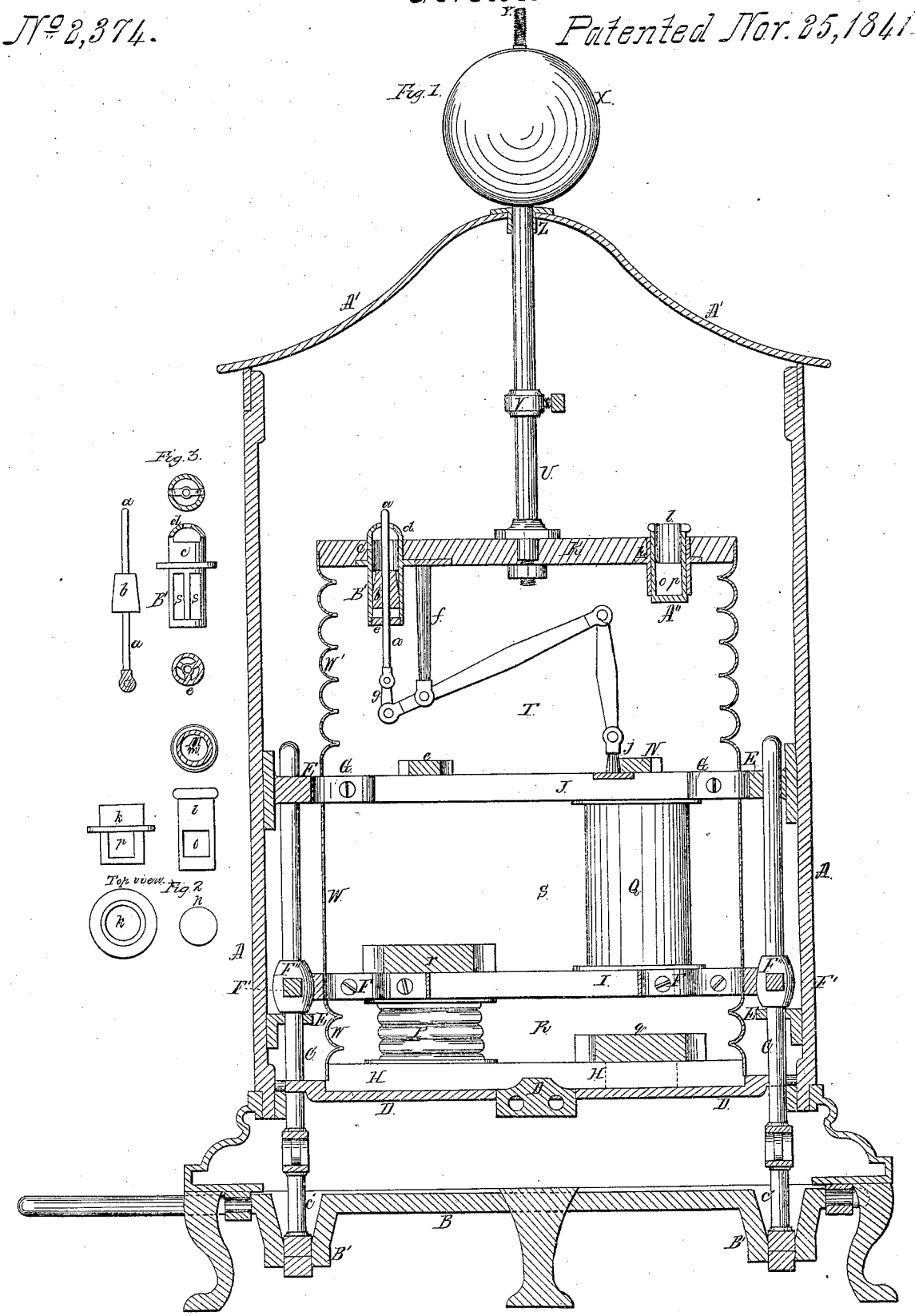
L. Line,

Governor.

No. 2,374. Patented Nov. 25, 1841.



UNITED STATES PATENT OFFICE.

LOUIS LIZÉ, OF PITTSBURGH, PENNSYLVANIA.

METHOD OF CONSTRUCTING THE GOVERNORS OR REGULATORS OF STEAM-ENGINES, WATER-WHEELS, &c.

Specification of Letters Patent No. 2,374, dated November 25, 1841.

