(No Model.) 2 Sheets—Sheet 1.

A. B. LANDIS.

PUMPING ENGINE.

No. 492,870. Patented Mar. 7, 1893.

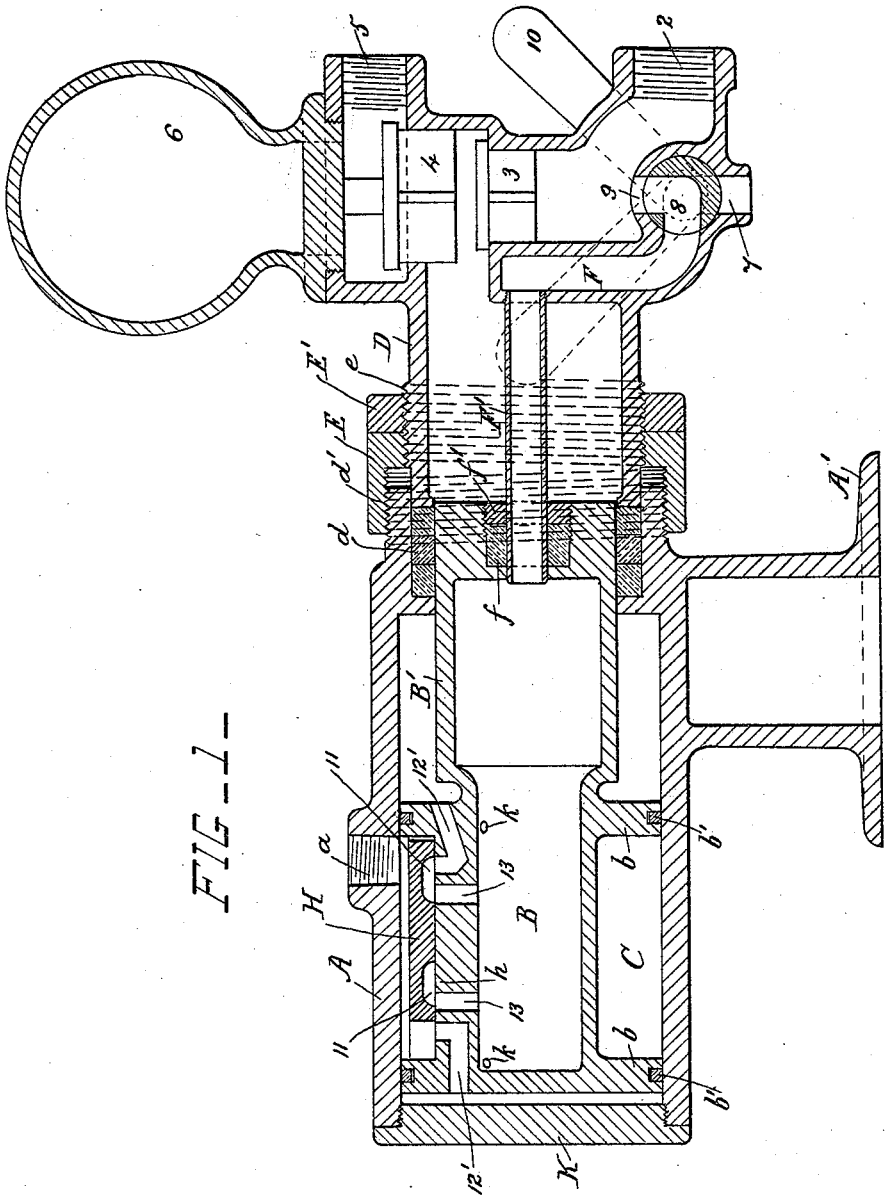

FIG. 1.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 2.

