A NEW FORM OF FRICTION CLUTCH

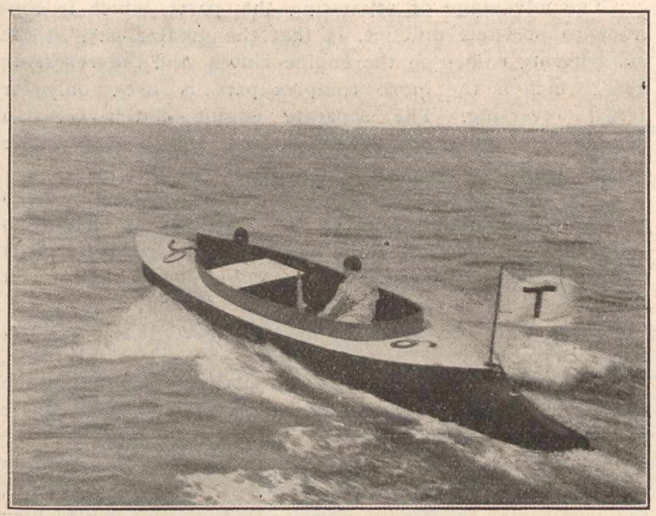

Fig. 1.—A View of the Thornycroft Launch "Scolopendra."

This boat—fitted with Hele-Shaw Clutch Reversing Gear,—won the Yachtsman's Cup at Cork; and the Cowes Cup, Isle of Wight. The following account is taken from "The Engineer," (London):—

"The marine section comprises many interesting features, not the least of which is the 30-ft. racing launch 'Scolopendra,' built by John I. Thornycroft & Co., Limited, Chiswick, which won the 50-guinea Yachtsman's Cup at Cork last summer. The craft has a total tength of 30 feet, with a beam of 5 feet, draught of hull only 8 inches, and extreme draught at the propeller 17 1-2 inches. She is propelled by a 20-brake horse-power petrol motor having four cylinders, and running at a normal speed of 1,000 revolutions per minute. The motor is of this firm's standard pattern, and is fitted with either mechanical or automatic inlet valves. *Reversing and stopping is effected by means of a Hele-Shaw friction clutch, which admits of rapid manoeuvring without shock, while being highly efficient.* The propeller is of bronze, and of the well-known Thornycroft pattern. Six runs over the measured mile, with two persons on board, gave a mean speed of 18.2 miles per hour."

Some years ago Professor Hele-Shaw, LL.D., F.R.S., of Liverpool University, used to drive a Darracq car fitted with a leatherfaced cone clutch of the usual type. Of all the parts of the car the clutch was the most disappointing, and Professor Hele-Shaw determined to find a form of clutch more flexible and less liable to injury than a leather-faced cone.

A series of experiments were conducted; one clutch after another was tried, only to be discarded. Strangely enough, the design that came out of the trials best was the old flat plate clutch, invented by Thomas Weston. The disc principle is a good one in clutch designing, since the torque obtained for a given end pressure is increased proportionately for every additional pair of surfaces. In other words, a clutch can be made more powerful by adding friction plates to the pack without increasing the end pressure.

In the experiments with the Weston clutch it was found difficult to get the plates perfectly flat; a persistent tendency to buckling made the clutches very unreliable. They were, moreover, very sluggish in action and not easily released. All these troubles, however, were overcome by stamping a circular V-shaped groove into the plate. This V groove, or web, was found to give rigidity to the plates in much the same way as a web gives strength to a girder. Thin sheet steel plates, with the V groove stamped into them, showed no tendency to buckling whatever, and developed other qualities of hardly less importance.

The grooves in the plates enter each other at an angle, and consequently the end pressure required for a given torque is diminished by an amount varying with the co-secant of the angle of the V. In other words, the Hele-Shaw clutch will transmit great power with light end pressure. Further, contact is established between the faces of the grooves only. The flat portions of the plates do not make contact with one another, consequently there is a tendency to part rapidly with heat.

Very complete lubrication and, if necessary, cooling of the pack is possible for the same reason. These advantages, following the adoption of the V-shaped groove give rise to one or two properties in a Hele-Shaw clutch which are entirely new and exceedingly useful. For instance, a clutch on Hele-Shaw principles can be applied for slipping indefinitely without injury to the plates, the heat produced being dissipated at once into the lubricant. It is largely to this feature that the Hele-Shaw clutch owes its present position among the automobilists.

Fitted with a Hele-Shaw clutch, a car can be driven through traffic on the top gear with the clutch slipping and the car gliding in and out of the vehicles under perfect control.

It is especially valuable for motor 'buses and heavy vehicles, which are constantly at work in busy streets. In England, it is rapidly becoming universally adopted on all forms of motor vehicles.

It may be readily imagined that a clutch which can make a name for itself in automobile work has had no difficulty in securing a place in industrial engineering.

At a large glass works in Lancashire ten of these slipping clutches are at work transmitting 80 h.p. at 60 r.p.m. It is one of the conditions of working of these clutches to slip 50 per cent. for two hours daily; that is to say, the driving part runs at 60 revolutions, while the driven is running at 30 revolutions. In this way nearly 40 h.p. is being absorbed by friction of the plates running in lubricant. The first two or three of these clutches installed have been at work night and day for three years, and have given every satisfaction.

This unique property of "slipping at will" enables the Hele-Shaw plates to be used for brakes, dynamometers, capstans, etc., and has considerably modified engineering practice in all these directions.

One of the designs which the British Hele-Shaw Company are finding in considerable demand is the automatic release clutch. This is particularly useful for heavy work, such as rolling mills, brick works, and coal-handling plants. In this design the pressure on the plates is suddenly relieved as soon as the torque rises above a definite maximum, and the clutch slips under the load.

When the obstruction is removed and the load reaches the normal, the clutch takes up the load again automatically. The automatic release clutch is installed in a number of automatic coaling barges where the coal is handled by bucket elevators. Formerly, it was necessary to have a weak link in the chain, so that when a bucket came up against an obstruction the link would snap and save the bucket from breaking off. This method worked very well, but it was a long job getting another link and putting the chain back.

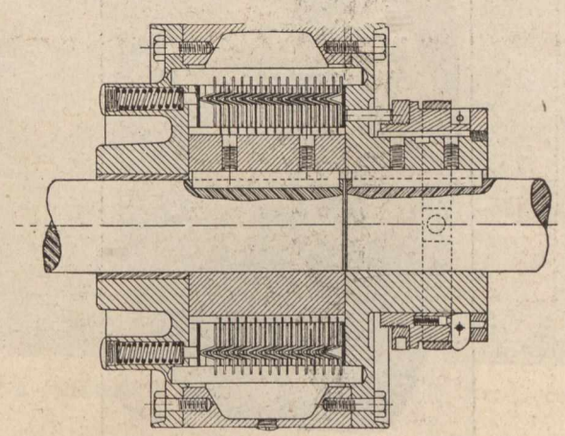

Fig. 2.—Standard Hele-Shaw Clutch Coupling.

With the Hele-Shaw automatic release conveniently placed between the engine and the elevator, a stoppage for obstruction lasts only as long as it takes to clear the obstruction. As soon as the extra stress comes on the chain, the clutch slips and continues slipping until the load falls to the point that the chain will take with safety, when it instantly takes up the drive again automatically.