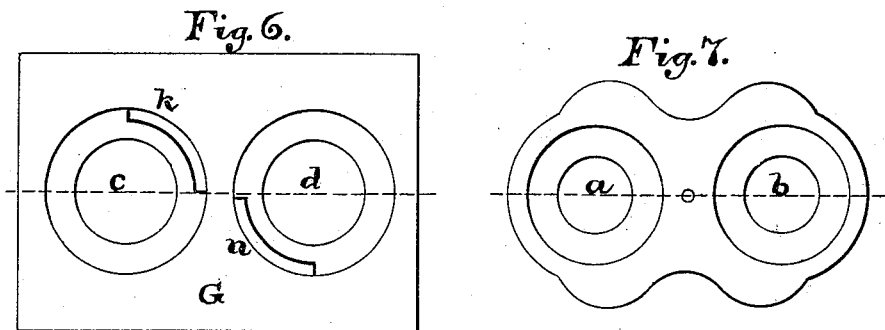
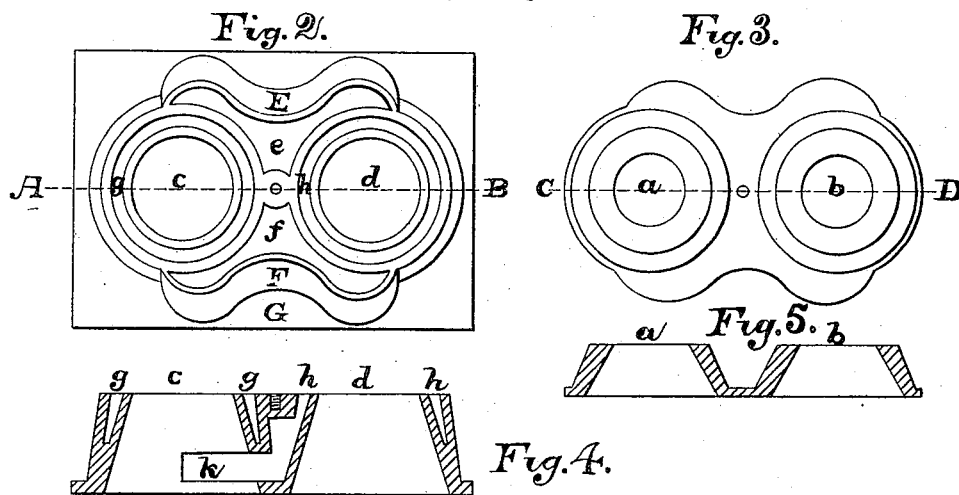
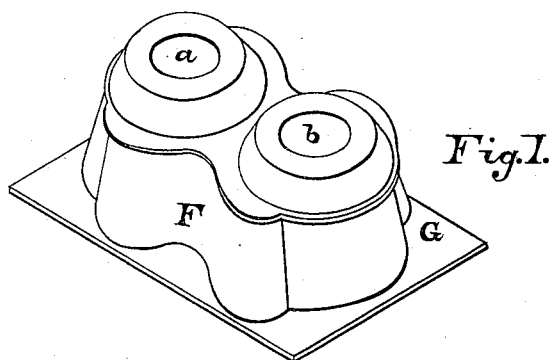


(No Model.)

D. HARRIGAN.
VACUUM EXHAUST PIPE.

No. 263,514.

Patented Aug. 29, 1882.



Witnesses;

Berkeley Powell
Edgar H. Woodman

Inventor.

Dennis Harrigan

UNITED STATES PATENT OFFICE.

DENNIS HARRIGAN, OF SOMERVILLE, MASSACHUSETTS.

VACUUM EXHAUST-PIPE.

SPECIFICATION forming part of Letters Patent No. 263,514, dated August 29, 1882.

Application filed July 13, 1882. (No model.)

To all whom it may concern:

Be it known that I, DENNIS HARRIGAN, a citizen of the United States, residing at Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Vacuum Exhaust-Pipes; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a perspective view of the complete device with the tips attached. Fig. 2 is a top view with the tips removed. Fig. 3 is a top view of the tips. Fig. 4 is a section through Fig. 2 from A to B. Fig. 5 is a section through Fig. 3 from C to D. Fig. 6 is a bottom view of the complete exhaust, and Fig. 7 is a bottom view of the tips.

The invention is intended not only to diminish what is called the "back-pressure" upon the piston, which naturally results from the contraction of the nozzle of the exhaust-pipe, but to utilize such back-pressure by creating a vacuum in front of the other advancing piston. The arrangement of parts is such that this action alternates from one piston to the other, according to which of the two exhaust-pipes is in use for the escape of exhaust-steam.

The device hereinafter described is analogous to one for which Letters Patent No. 240,249, dated April 19, 1881, have been granted to me, but improved and rendered more effective by a rearrangement and modification of its parts.

The exhaust-pipes—one for each cylinder—are arranged near each other, as in the ordinary method, and united together in such way, by casting all but the tips in one piece, so as to prevent any connection between the steam-spaces *e* and *f* upon their opposite sides.

a b are the openings in the tips for the passage of the exhaust-steam after leaving the main exhaust.

c d are the openings of the main exhaust-pipes and represent the main pipes.

g h are annular chambers surrounding the main exhaust-pipes, each having a suitable opening into one of the steam-spaces *e f*.

G is a plate forming part of the casting, ex-

tending around the outsides of the exhaust-pipes, and sufficiently large to admit the inclosing of a space upon its surface outside the annular chambers to make the steam spaces *e f*.

Upon the inside of the exhaust-pipe *c*, near the point where the exhaust-steam enters, a port, *k*, of suitable dimensions, is cut through its cylindrical wall for the passage of steam into the steam-space *e*, and a similar port, *n*, in the wall of the exhaust-pipe *d*, allows the passage of exhaust-steam into the steam-space *f*. At the opposite end of this steam-space *f* an opening connects with the annular chamber *g*, and a similar opening from the steam-space *e* connects with the annular chamber *h*.

The tips are made in a separate casting, to be attached to the main exhaust by screws at suitable points, so as to be removable at pleasure, and the openings *a b* in the tips are somewhat reduced in size from those in the main exhaust. The tips may be discarded altogether by providing suitable coverings for the steam-spaces *e f*, so as to prevent the escape of steam except through the annular chambers; but the detachable tips are in many respects preferable.

When in use the exhaust operates as follows: If the steam is passing from the cylinder upon that side through the exhaust-pipe *c*, the contracting sides of that exhaust-pipe retard its escape, and a portion passes through the port *k* and steam-space *e* into the annular chamber *h*, and thence outward through the tip *b*. This escaping steam, rushing through the tip *b* when the opposite side is exhausting, serves to create a vacuum in the main pipe *d*, and thus assist in removing the obstruction of atmospheric pressure or dead steam from the path of the advancing piston. Similar action takes place when the other cylinder is exhausting, but upon the opposite exhaust-pipe, and thus the action alternates from one pipe to the other in perfect regularity, according to the strokes of the pistons on either side.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A vacuum-exhaust consisting of two pipes provided with steam-spaces, and annular chambers and suitable ports, and connecting-passages between said spaces and chambers for creating a vacuum in the pipe not then exhaust-

ing, constructed and arranged substantially as shown and described.

2. In combination with the plate G, the pipes *c d*, surrounded by the annular chambers *g h*, and the steam-spaces *e f*, provided with suitable ports and connecting passages, with the tips *a b*, arranged and constructed substantially as shown, and for the purpose set forth.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

DENNIS HARRIGAN.

Witnesses:

BERKLEY POWELL,
EDGAR H. WOODMAN.