(No Model.) 2 Sheets—Sheet 1.

J. BIRNER & H. MESSING.

AIR COMPRESSOR.

No. 520,405. Patented May 29, 1894.

Fig. 1.

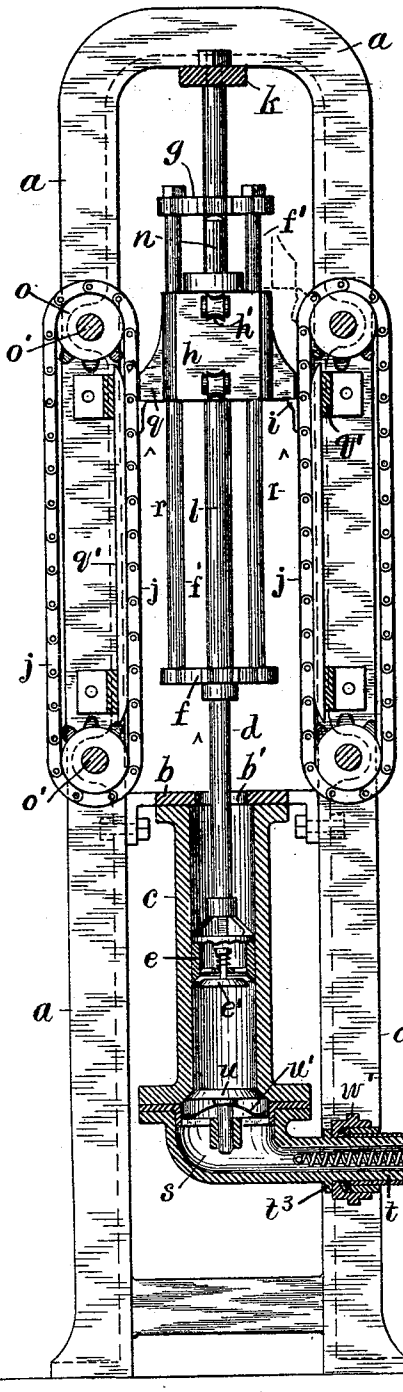
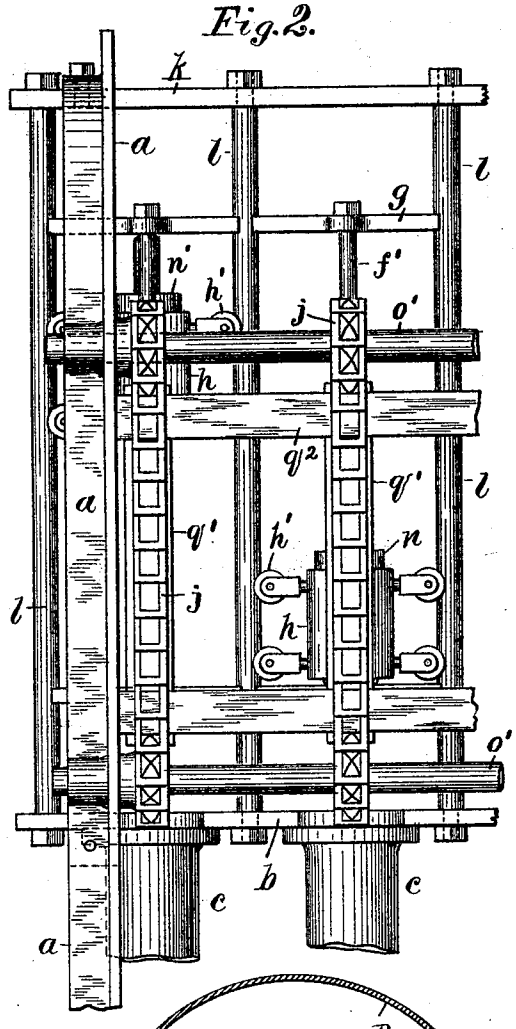
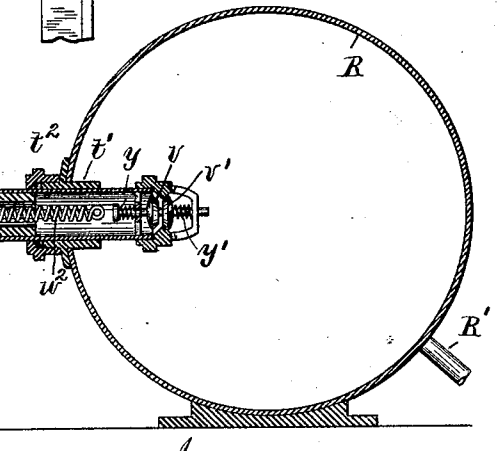


Fig. 2.