To all whom it may concern:

Be it known that I, L. Lizé, a native and citizen of the Kingdom of France, but now residing at Pittsburgh, in the State of Pennsylvania, have invented a new and improved regulator or governor for regulating the motive power of steam-engines and of hydraulic machinery, which improved instrument I denominate the "pneumatic regulator"; and I do hereby declare that the following is a full and exact description thereof.

It is well known to those persons who are well acquainted with the construction of steam engines, and of those also which are moved by the power of water, that in order to obtain in them a motion as nearly uniform as possible, instruments denominated governors, or regulators, have been appended to such machines; these instrumens have been principally of two kinds, that usually denominated a governor producing its effect by means of pendulums having weights at their lower ends, and being attached near their upper ends to a revolving shaft, in such manner as that when the weights on said pendulums are thrown out by centrifugal force, as the shaft revolves, a connecting rod attached to and operated upon by the pendulums, shall act upon a throttle or other valve in the supply pipe of a steam engine, and close or open it in proportion to the effect produced upon the pendulums by the velocity with which the shaft revolves; as like regulating effect is produced by the same apparatus, upon the shuttle or gate of a water wheel, which it is made to close or open; and also upon the sails of a windmill, which it has been made to weather. The second kind of regulator above referred to is that denominated a water regulator, which consists of a cistern into which water is pumped in quantities proportioned to the rapidity of the strokes of the pump, and from which it is allowed to escape in a regulated quantity, by means of a cock. When the supply of water is increased beyond the intended point within the cistern, a float is made to actuate a connecting rod, which closes or opens a valve or gate as the case may be.

The intention of my improvement is the same with the foregoing, but I effect the purpose by means of air, and in a manner more immediate in its action, and less liable to objection, than by any of the apparatus heretofore employed for the same purpose.

In the accompanying drawing Figure 1, is a vertical section of my pneumatic regulator, which consists principally of a receiver and of double bellows by which air is to be forced into said receiver, the rising and falling of the upper part of which is made to regulate the supply of steam, or water. A, A, are two upright posts, of which there may be any desired number, rising from a suitable base, and supporting a top, or dome A′, A′. B, is a shaft carrying two cranks B′, B′, by means of which motion is to be communicated to the bellows. The shaft B, is so connected with a steam engine, or with a water wheel, as to move with a velocity corresponding with their motion, and it may be made either to rotate, or vibrate, as may be desired; as shown in the drawing the shaft must vibrate only. C, C, are vertical rods, connected to the cranks by jointed rods C′ C′, and passing through guides E, E. H, H, is the lower board of the bellows, which is stationary, and which may rest upon supports D, D; J is also a stationary board; and between H, and J, is the movable board I, which is made to vibrate up and down by means of the rod C, C; screws at F′, F′, serve to attach the board I, to these rods, the iron straps F, F, being screwed to said board, and being in one piece with the socket F″, F″. The movable board I, is represented as depressed to its lowest point, and consequently making its nearest approach to the lower board H, H. The space R, is the lower chamber of the double bellows; the space S, the upper chamber thereof, and the space T, that of the receiver into which the air is to be forced. The boards H, I, J, and K, I usually make circular, although this form is not by any means essential; W, W, W′, is the leather by which the respective chambers are surrounded, and which admits of the ascent and descent of the boards I and K, the latter of which constitutes the upper, or movable, board of the receiver T.

The movable board I, is connected to the stationary boards H, and J, not only by the exterior leather W, W, but likewise by tubes of leather P, and Q, admitting of the same play, up and down as is admitted by the ex-

ternal leathering W, W. Through each of the boards H, I and J, there are two openings one of which in the bottom board H, is covered with a clock valve, opening upward, and both of which are covered with similar valves in the boards I and J. The valve in the board H is shown at *q*, covering an opening immediately under it, as represented by the dotted lines; through this the external air is admitted to the bellows. The second opening in this board is surrounded by the leather tube P, through which the external air is admitted for the purpose of supplying the upper chamber S, of the bellows, the valve *r*, on the board I, closes an opening in the said board to which the leather tube leads. The leather tube A, in the air chamber S, surrounds in like manner a hole through the board I, and another through the board J, which latter hole or opening is covered by a valve N. Through the board J there is a second opening surmounted by a valve O. It will be seen by this arrangement that the respective openings, valves, and tubes air will be freely supplied to the receiver T, both in the up and down stroke of the movable board I. The following is the manner in which it is then made to operate so as to produce the desired regulation.

