STEAM POWER

BY

C. F. HIRSHFELD, M.M.E.

PROFESSOR OF POWER ENGINEERING, SIBLEY COLLEGE, CORNELL UNIVERSITY

AND

T. C. ULBRICHT, M.E., M.M.E.

FORMERLY INSTRUCTOR, DEPARTMENT OF POWER ENGINEERING, SIBLEY COLLEGE, CORNELL UNIVERSITY; ASSOCIATE MEMBER AMERICAN SOCIETY OF MECHANICAL ENGINEERS

FIRST EDITION

TOTAL ISSUE, FIVE THOUSAND

NEW YORK

JOHN WILEY & SONS, INC.

LONDON: CHAPMAN & HALL, LIMITED

1916

92. Poppet Valves. Attention has already been called to the fact that the use of highly superheated steam is very effective in lessening or even eliminating initial condensation. Experience has shown that large valves and valves with sliding surfaces such as slide valves and Corliss valves do not work well with highly superheated steam. The large castings warp so that contact surfaces do not remain true and the lack of moisture which acts as a seal with saturated steam leads to excessive leakage. Difficulty has also been experienced with the lubrication of these sliding types of valves when using highly superheated steam.

An old form of valve known as the **poppet valve** has recently been adopted by some builders as a solution of the difficulties met in the use of highly superheated steam. This form of valve in four-valve arrangement, combined with designs in which short ports and symmetrical cylinder castings are used, yields very economical engines which can be safely used with a degree of superheat prohibitively high in the case of the sliding and oscillating forms of valves.

Sections of a modern type of poppet valve engine are shown in Figs. 136 (*a*) and 136 (*b*), and details of the admission valve and its operating mechanism are given in Fig. 137 (*a*) and (*b*). The valves are all double-seated (double-ported or double-beat), that is, they seat at both ends and are made hollow so that the steam passes both around the outside of the valve and through the valve as shown by the arrows in Fig. 137 (*b*). This results in large area for passage of steam and in quick opening and closing, as in the case of gridiron valves, with small actual movement of the valve.

The valves are opened positively by eccentrics operating through cams and rollers as shown in Fig. 136 (*b*) and they are closed by springs as rapidly as the return motion of the cam permits. The eccentrics are mounted on a horizontal lay shaft which is located to one side of the engine, with its axis parallel to that of the latter, and which is driven by bevel gears from the crank shaft of the engine.

Since this valve arrangement gives short steam and exhaust ports, permits the use of small clearance, and

gives fairly rapid opening and closing of valves with little throttling when open, it gives good economy when used with saturated steam. By adding superheat the economy is still further improved. The water rate of one of these engines is shown for one load in Fig. 134 (*a*). A simple, Lentz non-condensing engine is reported to have given a consumption of 16.13 lbs. of steam per horse-power hour with 92.7° superheat, and a pressure of 133 lbs., and this figure is materially lowered by compounding, higher superheat, lower back pressure, etc.

