W. F. GARRISON.

Air and Gas Compressor.

No. 214,769. Patented April 29, 1879.

Fig. 1.

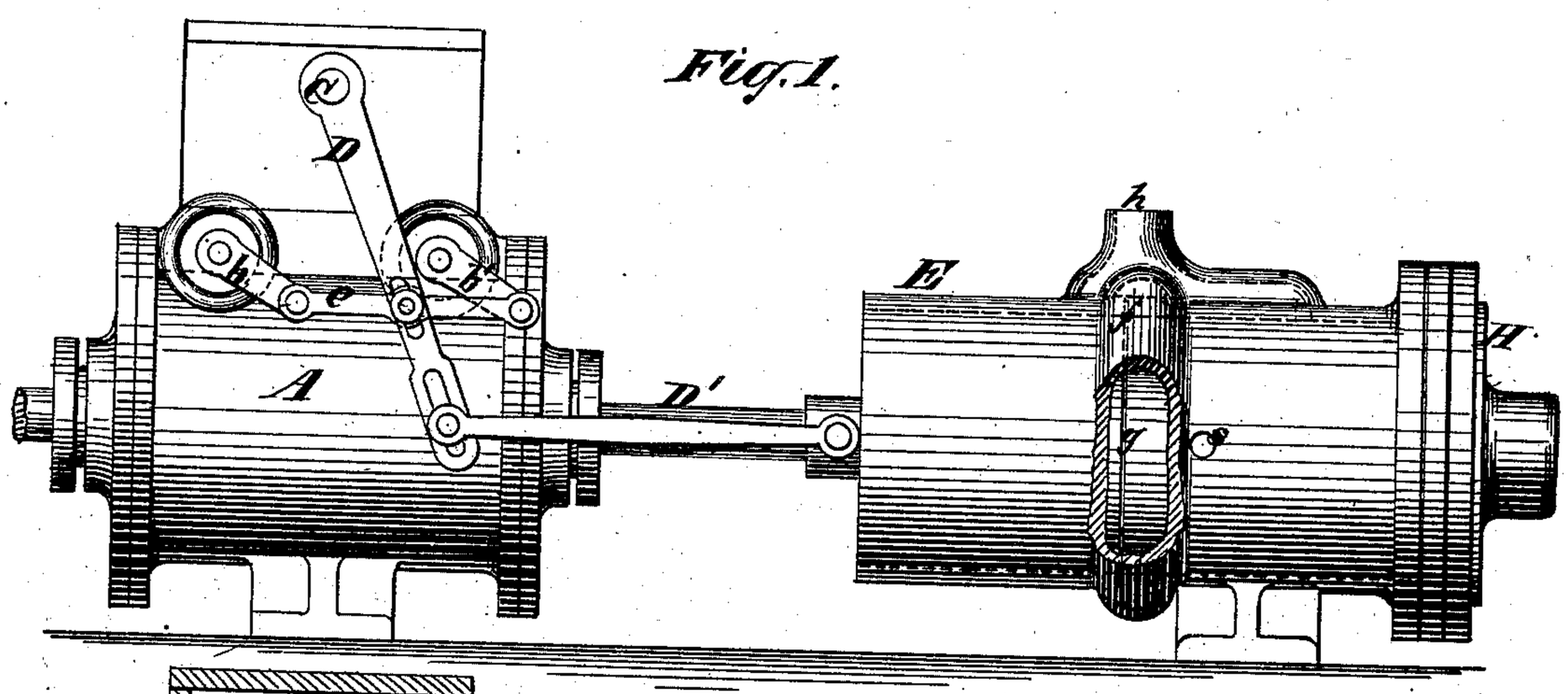


Fig. 2.

