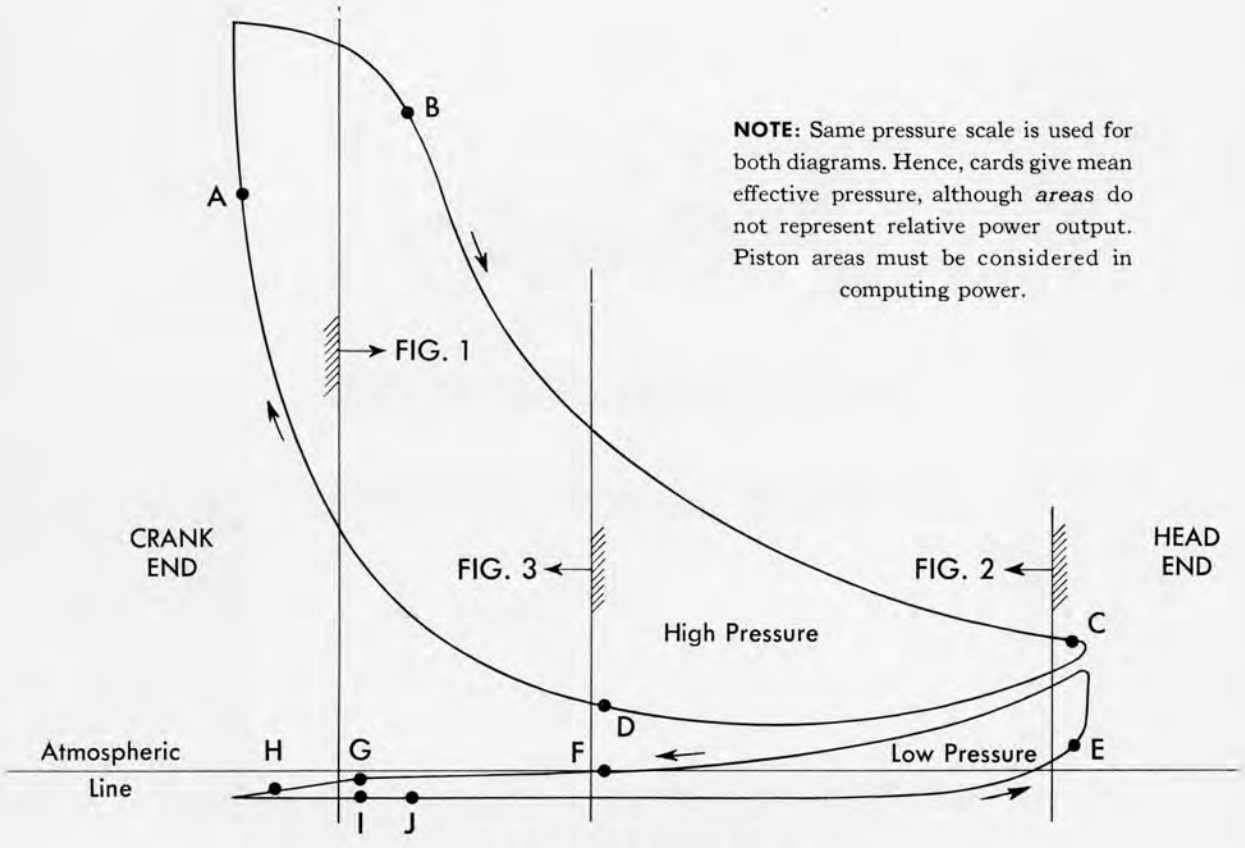
DESCRIPTION OF STEAM CYCLE OF Skinner COMPOUND UNAFLOW MARINE STEAM ENGINES

TURN TO START SEQUENCE

HIGH and LOW PRESSURE DIAGRAMS

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



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.

