2 Sheets—Sheet 1.

N. CURTIS.

Safety Valve.

No. 231,214. Patented Aug. 17, 1880.

Fig. 1.

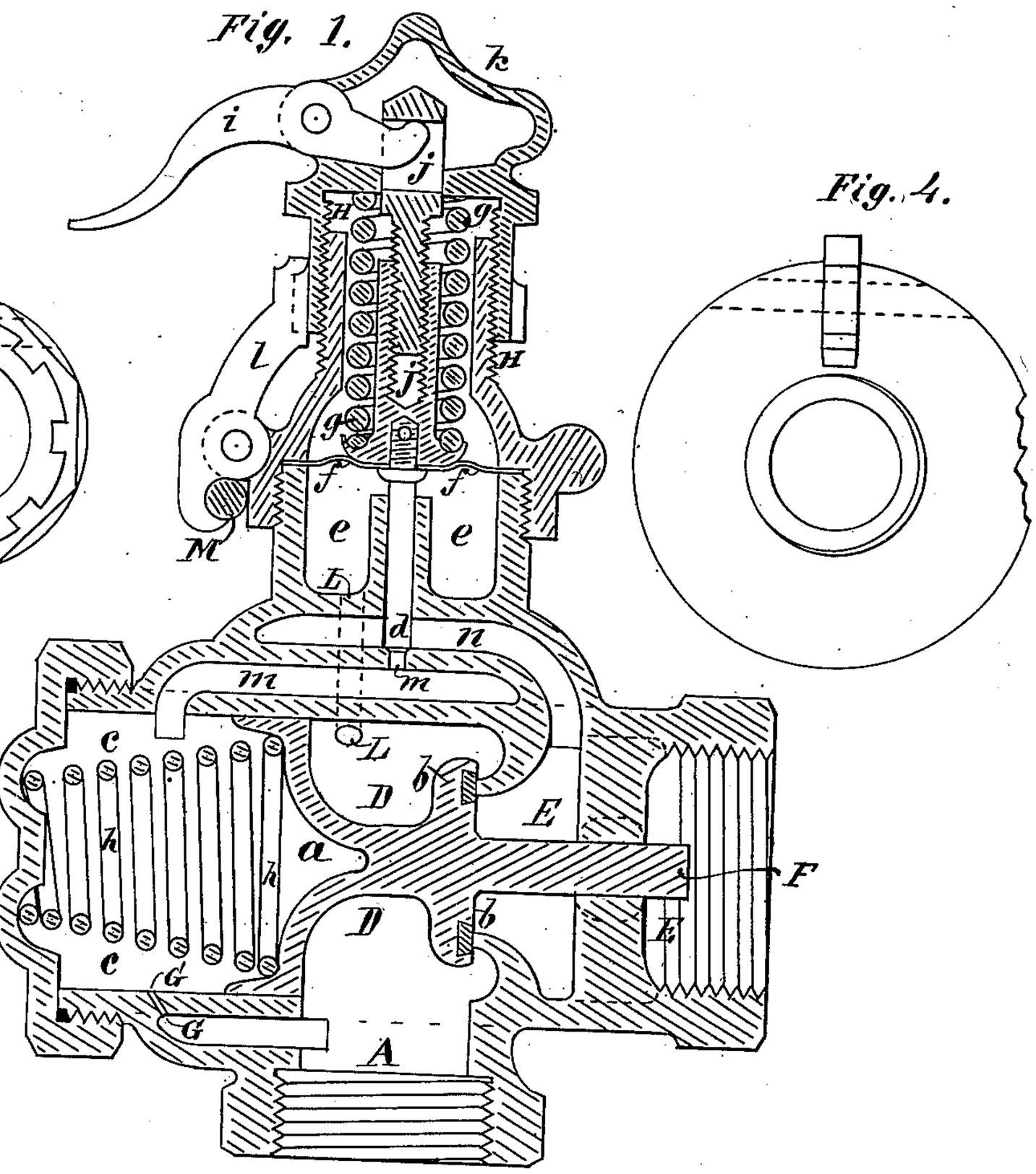

Fig. 3.

