(No Model.) 3 Sheets—Sheet 1.

J. McGWIN.

RETURN STEAM TRAP.

No. 418,213. Patented Dec. 31, 1889.

Fig. 3.

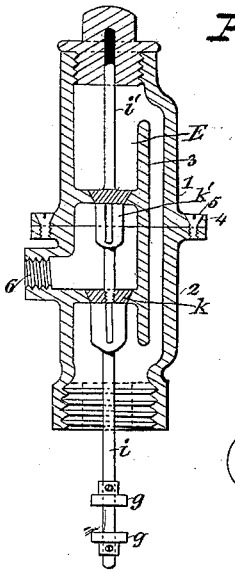

Fig. 1.

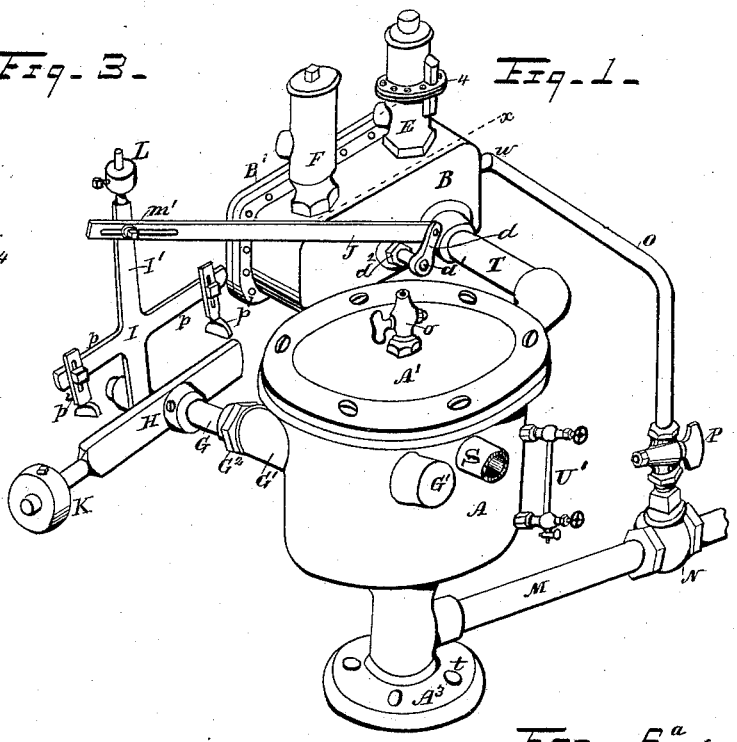

Fig. 6a.

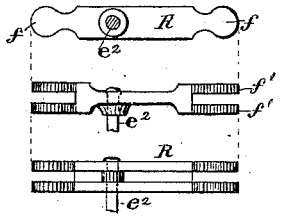

Fig. 2.

Witnesses

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(No Model.) 3 Sheets—Sheet 2.