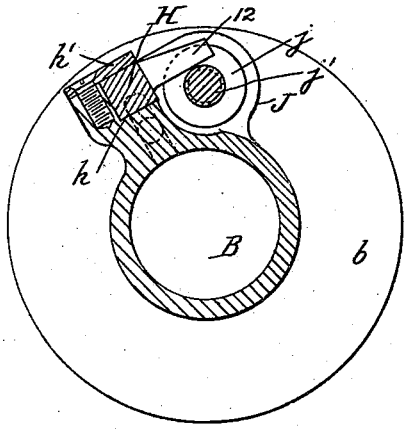


FIG. 3.

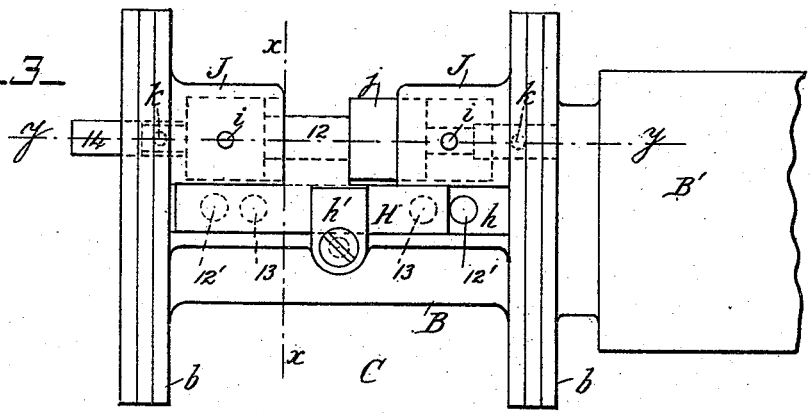


FIG. 4.

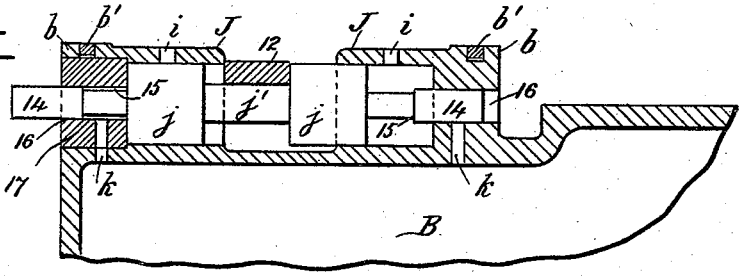
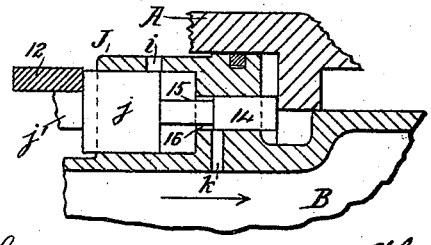


FIG. 5.



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UNITED STATES PATENT OFFICE.

ABRAHAM B. LANDIS, OF WAYNESBOROUGH, PENNSYLVANIA.

PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 492,870, dated March 7, 1893.

Application filed September 10, 1892. Serial No. 445,552. (No model.)

To all whom it may concern:

Be it known that I, ABRAHAM B. LANDIS, a citizen of the United States, residing at Waynesborough, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Pumping-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to pumping engines; and it consists in the novel construction and combination of the parts hereinafter fully described and claimed.

In the drawings: Figure 1 is a longitudinal section through a pumping engine constructed according to this invention. Fig. 2 is a cross-section through the exhaust chamber, taken on the line *x x* in Fig. 3, and drawn to a larger scale. Fig. 3 is a detail plan view of the main pistons and steam distributing devices. Fig. 4 is a longitudinal section through the small cylinders for operating the valve, taken on the line *y y* in Fig. 3. Fig. 5 is a similar view of one of the small cylinders showing its piston in a position to be operated by the steam.

A is the steam cylinder of the pumping engine, provided with the stand A′ and the steam inlet *a*.

B is the exhaust chamber, and *b* are two pistons which slide back and forth in the cylinder and guide and support the said exhaust chamber.

C is the steam chest formed between the two pistons and between the cylinder and the exhaust chamber.