LOW-PRESSURE DIAGRAM

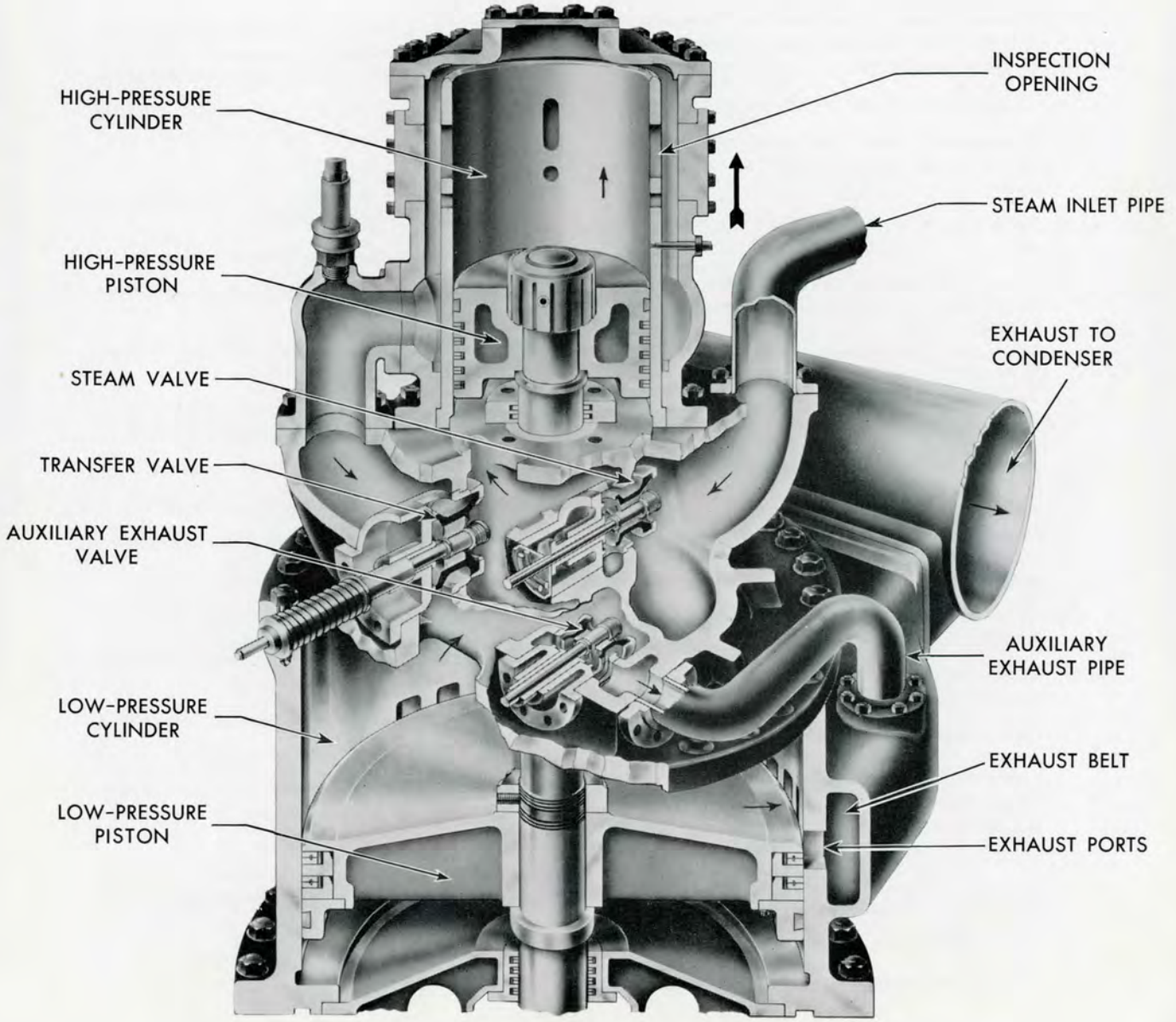
E — Transfer valve opens (low-pressure admission)
E to F — Admission to low-pressure cylinder
F — Transfer valve closes (low-pressure cut-off)
F to G — Expansion in low-pressure cylinder
G — Exhaust ports uncovered in low-pressure cylinder
G to I — Exhaust from low-pressure cylinder to condenser
H —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

IDENTIFICATION of PARTS

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

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.