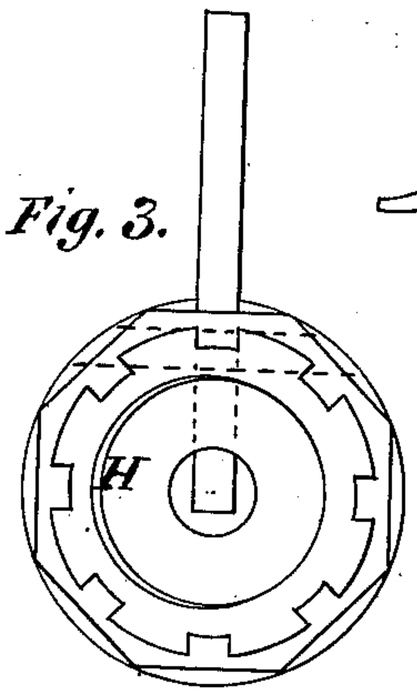

Fig. 4.

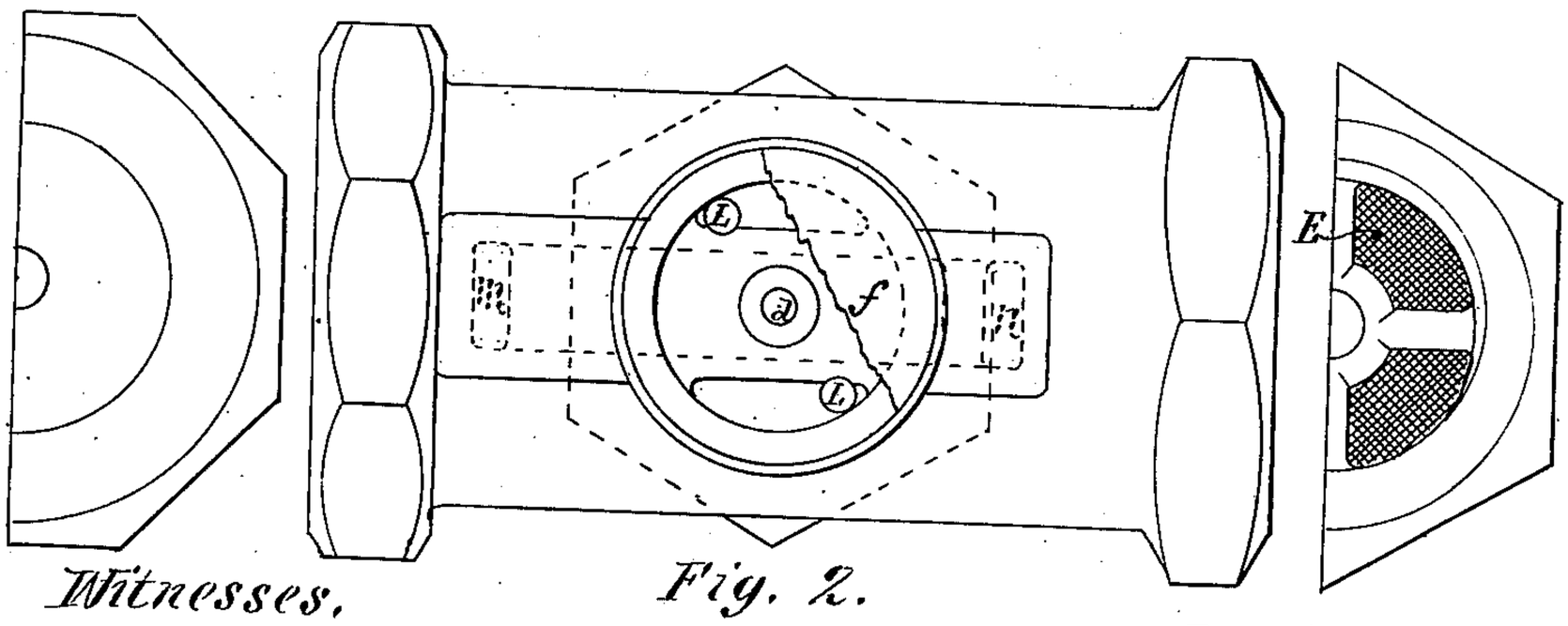

Fig. 2.