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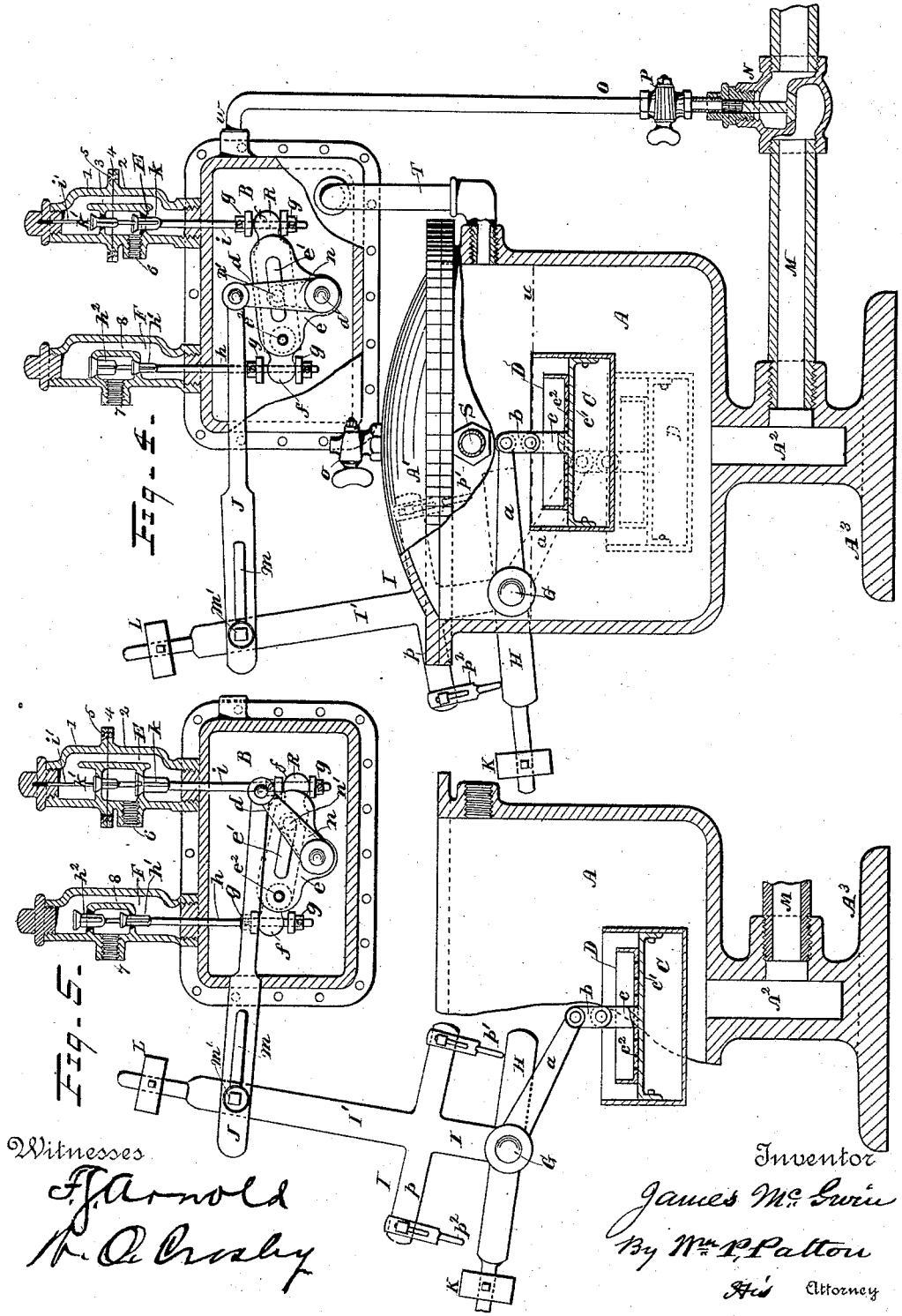

Witnesses
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R. A. Crosby

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(No Model.) 3 Sheets—Sheet 3.

J. McGWIN.

RETURN STEAM TRAP.

No. 418,213. Patented Dec. 31, 1889.

Fig. 7.

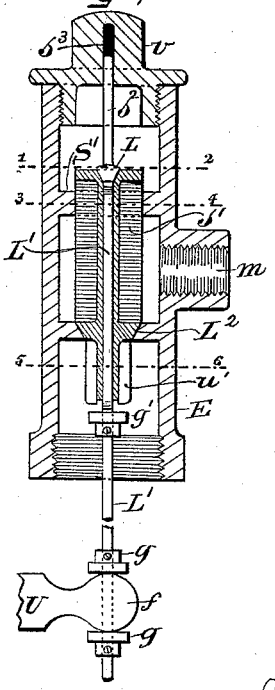


Fig. 8.

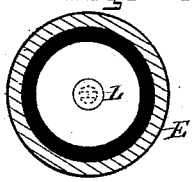


Fig. 9.

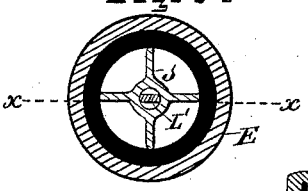


Fig. 6.