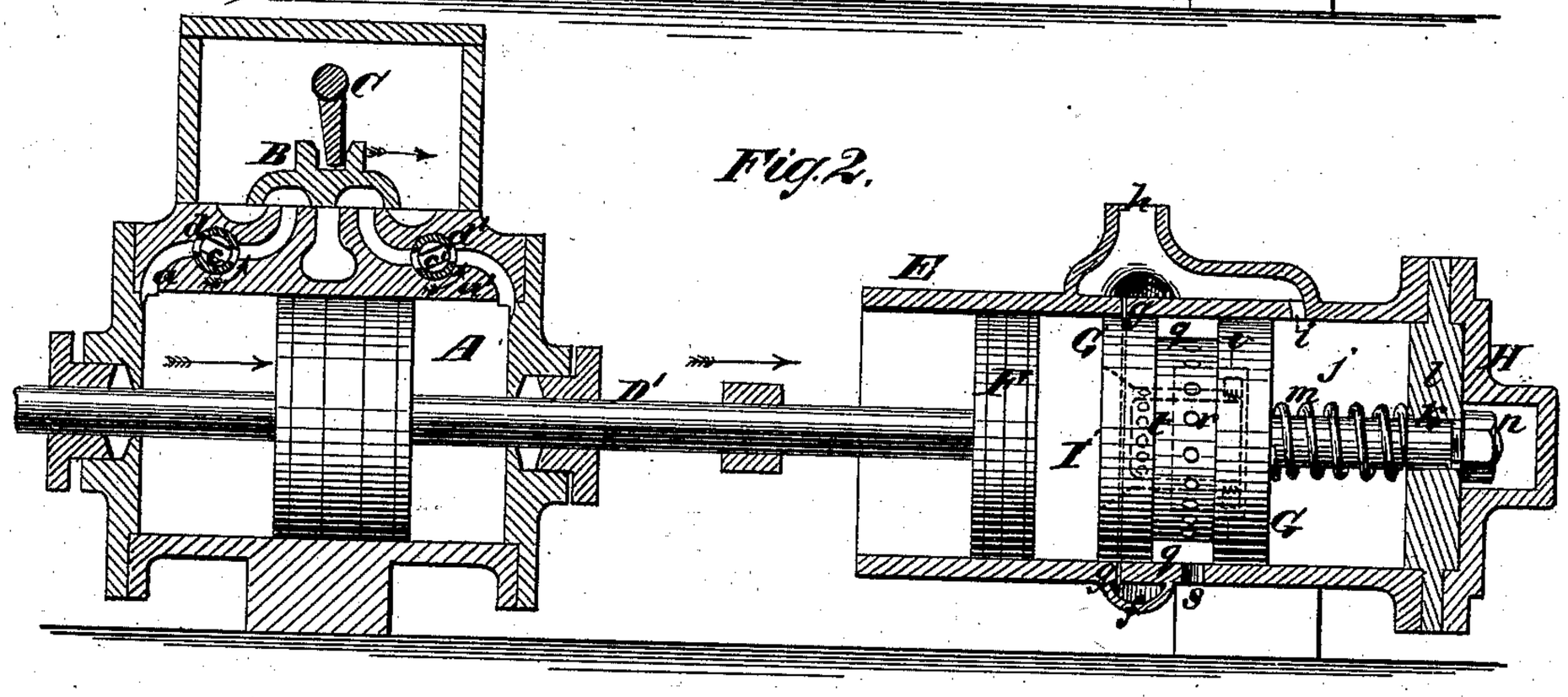


Fig. 3.

