(No Model.) 2 Sheets—Sheet 1.

J. G. J. DAVIS.

DEVICE FOR RELIEVING PRESSURE IN BOILERS.

No. 579,700. Patented Mar. 30, 1897.

Fig. 1.

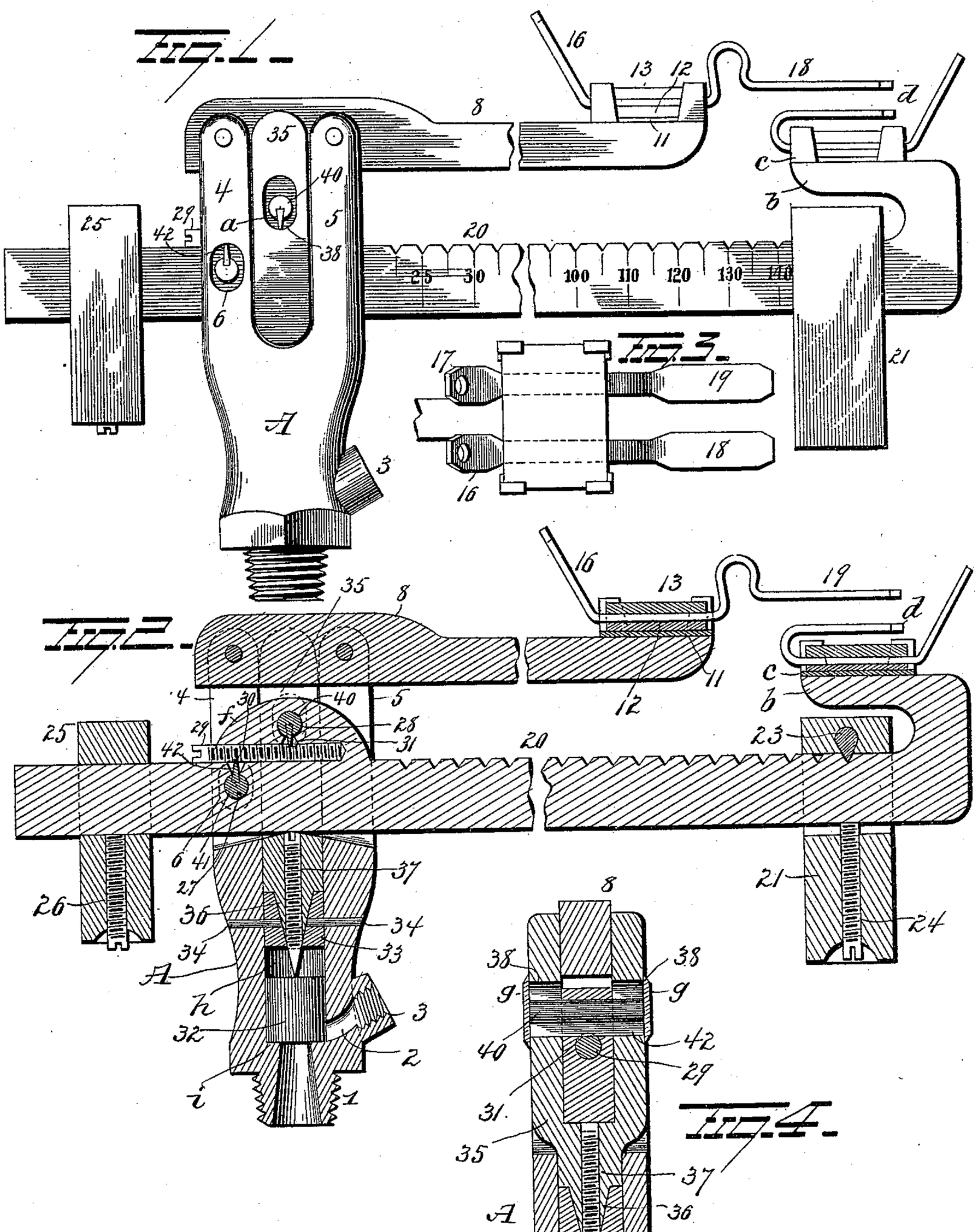

Fig. 3.

Fig. 2.

