R., *Nature*, **122**, 729 (1928).
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Comparative Vacua Produced by Different Oils in a Diffusion Pump

IN our previous communication[1] it was noted that the vapour pressure of the pump fluid affects the total vacuum only by a minor fraction, and the pump continues to exhaust air from the chamber to be evacuated to a pressure far below the vapour pressure of the fluid. A picture of the pumping action has also been suggested.

The practical independence of ultimate vacuum on a change of pump fluids has been studied in subsequent experiments[2]. Different types of fillings were used: Apiezon *B*, Capella *D* (Caltex), Mobile *B*, Petroleum jelly (white) and solid paraffin. They gave the same ultimate vacuum with a single-stage diffusion pump within the workable range of adjustments (see table). The increase of heat input with the petroleum jelly and solid paraffin fillings are worth mentioning. In these cases the flow of water had to be reduced in order to keep the body of the pump sufficiently warm.

The total pressure was measured by a Pirani gauge and the partial pressure by a McLeod gauge.

EFFECT OF PUMP FLUIDS ON THE PRODUCTION OF VACUUM BY A SINGLE-STAGE DIFFUSION PUMP (PRESSURE IN $\mu = 10^{-3}$ MM. MERCURY).

Pump filling	Vacuum conditions		Relative heat input (estimated)	Remarks
	Partial pressure of air	Partial pressure of fluid vapour*		
Apiezon oil	0·03	0·10	1	
Capella *D* (Caltex)	0·03	0·17	1·5	
Mobile *B*	0·03	0·97	1·5	
Petroleum jelly (white)	0·03	0·67	2	Water circulation is to be low enough to maintain fluidity and adequate boiling
Solid paraffin	0·03	0·57	2·5–3	,,

* This is, however, not the true vapour pressure of the fluid under static saturation condition, as the pressure is measured under constant pumping condition.

In another experiment solid paraffin was used in a three-compartment fractionating pump. The suction of air was not improved, but the back diffusion of fluid vapour was markedly reduced. With a single-stage pump it was 0·57 μ (see table), but with the three-compartment pump it came down to 0·06 μ. These experiments corroborate our picture of the working of a diffusion pump.

Our thanks are due to Prof. M. N. Saha for his interest in the work, and also to the authorities of the B.S.I.R. for a financial grant to carry out the investigation.

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An Illusion of Size

IN his letter, Mr. J. Phelps[1] refers to an interesting point in the manufacture of threepences, namely, their expansion in the coining press into dodecagonal steel collars. The fact that the corners of coins subsequent to 1940 are more rounded than are those of earlier ones seems to point to a change in the collars at about that date. If this is the case, it will also explain the change in the size of the coins which occurred at about the same time referred to in my letter[2].

The difference in size of the old and new issue is easily demonstrated with callipers, for if these are adjusted to be a tight fit on little-worn coins of the old issue they will be found to be quite loose on similar coins of the new one.

Mr. Phelps's statement that the edges of all coins become rounded in circulation is almost certainly correct, but I do not think that it accounts satisfactorily for the 'illusion', for the statement made by Dr. A. Loewenstein[3] was that it was the new coins which appeared to be the smaller, whereas according to Mr. Phelps it should be the old ones with worn edges which appear to be the smaller.

I feel that the word 'illusion' should not be used where actual differences of shape exist such as these. It should be reserved for cases where a faulty judgment has been made because of some defect in a sense-organ. All the familiar optical illusions come in this category.

When light is failing, and I am not wearing spectacles, I tend to confuse two-shilling pieces with half-crowns. This is an illusion which I find embarrassing. Would it be possible for one of these coins to be given the dodecagonal shape of the threepenny piece ?

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[1] *Nature*, **156**, 269 (1945).
[2] *Nature*, **156**, 118 (1945).
[3] *Nature*, **155**, 672 (1945).

To see if Prof. H. Hartridge's explanation[1] of the effect discovered by Dr. A. Loewenstein[2] was justified, the experiment described by them was repeated on a comprehensive scale. Four nickel threepenny bits coined in 1942 were selected and two of them had their edges and heads filed off* so that a flat surface was obtained on both. One coin of each pair was

* Permission to mutilate the coins was obtained from the Deputy Master and Comptroller of the Royal Mint.