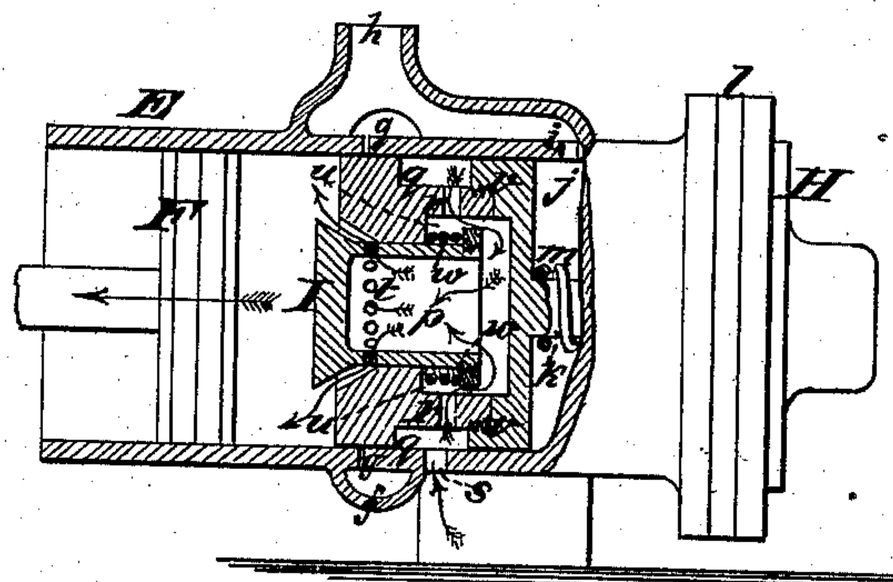
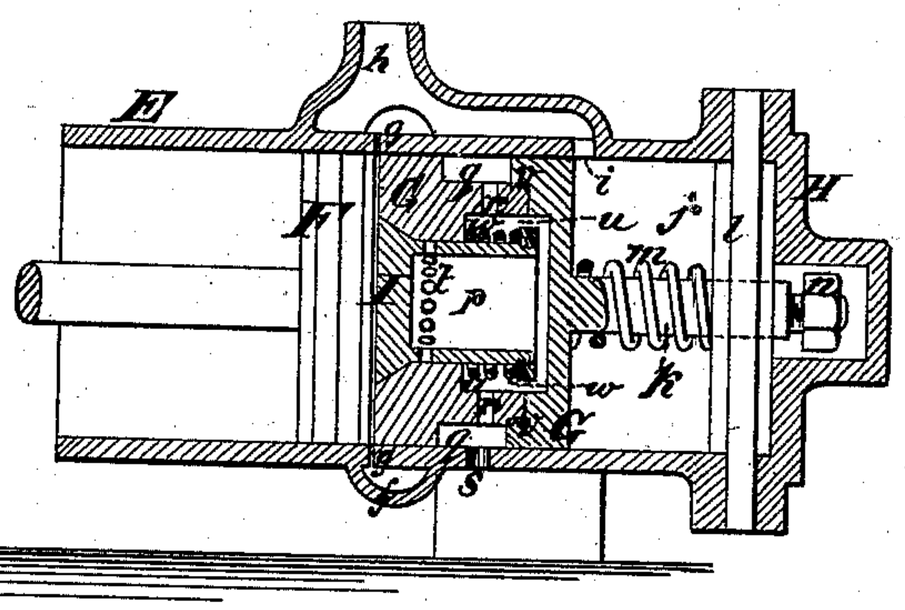


Fig. 4.



Witnesses
John Becker
by Fred'k Haynes

Inventor
William F. Garrison
by his Attorneys
Brown & Allen

UNITED STATES PATENT OFFICE.

WILLIAM F. GARRISON, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN AIR AND GAS COMPRESSORS.

Specification forming part of Letters Patent No. **214,769,** dated April 29, 1879; application filed April 16, 1878.

To all whom it may concern:

Be it known that I, WILLIAM F. GARRISON, of the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Air and Gas Compressors; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

My invention consists in a novel construction of the air or gas compression cylinder and delivery-valve of an air-compressor, and a novel system of passages in the said cylinder, whereby provision is made for the complete expulsion of all the compressed air from the cylinder at the end of the stroke.

My invention further consists in a novel combination of induction and eduction valves in an air or gas compressor, whereby a very effective operation of said valves is obtained.

In the accompanying drawings, Figure 1 is a side elevation of the steam-cylinder and one of the air-cylinders of a direct-action air-compressor, illustrating the several improvements. Fig. 2 is a longitudinal vertical section of the same. Figs. 3 and 4 are central longitudinal sections of the air-cylinder, showing different positions of the piston and valves.

A is the steam-cylinder of the engine, the piston of which, subject to the control of a valve, B, operates the air or gas compressor. Said engine or motor and its controlling-valve may be of any suitable construction and be variously operated, the same forming no part of the present invention, and only being introduced as representing a direct-acting motor of the compressor. The drawings, however, represent a combination of independent valves with the main induction and eduction valves of an engine, which it is my intention to make the subject of a separate application for Letters Patent.

The compressor-cylinder E represented is one of two which are arranged at opposite ends of the steam-cylinder A, whose piston-rod D′ is extended through both steam-cylinder heads and connected with the compressor-piston F of each compressor-cylinder. The other compressor-cylinder, being just like the one represented, is omitted from the drawings as unnecessary to illustrate the invention.

