(No Model.)

C. MONSON.

AIR COMPRESSOR.

No. 328,598. Patented Oct. 20, 1885.

Fig. 1.

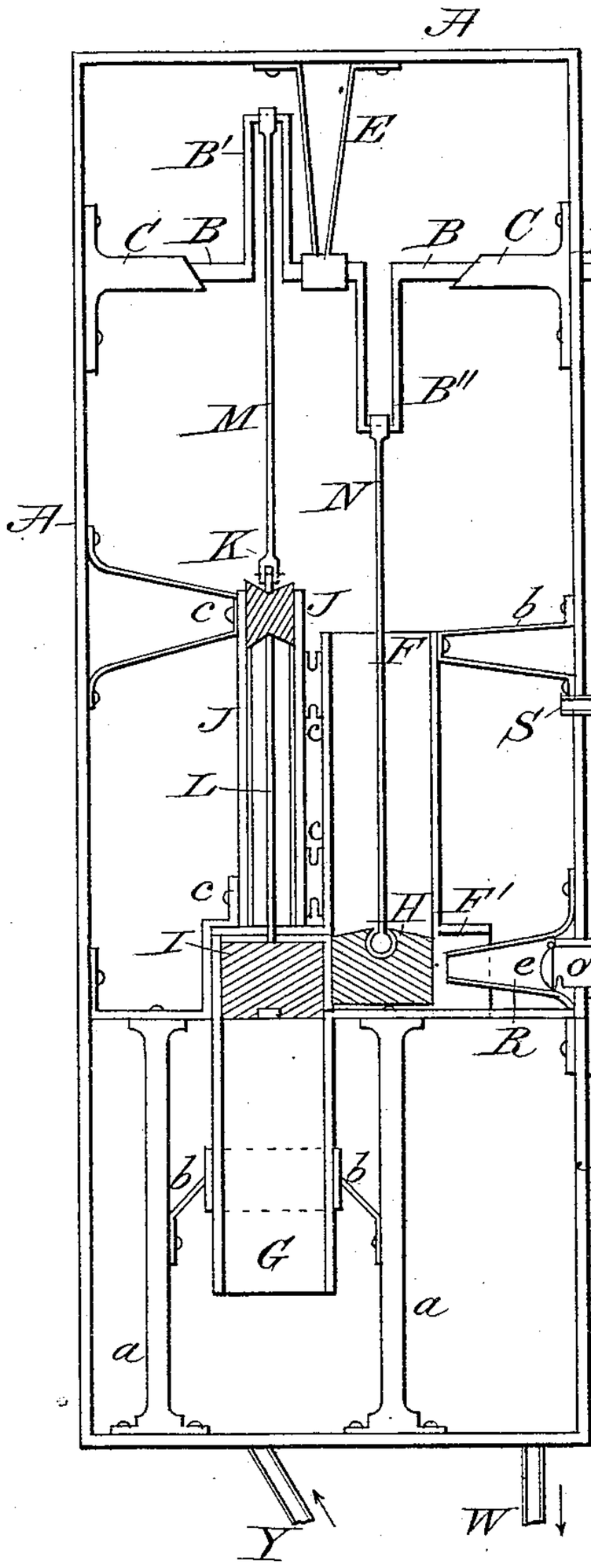

Fig. 3.

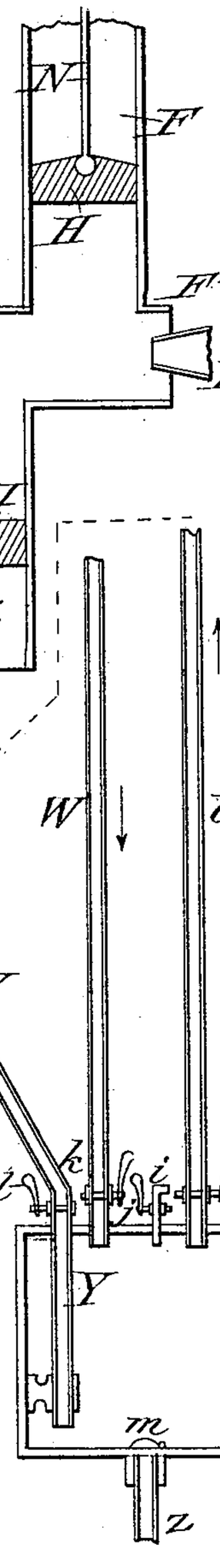

Fig. 2.

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CHARLES MONSON, OF NEW HAVEN, CONNECTICUT.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 328,598, dated October 20, 1885.

Application filed October 16, 1882. Serial No. 74,311. (No model.)

To all whom it may concern:

Be it known that I, CHARLES MONSON, of the city and county of New Haven, in the State of Connecticut, have invented a certain new Improvement in Air-Compressors; and I declare the following to be a specification thereof, reference being had to the accompanying drawings.

Figure 1 is a vertical central section of the air-chamber and its connected mechanism for compressing air. Fig. 2 is intended to be in continuation and extension of the lower portion of Fig. 1, and represents in central vertical section the water-tank and the several pipes thereof. Fig. 3 is a sectional detail showing the manner in which the cylinders communicate.

