

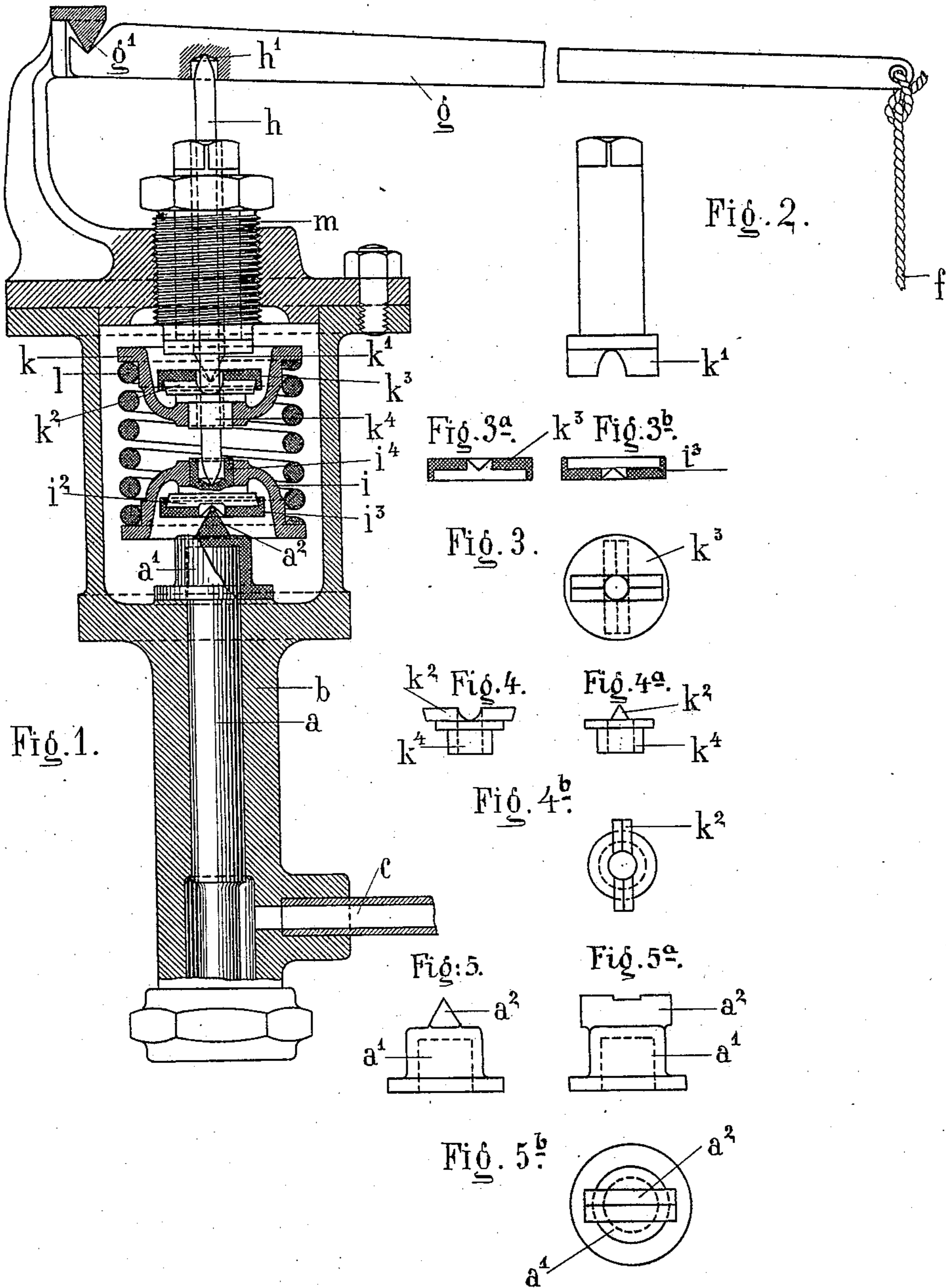
(No Model.)

2 Sheets—Sheet 1.

C. G. P. DE LAVAL.
DAMPER REGULATOR.

No. 577,262.

Patented Feb. 16, 1897.



WITNESSES:
Carl Kalle.
Genl. Wheelock.

INVENTOR
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(No Model.)