Fig. 4.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

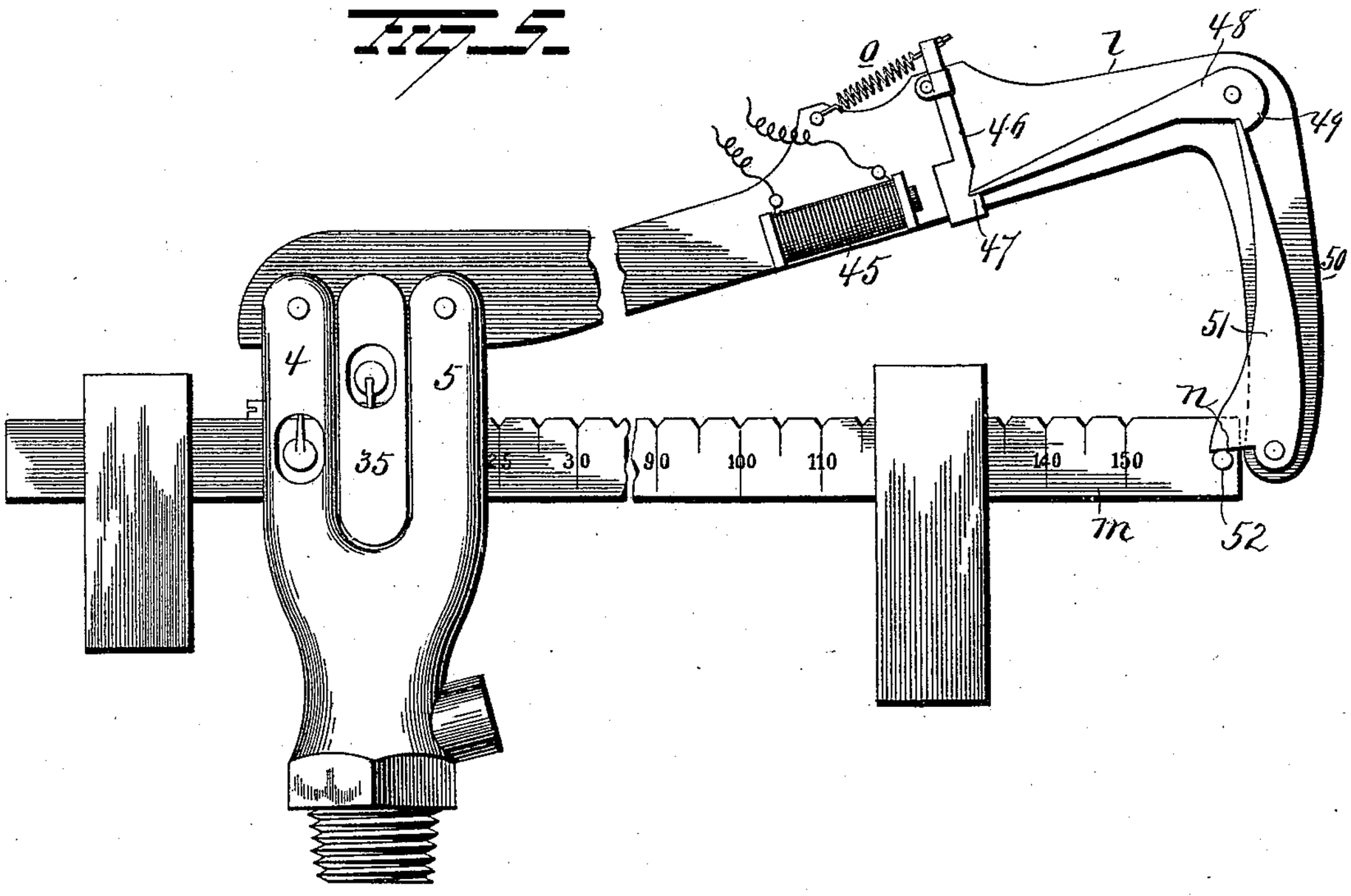
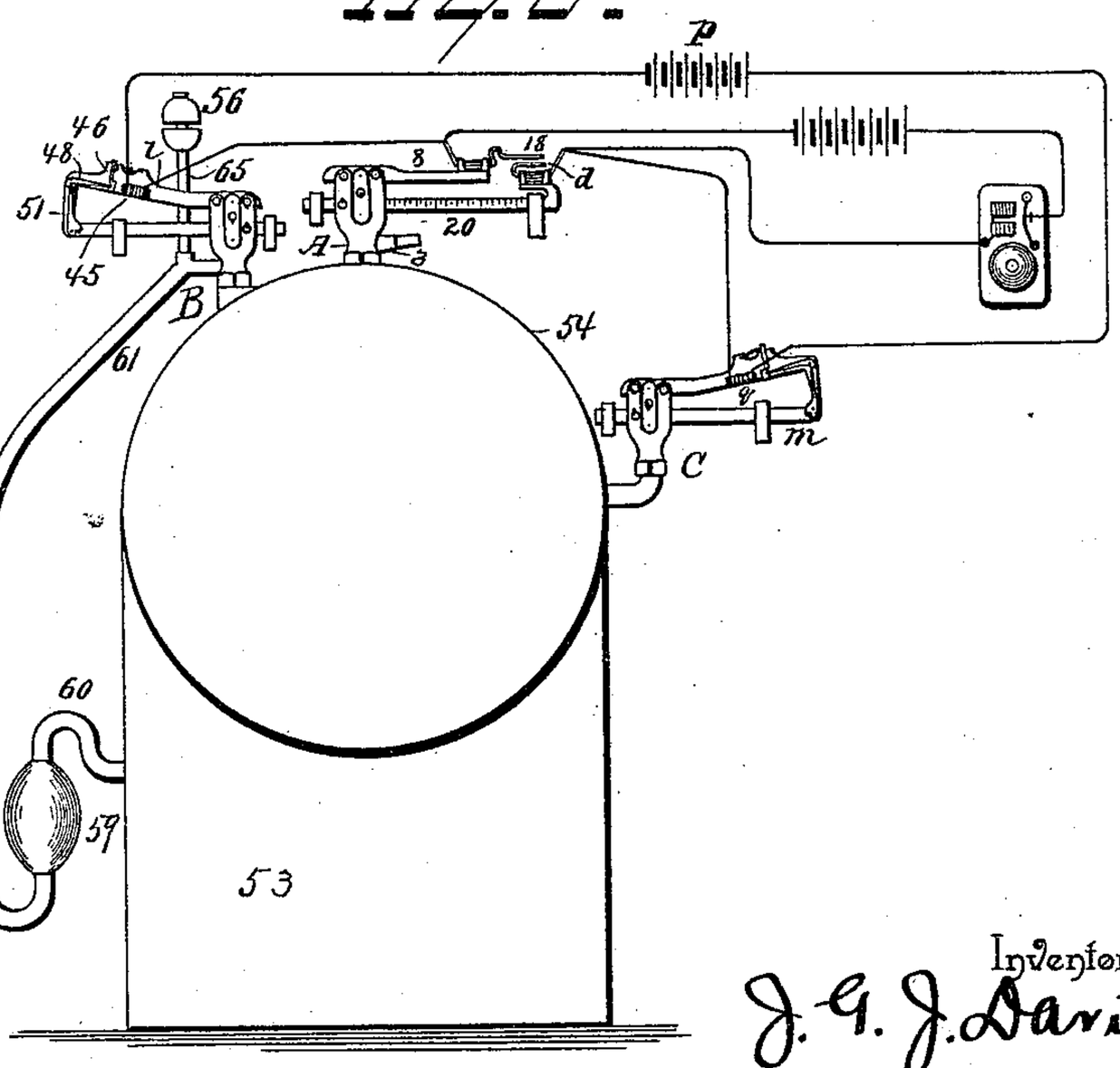


