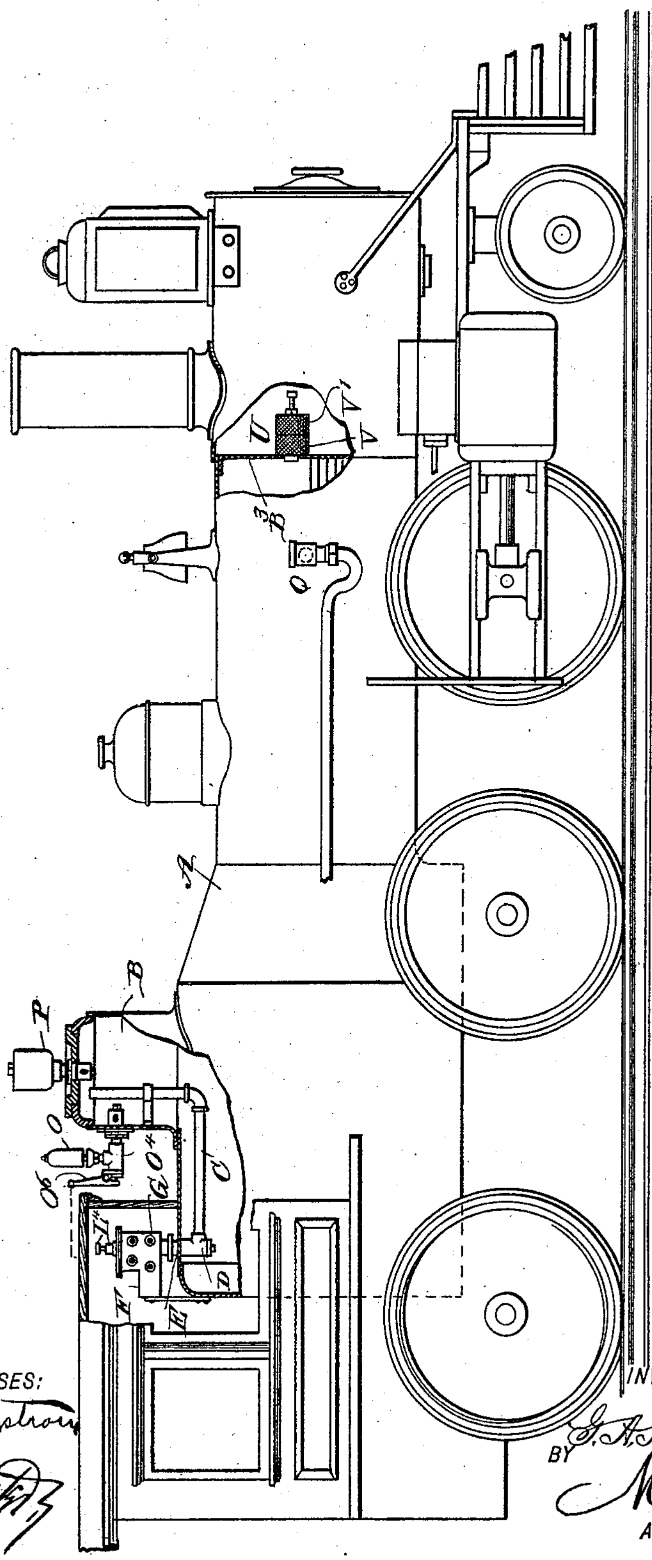
(No Model.) 4 Sheets—Sheet 1.

G. A. AKERLIND.

LOCOMOTIVE BOILER.

No. 527,645. Patented Oct. 16, 1894.

Fig. 1



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G. A. AKERLIND.