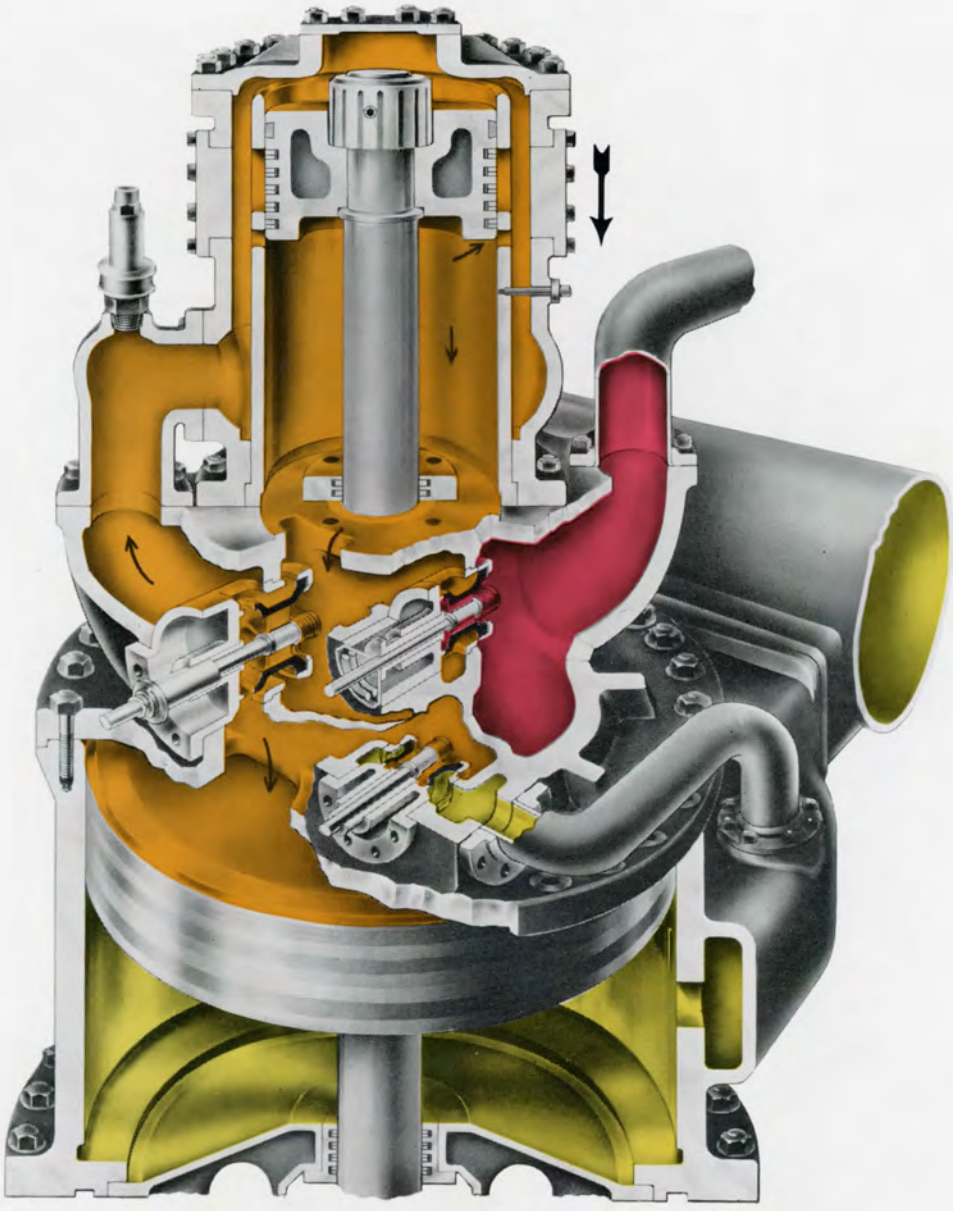


FIG. 2

ALL VALVES CLOSED

All valves closed
Power stroke downward

Steam continuing to expand in low-pressure cylinder.
Compression beginning in high-pressure cylinder.