Like letters indicate like parts.

My invention relates to the general subject of air-compression.

It consists in a new modification and adaptation of the air-compressor particularly specified in Letters Patent of the United States No. 257,885, granted to me May 16, 1882. In that invention I cause natural or uncompressed air which has been drawn into cylinder by the operation of a piston to be discharged from said cylinder into the central air-chamber through a port which lies within a larger port of another cylinder, the latter discharging a current of compressed air into the air-chamber, by means of which contrivance a current of uncompressed air is forced into a current of compressed air, surrounding it, and flowing in the same direction. In my present device I secure a similar movement of natural and compressed air, but create the currents of compressed air by suction, instead of pressure, by two pistons, operating in opposite directions in their respective cylinders. My invention also provides a method of precompressing automatically the installment of new air before forcing it into the central reservoir, as hereinafter fully specified.

In the drawings, A represents the air-chamber. A crank-shaft, B, having three cranks, B′, B″, and B‴, revolves within the bearings C C, and passes through one side of the air-chamber A, as shown in Fig. 1, being turned by the driving-pulley D, at the external end thereof, by power applied by a belt, or any other suitable manner. The crank B‴, as well as the pulley D, is thus external to the air-chamber A. The crank-arms B′ and B‴ are in the same plane with the crank-arm B″, but the latter extends in a direction exactly opposite to that of the former, as fully shown in Fig. 1. A hanger, E, inside the air-chamber A furnishes an additional bearing at the center of the shaft B.

Two communicating cylinders, F and G, are supported within the chamber A by standards *a* and braces *b b b*. The cylinder F is open at the top, and has an entry-port, F′, extending at a right angle from the bottom thereof. The cylinder G is closed at the top, (except a central aperture for the working of its piston-rod,) and is open at the bottom. These cylinders communicate at the point where they overlap each other, as shown in Figs. 1 and 3. In the cylinders F and G, respectively, are the pistons H and I, operated by means of the cranks B″ and B′. Upright ways J J extend up from the top of the cylinder G, and are firmly braced, as shown at *c c c*. A grooved sliding block, K, has a reciprocating motion along said ways, and by means of the connecting-rod L communicates a similar motion to the piston I of the cylinder G. A pitman, M, of the crank B′, communicates motion to the sliding block K, to which it is pivoted. The pitman N of the crank B″ is connected by a ball-and-socket joint (or other suitable means) to the piston H.

Outside the air-chamber A is another cylinder, O, within which moves a piston, P, having at the top a tubular extension, *p*. The piston P derives its motion from the pitman Q, to which it is connected by a ball-and-socket joint, (or other suitable means,) which pitman is operated by the crank B‴. The cylinder O, at its bottom, has an entry-port, *o*, covered by a flap-valve, *d*. It also has a discharging-port, *o′*, extending at a right angle therefrom and entering into a funnel, R, within the air-chamber A. Two flap-valves, *e e*, close said port *o′*. Near the top of the cylinder O is a short tube, S, which connects the cylinder O with the air-chamber A, the purpose of which I will presently describe. The smaller end of the funnel R enters within the entry-port F″ of the cylinder F, and is preferably concentric therewith. It will be seen that as the shaft B revolves the pistons I and

P move simultaneously, and always exactly begin and finish their strokes at the same instant, while the piston H simultaneously moves, but in an opposite direction, accomplishing its stroke in precisely the same length of time.

Beneath the cylinder O is a box, T, into which the port *o* enters at the top. At the bottom of the box T is a short open pipe, *f*, communicating with the external atmosphere, and also a pipe, U, extending from the chest T into the tank V, and having at the top and bottom thereof, respectively, the cocks *g* and *g'*. The pipe *f* also has a cock, *h*, which is operated at the same time with the cock *g* by means of one handle. The tank V has at its top a vent, *i*, closed by a cock, *j*. A pipe, W, extends from the tank V up into the air-chamber A, entering the rear side thereof at a point above the bottom of said chamber. (Not indicated in the drawings.) The pipe W has a cock, *k*, at the bottom. The pipes U and W extend only a trifle into the tank V.

From near the bottom of the tank V, and extending through its top, is a discharge-pipe, Y, extending upward to the surface of the ground or into a suitable reservoir. It has a stop-cock, *l*. A pipe, Z, extends from the tank V downward into the water, and a flap-valve, *m*, covers the top of said pipe.

Having thus described all the parts of my invention, I will now explain their operation.