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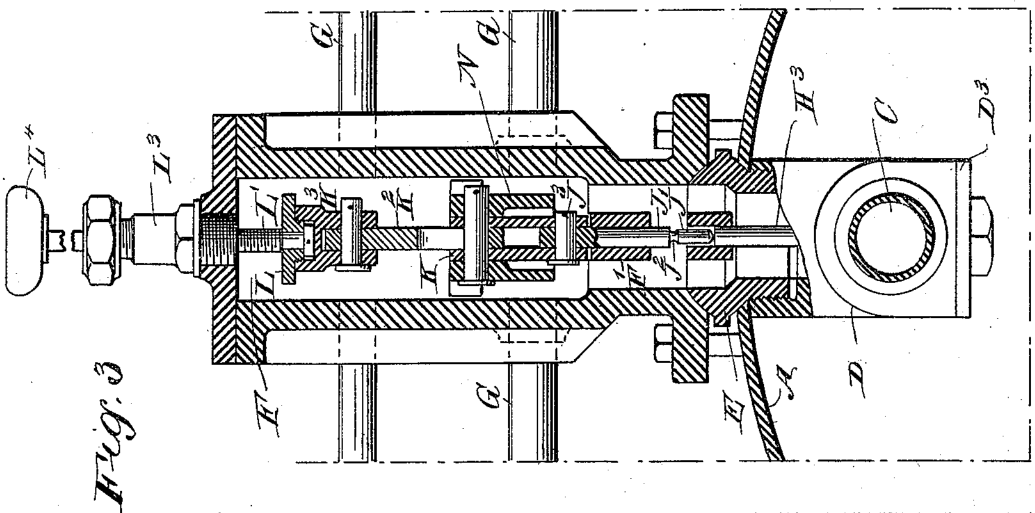

Fig. 3

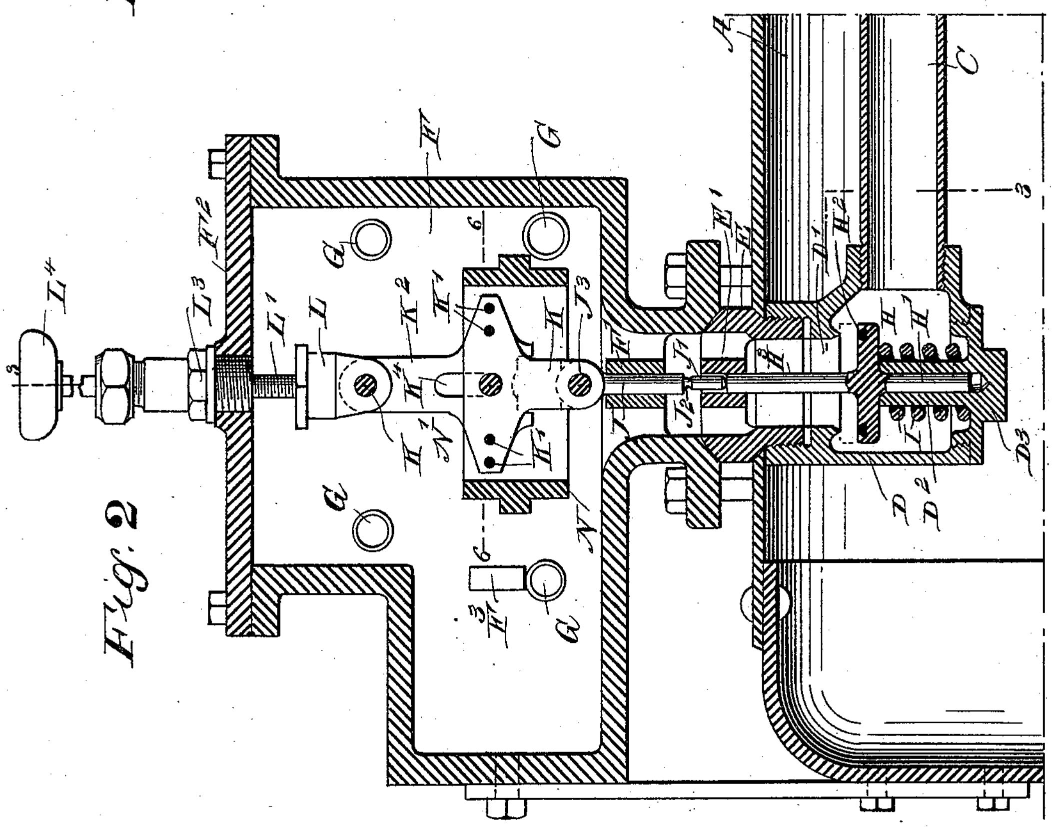

Fig. 2

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(No Model.) 4 Sheets—Sheet 3.

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LOCOMOTIVE BOILER.

No. 527,645. Patented Oct. 16, 1894.