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN GADDY JONES DAVIS, OF AUGUSTA, GEORGIA.

DEVICE FOR RELIEVING PRESSURE IN BOILERS.

SPECIFICATION forming part of Letters Patent No. 579,700, dated March 30, 1897.

Application filed June 9, 1896. Serial No. 594,881. (No model.)

To all whom it may concern:

Be it known that I, JOHN GADDY JONES DAVIS, a resident of Augusta, in the county of Richmond and State of Georgia, have invented certain new and useful Improvements in Devices for Relieving Pressure in Boilers, &c.; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in devices for relieving pressure in boilers, radiators, &c., the objects of the invention being to so construct a system of devices that when pressure in a steam-boiler or other apparatus to which the devices are attached rises beyond a predetermined degree such pressure will be automatically relieved and the escaping steam utilized for operating devices for sounding a whistle, ringing a bell, and reducing the fire under the apparatus in which the steam is generated.

With these objects in view the invention consists in certain novel features of construction and combinations and arrangements of parts, as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side view of my improved valve mechanism. Fig. 2 is a sectional view. Fig. 3 is a plan view of one set of electrical contact devices. Fig. 4 is a vertical cross-section. Fig. 5 is a detail view of one of the auxiliary exhaust-valve and tripping mechanisms. Fig. 6 is a view showing the arrangement of the various devices when assembled.