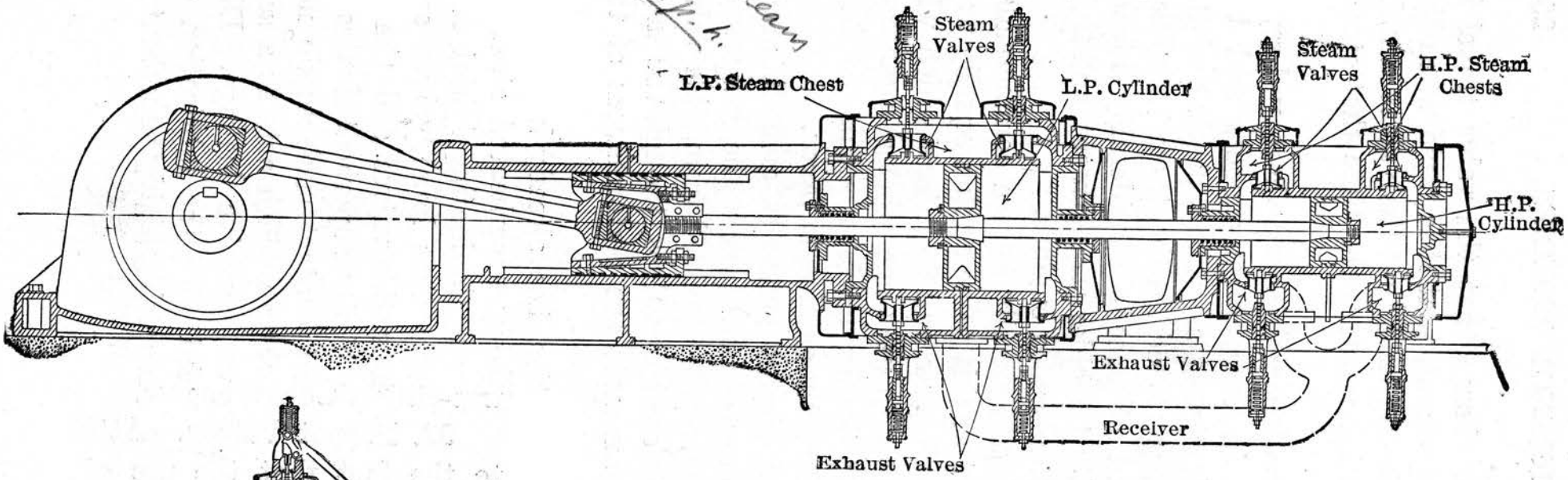
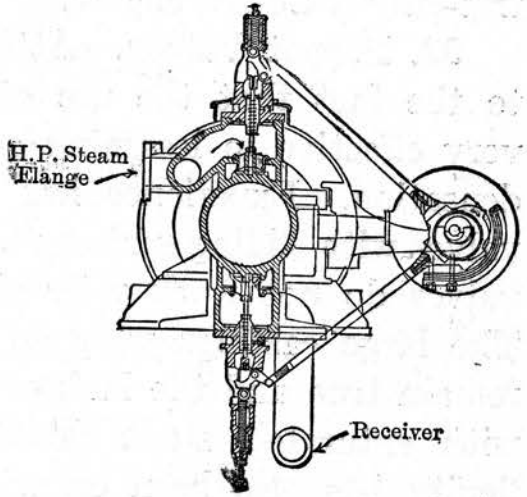


FIG. 136*a*.—Lentz Poppet Valve Engine.



FIG, 136*b*.—Cross-section, Lentz Engine.

