



ON HYDRAULIC LIFTS FOR PASSENGERS AND GOODS.

requisite safety is thus secured, but at a most extravagant expenditure of power, owing to the want of any balance; the expenditure due to weight of the ram and cage, and to the loss by displacement, being often five or six times that due to the net load. The author has erected several lifts on this plan, where it has not been necessary to provide special pumping plant to obtain the high pressure required. It would however be impracticable to adopt the arrangement as a general rule.

Messrs. Tommasi & Heurtvisé have designed a balancing arrangement separate from the lift cylinder, as shown in Fig. 15. The lifting cylinder A is in hydraulic connection with a second cylinder B of equal capacity, though of shorter stroke. In the second cylinder there is a loaded ram C, of sufficient weight to balance the minimum weight of the lift-ram and cage when at the bottom. This heavy ram works through the stuffing-box of a third cylinder D, of the same capacity as B; and the pressure of water in this third cylinder lifts the net load. Heavy chains E are attached to the ram C, between the two short cylinders, to balance the varying displacement of the ram A as it travels. This plan is satisfactory as regards safety, but the weight and size of the cylinders and moving parts are so great as to render its adoption on a large scale impracticable.

HYDRAULIC BALANCE LIFTS.

The author has endeavoured to overcome the above-mentioned difficulties; and has devised an arrangement which appears to him to meet all the requirements of a perfectly safe, rapid and economical passenger lift. The conditions of the apparatus are as follows:—

- (a) The motive power is water, either at high or low pressure;
- (b) The ram is always in compression, and supporting the load directly;
- (c) The dead weight of the ram and cage is balanced wholly or partly by hydraulic pressure;
- (d) The displacement of the ram is reduced to a minimum, and is balanced without any special mechanism;
- (e) The weight of the moving parts of the lift is reduced to a minimum;
- (f) No part of the machinery or supports is above the cage;
- (g) There is no part of the machinery which, by giving way, could reasonably be expected to cause an accident to those ascending or descending in the lift.

This Hydraulic Balance Lift is shown in Page 87. The hydraulic lifting cylinder, ram, and cage are as usually made, except that the ram is smaller in diameter. Its size is deter-