A indicates a valve-casing having a hollow screw-threaded shank 1 for attachment to a boiler 54, and an exhaust-port 2, which communicates with a screw-threaded nipple 3 on the valve-casing. The upper portion of the valve-casing is made with two pairs of arms 4 5, and the arms 4 are provided with elongated openings 6, in which a knife-edge 42 has its bearing, said knife-edge being secured to a cylindrical pin 41 and constituting trunnions for a scale-beam 20 through an opening 27, in which latter the cylindrical pin 41 passes.

Between the pairs of arms 4 5 a laterally-projecting arm 8 is secured and provided at its free end with a holder 11 for the reception of plates 12 13 of insulating material, between which plates contact arms or springs 18 19 are secured, the rear ends 16 17 of said arms or plates being adapted for the attachment of electric wires. The outer end of the scale-beam 20 is made with an upwardly and rearwardly projecting arm *b* for the reception of a holder *c*, in which plates *d d* of insulating material are located. Between the plates *d d* contact-plates are secured, so as to be engaged by the contact-arms 18 19 to close electric circuits, for a purpose hereinafter explained.

The scale-beam is provided with graduations designating steam-pressure in pounds, and the upper edge of the long arm of said beam is made with notches for the reception of a knife-edge pin 23, secured in an adjustable weight 21, and serving as a support for the latter on the scale-beam. The weight 21 is made with a screw-threaded socket for the reception of a screw 24, adapted to engage the lower edge of the scale-beam and prevent accidental displacement of the weight. A weight 25 is mounted on the small arm of the beam 20 and held in position by means of a screw 26.

Between the pairs of arms 4 5 at the upper end of the valve-casing A a stirrup 35 is loosely disposed and adapted to loosely embrace the fixed end of the arm 8, by which it will be guided. The vertical arms of the stirrup 35 are made with elongated slots 38, in which a knife-edge *a* has its bearings, said knife-edge being carried by a cylindrical pin 40, which passes through a hole 28 in an enlargement *f* on the scale-beam. A screw 29 passes into the enlargement *f* and provided with an annular groove 30 for the reception of the knife-edge 42, and with an annular groove 31 for the reception of the knife-edge *a*. By means of the screw 29 the knife-edges 42 and *a* can be moved slightly (the pins 40 41 turning in their bearings in the scale-beam 20) when they become slightly rounded, so as to insure the maintenance of sharp bearing edges.

Lateral displacement of the scale-beam will be prevented by means of caps *g*, secured to the arms 4 and the stirrup 35.

The stirrup 35 is made with a shank which depends within the valve-casing and pro-

vided with a conical lower end 36, adapted to pass through a similarly-shaped opening in a block 33, secured within the casing A by means of pins 34. The shank of the stirrup 35 is made with a longitudinal screw-threaded opening for the reception of a screw 37, the lower pointed end of which projects below the conical end 36 of the stirrup-shank. The lower portion of the valve-casing forms a cylindrical valve-chamber *h*, in which a piston-valve 32 is located and held normally to its seat *i* by the screw 37 in the stirrup 35. The upward movement will be limited by the block 33. The valve 32 has a neat fit within the valve-chamber and prevents the escape of steam up through the valve-casing to the bearings of the scale-beam. The valve 32 normally closes the exhaust-duct 2 and also the passage through the shank 1 and presents a flat surface to the steam-pressure entering said shank 1.

From the construction and arrangement of parts above described it will be readily seen that when the pressure of steam in the boiler 54 rises beyond a predetermined degree (at which the weight 21 is set on the scale-beam 20) the piston-valve 32 will rise and open the exhaust-port 2, thus permitting the escape of steam through a pipe 64, connected with the nipple 3. When the valve is thus raised by the excessive steam-pressure, the stirrup 35 will be raised, resulting in raising the long arm of the scale-beam and causing the contact-plates *d* to engage the contact-arms 18 19. An electric rheotome-bell *j* is included in circuit with one of the contact-plates *d*, the contact-arm 19, and a suitable battery *k*, so that when the scale-beam is raised in the manner above described an electric circuit through said bell will be closed and the bell sounded, thus indicating that an excessive pressure of steam exists in the boiler.