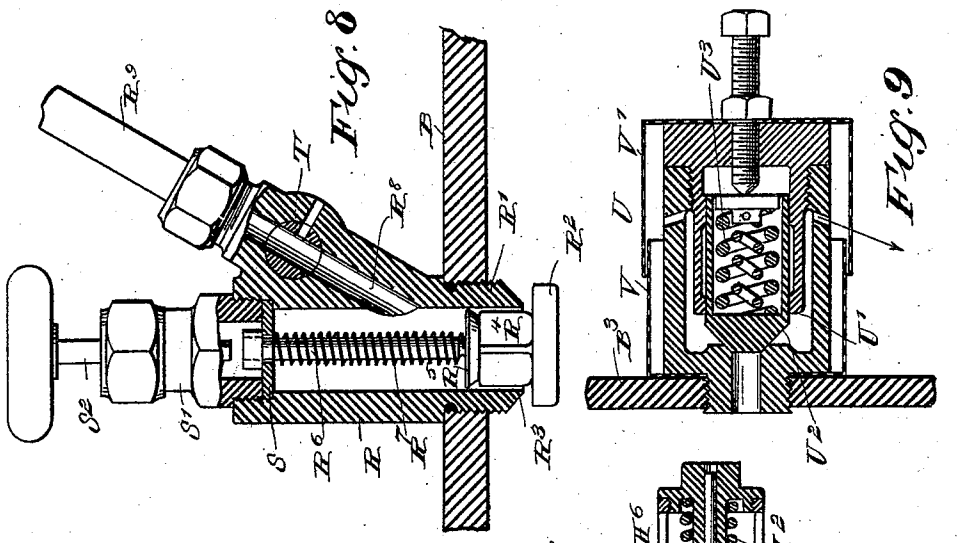

Fig. 8

Fig. 9

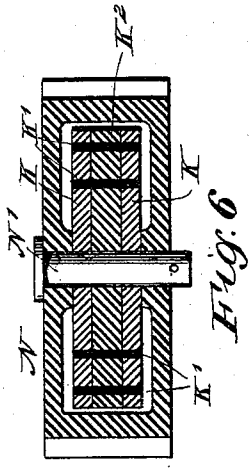

Fig. 6

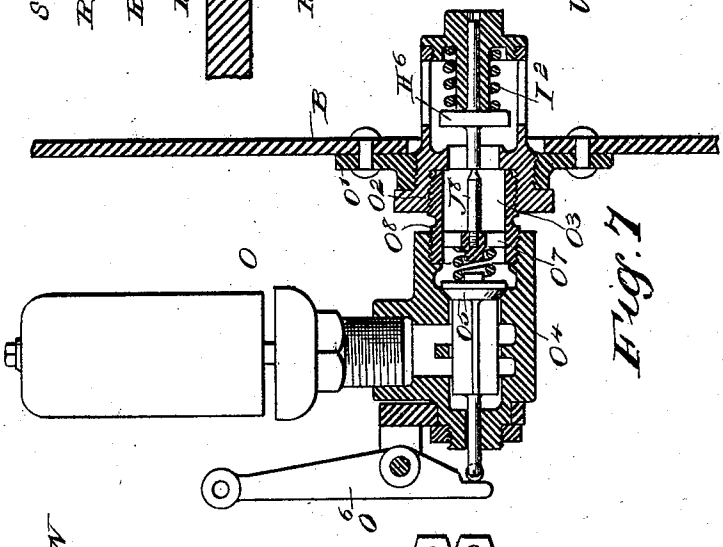

Fig. 7

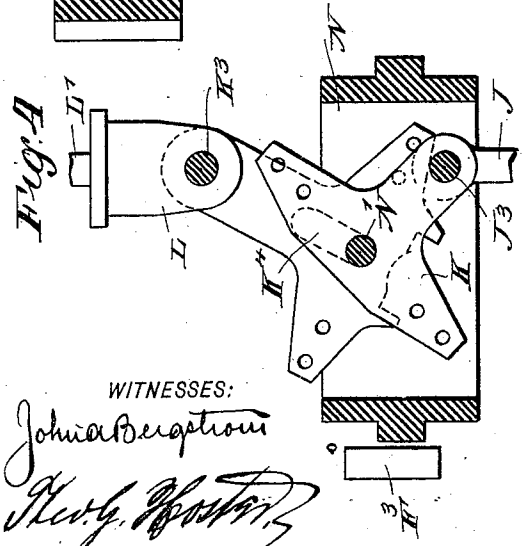

Fig. 4

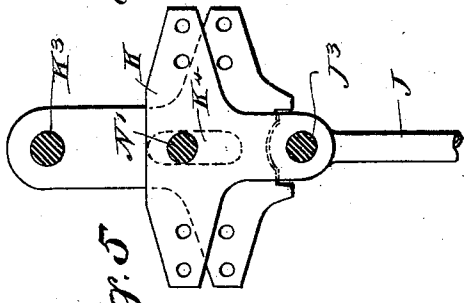

