DESCRIPTION OF
STEAM CYCLE
OF
Skinner
COMPOUND UNAFLOW
MARINE STEAM ENGINES
**HIGH-PRESSURE DIAGRAM**

A — Steam valve opens
A to B — Admission to high-pressure cylinder
B — Steam valve closes (high-pressure cut-off)
B to C — Expansion in high-pressure cylinder
C — Transfer valve opens (high-pressure exhaust)
C to D — Exhaust from high-pressure cylinder to low-pressure cylinder
D — Transfer valve closes
D to A — Compression in high-pressure cylinder

**LOW-PRESSURE DIAGRAM**

E — Transfer valve opens (low-pressure admission)
E to F — Admission to low-pressure cylinder
F — Transfer valve closes (low-pressure cut-off)
F to G — Expansion in low-pressure cylinder
G — Exhaust ports uncovered in low-pressure cylinder
G to I — Exhaust from low-pressure cylinder to condenser
H — Auxiliary exhaust valve opens
H to J — Auxiliary exhaust from low-pressure cylinder to condenser
J — Auxiliary exhaust valve closes
J to E — Compression in low-pressure cylinder

**NOTE:** Same pressure scale is used for both diagrams. Hence, cards give mean effective pressure, although areas do not represent relative power output. Piston areas must be considered in computing power.
TRI-DIMENSIONAL SECTION

(partially diagrammatic)

through high-pressure cylinder, main cylinder head and low-pressure cylinder, showing pistons, valves and related parts
Transfer valve open
Steam valve closed
Auxiliary exhaust valve closed
Power stroke downward

Steam exhausting from high-pressure cylinder into low-pressure cylinder for further expansion.
All valves closed

Power stroke downward

Steam continuing to expand in low-pressure cylinder.
Compression beginning in high-pressure cylinder.
Steam valve open
Auxiliary exhaust valve open
Transfer valve closed
Power stroke upward

High-pressure steam acting on bottom of high-pressure piston.
Low-pressure steam exhausting to condenser through exhaust ports
and auxiliary exhaust valve.
DESIGN FEATURES OF THE SKINNER
COMPOUND UNAFLOW MARINE STEAM ENGINE

1. Inspection cover.
2. Positive piston rod lock.
3. Four inspection ports for piston rings.
4. High-pressure piston, alloy iron.
5. High-pressure cylinder liner, forged steel, chromium plated. Taper bored to compensate for expansion due to temperature gradient. Cooled by low-pressure steam.
6. High-pressure cylinder casing, alloy iron.
8. Piston rod, forged alloy steel, ground to fine finish.
9. Steam-tight transfer valve, transfers steam to low-pressure cylinder after expansion in high-pressure cylinder.
   Steam valve (not shown) admits steam to high-pressure cylinder from manifold.
   Auxiliary exhaust valve (not shown), relieves compression in low-pressure cylinder when reversing, and may be held open to permit removal of water from self-draining high-pressure cylinder and head.
   All valves are steam-tight, double-seat, telescopic poppet type, with free seat. Permanently tight, regardless of variation in pressure and temperature.
10. Valve cage, steel, with integral seats. All valves mounted in cages for convenience in handling.
11. Return motion mechanism, hydraulic controls, for lead and cut-off.
12. Dual camshafts for accurate timing and positive control of lead and cut-off. All cams, rollers and gears are hardened and ground to close tolerances. Rollers have line contact on cams. Pressure lubrication of all cam mechanism.
13. Control lever, cut-off ahead (or lead astern).
14. Control lever, cut-off astern (or lead ahead).
15. Throttle valve control lever (hydraulic control).
16. Bored crosshead guide, concentrically rabbeted to low-pressure cylinder for permanent alignment.
17. Crosshead shoe, babbitted top and bottom. This construction allows continuous full-load operation either ahead or astern.
18. Crosshead and pins, single-piece high-carbon steel forging.
19. Permanent indicator reducing motion, with detent, for each cylinder. Permits taking indicator cards at any time without stopping the engine.
20. Connecting rod, forged steel, forked at upper end to reduce height, with heat-treated fitted bolts.
21. Frame weldment, box type, provides rigidity and total enclosure for cleanliness.
22. Base weldment, heavy construction for rigidity.
23. Dry sump to prevent oil loss and oxidation due to splash.
24. Injectors for steam cylinder oil. Two for each high-pressure cylinder.
25. Permanent double ground joints, head to high-pressure and low-pressure cylinders. No gaskets.
26. Steam piping, designed to permit expansion.
27. Cylinder head, steam-jacketed, cast steel.
28. Throttle valve, balanced for ease of operation.
29. Exhaust manifold, fabricated steel.
31. Drain for condensate under low-pressure piston.
32. Exhaust ports, ample area to manifold.
33. Low-pressure cylinder, alloy iron, taper bored to compensate for expansion due to temperature gradient.
34. Bulkhead, split for removal through crankcase to provide access to low-pressure piston and cylinder.
35. Bulkhead and vacuum packing, split cases to facilitate removal.

SEE TRANSVERSE SECTION OF COMPLETE ENGINE FOLLOWING DESCRIPTION OF STEAM CYCLE