The end of each cylinder E next the steam-cylinder may be open to the atmosphere, as the compression is all performed on the other side of the piston F, which is solid or without valves. The discharge-valve G consists of a piston of the same diameter as that of the piston F, fitted to the bore of the cylinder E. The said cylinder is provided with an annular discharge-port, *g*, communicating with the interior of a hollow band, *f*, which surrounds the said cylinder, and from which a pipe, *h*, leads to the compressed-air receiver. This port *g*, extending all round the cylinder, requires only to be very narrow to obtain a sufficient area of opening for free discharge. The hollow band *f* and pipe *h* are in constant communication by a passage, *i*, with a chamber, *j*, formed by a prolongation of the cylinder E beyond the piston-valve G. The valve G has a stem or rod, *k*, which is fitted so as to be free to move back and forth a short distance in a stop, *l*, which consists of a false head or bar secured across the cylinder inside of the head H, by which the outer end of the cylinder is closed; and the said stem or rod has coiled around it a spiral spring, *m*, which constantly presses against the valve with sufficient force to overcome the friction of the latter within the cylinder, but is prevented from pressing it more than a certain limited distance beyond a position to cover and close the discharge-port *g* by means of a nut, *n*, screwed onto the stem *k* at the back of the stop *l*.

The air-inlet valve I represented is of the conical kind. It is contained within the discharge-valve G, and so fitted to a seat in the face of the latter that when closed its exterior surface is flush with the said face, which is flat, or of a form to fit closely to the whole opposing face of the piston F. The head of the said valve I is solid, but its stem *p* is hollow, and enters a cavity, *u*, provided in the center of the discharge-valve G, the said cavity communicating, by holes *r*, with an annular groove, *q*, which is provided in the periphery of the said valve G, and which is always in communication with the atmosphere through one or more holes, *s*, in the sides of the cylin-

der E. The hollow valve-stem *p* has a number of lateral openings, *t*, just behind its conical face, and it is surrounded with a spiral spring, *w*, which presses against a collar around its rear end, for the purpose of closing the valve I. The back of the valve G is entirely closed, so that no air can pass through it, and, in order to provide for convenient construction, it is made of two pieces, screwed or otherwise secured together at *v*.

The operations of the compressor-valves are as follows: As the piston F moves from the valves and produces a vacuum behind it in the cylinder, the inlet-valve opens, as shown in Fig. 3, and the air enters through the holes *s* of the cylinder into the annular groove *q* around the discharge-valve, passes through the holes *r*, through the hollow stem *p* of the valve I, and enters the cylinder through the holes *t* in the said stem. During the return movement of the piston the valve I closes, and the discharge-valve, being held against the stop *l* by the pressure of the air in the chamber *j*, remains stationary until the air has been compressed between the piston and the valve G to a tension sufficiently greater than that in the chamber *j* and the pipe *h* to overcome the friction of the said valve and the pressure of the spring *m*, when the said valve is pressed back past the port *g*, as shown in Fig. 4, and the air is discharged from the cylinder into the receiver. After the port *g* has been thus opened there will be an equilibrium established between the air in the cylinder and that in the chamber *j*, pipe *h*, and receiver, and as the piston completes its stroke the pressure of the spring *m* will press back the valve G and bring its face into close contact with the opposing face of the piston, thereby expelling from the cylinder every particle of compressed air which has remained in the cylinder.

The inlet-valve I, instead of being of the conical kind, may be of the piston kind.

It will be readily understood that the same system of inlet and discharge valves, ports, and passages is applicable in a double-action compressor-cylinder, the system having in such case to be duplicated at the two ends of the cylinder.

I claim—

1. The piston discharge-valve G, of a diameter corresponding with the compressor-piston and fitted to the bore of the compressor-cylinder E, in combination with the chamber *j*, formed within said cylinder, the discharge-port *g*, and the separate passage *i*, opening from said chamber *j* to the discharge-pipe, substantially as and for the purpose herein described.

2. The stop *l*, in combination with the compressor-cylinder E, the piston-valve G, fitted to work within said cylinder, the spring *m* around the valve-stem *k*, between said stop and the piston-valve G, and the projection or nut *n*, connected with said valve, and arranged on the reverse side of the stop to the spring *m*, substantially as and for the purposes herein described.

3. The combination, with a discharge-valve in an air or gas compressor, of an inlet-valve fitted to and admitting air through the discharge-valve, substantially as herein described.

4. The piston discharge-valve having an internal cavity, *u*, which receives the inlet-valve, and having lateral openings *r*, forming a constant communication between said cavity and the atmosphere through an opening or openings in that part of the compression-cylinder which surrounds the said discharge-valve, substantially as herein described.

W. F. GARRISON.

Witnesses:
HENRY T. BROWN,
VERNON H. HARRIS.