Fig. 5

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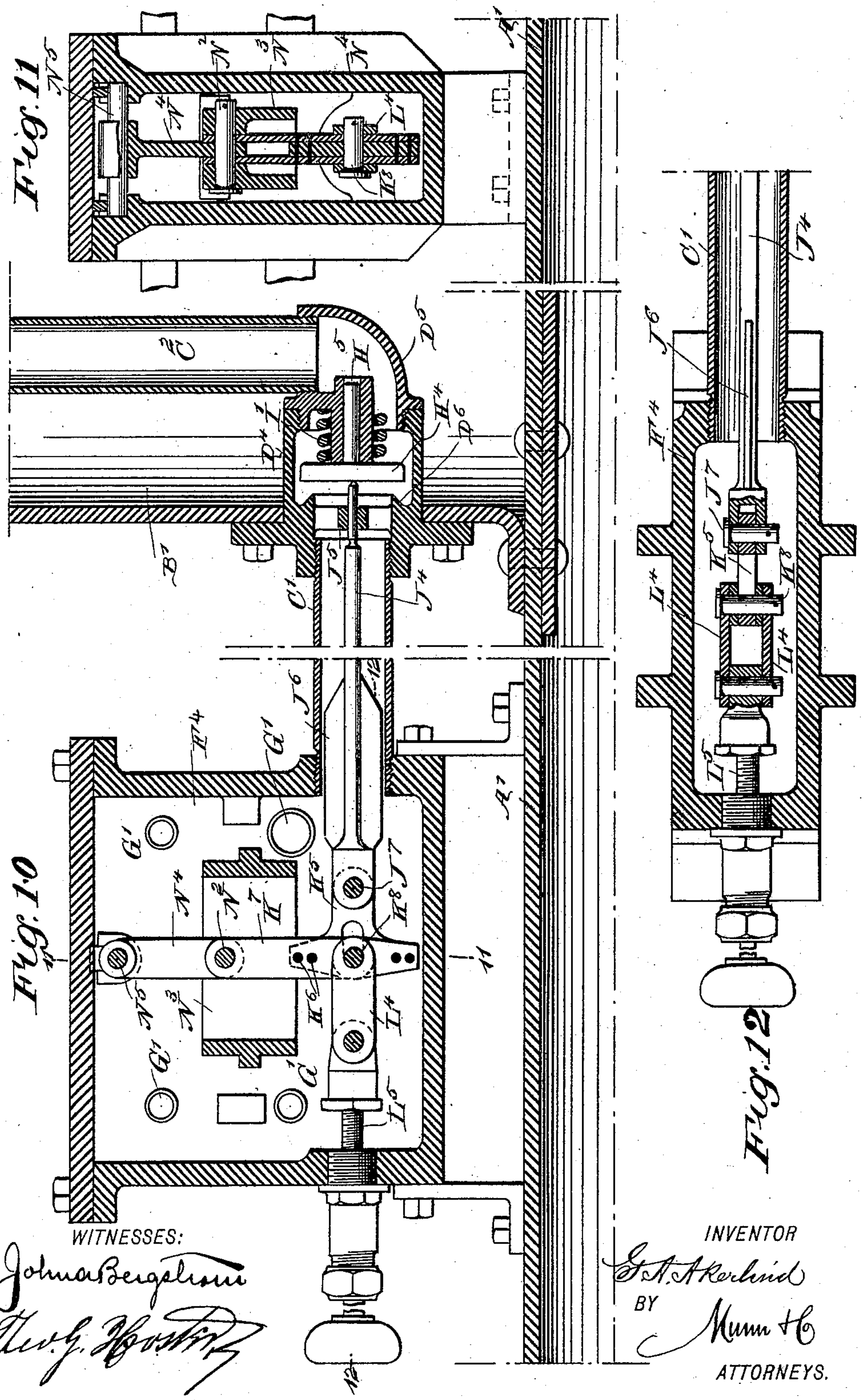

Fig. 10

Fig. 11

Fig. 12

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UNITED STATES PATENT OFFICE.