A valve mechanism B, substantially identical with that above described, is connected with the boiler 54. In lieu of the arm 8 above described the valve mechanism B is provided with an L-shaped arm *l*, secured to the arms 4 5 of the valve-casing A, the short depending arm 50 of said L-shaped arm terminating in proximity to the free end of the long arm of the scale-beam *m*, as clearly shown in Fig. 5. A lever 51 is pivoted at the free end of arm 50 and provided with a shoulder *n* to be engaged by a pin 52 at the free end of the scale-beam, so as to force the free end of said lever 51 in engagement with a shoulder 49 on a pivoted lever 48, and the free end of the latter is adapted to engage a shoulder 47 of a pivoted armature-lever 46. The normal engagement of the armature-lever 46 and lever 48 is insured by a spring *o*. The levers 46, 48, and 51 thus serve to lock the scale-beam *m* and consequently the valve mechanism B, and said levers will be released so as to permit the valve mechanism B to operate by means of an electromagnet 45, adapted to actuate the armature-lever, the coil of said electromagnet being included in circuit with a battery *p*, one of the contact-plates *d*, and the contact-arm 18, which circuit also includes an electromagnet *q*, adapted to actuate tripping mechanism identical with that above described, for a valve mechanism C identical with the valve mechanism A and B. The casing of the valve mechanism C communicates with the boiler in proximity to the water-line, so that when the valve rises excessive steam and water can escape through a pipe 63, connected with the nipple 3.

The valve mechanism B may connect with the boiler 54 at a point in proximity to the valve mechanism A, and with the nipple 3 of said valve mechanism B two pipes 61 and 65 communicate, the pipe 65 leading to a steam-whistle 56 and the pipe 61 leading to a receptacle 59, containing a chemical compound which will be driven by the steam through a pipe 60 into the fire in the furnace 53 and result in reducing the fire.

Assuming that the main-valve mechanism is set to operate when the pressure in the boiler exceeds one hundred and fifty pounds and the auxiliary valves are set to operate at one hundred and twenty-five pounds pressure, under such conditions when the pressure exceeds one hundred and fifty pounds the piston-valve of the main-valve mechanism will rise and cause the free end of the long arm of scale-beam 20 to rise and close the electrical circuits through the bell and the electromagnets of the valve mechanisms B and C, whereupon said magnets will act to release the trip mechanisms and permit the valves of the mechanisms B and C to open and allow excessive steam and water to exhaust from valve mechanism C and steam to exhaust from valve mechanism B for the purpose of sounding the whistle from the receptacle 59 to the fire in the furnace.

From the contruction and arrangement of parts above described it will be seen that when the steam-pressure in the boiler becomes excessive the main-valve mechanism A will operate to exhaust a portion of the steam, ring a bell, cause other valves to be opened for exhausting excessive steam and water, sounding a whistle, and injecting a chemical into the furnace for subduing or reducing the fire.

When the pressure in the boiler drops below one hundred and twenty-five pounds, the valves will be automatically reset and the trip devices of valve mechanisms B and C can then be normally reset.

Various slight changes might be made in the details of my invention without departing from the spirit thereof or limiting its scope, and hence I do not wish to limit myself to the precise details herein set forth; but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a safety-valve of an electric bell, and electric contacts con-

nected with the scale-beam, of the safety-valve and an arm connected therewith for automatically closing the circuit, when the valve opens to exhaust steam, and thereby cause the bell to operate, substantially as set forth.

2. The combination with a steam-boiler, of a safety-valve and one or more auxiliary valves, signaling devices adapted to be operated by the opening of the safety-valve and auxiliary valves and an electric circuit and electrically-operated devices, for automatically ringing a bell, and unlocking the auxiliary valves, substantially as set forth.

3. The combination with a steam-boiler and a receptacle for containing a chemical, a furnace, of valve mechanism adapted to permit the exhaust of steam when the pressure becomes excessive and connections between the chemical-receptacle and the valve mechanism and furnace, whereby the exhaust-steam will be utilized to inject a chemical into the fire in the furnace, substantially as set forth.

4. The combination with a steam-boiler, of a main safety-valve mechanism adapted to permit the escape of steam when the pressure in the boiler becomes excessive, and an auxiliary-valve mechanism connected with the boiler in proximity to the water-line and adapted to be released by the operation of the main safety-valve mechanism, substantially as set forth.

5. The combination with a steam-boiler, of a main safety-valve mechanism communicating therewith, auxiliary-valve mechanisms communicating with said boiler, electromagnet trip devices adapted to normally lock said auxiliary-valve mechanisms, a circuit-closer connected with and operated by the main safety-valve mechanism and an electric circuit including the electromagnets of the trip devices of the auxiliary-valve mechanisms, and said circuit-closer, substantially as set forth.