I turn the handle of the cocks *h* and *g*, (the openings of which are respectively at right angles to each other,) and thereby open the pipe *f* and close the pipe U. As the piston P begins to ascend from the bottom of the cylinder O it draws into said cylinder a current of natural or uncompressed air, which flows in through the pipe *f* and box T, and up through the entry-port *o*, lifting the flap-valve *d*. At the same time the valves *e e* of the port *o'* are drawn tightly down by this suction and prevent any entrance of air from the chamber A. As the piston P continues to ascend it fills the lower portion of the cylinder O with natural air. In the meantime the inner end of the tube S has been snugly closed by the piston P and its tubular extension, *p*. As soon, however, as the bottom of the piston P has cleared the tube S there instantly rushes through the tube a current of air from the chamber A, (the contents of which chamber, for the purposes of this explanation, we may suppose have been already compressed by the previous operation of the machine.) By the law of fluid-pressures the compressed air in the chamber A, and the less compressed or natural air in the chamber or cylinder O, though previously of different densities, will instantly commingle and become of uniform density. The piston P, having now completed its upward stroke, begins to descend. It immediately closes the end of the tube S and shuts down the flap-valve *d*, and crowds from their seats the valves *e e*. As the piston P continues to descend it forces the now automatically-compressed contents of the cylinder O through the port *o'* into and through the funnel R. Synchronous with this movement of the piston P is a movement of the pistons H and I by means of their respective cranks. When the piston P begins its downstroke, the position of the pistons H and I is that shown in Fig. 1. As the piston P continues to descend the pistons H and I move respectively in divergent directions in their respective cylinders, and by suction draw into the entry-port F' the contents of the cylinder O, which at the same time are being driven down and out by the pressure of the piston P. This conjoined action of the pistons H and I in drawing air into and through the entry-port F' is made possible through the communication that exists between the cylinders F and G at the point where they lap each other, as before mentioned. The contents of the chamber A are thus unbalanced and forced into favorable currents to facilitate the entrance of the new installment of air. While the funnel R is thus discharging the contents of the cylinder O the compressed air, already inclosed in chamber A is being drawn inward through the port F' in the same direction with the current which flows out of the funnel R, so that the contents of the chamber A, instead of opposing the entrance of new air, are flowing in the same direction with it in an escorting current, while the divergent operation of the pistons H and I, moving respectively in the communicating cylinders F G, tend to separate and draw apart the compressed air at the point of discharge of the funnel R for the purpose, as it were, of engulfing the discharge of the funnel.

Instead of experiencing an intensely-accumulating resistance to the inward currents of the new air in entering the central reservoir, as in all other air-compressors, I provide an easy and efficient entrance for the new air by the combination and co-operation of these several methods, viz: first, by the valuable and important precompression of the contents of the cylinder O by the means of the tube S, whereby the new air is automatically brought to the same density as the contents of the central chamber, thus giving the incoming air precisely the same force as the contents of the chamber instead of a less density and weaker force; secondly, by the pressure of the piston P, expelling the contents of the cylinder O through the port *o'* and the funnel R; thirdly, by the suction of the pistons H and I, drawing out the contents of the cylinder O through the funnel R, entry-port F', and communicating cylinders F G; fourthly, by the formation of a surrounding current of compressed air, drawn by said suction into the port F', to inclose and escort in the same direction the discharge of the funnel R.

What I claim as my invention is—

1. In an air-compressor, the combination of a chamber or receiver for compressed air, a chamber for compressing air with means for compressing, a tube or opening from the com-

pressor-chamber to the receiver or chamber for storing the compressed air and through which the air is forced from the former to the latter, and a tube or opening from the receiver to the compressing-chamber through which compressed air is admitted from the receiver to the compressing-chamber, with suitable valves or means for closing and opening said tubes, by which combination and arrangement, when the machine is operated, the contents of both chambers are brought to equal density, substantially as set forth and described.

2. In an air-compressor, the combination, with the chamber A and cylinder O, of the connecting pipe or tube S, adapted to be periodically opened to admit into the cylinder O a current of compressed air from the chamber A, for the purpose of automatically bringing the contents of said cylinder and chamber to the same degree of compression, substantially as described.

3. The combination of the chamber A, cylinder O, having suitable valve-posts, the tube S, connecting said chamber and cylinder, the piston P, pitman Q, and cranked shaft B, substantially as described.

4. The combination of the chamber A, tube S, piston P, and cylinder O, having ports *o o'*, and valves *d e e*, substantially as and for the purpose specified.

5. The combination of the chamber A, communicating cylinders G F O, two of which are inclosed in the said chamber while the other cylinder is exterior thereto and communicates directly with the external arm, the pistons I H P, pitmen M N Q, shaft B, having cranks B' B'' B''', and means for connecting the external cylinder, O, to the chamber A, and cylinder F, substantially as and for the purpose described.

6. The combination of the chamber A, cylinder G, having piston I, cylinder F, having port F' and piston H, the cylinder O, having piston P, ports *o o'*, and valves *d e e*, the tube S, connecting the cylinder O and chamber A, and the funnel R, connecting the ports F' and *o'*, substantially as and for the purpose set forth.

7. The combination of the cylinders F O and pistons H P, operated by pitmen N Q and cranks B'' B''' on the shaft B, for the purpose of forcing the air contents of the cylinder O into the chamber A by the combined pressure of the piston P and suction of the piston H, substantially as described.

8. An air-compressor consisting of the chamber A, shaft B, cranks B' B'' B''', pitmen M N Q, sliding block K, rod L, ways J J, pistons I H P, cylinders G F O, having suitable ports and valves, the funnel R, and tube S, all substantially as and for the purpose specified.

CHARLES MONSON.

Witnesses:
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ABEL B. JACOCKS.