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H. J. Edwards.

Inventor.
Nelson Curtis

2 Sheets—Sheet 2.

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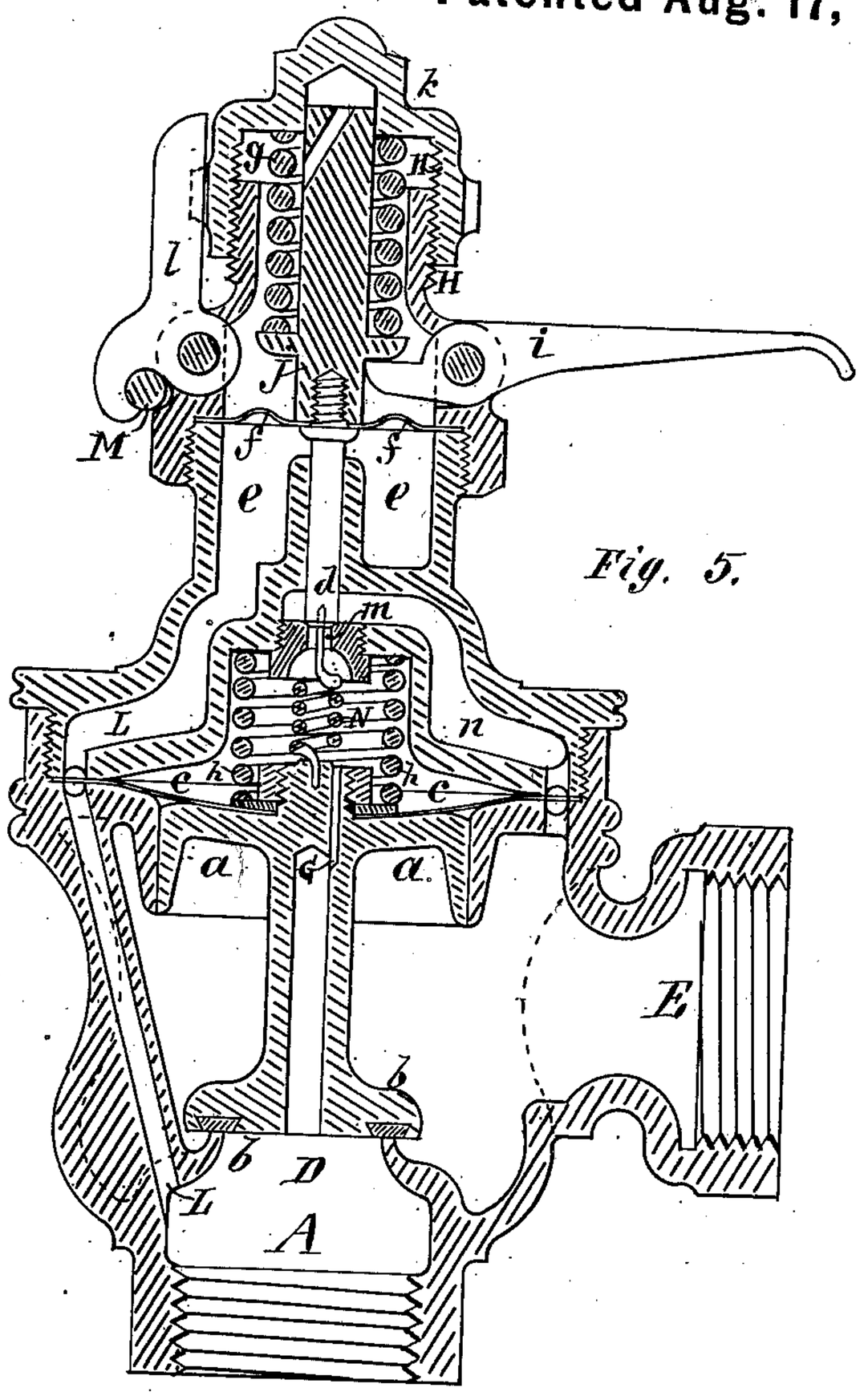

Fig. 5.