Attest:
L. Lee.
W. Baton.

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Joseph Birner & Henry Messing,
per Crane & Miller attys.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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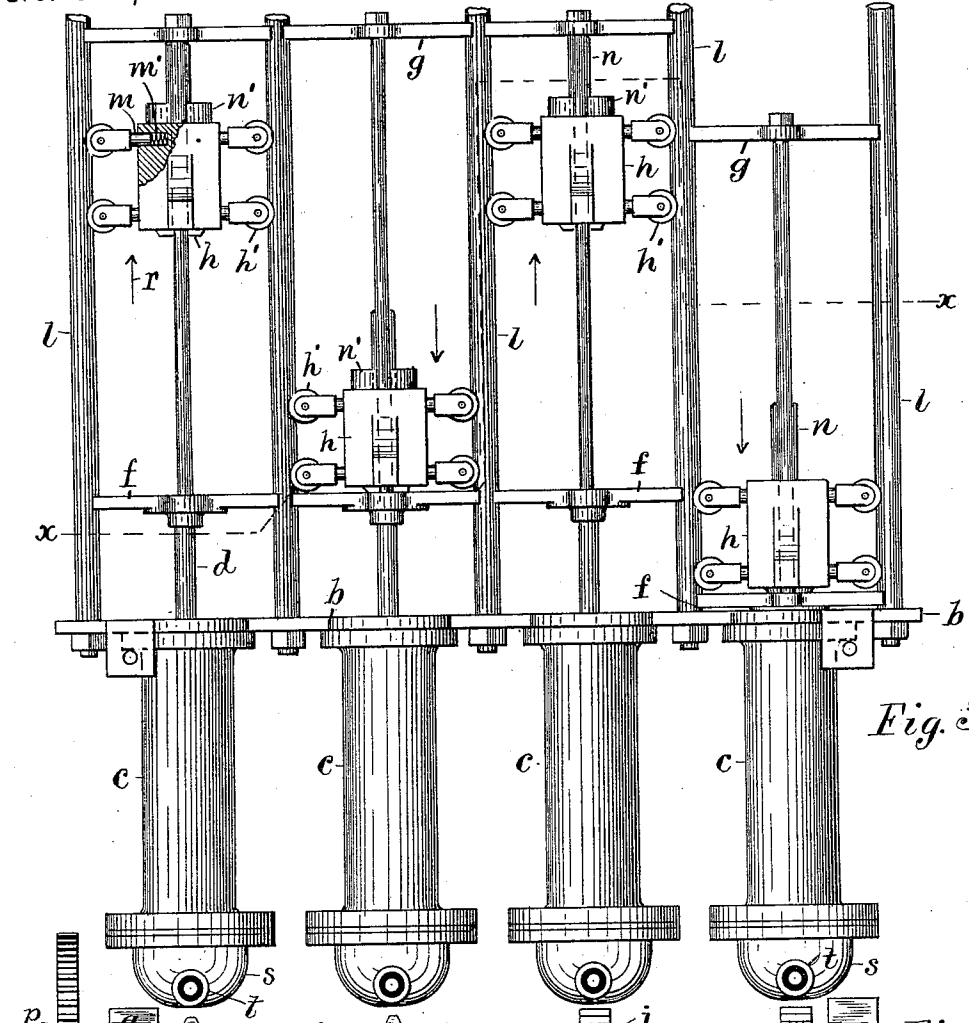

Fig. 3.

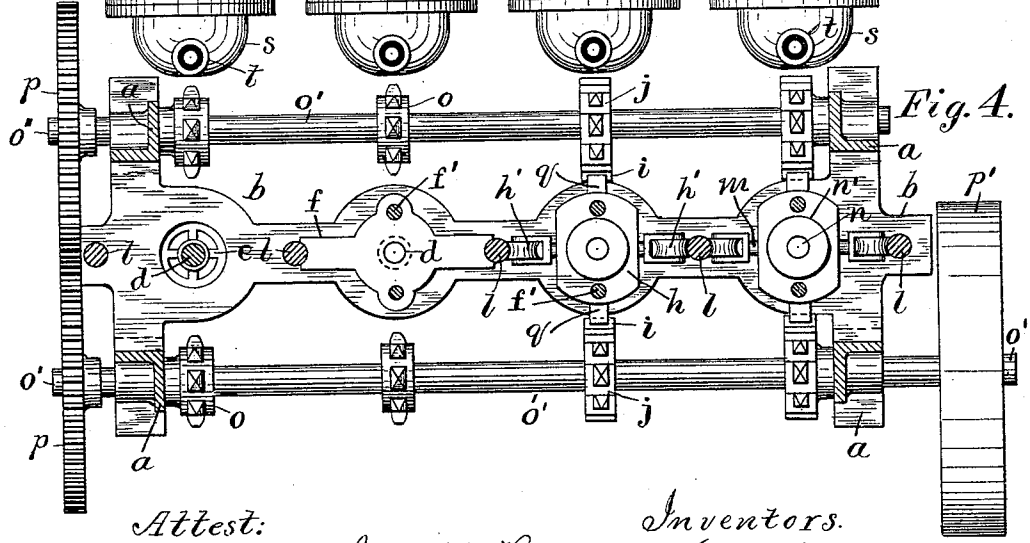

Fig. 4.