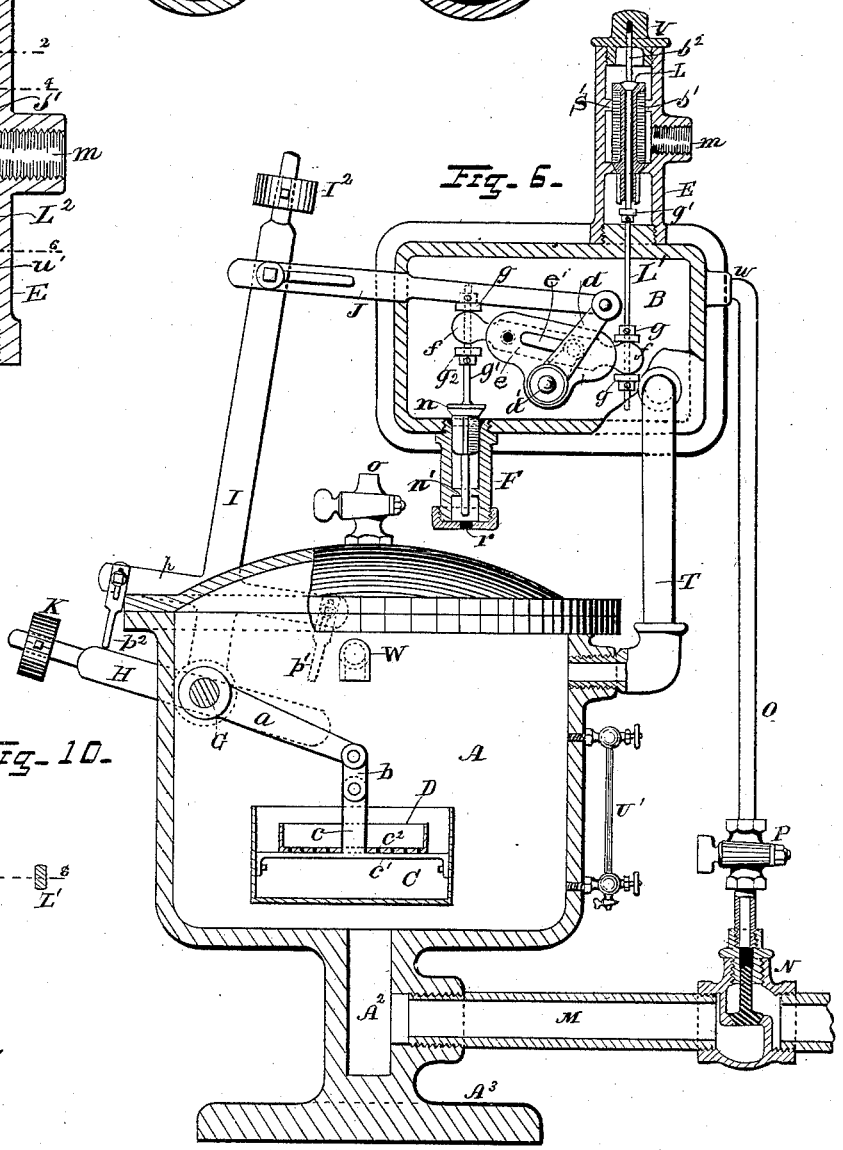


Fig. 10.

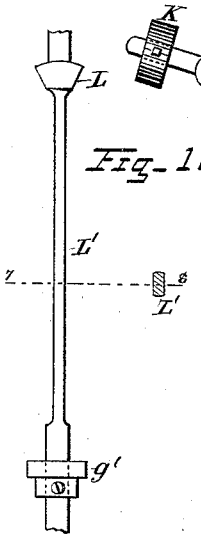
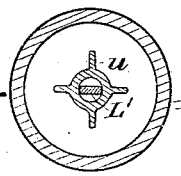


Fig. 11.



Witnesses

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His Attorney

UNITED STATES PATENT OFFICE.

JAMES McGWIN, OF FULTON, MISSOURI.

RETURN STEAM-TRAP.

SPECIFICATION forming part of Letters Patent No. 418,213, dated December 31, 1889.

Application filed March 8, 1889. Serial No. 302,506. (No model.)