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H. J. Edwards

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UNITED STATES PATENT OFFICE.

NELSON CURTIS, OF NEWTON CENTRE, MASSACHUSETTS.

SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 231,214, dated August 17, 1880.

Application filed November 10, 1879.

To all whom it may concern:

Be it known that I, NELSON CURTIS, of Newton Centre, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Safety-Valves, of which the following is a full and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which drawings form a part of this specification.

The nature of my invention relates to the improved and novel construction of a safety or relief valve, whereby the direct pressure is made to act on a piston or diaphragm so as to open the escape or relief valve with a clear opening, and to hold it thus open until the pressure subsides to the given limit, so preventing the escape or relief valve from riding upon or throttling the escaping flow of steam or other fluid, &c., under pressure, substantially as hereinafter more fully set forth.

With reference to the drawings, Figure 1 is a sectional elevation illustrating the invention, the section being taken in a vertical plane coinciding with the axes of the valves. Fig. 2 is a plan of the main or body part containing the induction and eduction passages, the relief-valve, piston *a*, &c., with half end views of the same. Fig. 3 is a view from beneath of the top part used as an adjusting-screw for spring *g*. Fig. 4 is a plan of the intermediate part carrying the adjusting-screw, &c. Fig. 5 illustrates one of the modifications of my improvement deemed practicable to make, and represents, like Fig. 1, a vertical central sectional elevation.

Like letters refer to the same or corresponding parts in all the figures.

Referring to the drawings, A is an induction passage or pipe. E is an eduction or escape pipe or passage. *a* is a piston, to be operated upon by the direct pressure of the steam, fluids, or gases under pressure to which its use is applied. *b* is the principal or relief valve.

A spring, *h*, bears the valve *b* to its seat with a moderate pressure. The valve is guided in its movements by the piston *a*, to which it is attached, and stem F or other suitable means.

The pressure finds its equilibrium in chambers *c* and D, on both sides of piston *a*, through the small passage G. A secondary valve, *d*, furnishes an exhaust or escape for the pressure in chamber *c* through passage *m n* to the escape-passage E.

A passage, L, leads from chamber D or other space containing the direct pressure into the chamber *e*, where is provided the diaphragm *f* connected to valve *d*, so that when the pressure increases beyond a given limit it forces the diaphragm *f* to lift the valve *d*, giving free exit for the pressure in chamber *c* out into the escape-passage E through *m n*. This relieves the pressure in chamber *c* more promptly than it can be maintained by the supply through the diminutive passage G, and gives an immediate preponderance to the pressure in chamber D, which acting on piston *a* forces it back, giving free opening to valve *b*. In opening valve *b* the pressure in chamber D is available on the excess of the area of piston *a* over that of valve *b*.

The passage G in Fig. 1 may be made in the piston *a*, if preferred.

A spring, *g*, is arranged to act upon the back of diaphragm *f*, and is adjusted to any required limit of pressure by means of a suitable adjusting-screw, as H H, so that when the pressure in chamber *e* exceeds this point of adjustment it forces the diaphragm *f*, compressing-spring *g*, and lifting-valve *d* open, as above explained; but when the pressure in A D *e* falls below the point of adjustment the spring *g* presses valve *d* to its seat, when immediately, though not too suddenly, the pressure in chamber *c* is brought to an equilibrium of pressure with that of D by means of the small passage G. The valve *b* is then forced to its seat by the action of the restored pressure in chamber *c* acting upon so much of the piston area as is represented by the area of valve *b*, (which valve-area when closed is exposed only to atmospheric pressure,) aided by the recoil of spring *h*. The required pressure is thus maintained, any excess thereof acting immediately, as before, on diaphragm *f*, when the same process is repeated.