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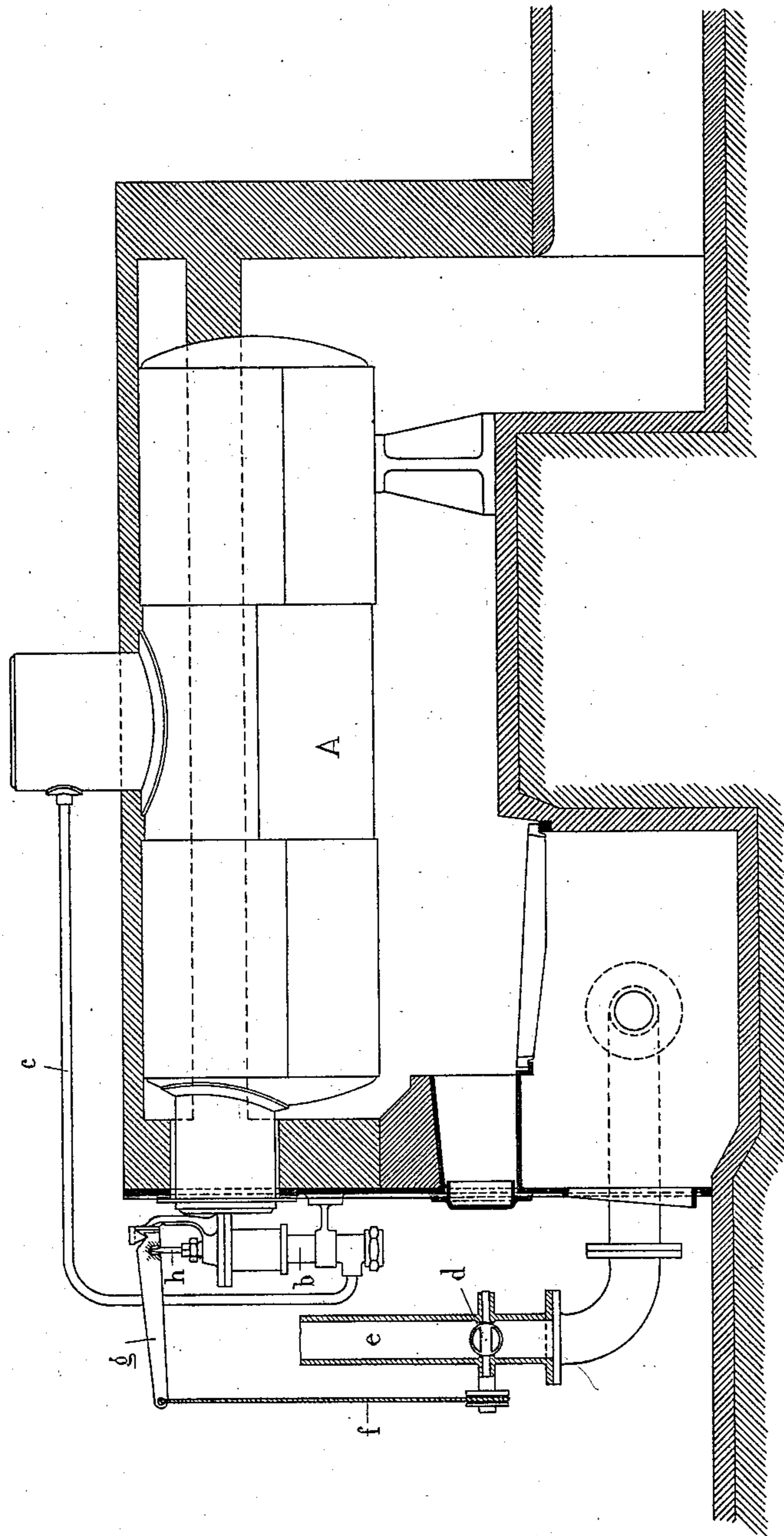
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Fig. 6.



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UNITED STATES PATENT OFFICE.

CARL GUSTAF PATRIK DE LAVAL, OF STOCKHOLM, SWEDEN.

DAMPER-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 577,262, dated February 16, 1897.

Application filed October 8, 1895. Serial No. 565,066. (No model.)

To all whom it may concern:

Be it known that I, CARL GUSTAF PATRIK DE LAVAL, of Handtverkaregatan 16 A, Stockholm, Sweden, have invented certain new and useful Improvements in Damper-Regulators, of which the following is a specification.

The present invention has for its object to furnish certain improved means for controlling the air-supply to the furnaces of water-tube boilers according to the consumption of steam. For this object the steam generated by the boiler (or water with a pressure following the variations of the steam-pressure) is made to act upon a piston movable in a cylinder which by a suitable transmission is connected with the air-controlling device. The construction of said device varies with the construction of the water-tube boiler, and may consist of an air-valve communicating with the fireplace, of a damper in the blast-pipe leading to the fireplace, or any other well-known contrivance. The steam or water pressure acting upon the piston may be balanced by a spring-pressure, whereby the piston is put in motion in the cylinder by the variations in the steam or water pressure and thus enabled to perform the opening or closing of the air-controlling device until equilibrium is restored by the spring. Said spring is strained between two blocks which are suspended between knife-edges. The object of these knife-edges is to assure an axial attachment of the spring on the piston and thus to enable the latter to move freely, this being obtained because the blocks can tip sidewise in all directions.

