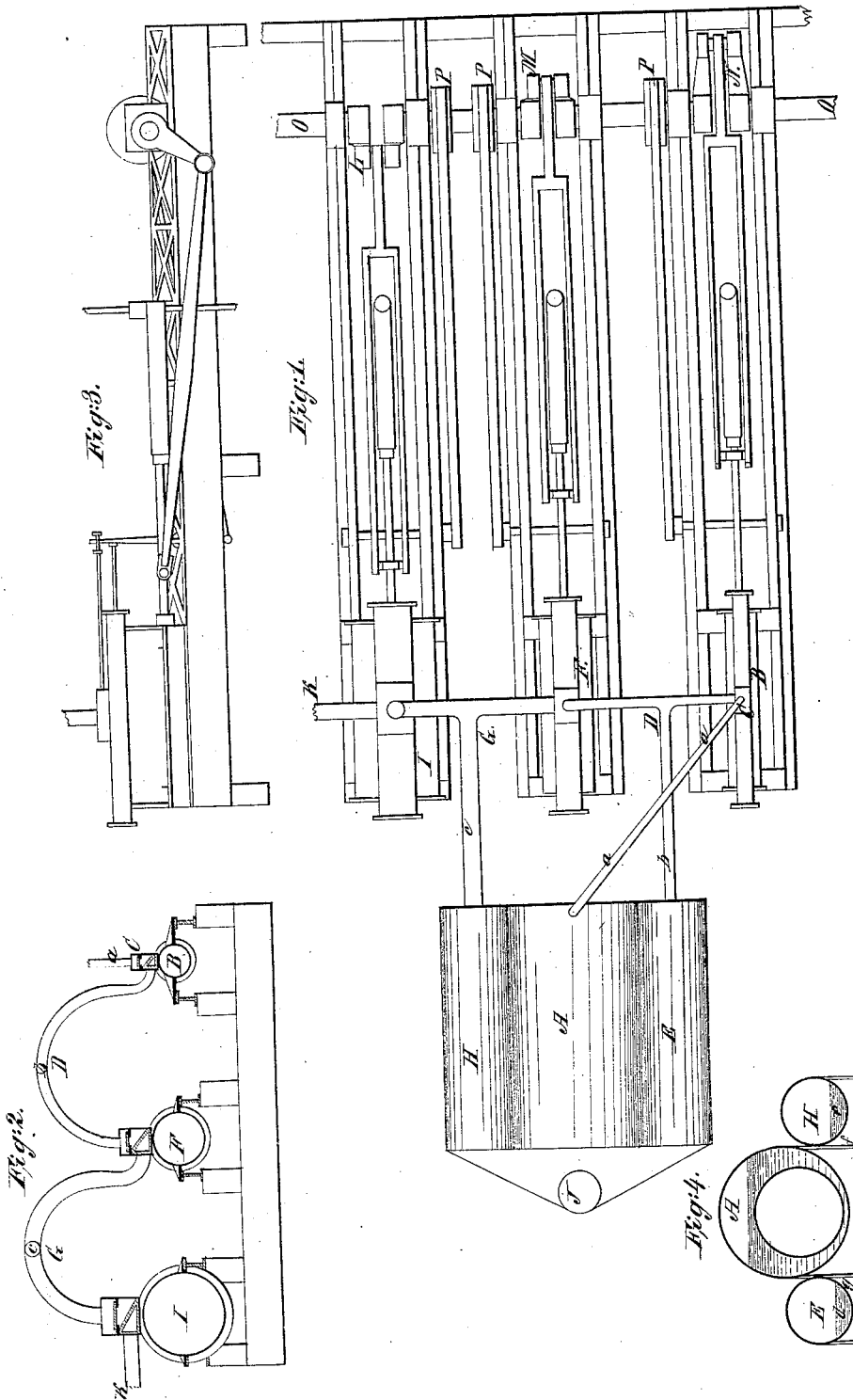


*J. Frost,
Compound Steam Engine.*

N^o 2,323.

Patented Nov. 3, 1841.



UNITED STATES PATENT OFFICE.

JAMES FROST, OF BROOKLYN, NEW YORK.

CONSTRUCTION OF STEAM-ENGINES KNOWN AS "THE REPEATING EXPANSIVE ENGINES."

Specification of Letters Patent No. 2,323, dated November 3, 1841.

To all whom it may concern:

Be it known that I, JAMES FROST, civil engineer, of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in the Manner of Constructing Steam Engines; and I do hereby declare that the following is a full and exact description thereof.