GUSTAF A. AKERLIND, OF ROCK ISLAND, ILLINOIS.

LOCOMOTIVE-BOILER.

SPECIFICATION forming part of Letters Patent No. 527,645, dated October 16, 1894.

Application filed May 23, 1894. Serial No. 512,161. (No model.)

To all whom it may concern:

Be it known that I, GUSTAF A. AKERLIND, of Rock Island, in the county of Rock Island and State of Illinois, have invented new and useful Improvements in Locomotive-Boilers, of which the following is a full, clear, and exact description.

The object of the invention is to provide certain new and useful improvements in locomotive boilers, whereby the steam contained in the boiler is prevented from escaping through broken pipes, valves, or other parts of the boiler in case of collision or other accident to the locomotive, to prevent the scalding of persons by escaping steam.

The invention consists principally of a spring-pressed valve normally held open and adapted to close automatically in case of a shock to the locomotive, or in case a steam conveying pipe of the boiler is broken off.

The invention further consists of an auxiliary safety valve held in a sheltered place on the boiler and set to a higher pressure than the ordinary safety valve of the boiler.

The invention also consists in certain parts and details, and combinations of the same, as will be hereinafter fully described and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of a locomotive with the improvements applied, parts being in section. Fig. 2 is an enlarged sectional side elevation of the improvement as arranged on the general steam distributing box for the injectors, air pump, blower pipe, steam heating system, lubricators, &c. Fig. 3 is a transverse section of the same, on the line 3—3 of Fig. 2. Fig. 4 is an enlarged side elevation of the weight for holding the valve and adjacent parts in position after a shock to the locomotive. Fig. 5 is a side elevation of the link connection for the weight, with the rivets sheared off by the weight. Fig. 6 is a sectional plan view of the same, on the line 6—6 of Fig. 2. Fig. 7 is an enlarged sectional side elevation of the improvement as arranged for the whistle. Fig. 8 is a like view of the improvement as arranged for the steam gage. Fig. 9 is a similar view of the auxiliary safety valve in the smoke arch. Fig. 10 is an enlarged sectional side elevation of a modified form of the improvement as arranged for the general steam distributing box, with the steam supply pipe from the dome outside the boiler shell. Fig. 11 is a transverse section of the same, on the line 11—11 of Fig. 10; and Fig. 12 is a sectional plan view of the same, on the line 12—12 of Fig. 10.

The locomotive illustrated in Fig. 1, is provided with the usual boiler A, having the steam dome B, into the top of which extends the steam supply pipe C, leading to a valve D connected with a bushing E fitted into and opening in the shell of the boiler A, as plainly shown in Fig. 2, the outer end of the said bushing E being engaged by the neck of a general steam distributing box F, into which passes the steam from the dome by means of the said pipe C, the valve D and bushing E, so as to distribute the steam from the said box F by means of pipes G, to the various devices of the locomotive to be supplied with steam. Usually the injectors, the air pump, the blower pipe, the steam heating system and the lubricators are connected by pipes G with the said general steam distributing box, so as to supply the devices with the necessary amount of steam to cause the devices to properly perform their usual functions.

The casing of the valve D, shown in detail in Figs. 2 and 3, is provided with a valve seat D′ on which is adapted to be seated a disk valve H, contained in the casing, but normally held in an open position or off the said seat D′ to permit the free passage of steam from the dome B to the said distributing box F as previously described. The disk valve H is provided with a downwardly-extending stem H′, fitted to slide vertically in the bore of a lug D^2 formed centrally on the inside of the cap D^3 for the casing of the valve D. A spring I rests with its lower end on the inner face of the said cap D^3, and presses with its upper end on the under side of the disk valve H, so as to force the latter upon its seat D′ whenever the said disk valve H is released, as hereinafter more fully described, to close the connection between the steam dome B and the distributing box F. The top face of the disk valve H is provided with a gasket H^2, of a soft material, adapted to be seated

upon the sharp edge of the valve seat D′ to firmly embed the said gasket H^2 on the seat to form a steam tight joint.

The disk valve H is provided with an upwardly extending stem H^3, in alignment with the stem H′ and fitted to slide at its upper end in a spider or bridge E′ arranged inside of the bushing E, as plainly illustrated in Figs. 2 and 3. The top of this stem H^3 is engaged by the reduced end J′ of a rod J, fitted to slide vertically in a spider or bridge F′ arranged in the neck of the steam distributing box F. The connection between the reduced end J′ and the rod J is made by a reduced neck J^2, so as to permit of readily breaking the reduced end J′ from the rod J, whenever the steam box F receives a shock or is torn off from its support on the shell of the boiler A.