6. The combination with a safety-valve casing, a scale-beam pivoted thereto, a valve, a stirrup resting upon the valve and retaining it against its seat, and serving as a pivotal support for the scale-beam, substantially as set forth.

7. The combination with a valve-casing and a scale-beam connected thereto, of a piston-valve in said casing, and an adjustable connection between said valve and scale-beam at one side of the pivotal connection of the latter with the valve-casing, substantially as set forth.

8. The combination with a valve-casing and a scale-beam pivotally connected therewith, of a piston-valve in said casing, a stirrup connected with the scale-beam to one side of the connection of the latter with the valve-casing, and a screw passing through said stirrup and adapted to normally bear on said piston-valve, substantially as set forth.

9. The combination with a valve-casing and a scale-beam pivotally connected therewith, of a piston-valve in said casing, a block having tapering opening in said casing above the valve, and a stirrup connected to the scale-beam and having a tapering lower end to project through the tapering opening in said block and normally engage the piston-valve, substantially as set forth.

10. The combination with a valve-casing, of a piston-valve therein, a scale-beam, a cylindrical pin passing through the scale-beam and carrying knife-edges having a bearing in the valve-casing, a stirrup adapted to bear on the piston-valve, a cylindrical pin passing through the scale-beam and carrying knife-edges having bearings in the stirrup, and a screw in the scale-beam adapted to engage said knife-edges for adjusting them, substantially as set forth.

11. The combination with a valve-casing having two pairs of arms and a piston-valve in said casing, of a scale-beam pivotally connected to one pair of arms, a stirrup located between the pairs of arms and adapted to bear against the piston-valve, said stirrup being pivotally connected to the scale-beam, a rigid arm secured to said pairs of arms, insulated contact-plates secured to said rigid arm, insulated contact-plates secured to the scale-beam, and electric circuits including said contact-plates and signal and releasing devices, substantially as set forth.

12. The combination with a casing and a piston-valve therein of a scale-beam pivotally connected with the casing, a stirrup connected with the scale-beam and bearing on said piston-valve, a weight on each arm of said scale-beam, and screws passing through said weights and engaging the scale-beam, substantially as set forth.

13. The combination with a steam-boiler and its furnace, of a safety-valve and an auxiliary valve, a receptacle for chemicals, and a pipe, leading from the chemical-receptacle to the furnace, whereby on the opening of the auxiliary valve, steam will be forced through the chemical-receptacle and force the chemicals into the furnace, substantially as set forth.

14. The combination with a steam-boiler of a safety-valve, an auxiliary valve, and a steam-whistle connected with the auxiliary valve, of electric circuits and electrically-actuated mechanism included therein, whereby on the opening of the safety-valve, the auxiliary valve will be released with the result that the whistle will be operated, substantially as set forth.

15. The combination with a steam-boiler and its furnace, a safety-valve, and auxiliary valves, of a steam-whistle, an electrically-actuated bell, a chemical-receptacle, and electric circuits and electrically-actuated devices included therein, substantially as set forth.

16. The combination with a steam-boiler, of a sensitive valve blown by excessive steam-pressure and adapted to complete an electrical circuit when blown, an electromagnet included in said electrical circuit, and trip mechanism released by the action of the mag-

net and adapted to open the second valve, substantially as described.

17. The combination with a steam-boiler, of a valve blown by excessive steam-pressure and comprising a pivoted scale-beam, a piston directly operated on by the steam, and a stirrup straddling the scale-beam and pivoted thereto and provided with a pointed shank bearing on the piston, substantially as described.

18. The combination with a steam-boiler, of a valve blown by excessive steam-pressure, and comprising a pivoted scale-beam, a piston directly acted on by the steam-pressure and governing an exhaust-port, a stirrup straddling the scale-beam, being pivoted thereto and provided with a shank, and an adjusting-screw in said shank and having its end bearing on the piston, substantially as described.

19. The combination with a steam-boiler, of a valve blown by excessive steam-pressure and comprising a valve-casing, a scale-beam hung on an adjustable knife-edge, a stirrup straddling the scale-beam and hung on an adjustable knife-edge, said stirrup being provided with a pointed shank, and a piston on which the pointed shank rests, substantially as described.

20. The combination with a steam-boiler, of a scale-beam having an adjustable weight and carrying an electrical contact device, a contact-arm carrying an electrical contact device, and a valve for raising the scale-beam to bring said contact devices into connection, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN GADDY JONES DAVIS.

Witnesses:

JOHN L. ARMSTRONG,

JAS. P. ARMSTRONG.