I denominate my improved engine the "repeating expansive engine," and I so denominate it because I use the same steam expansively, in two, three, or more, cylinders in succession, each of larger capacity than that which preceded it. The first, or smallest, cylinder is to receive its supply of steam directly from the boiler, or generator, which is constructed and heated in the ordinary way. Alongside of this boiler I place steam receivers, or reservoirs, which I usually make cylindrical and of the same length with the boiler; these I make capacious, say of half the diameter of the boiler, more or less; they are intended to receive the steam after it has acted in one cylinder, on its way to that in which it is next to operate. These steam receivers I keep heated by causing the gaseous products of combustion to pass through flues below them, on their way to the chimney, instead of allowing them to pass directly thereto; the heat, therefore, which would otherwise be wasted, I employ to heat these receivers, and thus to preserve and augment the elasticity of the steam during its passage from one cylinder to another. As the heat thus communicated to these steam receivers will, in general, be sufficient not only to preserve the elasticity of the steam, but also, as above indicated, to augment it, I cause them to receive a small supply of water, which may be evaporated by this excess of heat, and thus operate in increasing the power of the engine without increasing the consumption of fuel.

In the accompanying drawing Figure 1, is a top view of my engine, showing three combined expansive cylinders, which number I believe to be that which it will be found most convenient to use. Fig. 2, is a cross section through the middle of the respective cylinders; Fig. 3, a side view of one of the cylinders, together with the connecting rod, crank, valve rods, and other parts. Fig. 4, is a cross section of the boiler, and the two steam receivers.

In each of these figures like parts are designated by the same letters of reference.

A, is the steam boiler which may be constructed in any of the known ways adapted to the purpose; B, is the first cylinder, in which the high steam from the boiler is to operate, *a, a*, being the steam tube leading from it to the valve box C. This is to be furnished with a cut-off, or expansion, valve, by which the entrance of steam from the boiler is cut off at any determined part of the stroke, say at one-third, or one-fourth, it being allowed to act expansively during the remainder of it. At the termination of the stroke in this cylinder, the steam escapes therefrom into the pipe D, through which it is admitted into the steam receiver E. The pipe D, as represented in the drawing, passes over in an arched direction to the second steam cylinder F, see Fig. 2, but it has a pipe *b*, leading from it into the receiver E, and the valve in F, not being in a position to admit the steam, it passes into the receiver. It will be manifest that the steam may, if preferred, be carried through a tube directly into the receiver, and from that through a second tube to the cylinder F. Into this second cylinder the steam is to be admitted during a portion only of the stroke, and is then to operate expansively as in the first cylinder; the second cylinder is to be of greater capacity than the first, say two or three times as great; in other respects, its construction and action will be identical with the former.

G, is a steam pipe of a size considerably larger than D, to adapt it to the conveyance of less elastic steam; this tube conveys the steam from the cylinder F, to a third cylinder I, and has a tube *c*, leading from it to the second receiver H, the connection in this case being precisely similar to that between the cylinders B, and F, and the capacity of the cylinder I, in like manner exceeding that of the cylinder F. From the last cylinder in the series the steam is to escape in a very expanded state, as through the eduction pipe K, by which it may be conveyed to a condenser.

In the steam reservoirs, or receivers, E, and H, Fig. 4, the shaded part *d*, and *e*, represents a portion of water in each of them, for the purpose hereinbefore made known. Below these receivers are flues *f*, and *g*, through which the heated air from

the furnace of the boiler A, is to pass on its way to the chimney J. The arrangement of this part must be such as to adapt it to the boiler and furnace, and may vary according to the judgment of the engineer. The stroke of the respective cylinders will be governed by the cranks L, M, and N, on the crank shaft O, O.

P, P, P, are eccentrics, for operating the valves in the usual manner.

Having thus, fully described the nature of my improvement in the steam engine, what I claim therein as new, and desire to secure by Letters Patent, is—

The use, in combination, of two, three, or more steam cylinders, in each of which the same steam is to be used expansively, its supply being cut off at any preferred part of the stroke, and the successive cylinders being of increased capacity, as set forth; and in combination with said cylinders; and as making a part of my particular arrangement, I claim the employment of the steam receivers, intermediate between the respective cylinders; said receivers being heated by the heated air from the furnace, in its passage to the chimney; the whole being combined, arranged, and operating, substantially as herein described.

I do not claim either of the component

parts of this apparatus taken individually; nor do I claim the right of using the same steam in two, or more, cylinders successively, that having been done by James, and by others. Nor do I claim the exclusive right of using steam in an engine with double cylinders of unequal dimensions, where the steam is used expansively in the larger cylinder, while the steam reacts with a great and variable force against the piston of the smaller cylinder propelled by unexpanded high steam; this having been done, and being still done, in Woolf's engine.

The difference between the action of the engine as claimed by me, and those referred to in the foregoing disclaimers will be apparent to every engineer conversant with the subject of steam engines; as it will be readily perceived that by my arrangement, all unnecessary reaction upon primary or secondary pistons may be avoided, or reduced to the minimum, while the expansive force of the steam is preserved as nearly at its maximum as can be practically effected.

JAMES FROST.

Witnesses:

EDWARD COPLAND,
WILLIAM RUSHMORE.