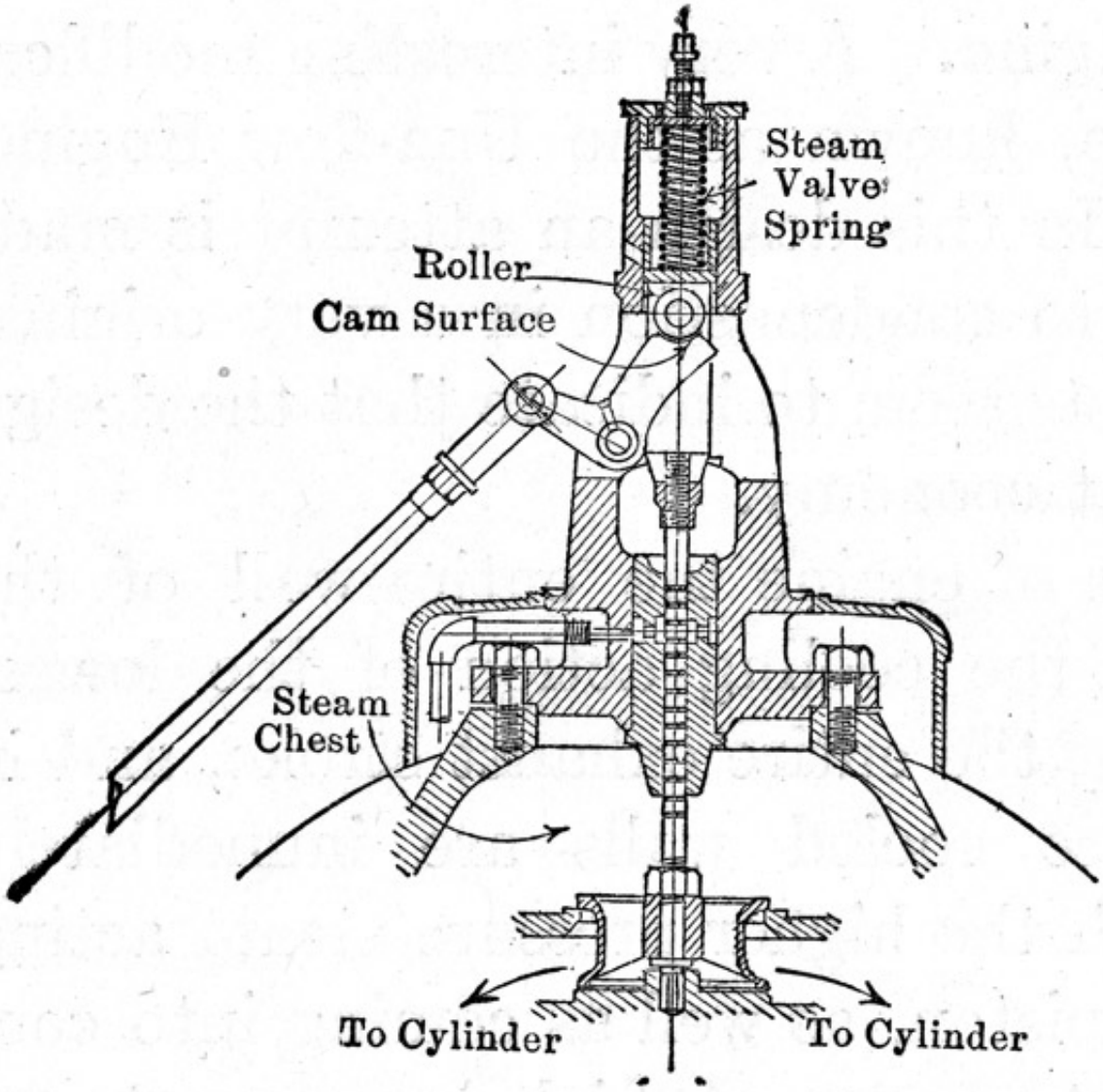


FIG. 137*a*.—Admission Valve and Operating Mechanism, Lentz Engine.

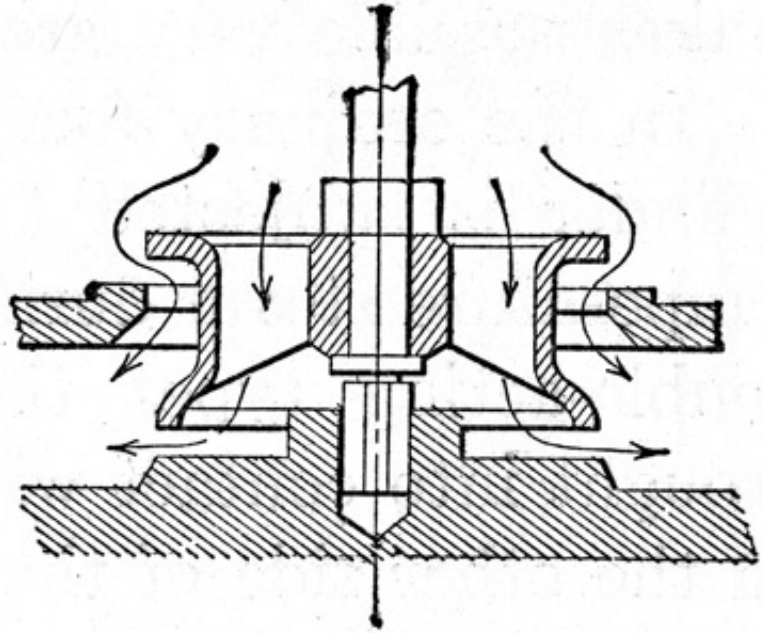


FIG. 137*b*.