The upper end of the rod J carries a pivot pin J^3 pivotally connected with T-shaped arms K, connected by pins or rivets K′ with a similar arm K^2 extending upwardly and pivotally connected at its upper end by a transverse pin K^3 with the head L, mounted to turn loosely on the lower end of a screw rod L′ screwing in a suitable box L^3 held on the cover or lid F^2 of the steam distributing box F.

On the upper outer end of the screw rod L′ is arranged a handle for a hand wheel L^2, for conveniently turning the said screw rod L′ to screw the latter up or down in the box L^3, to adjust the head L and consequently the position of the arms K^2, K, and their connected parts. In the arm K^2 is arranged a vertically disposed slot K^4, through which passes transversely a pin N′, also passing through the arms K, between the rivets or pins K′, as plainly shown in Figs. 2 and 3, the said pin N′ being held in the front and rear of a weight N, made box-shaped with an open top and bottom to inclose the main parts of the said arms, as plainly shown in the figures referred to.

The weight N has a limited longitudinal motion in case a shock is given to the locomotive, or the cars connected therewith, in a longitudinal direction, the said weight striking either a stop lug F^3 in the box F, in case the shock comes from the front and goes rearward, or the front end of the box F in case the shock is from the rear to the front.

The operation is as follows: When the several parts are in the position illustrated in Figs. 2 and 3, then the valve H is held in an open position against the tension of the spring I, by the reduced end J′ of the rod J engaging the upper end of the stem H^3, the said rod J being held in place by the arm K rigidly connected with the arm K^2, both being held in the weight N, and supported in a vertical position by the head L and screw rod L′. Steam from the dome B can now readily pass to the distributing box F, to pass through the pipe G to the several devices to be supplied with steam in the ordinary way. Now, in case of accident to the locomotive by collision, &c., the weight N is caused to move rearward or forward according to the direction in which the shock is inflicted, so that the pin N′ moving with the weight N, causes a swinging of the arms K and K^2, but in opposite directions, whereby the pins or rivets K′ are sheared off and the said arms assume the position shown in Fig. 4, that is, the arms K held on the pin N′ draw up the rod J, to release or unlock the stem H^3 of the valve H, so that the latter is forced to its seat by the action of the spring I, to shut off the steam from the dome B to the distributing box F and the devices connected therewith.

In case of an accident tearing off the distributing box F from its support on the shell of the boiler A, then the rod J will be broken off at the neck J^2, so that the valve stem H^3 is released, and the force of the spring I, will seat the valve H on its seat D′ in the valve casing. Thus in every case steam is shut off from the distributing box F to prevent the escape of steam.

As shown in Figs. 1, 2 and 3, the steam supply pipe C leading from the dome B to the distributing box F, is arranged within the shell of the boiler A, but in the device illustrated in Figs. 10, 11, and 12, the steam supply pipe C′ is arranged outside the shell of the boiler A′, and in this case the improvement is applied as follows: The steam supply pipe C′ extends from the valve casing D^4 directly into the distributing box F^4, supported on the shell of the boiler A′. The inner end of the valve casing D^4 is provided with an elbow cap D^5, from which extends upwardly the pipe section C^2 of the supply pipe C′, the upper end of this section extending near the top of the dome into the latter, to take as dry steam as possible. In the elbow cap D^5 is fitted to slide the stem of a disk valve H^4 adapted to be seated on the seat D^6 of the casing D^4 by the action of a spring I′, but normally this disk valve H^4 is held off its seat by the reduced end J^5 of a rod J^4 extending horizontally through the steam supply pipe C′, to pass into the steam distributing box F^4. In order to guide the forward end of this rod J^4, I provide the same with wings J^6 fitting into the steam supply pipe C′. A pin J^7 connects the end of the rod J^4 with a T-shaped arm K^5 connected normally by rivets or pins K^6 with plates K^7, pivoted on a transversely-extending pin N^2 carried by the weight N^3. The pin N^2 is supported on a link N^4 hung on a pin N^5 journaled in suitable bearings in the sides of the box F^4, as plainly illustrated in Fig. 11. Thus the weight N^3 is free to swing longitudinally with the pin N^5 as a fulcrum. A pin K^8 passes through the plates K^7 and K^5, and this pin is also connected by links L^4 with the head of a screw rod L^5, similar in construction to the screw rod L′, and under the control of the operator, the said screw rod being however, in alignment with the rod J^7, as indicated in the drawings. Now, by the device described, the disk valve H^4 is nor-