The receiver space T, is formed by the stationary board J, the movable top board K, and the surrounding leather W′, in the board K there is placed an escape cock, or valve A″, the respective parts of which are shown in detail at Fig. 2; this consists of a tube or socket of brass *k*, fixed firmly in the board K, and of a second tube or socket *l*, fitting closely into it, like the key of a cock; the bottom of the socket *l*, is closed, as shown in the bottom view of it, at *n*, its top being open as shown in its top view, at *m*. There is an opening *p*, through one side of the tube *k*, and a correponding opening *o*, through one side of the tube *l*, and by turning this latter tube, the escape of air through it may be regulated at pleasure. The position of this part of the apparatus is to be permanent under any determined maximum velocity of the machine to be regulated; the opening through this cock, or valve, and through a second to be described, being such that at, and below, this velocity all the air forced in by the bellows will escape without causing the board K to rise.

B′, is the regulating valve the respective parts of which are shown at Fig. 3, a piece *b*, in the form of a truncated cone is fixed on to a stem *a*, *a*; said stem passing through holes in the top *d*, and the bottom *e*, of the tubular cage B′, forming the exterior of the valve. The part *c*, of this is a continuous tube, and below this part there are openings *s*, *s*, for the free admission of air. When the engine, or machine to be regulated is not moving with a greater velocity than is desired, a portion of the air passing into the receiver escapes through the tube *c* of the regulating valve above the truncated cone *b*, as well as through the regulating valve or cock A″, and in this particular it performs the same office therewith; but when the quantity of air forced into the receiver is increased beyond the desired point, the conical valve *b*, is brought into action in the following manner, a support *f* is attached to the board K, and is made the fulcrum of a lever *h*, which is connected to the stem *a*, *a* by means of a jointed rod *g*, and to the stationary board J, by means of the joint rod *i*, and the standard *j*. The lower part of the truncated cone *b*, is equal in diameter to the tube *c*, and when raised to its greatest height will entirely close the said tube. As the pressure within the receiver becomes too great the board K, will be raised by it, and this will put the lever *h*, into action, and thus cause the cone *b*, to pass to a greater distance into the tube *c*, closing in part the aperture for the escape of air, and augmenting its action on the movable board K, to this board K is attached a vertical rod U, which passes through the center of the top, or dome, A′ sliding through a collar at L. Upon the upper part of the rod U, is a weight X, say of twenty or thirty pounds, more or less, according to circumstances. To the upper end Y, of the rod U, is attached the connecting rod, which is to open or close a valve in a steam pipe, or to raise or lower the gate of a water wheel, in the same manner with other regulators or governors. The collar V, may be used to determine the range of the rod U, to any part of which it may be attached at pleasure. When the apparatus is so arranged as to cause the machine which it is to regulate to move with the required degree of velocity, the conical piece *b*, will be in part within the tube *c*, and the top board K somewhat elevated by the force of the air, this position being necessary to the capacity of regulation in both directions.

Although I have described and represented the conical valve *b*, as operated upon by the rising of the movable board K, through the intervention of the levers *h*, and its appendages, I have contemplated another modification of this valve, in which the conical part will remain stationary. This may be carried into effect in the following manner, as shown in Fig. 4. The cone *b*, may be held by a stationary stem, above the board K, in an inverted position, and so that its smaller end will enter the upper end of the tube *c*; as the board K rises the space for the escape of air will be diminished, as in the former case, and the same general effect will be produced; the cone *b*, will have to be of greater length under this than

under the first described arrangement, and the cage part below the tube *c*, will not be required.

Having thus fully made known the nature of my pneumatic regulator, and shown the manner in which the same operates, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The manner of constructing and arranging the double bellows for supplying air to the receiver, by means of the leather tubes and valves combined with each other substantially as herein set forth.

2. I claim also the manner of constructing the apparatus by which the conical valve *b*, is made to operate, said apparatus consisting either of the tubular cage B′, and the lever *h*, and its appendages; or having the cone inverted so as to operate in the manner described in the second modification of this apparatus; the respective parts being brought into action by the elevation of the movable board K.

3. And in combination therewith I claim the connecting of said movable board, with the rod which is to actuate a valve or gate, by means of the weighted rod U, operating substantially as described.

L. LIZÉ.

Witnesses:
THOS. P. JONES,
A. FAUTREL.