To all whom it may concern:

Be it known that I, JAMES McGWIN, a citizen of the United States, residing at Fulton, in the county of Callaway and State of Missouri, have invented certain new and useful Improvements in Return Steam-Traps; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to an improvement in return steam-traps for the automatic return of water of condensation from radiators or steam-heating-pipe coils to the steam-generator.

One object of my present invention is to provide a simple, cheap, and efficient trap that will work reliably under varying steam-pressure and automatically discharge water from the heat-radiator to which it is attached, permitting it to flow by gravity to the steam-boiler from whence it came in the form of steam.

A further object is to furnish a return steam-trap which may be readily repaired or examined when necessary without removal from its pipe-connections, the major portion of the operating mechanism being outside of the body of the trap.

With these objects in view my invention consists in certain features of construction and combinations of parts, which will be hereinafter described, and pointed out in the claims.

Referring to the drawings making a part of this specification, Figure 1 is a side elevation in perspective of the device complete. Fig. 2 is a top plan view of the trap with the lid of the trap-chamber removed and the top side of the steam-chest broken away to expose interior parts. Fig. 3 is an enlarged sectional view in elevation of the steam-valve of the trap. Fig. 4 is a side elevation of the trap, the main chamber and steam-chest being broken away on the lines *v* and *x*, Fig. 2, to expose the interior parts, the steam and air valves also being shown in elevation, with their castings in section to expose their puppet-valves. Fig. 5 is a view of the working parts of the trap, the same parts being shown in section on the same lines as is exhibited in Fig. 4, the adjustment of the trap mechanism being changed. Fig. 6 represents a modified form of steam and air valves in position on the steam-chest of the device. Figs. 7, 8, 9, 10, and 11 are views in detail of the steam-valve shown in Fig. 6.

A represents the main chamber or water-receptacle of the trap. It is preferably made of cast metal and is provided with a short column A^2, which is hollow, and has a foot or base flange A^3 formed on it to support the entire device, which may be secured firmly, if desired, by screws inserted in the holes *t*. The pipe S is inserted through the vertical wall of the trap-chamber A and is provided with a check-valve *s*. Said pipe when extended is connected to the lower portion of a steam-heat radiator or heating-coils, and is intended to convey water of condensation into the trap-chamber, and it will be noticed that it will discharge this water into a bucket C, which will presently be described. A water-discharge pipe M is made to intersect the hollow column A^2, which pipe is also furnished with a check-valve N, and beyond this valve is projected to enter the steam-boiler below the water-line of the same, thus connecting the trap-body to the steam-generator to return condensed water to the latter. The upper edge of the chamber A terminates in a laterally-extended flange on which the cap-plate A′ is seated and thereto secured by screws or other preferred means. The meeting surfaces of the flange and cap should be rendered true to afford a close joint between them.

An open bucket C is placed in the chamber A. This is sustained pivotally upon the inner end of the arm *a*, which is affixed to the rock-shaft G, that is journaled in the integral boxes G′, formed on the side surface of the chamber A. It will be seen in Figs. 2, 4, and 5 that from the curvature of the side of the chamber A a portion of the shaft G will be located within this chamber, so that it may afford support to the interior bucket C, as stated.

The means of swinging connection provided for the bucket C, to suspend it below the outer end of the arm *a* and connect it

thereto, consists of two links *b*, pivoted to the free end of the arm *a*, and also to the upper end of the standard *c*, which is projected from the cross-bar *c'*, that is attached by its ends to the side wall of the bucket at opposite points, as shown in Figs. 2 and 4.

Within the bucket C a shallow splash-cup D is supported concentric with it, both vessels being made circular in form. The splash-cup, that from its position receives the water of condensation from the pipe S and breaks its fall into the bucket C, is perforated in the bottom, as shown in Fig. 2, and is of less diameter than the bucket, thus permitting an annular space to invervene between its upturned flanged edge and the inner surface of the bucket-wall, so that water which enters the splash-cup will flow gently into the bucket and over its edge into the chamber A.

A steam-chest B is connected to the trap-chamber A by the pipe T, which is sufficiently stable to hold it in place firmly projected away a short distance from the upper edge of the trap-chamber. Said steam-chest is preferably made in the form of a rectangular box having its rear sides open and flanged to receive a lid B', which may be secured by screws or bolted fast to the chest, and thus afford means of access to its interior.