mally held off its seat by the locking rod J^4, and in case a shock is given to the locomotive in either direction, then the weight N^3 will swing and cause a shearing off of the pins or rivets K^6, to move the plates K^5, K^7, into an angular position, and to draw the rod J^4 away from the disk valve H^4 to permit the spring I′ to force the disk valve upon its seat D^6, to shut off the steam from the distributing box F. Should the collision not disable the engine, then the valve H^4 can readily be opened by the operator screwing the hand wheel L^4 on either the screw rod L′ or L^5, to force the rod J or J^4 against the corresponding disk valve H or H^4, to open the same. By taking off the cover of the steam distributing box F or F^4, the momentum weights N or N^3 can be readily taken out and new rivets or pins K′ and K^6 put in place on the arms K, K′ or plates K^5, K^7 to reset the device as above described.

It is understood that in either case illustrated in Figs. 2 and 10, the center of gravity weight N or N^3 is a suitable distance below its support in the head L or pin N^5, to permit the weight to properly swing endwise whenever a shock occurs.

In case of repairs the disk valve H or H^4 can be readily closed by raising the momentum weight N, and screwing up or lifting the rod L′.

For the whistle O, I provide a threaded flange O′, riveted to the dome B, and supporting a valve casing O^2 opening into the dome, as shown in Fig. 7. This casing O^2 contains the disk valve H^6 pressed on by a spring I^2, to close the valve casing in case of an accident, to prevent the escape of steam through the casing. A pin J^8 holds the valve H^6 normally in an open position. The whistle valve casing O^4 screws on the outer end of a short pipe O^3, screwing in the valve casing O^2, and this casing O^4 contains the usual spring-pressed valve O^5, adapted to be opened by a lever O^6 under the control of the operator. The pin J^8 is secured in a bridge or spider O^7 arranged in the pipe O^3, and the latter is exteriorly provided between the casings O^2, O^4, with an annular groove to weaken the pipe and to permit it to readily break off the casing O^4 and the whistle valve supported thereby, together with the valve O^5, and to release the disk valve H^6 from the pin J^8, to permit the said disk valve H^6 to close in the casing O^2, thereby shutting off the steam.

In the safety valve P in the top of the dome B, a similar arrangement is provided, so that in case of an accident the said valve is broken off, the steam will be prevented from escaping at this point. A like arrangement is provided for the injector check valve Q, see Fig. 1, so that in case the check valve casing is broken off, the steam or water cannot escape from the boiler at this point.

For the steam gage connection the following device is provided, special reference being had to the detail Fig. 8: In the shell of the boiler A is screwed the threaded end R′ of the casing R, and a valve R^2 is adapted to be seated on the seat R^3, formed on the end R′ inside of the boiler. The valve R^2 is provided with wings R^4, and the smaller auxiliary piston valve R^5, extending loosely into the casing R. A valve stem R^6 extends from the piston valve R^5 to have a bearing in a washer S, held in the casing R by a nut cap S′ containing a screw rod S^2 under the control of the operator and in alignment with the stem R^6. A spring R^7 on the stem R^6 holds the valve R^2 normally off its seat R^3. A branch pipe R^8 leads from the casing R and connects with the pipe R^9 leading to the gage, and in this branch pipe is arranged a three-way cock T, under the control of the operator.

The stem R^6 is necked in directly above the piston valve R^5, and a similar neck or annular groove is formed on the junction of the threaded end R′ with the casing, to permit the latter to readily break off at this point in case of accident, together with the stem R^6 at the necked-in part to release the valve R^2 and to permit the steam from the boiler to force the valve R^2 to its seat to close the remaining threaded end R′.