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THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOSEPH BIRNER AND HENRY MESSING, OF ELIZABETH, NEW JERSEY.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 520,405, dated May 29, 1894.

Application filed September 6, 1893. Serial No. 484,885. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH BIRNER and HENRY MESSING, citizens of the United States, residing at Elizabeth, Union county, in the State of New Jersey, have invented certain new and useful Improvements in Air-Compressors, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to compress air under high tension by a force of low intensity. This is effected by the mechanism herein shown and described, wherein the repeated falling of a weight upon the end of the piston rod of the air pump actuates the piston to compress the air in the pump cylinder and force the same into the reservoir or receiver.

The invention is illustrated in a construction having four cylinders, the pistons of which are actuated in succession by separate falling weights.

In the drawings, Figure 1 is a sectional elevation of the machine, with one frame and gearing removed. Fig. 2 is a side elevation of one end of the machine, with the parts below the middle of air cylinders removed. Fig. 3 is a side elevation with the frames and lifting devices removed, and one of the hammers partly in section; and Fig. 4 is a plan, in section where hatched, on line x, x, in Fig. 3.

Two end frames or stanchions a are connected by a bed-plate b; beneath which four pump cylinders c are attached, with openings b' for the passage of piston rods d. Each piston rod is provided with a crosshead f connected by ties f' with a lifter g. The hammer h is movable upon the ties f' and is raised by dogs i attached to lifting chains j. A plate k connects the frames a at the top, and a series of guide rods l are affixed to the plates b and k intermediate to the cylinders. The hammers are provided with rolls h' fitted to the guide rods l; and the crossheads f and lifters g are fitted to the same rods. The roll shanks m (as shown in the section of hammer in Fig. 3) are fitted to sockets in the hammer, and pressed outward by springs m' to hold the hammer from vibration. A lifting pin n is projected from the top of each hammer, to contact with the lifter g, and movable weights n' are shown on the pins to augment the force of the hammer's blow.

The chains j are driven by sprocket wheels o upon shafts o' projected from frame to frame and journaled in the latter. The shafts are connected by cog-wheels p and are driven by pulley p' (shown only in Fig. 4).

All the parts above the bed-plate are removed over the left hand cylinder in Fig. 4, exposing the pump plunger e; and over the next cylinder is shown the crosshead f attached to the piston rod d. The two cylinders at the right of the figure are shown provided with the hammers h having teeth q upon their front and rear sides to engage the dogs i upon the lifter chain. The chains are omitted to expose the sprocket wheels o, next to the left hand cylinders. The ties f' are made of such length that the hammer, in falling between the lifter g and crosshead f will depress the piston with the required force. The chain operates, as it turns over the upper wheels o, to retract the dogs i simultaneously from the teeth q upon the opposite sides of the hammer; as indicated in dotted lines in the upper part of Fig. 1, upon the right hand wheel. The hammer in this figure is shown with the pin n against the lifter g, and the piston rod moved half way upon its upward stroke; while the hammer is shown half way upon its downward stroke upon the second cylinder from the left, in Fig. 3, and at the bottom of its downward stroke upon the right hand cylinder in the same figure. The other two hammers in Fig. 3 are shown upon the upward stroke, like that in Fig. 1, as indicated by the arrows r. The plunger e is open upon the top and provided upon the bottom with a self-closing valve e'. The bottom of each cylinder is provided with a valve u opening downward and a chamber s is secured below such valve and provided with a long tubular nozzle t. The valve u is automatically closed by spring u'.