The customary external steam chest, with its joints and cover, is dispensed with, and the combined steam chest C and exhaust chamber B slide back and forth with the pistons *b* inside the cylinder A. The steam inlet *a* is arranged at about the middle of the cylinder, and the pistons *b* are arranged at such a distance apart from each other that the steam chest C is always in communication with the said inlet. The pistons *b* are provided with packing rings *b′* of any approved construction.

B′ is the pump plunger which forms a continuation of the exhaust chamber B, and slides back and forth with it.

D is the pump barrel provided with the water inlet 2, the suction valve 3, the delivery valve 4, the water outlet 5, and the air vessel 6, all the said parts being of any approved construction.

A stuffing-box *d* is formed at the front end of the cylinder A, and has an external screw-threaded portion *d′*. The end of the pump barrel is inserted in the stuffing-box, and is provided with the screwthreaded portion *e*. The screwthreads *d′* and *e* are cut in reverse directions, and E is a coupling nut provided with screwthreaded portions cut in opposite directions and engaging with the said screwthreads *d′* and *e*. The end of the pump barrel is drawn within the stuffing-box to tighten the packing by turning the nut E.

E′ is a jam nut screwed on the screwthread *e* to prevent the said nut E from working slack.

F is the exhaust steam passage, preferably formed in the water space or chamber of the pump between the end of the pump barrel and the water inlet or suction. F′ is the exhaust pipe secured to the end of the pump barrel in communication with the passage F. This pipe F′ passes centrally through the front end of the plunger B′ and is constantly in communication with the exhaust chamber B. A stuffing-box *f* is formed in the front end of the pump plunger, and *f′* is a nut for tightening up the packing in the said stuffing-box around the pipe F′.

The exhaust steam passage F is provided with an outlet 7 leading into the atmosphere, and a second outlet 9 leading into the water inlet of the pump. A valve 8 is seated in the lower part of the pump casting and is provided with a handle 10 so that it may be turned in its seat to place either of the passages 7 or 9 in communication with the exhaust steam passage F. This permits the exhaust steam to be discharged into the atmosphere or into the water which is being pumped. The exhaust steam is mostly condensed in its passage from the exhaust chamber through the pipe F′ and passage F, and the remainder of

it is condensed by contact with the water in the pump, and is forced through the delivery valve by the action of the pump.

H is the slide valve which slides back and forth in a seat *h* arranged in the steam chest and projecting from the exhaust chamber. A removable cover *h'* is provided for retaining the valve on its seat.

The slide valve H is provided with two exhaust cavities 11, and has an arm 12 projecting from its side for operating it.

The valve seat *h* is provided with two steam ports 12' leading into the opposite ends of the cylinder, and two exhaust ports 13 leading into the exhaust chamber.

J are two small auxiliary cylinders projecting from the pistons *b*, in line with each other, within the steam chest. Two pistons *j* slide within the cylinders J and are connected by the central stem *j'*. The arm 12 is arranged between the pistons *j* and is operated by them. The ends 14 of the stem *j'*, at the opposite ends of the pistons *j*, are provided with circumferential grooves 15 and slide in holes 16 in the ends of the cylinders J. The end of the rear cylinder is formed of a removable plug 17, so that the pistons can be inserted into the cylinders. Holes *i* are provided for connecting the cylinders J with the steam chest, and holes *k* are provided for connecting the holes 16 with the exhaust chamber.

The ends 14 of the stem *j'* are adapted to strike the ends of the steam cylinder as the main pistons move back and forth in it. The rear end of the cylinder consists of a removable cover K, and all the working parts may be removed and examined by simply taking off this cover and sliding the main pistons out of the cylinder. The width of the arm 12 is less than the distance between the pistons *j*, and the holes *i* and *k* are arranged so that the hole *k* is closed and the hole *i* opened when the piston *j* touches the arm 12, as shown in Fig. 5, and when the main pistons and exhaust chamber are moving in the direction of the arrow.

