

Another valuable application of the Hele-Shaw clutch is on the armature spindle of electric motors. In this position, the speed being usually very high, the clutch is small and easily contained in the boss of the motor pulley, only the light starting handle at the side of the pulley indicating that a clutch is fitted. The object is to save using the controller continually in driving a heavy machine which has to be stopped and started frequently. Printing machinery, for instance, can be manoeuvred entirely on the clutch, the motor running full speed the whole time. It is good practice to put the burden of such trying work as this on a pack of Hele-Shaw friction discs running in oil. They are better fitted to stand wear and tear than electrical controlling

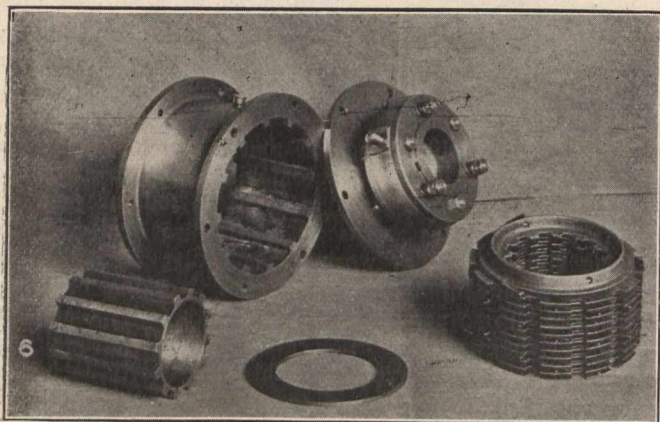


Fig. 3.—Parts of Hele-Shaw Friction Clutch.

gears. In three-phase motors it is almost a necessity to use this clutch.

In all these special applications of the Hele-Shaw clutch it is usual to fit alternate bronze plates, so that the friction is similar to that of a shaft turning in its oiled bearings, and consequently very little wear of the surfaces takes place. It is found with these bronze plates that even constant slipping does little more than cause the faces of the steel plates to be speckled with bronze and the bronze plates to acquire a high polish.

It is manifest that there must be very little wear of the plates when a 150 h.p. Hele-Shaw dynamometer at

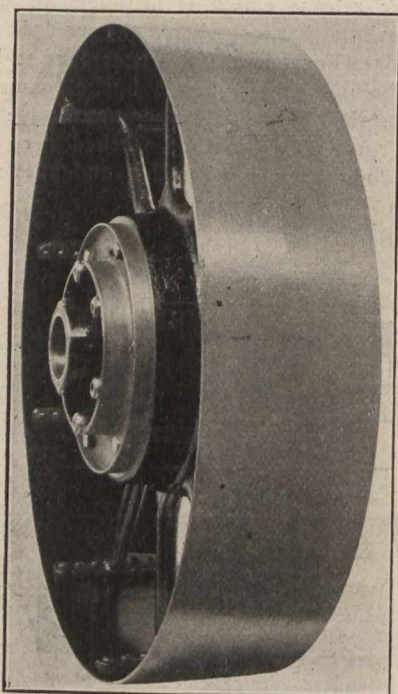


Fig. 4.—Clutch fitted to Pulley.

Liverpool University has been in use regularly for three years without renewal of the plates. Other dynamometers, including one of 600 h.p. for Messrs. Vickers, Sons & Maxim, have been constructed on Hele-Shaw principles, with very satisfactory results.

In marine work the Hele-Shaw reversing gear has secured recognition in the highest quarters as the best

design for reversing a petrol launch. The gear consists of a reversing clutch and epicyclic train, with a separate clutch for giving a free engine.

The advantage of separating the parts, which is contrary to previous practice, is that the greater part of the manoeuvring comes on the engine clutch, and the reversing gear, which is the more complex part, is used only for actual reversing. The separate engine clutch gives a flexible drive in either direction, and the boat is under perfect control.

This quality of the Hele-Shaw reversing gears is much appreciated in crowded waters, like the upper Thames in summer and Cowes in the yachting season. Motor boats have not the same privileges as sailing boats, and must look after themselves when there are steamers about.

From these instances it will be seen that the Hele-Shaw friction plates have a very wide sphere of usefulness. Hitherto friction clutches have found their field among the factories almost entirely—small clutches for single machines and large clutches for main drives.

The Hele-Shaw has opened up new ground entirely among automobiles and motor launches. At the same time, the new clutch is steadily coming to the front for factory work. The essential simplicity of the designs for pulleys and couplings, the protection of the friction surfaces from dust, and the shielding of projecting parts likely to be a source of accidents, all have their effect in making the clutch popular with mill-owners and mechanics.

In South Africa a Hele-Shaw clutch of the coupling type is transmitting 560 h.p. coupled up to a winding drum

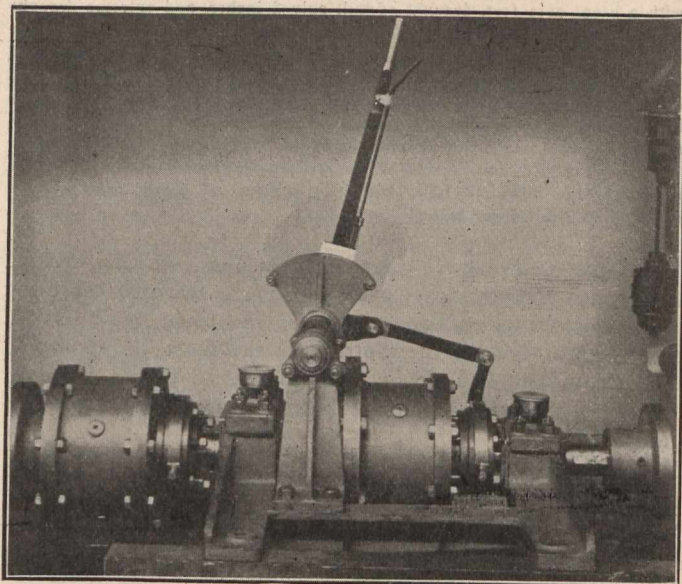


Fig. 5.—Hele-Shaw Reversing Gear.

in the gold fields. In many cases in England the clutch has been applied, transmitting powers over 200 h.p.

The success of the clutch in all these directions is due to the soundness of Hele-Shaw principles, and the thoughtful way in which these principles have been embodied in the designs. It is probably the first time since the days of Thomas Weston that organized methods of research have been brought to bear on the difficult problem of the friction clutch, and it is satisfactory to know that in this case at least the scientific method has been found also the most profitable. The clutches described above are manufactured by the British Hele-Shaw Patent Clutch Co., Limited, Chatham Street, Liverpool.



LONG BRIDGES.

| | Length Ft. | Type. |
|--------------------------------|------------|------------|
| Tay, Scotland | 10,779 | Girder |
| Forth, Scotland | 8,296 | Cantilever |
| East River, New York | 7,200 | Suspension |
| Brooklyn, New York | 5,989 | Suspension |
| Clifton | 702 | Suspension |
| Quebec, Canada | 3,228 | Cantilever |