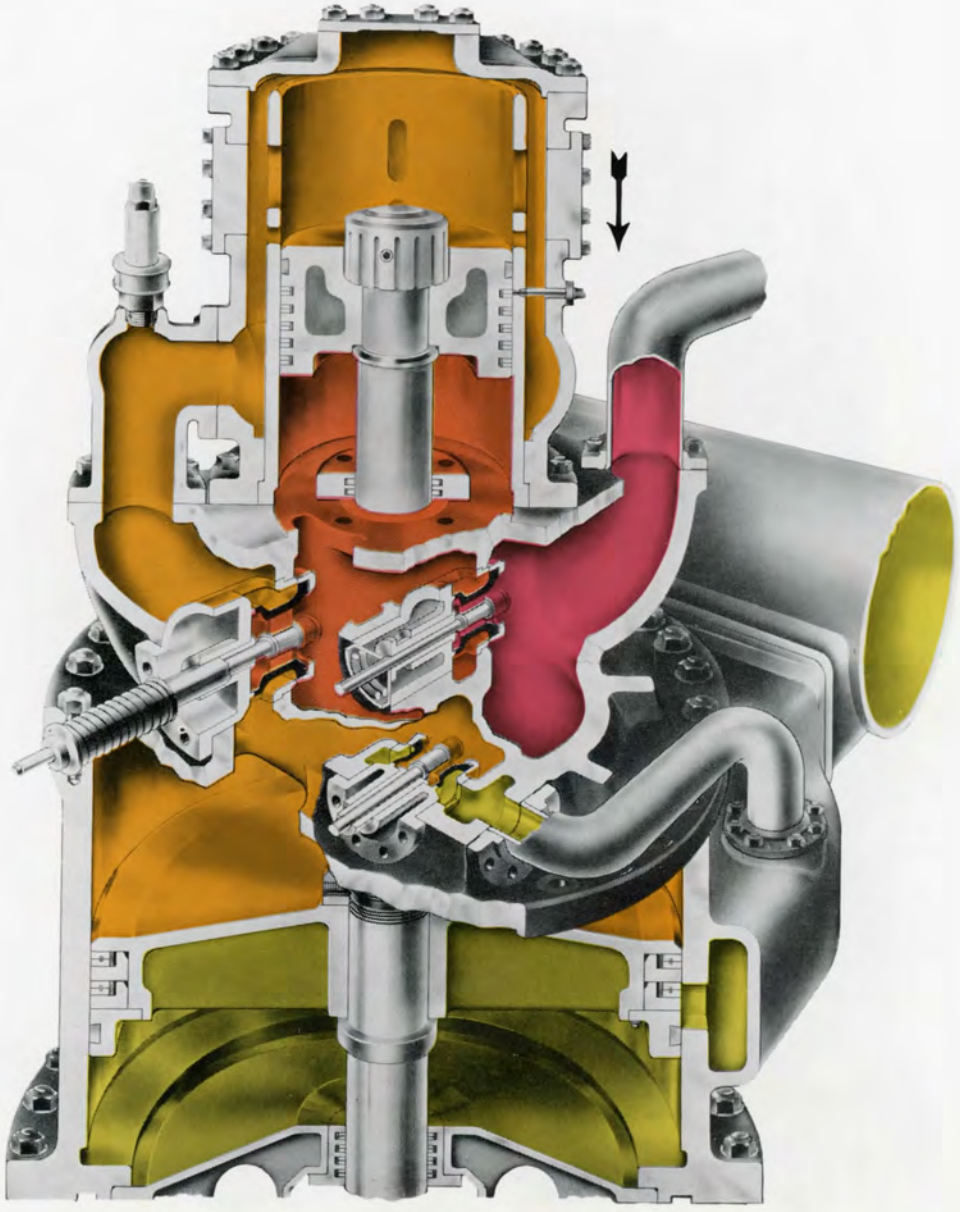


FIG. 3

STEAM VALVE OPEN
AUXILIARY EXHAUST VALVE OPEN

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.