An air reservoir R is shown in Fig. 1 arranged transversely to the nozzle t and would be formed in practice with a socket t' and stuffing box t^2 on a line with the nozzle upon each of the cylinders. A movable sleeve w is fitted to the outside of the nozzle t and is made air-tight by any suitable packing or by a stuffing box w'. Valves are applied to the sleeve to retain the compressed air in the reservoir R, and also to close the end of the sleeve within the reservoir when the piston first descends. The sleeve is drawn outward from the reservoir by a spring w^2 attached to the nozzle t, into contact with the stop t^3 and is driven into the reservoir at each descent of the plunger, by the automatic closing of a valve v which is seated inside the sleeve and is held normally open. A check valve v' upon the end of the sleeve is normally closed by a lighter spring y'. The first effect of the piston's downward stroke, which is effected very rapidly by the blow of the hammer upon the crosshead f, is to temporarily close the valve v and to thus drive the sleeve into the reservoir. The inertia of the sleeve at first causes the valve to move under the air current flowing through the sleeve; but when the sleeve moves into the reservoir, the air pressure operating upon the valve v is reduced and the spring v opens such valve and allows the air to enter the reservoir. The valve v' makes no resistance as the spring y' is only made of sufficient strength to push such valve shut.

Backing plates q' are mounted upon the outer sides of the chains j to hold the same in a straight path while the dogs i are lifting the hammer. These pieces are affixed to cross-bars q^2, shown in Figs. 1 and 2.

From the above description it will be observed that the hammer, which falls with an accelerated velocity, is able to actuate the plunger e with more force than could be secured by the direct application of the chain to the piston rod and the air may thus be compressed under a higher tension. The dogs i, in a machine with several cylinders, like that shown in the drawings, would be adjusted to raise the hammers successively; and the several plungers would be actuated in succession, and the driving shaft would thus be burdened with a smaller load than if all the hammers were raised at once.

By providing means to apply auxiliary weights n' to the hammers, the impact may be increased as the pressure increases in the reservoir R. A pipe R' is shown to supply the reservoir with air under a given limited pressure before the plungers are first operated; which is essential to prevent the hammers and the crossheads f from needless concussion with the bed-plate b. An initial pressure of twenty pounds per square inch in the reservoir is sufficient for this purpose; and can be readily produced by a hand pump or by reserving in a separate reservoir a small proportion of air previously compressed to a higher degree in the reservoir R.

Having thus set forth the nature of our invention, what we claim herein, and desire to secure by Letters Patent, is—

1. In an air compressor, the combination, with a pump plunger, of a piston rod having a crosshead, and a lifter plate secured thereto by tie-rods, of a hammer movable between the crosshead and lifter plate, and means for raising the hammer to engage the lifter plate and dropping it, substantially as set forth.

2. In an air compressor, the combination, with a pump plunger, of a piston rod provided with a movable hammer, guide rolls l at opposite sides of the piston rod, spring pressed rolls projected from the hammer against the guide rods, and means for raising and dropping the hammer, as set forth.

3. In an air compressor, the combination, with a pump plunger, of a piston rod provided with a movable hammer, guide rolls l at opposite sides of the piston rod, spring pressed rolls projected from the hammer against the guide rods, chains driven upwardly at opposite sides of the hammer, the teeth q upon the opposite sides of the hammer, and dogs i upon the chains to engage the teeth, substantially as set forth.

4. In an air compressor, the combination, with a pump plunger and its piston rod, of guides l at opposite sides of the piston rod, a hammer fitted to move between the guides, means (as the crosshead f) upon the piston rod to intercept the hammer, and lifter chains adapted for raising and dropping the hammer, as set forth.

5. In an air compressor, the combination, with the cylinder c, plunger e, and piston rod d having means to engage a movable hammer at opposite ends of its stroke, of the hammer h, the chains j at opposite sides of the same, the backing plates q' upon opposite sides of the chains, and the dogs i for engaging the hammer, as set forth.

6. In an air compressor, the combination, with an air cylinder having a plunger and foot valve, of the chamber s provided with nozzle t, the reservoir R, and the sleeve w fitted movably to the nozzle and to the reservoir and provided upon its outer end with a check valve, substantially as herein set forth.

7. In an air compressor, the combination, with an air cylinder having a plunger and foot-valve, of the chamber s provided with nozzle t, the reservoir R, and the sleeve w fitted movably to the nozzle and to the reservoir and provided with the valves v and v', arranged and operated substantially as set forth.

8. In an air compressor, the combination, with a cylinder of a pump plunger, a piston rod provided with a movable hammer, means for raising and dropping the hammer, the

chamber *s* provided with nozzle *t*, the reservoir R, the sleeve *w* fitted movably to the nozzle and to the reservoir, the spring w^2 connecting the sleeve and nozzle, the valve *v* seated inside the sleeve and held normally open, and the check valve *v'* pressed normally upon the outer end of the sleeve, the whole arranged and operated substantially as herein set forth.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

JOSEPH BIRNER.
HENRY MESSING.

Witnesses:
D. N. FREELAND,
HENRY J. MILLER.