For making the invention intelligible an apparatus constructed as above indicated is shown in the accompanying drawings, in which—

Figure 1 represents a vertical section thereof; Fig. 2, the bushing of the knife-edged screw; Figs. 3, 3^a, and 3^b, top and sectional views of the bearing-pieces; Figs. 4, 4^a, and 4^b, two side views, taken, respectively, at right angles to each other, and a top view, of knife-edged bushings arranged in the blocks that support the spring; Figs. 5, 5^a, and 5^b, two side views, taken, respectively, at right angles to each other, and a top view, of the inverted cup; and Fig. 6 shows the apparatus

applied to a boiler and controlling the air-supply to a furnace.

Similar letters of reference indicate corresponding parts.

a is a piston which is movable in a cylinder *b*, with the lower part of which a steam-inlet supply-pipe *c* is connected. The piston *a* carries at its upper end an inverted cup *a'*, the upper part of which is formed with a knife-edge *a*², Figs. 1 and 5. A similar cup *i*⁴, which forms a sort of bushing fixed in a block *i*, is provided with a knife-edge *i*², arranged at right angles to the knife-edge *a*². Said knife-edges rest in corresponding bearings in the piece *i*³. In the same manner a second block *k* carries the bushing or cup *k*⁴, which is provided with a knife-edge *k*². A similar knife-edge *k'* rests against the screw-nut *m'*, inserted in the top plate of the frame of the apparatus, and is provided with a stem *m*, passing through the hole in said screw-nut. The knife-edge *k'* is arranged at right angles to the knife-edge *k*² just mentioned. The two knife-edges *k*² and *k'* rest in corresponding bearings in the piece *k*³. Between the blocks *i* and *k* a strong helical spring *l* is strained, said spring being intended to balance the steam-pressure on the lower end of the piston *a*. A pin *h* passes through a central hole in the stem *m*, bearing-piece *k*³, knife-edges *k'* *k*², and bushing *k*⁴, and is stepped at its lower pointed end in the socket of bushing *i*⁴, while its upper pointed end is stepped in a corresponding socket *h'* in the under side of the lever *g*. The lever *g* rests with one end against the knife-edge *g'*, fixed on the frame of the apparatus, its other end being attached to rope *f*, which surrounds a wheel on the shaft of the damper *d*, inserted in the air-supply pipe *e*, leading to the fireplace of the boiler A, Fig. 6.

The apparatus works as follows: With normal steam-pressure equilibrium is established between the pressure of the steam on the piston *a* and the spring *l*, while the damper *d* occupies a position in which it supplies the air necessary to the furnace for generating a quantity of steam corresponding to the normal consumption. By increased or diminished consumption of steam the steam-pressure in *c* is either reduced or raised and the piston *a* moved in the cylinder *b* down or

up until equilibrium is again established by means of the spring *l*. According to these movements of the piston *a* the damper *d* is correspondingly operated by means of the transmission *h g f*, thus increasing or decreasing the air-supply through pipe *e* to the fire-place of the boiler. The generation is thus also increased or decreased in a corresponding degree.

10 The object of the crossed knife-edges $a^2 i^2$ and $k' k^2$ is to assure an axial attachment of the spring on the piston *a* and thus to enable the latter to move freely, this being obtained because the blocks *i* and *k*, owing to their
15 being suspended between said knife-edges, can tip sidewise in all directions. Thus an oblique position of the spring does not exert a side pressure on the piston, which would impair its free movement in the cylinder *b*.

20 Having now described and ascertained the nature of my invention and in what manner the same is to be performed, what I claim as new is—

1. In means for controlling the air-supply
25 to steam-boiler furnaces, the combination of a cylinder, a piston guided in the cylinder, a steam-supply pipe leading into the cylinder at one end of the piston, a system of blocks and knife-edges arranged between the other
30 end of the piston and one end of the cylinder, a spring arranged between and bearing at

one end against one of said blocks and at the other end against another of the blocks, an air-supply-controlling device, and means for connecting the piston with the air-supply-controlling device, substantially as set forth. 35

2. In means for controlling the air-supply to steam-boiler furnaces, the combination of a cylinder, a piston guided in the same, a steam-supply pipe leading into the cylinder at one end of the piston, a system of blocks and knife-edges arranged between the other end of the piston and one end of the cylinder, a spring arranged between and bearing at one end against one of said blocks at the other end against another of the blocks, an air-supply-controlling device, and means for connecting the piston with the air-supply-controlling device, consisting of a pin *h* passing through one end of the cylinder, one of the blocks and stepped into one of the other blocks, a lever *g* connected with the pin *h*, and a rope or cord *f* leading from said lever to a damper of the furnace, substantially as set forth. 40 45 50

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses. 55

CARL GUSTAF PATRIK DE LAVAL.

Witnesses:

TYCKO ROBSAHM,
WALDEMAR BOMAN.