It will be seen that when the valve *b* opens it is not dependent for its open condition upon the action of steam or other fluid, gas, or liquid rushing under its face in a throttled condition, but is held up by the direct pressure of steam

in chamber D acting on piston *a*, and can only close when this same pressure, maintained in chamber *e* by means of passage L and acting on diaphragm *f*, becomes reduced to the fixed limit, allowing the spring *g* to act and close the valve *d*. When this occurs it causes the immediate restoration of equal pressure in chambers *c* and D through passage G, as explained.

A latch, *l*, falls into lock-notches in screw H, and the shackle M of a padlock secures it there, thus locking the valve against any interference whereby the limit of pressure might be changed, while the lever *i* furnishes at the same time the means by which to open the valve *d*, and thereby the relief-valve *b*, as explained, the safety-valve all the while being, as explained, locked against the possibility of any one's interfering to change the limit of pressure.

It is obvious that a piston may be substituted for diaphragm *f*, or a diaphragm substituted for piston *a*, though at the present stage of experience it is thought with a possible, if not probable, disadvantage.

Fig. 5 illustrates another of the modifications deemed practicable to make, in which both piston *a* and the suggested diaphragm are used together. This modification permits the valve *b* to open in the direction of the flow of steam, &c., which may give it the preference with some; but its advantage may be questionable until demonstrated by further experience. In this instance, as see Fig. 5, a small spring, N, inserted between valve *d* and piston *a*, so as to retard the closing of valve *d* somewhat, may be found useful. In this modification (see Fig. 5) the equilibrium-passage G may be seen near the center of piston *a*. It may also be made in the piston shown in Fig. 1, if preferred, rather than in the case, as shown. This valve is deemed applicable to all the fluids, gases, and liquids employed under pressure, the materials for its construction being selected with reference thereto. For steam brass or the other materials usually employed will be found suitable.

The small passage G can be dispensed with by making the piston *a* fit the chamber so freely as to permit the limited transmission of pressure required from one side to the other.

The internally-threaded part of screw H has the head *k*, of which it is a part. This head H *k* performs several useful functions. Besides forming the ornamental cap-piece, it carries the lock-notches otherwhere referred to. Also, the lever *i* serves as an adjusting-screw for spring *g* and as guide for the prolongation of the stem of valve *d*.

I claim—

1. In a safety-valve having the valve *b* operated by a piston, *a*, the case comprising induction-passage A, escape-passage E, chamber *c*, passages *m n*, and chamber *e*, when constructed and arranged in combination with the secondary limited-pressure valve *d*, substantially as and for the purpose set forth.

2. The valve *d*, in combination with the pressure-chamber *c*, diaphragm or piston *f*, spring *g*, passage L, pressure-chamber *c*, and passage G, substantially as described.

3. In a safety-valve, the combination of the valve *b* and piston *a* with the spring *k*, arranged to act directly upon the piston *a* in the direction of the closing of the attached valve *b*, substantially as shown and described.

4. In a safety-valve, the screw-cap H *k*, constructed to adjust the spring *g* and carry the lever *i* and notched receiver for detent-lever *l*, in combination with spring *g* and valve *d*, substantially as shown and described.

5. In a safety-valve, the screw-cap H *k*, constructed to adjust the spring *g* and carry the lever *i* and notched receiver for detent-lever *l* and guide the stem or prolongation thereof of valve *d*, in combination with valve *d* and spring *g*, substantially as shown and described.

6. The screw H, notched to receive detent-lever *l*, in combination with lever *l*, spring *g*, diaphragm or piston *f*, and the secondary valve *d*, substantially as described.

7. In a safety-valve, the detent-lever *l*, when provided with the retaining-arm to receive the shackle of a padlock, in combination with the adjusting-screw H *k*, having the notched receiver for lever *l*, substantially as shown and described.

8. In a safety-valve, the relatively-large-area diaphragm or piston *f*, when acted upon by the direct-supply pressure, so as to open the small valve *d*, thereby to open a main relief-valve, *b*, in combination with the valve *d*, substantially as and for the purpose set forth.

9. In a safety-valve, the screw-cap H *k*, constructed to adjust the spring *g* and carry the notched receiver for detent-lever *l*, in combination with the spring *g* and valve *d*, substantially as described.

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