The operation of the engine is as follows: The steam admitted to the steam chest as shown in Fig. 1, passes down the steam port to the rear end of the cylinder and propels forward the main pistons, exhaust chamber, steam chest and pump plunger, and the steam from the front end of the cylinder escapes through the exhaust cavity in the slide valve to the exhaust chamber. Shortly before the forward stroke is completed the front end 14 of the stem *j'* strikes the front end of the cylinder, and the two small pistons *j* are held stationary. The main pistons and the small cylinders J continue their forward motion, the slide valve and its seat moving with them until the arm 12 touches the end of the front piston and the exhaust hole *k* is closed by the end 14 of the stem *j'*, as shown in Fig. 5. At this moment the steam enters the front end cylinder J through the hole *i* and forces the pistons *j* rearwardly, to the position shown in Fig. 4. The pistons *j* move the slide valve to the opposite end of its stroke and permit the steam to enter the front end of the main cylinder. The steam from the rear end of the main cylinder escapes into the exhaust chamber through the cavity in the slide valve. The steam from the rear end cylinder J escapes through the groove 15 and hole *k*, as shown in Fig. 4, while the pistons *j* are being moved rearwardly by the steam. The valve is reversed in a similar manner at the rear of the cylinder, and the pump plunger is reciprocated as long as steam is supplied.

What I claim is—

1. The combination, with a cylinder, of two pistons sliding therein, a central exhaust chamber carried by the said pistons and forming an annular steam chest between the pistons and having steam and exhaust ports connecting the said steam chest with the ends of the cylinder and with the said exhaust chamber respectively, and a slide valve reciprocating with the said pistons and adapted to be slid independent of the pistons, substantially as set forth.

2. The combination, with a cylinder, of two pistons sliding therein, a combined exhaust chamber and steam chest carried by the said pistons and provided with steam and exhaust ports connecting the said steam chest with the ends of the cylinder and with the said exhaust chamber respectively, a slide valve arranged in the said steam chest, two auxiliary cylinders carried by the main pistons and provided with steam and exhaust passages, and two auxiliary pistons operatively connected with the said slide valve, whereby the slide valve is reversed at the ends of the strokes of the main pistons, substantially as set forth.

3. The combination, with a cylinder, of two pistons sliding therein, a combined exhaust chamber and steam chest carried by the said pistons and provided with the steam ports 12' and exhaust ports 13, a slide valve arranged in the steam chest and provided with the exhaust cavities 11 and a projecting arm, two auxiliary cylinders carried by the main pistons and provided with the steam inlet holes *i*, the holes 16 at the ends of the cylinders and the exhaust holes *k* connecting the holes 16 with the exhaust chamber, and two auxiliary pistons engaging loosely with the said arm and provided with a central stem having ends 14 provided with grooves 15, said ends being adapted to slide in the said holes 16 and to strike the ends of the main cylinder, substantially as set forth.

4. The combination, with a cylinder having a steam inlet at substantially the middle of its length, of a reciprocating exhaust chamber having a piston at each end and an annular steam chest between the said pistons and surrounding the said exhaust chamber, the said steam chest being constantly in communication with the said steam inlet, a valve carried in the said steam chest and operating to distribute the steam to the ends of the cyl-

inder and to the said exhaust chamber, and a stationary exhaust pipe projecting centrally within the said exhaust chamber, substantially as set forth.

5. The combination, with a cylinder, of a chamber for exhaust steam reciprocating in the cylinder, a water chamber secured to the said cylinder, and an exhaust pipe connected with the said water chamber and projecting centrally of the cylinder within the said reciprocating exhaust chamber, substantially as set forth.

6. The combination, with a cylinder, of a chamber for exhaust steam reciprocating in the cylinder, a water chamber secured to the said cylinder, an exhaust passage in the water chamber, an exhaust pipe connected to the said passage and projecting centrally of the cylinder and within the said reciprocating exhaust chamber, and a valve arranged in the said exhaust passage and adapted to discharge the exhaust steam into the water or into the atmosphere, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ABRAHAM B. LANDIS.

Witnesses:
FRANK WENGLY,
ALF. N. RUSSELL.