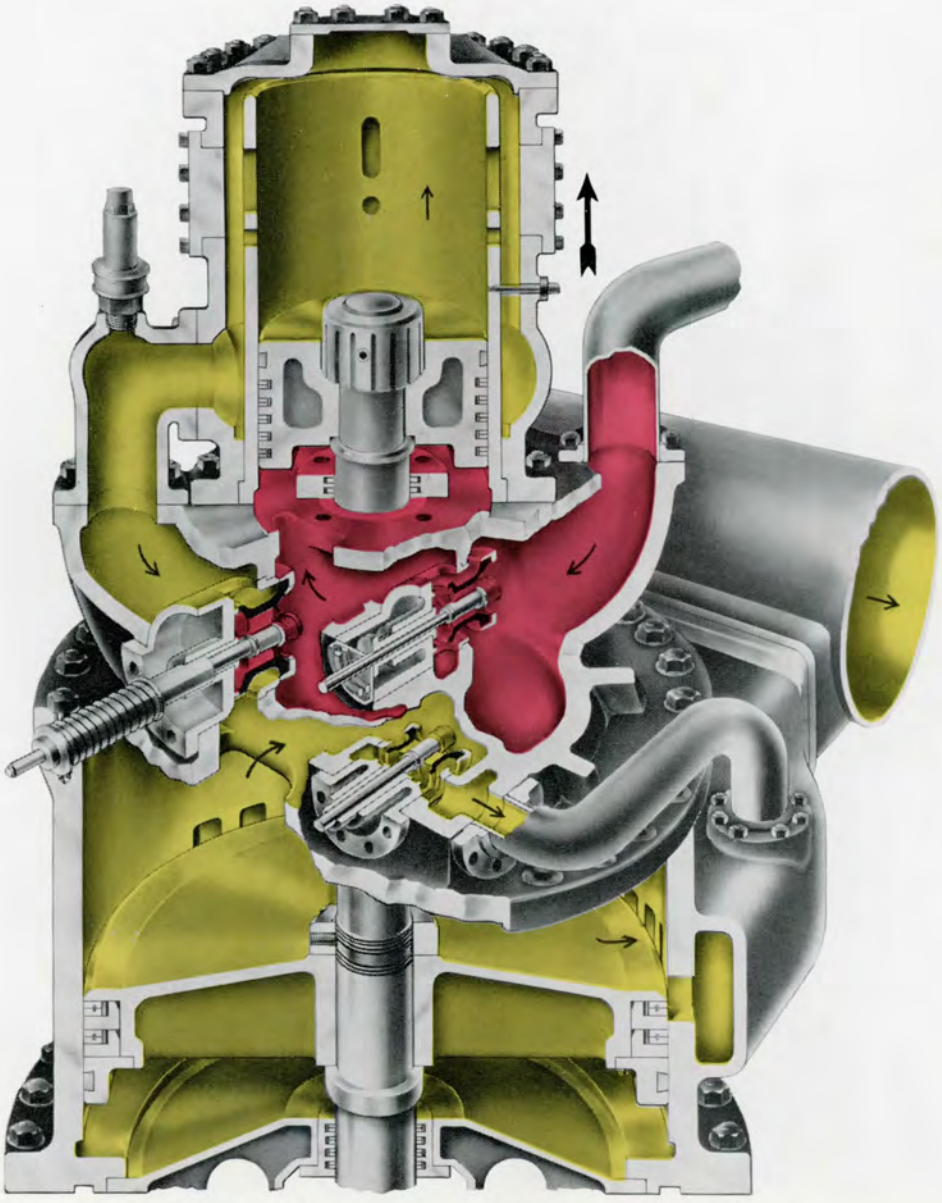
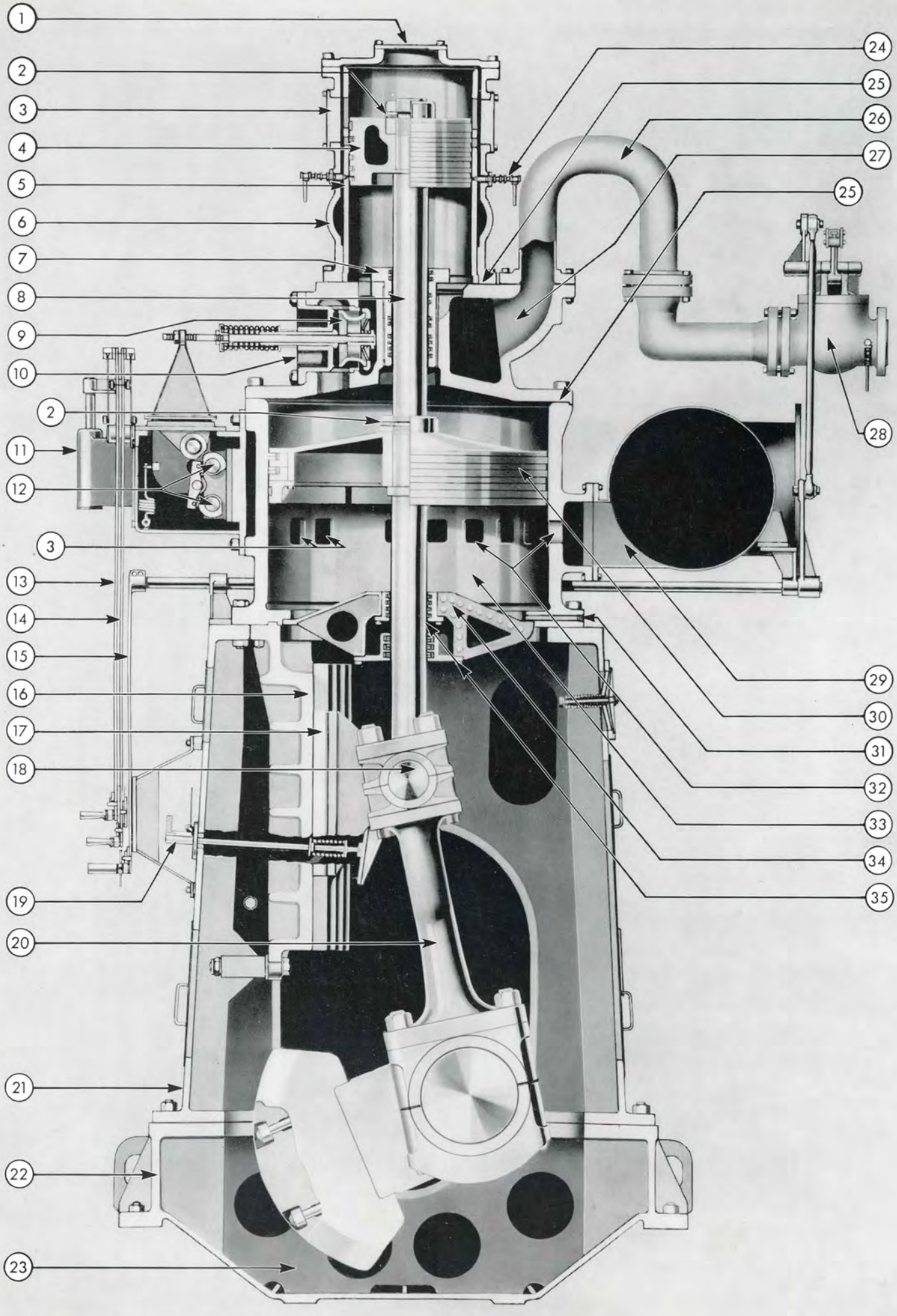


FIG. 1

(TURN FOR FIGS. 2 AND 3)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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.*
7. *High-pressure piston rod steam packing with special bronze rings. Cooled by low-pressure steam.*
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). Control shifts camshafts hydraulically for minimum effort and quick response.*
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.*
30. *Low-pressure piston, fabricated steel. Fitted with sectional piston rings and followers with wear-band inserts. Rings and followers removable through bulkhead opening.*
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