In order to prevent an explosion of the boiler after all the possible outlets for the steam are closed by the devices above described, and in case steam is still further generated in the boiler to a dangerous point, I provide an auxiliary safety valve U, illustrated in detail in Fig. 9, and preferably located at the head of the boiler in the smoke arch, as shown in Fig. 1. This auxiliary safety valve is provided with a casing U′ screwing in the head sheet B^3 of the boiler and containing a valve U^2 normally held to its seat by springs U^3, the tension of which can be regulated to hold the valve U^2 to its seat under a steam pressure somewhat higher than the pressure for which the regular safety valve P is set. A protection shell surrounds the casing U′, and is made in two sections V and V′, to prevent soot from clogging up the interior of the casing U′, and so arranged that the exterior part V′ is pushed over the part V and held there. When the safety valve opens and the steam fills the space formed by the cover, the part V′ will be forced away leaving free passage for the steam to spread in a certain direction where it is likely to do the least damage. In Fig. 9 it is shown by an arrow as spreading over the flue sheet thereby preventing further combustion in the fire-box as well as keeping the steam in the smallest possible space. The cover is of course not perforated.

In the valve arrangement shown in Fig. 8, suppose a boiler pressure is had of one hundred and fifty pounds per square inch and an opening of one square inch in the shell filled with a plug. If the plug fills the hole a force of one hundred and fifty pounds is required to counter-balance the steam pressure. Suppose the area of the plug be reduced ten per

cent. Then the pressure on this surface will be about ten per cent. less or one hundred and thirty-five pounds. This figuring, even if only approximately correct, demonstrates, that should the valve house and the valve stem be broken off, there will be a sufficient force not only to prevent the valve from falling into the boiler but to force it against its seat, and when seated, the force on the valve will be equal to the area of the opening it covers times the boiler pressure.

The space between the piston R^5 and the cylindrical part of the valve house need only be of the same area as the inlet to the steam gage (three-eights to one-half inch pipe) and when in working order the steam pressure is of course the same in the steam gage as in the boiler, and the steam passing the piston will only be required to replace the very small amount lost by condensation, and there is consequently very little chance of the valve being lifted, and the weight of the valve and a light spring will be sufficient to keep it down. This arrangement will also be suitable for the water gage on a boiler to shut off steam and water when the glass breaks.

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

1. A locomotive boiler provided with a spring pressed valve, and with a movable weight for normally holding the valve open, and releasing the same in case of shock to the locomotive, substantially as described.

2. A locomotive boiler, provided with a spring-pressed valve held normally open on the steam conveying pipe, and a suspended weight for locking the valve in an open position and adapted to swing in case of a shock to the locomotive, to unlock the valve and permit the same to close its conveying pipe, substantially as shown and described.

3. A locomotive boiler, provided with a spring-pressed valve held normally open on the steam conveying pipe, a suspended weight for locking the valve in an open position and adapted to swing in case of a shock to the locomotive, to unlock the valve and permit the same to close its conveying pipe, and intermediate mechanism, substantially as described, for connecting the said weight with the said valve, as set forth.

4. A locomotive boiler, provided with a steam distributing box, a steam conveying pipe for connecting the said box with the steam compartment of the boiler, a valve held normally in an open position on the said steam conveying pipe, and a suspended weight in the said box and connected with the said valve, to hold the latter in an open position, substantially as shown and described.

5. In a locomotive boiler, the combination, with a weight, of arms held on a pin on the said weight and controlling a valve, and rivets for connecting the arms with each other and adapted to be sheared off on the weight being forced out of its normal position, substantially as shown and described.

6. In a locomotive boiler, the combination, with a weight, of arms held on a pin on the said weight and controlling a valve, rivets for connecting the arms with each other and adapted to be sheared off on the weight being forced out of its normal position, and means, substantially as described, for moving the said connected arms, as set forth.

7. In a locomotive boiler, the combination, with a weight, of arms held on a pin on the said weight and controlling a valve, rivets for connecting the arms with each other and adapted to be sheared off on the weight being forced out of its normal position, and means, substantially as described, for suspending the said weight to permit it to swing, as set forth.

8. In a locomotive boiler, the combination with a spring pressed valve inside of the boiler, of a rod having an annular groove or reduced portion between its ends to weaken it, and means substantially as described for holding the said rod in engagement with the valve to hold it open, substantially as herein shown and described.

9. In a locomotive boiler, the combination with a spring pressed valve, of a rod having a reduced portion for weakening it, and a weight controlled mechanism for holding the rod in engagement with the valve to hold the said valve open, substantially as and for the purpose set forth.

10. In a locomotive boiler, the combination with an auxiliary safety valve set at a higher pressure than the regular safety valve, of a protecting shell surrounding the said valve, said shell being made in two parts, one projecting into the other, substantially as and for the purpose set forth.

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