Upon the upper wall of the steam-chest B two valves E F are secured. The valve E is a steam-inlet valve, its casing having a threaded branch nozzle 6, to which a steam-conduit pipe leading from the steam-generator may be attached. Valve E is a double-disk puppet-valve, there being a by-pass 3 formed in the casing to permit steam to press equally on the two valves *k k'*, the essential feature of the construction shown being the provision of a slightly-enlarged lower valve *k*, whereby an increase of area for steam-pressure is afforded this valve and a secure closure of the two valves insured. This will be further alluded to in describing the operation of the trap. The other valve F is also a double puppet-valve, and is intended to afford escape of steam from the body or chamber A of the trap. In this valve the lower disk *h'* is smaller than the upper disk h^2, so that the latter-named valve-disk will receive increased steam-pressure from the chest B when the parts are moved to close the air-valve F, this slight excess of pressure serving to hold the air-valve secure on its seat while steam from the boiler is automatically acting to empty the trap of condensed water that has entered it from the radiator-coil to which it is attached, as will be more fully explained. It will be noticed that an air-inlet 7 is provided for the valve F, which will introduce atmospheric air and permit the escape of steam from the trap at a proper time.

In order to render the operating mechanism of the device effective, it is essential that the valves E and F be so connected to the rock-shaft G, which supports the bucket C, that the valves will be alternately opened and closed by the vertical reciprocation of the bucket. To this end the shaft G is extended beyond the chamber A, as clearly shown in Fig. 2, a stuffing-box G' and follower G^2 serving to render the joint steam and water tight and at the same time allow the shaft to rock freely.

Upon the shaft G, near its outer end, the cross-arm H is placed and fastened thereto, said arm having the weight K adjustably secured upon the end that projects oppositely to the direction of the crank-arm *a*. The tappet-bar I is loosely mounted upon the shaft G outside of the cross-arm H, and upon its limbs *p* are movably affixed the tappets p' p^2, which may be "set" or adjusted vertically at any desired point, they being slotted, as shown in Figs. 1, 4, and 5, to permit such change of relative position.

Upon the upper end of the vertical portion I' of the tappet-bar I an adjustable weight L is mounted, which may be moved vertically to regulate its effect with regard to other connected parts of the mechanism.

Within the steam box or chest B a short shaft *d'* projects, a stuffing-box d^2 protecting the joint where said shaft extends beyond the outside of the chest. On the shaft *d'* an outside crank *d* is fastened, and within the chest a similar crank *n* is secured on the inner end of the shaft *d'*.

A rocking bar R (shown detached in Fig. 6^a) is provided, which has slotted ends, or this bar may be formed of two parallel plates, as shown at R' in the same figure. The ends of the rocking bar are rounded, as at *f*, and these engage the radial flanges of the collars *g*, which are adjustably secured upon the depending stems *i h* of the puppet-valves E F.

A slotted plate or link *e* is secured to the rocking bar R at e^2, and it will be noticed that this point of rigid connection of the link-plate and rocking bar is nearer to the stem *h* of the air-valve F than the other stem *i* of the valve E. This is for the purpose of assuring the closure of the steam-valve before the air-valve is opened, and the reverse; and to further facilitate the assured operation of these valves, as just mentioned, the collars on the air-valve stem are set a slight distance away from the rounded ends *f* of the rocking bar, which have rolling connection therewith, so that the lost motion thus afforded will permit the steam-valve to be securely seated before the air-valve is lifted. The two cranks *d n* are preferably projected in the same direction, the inner crank *n* being loosely connected to the link-plate *e* by a pin *n'*, which projects from the end of this crank-arm to enter the slot *e'* of the link-plate, as shown in Figs. 4 and 5 in dotted lines. The outer crank-arm *d* is pivoted to the connecting-rod J, which is loosely secured near its outer end, as at *m'*, to the vertical portion I' of the tappet-bar I, the connecting-rod being slotted to permit a proper adjustment of parts with regard to each other.

A small pipe O extends from the end of the steam-chest B toward the check-valve N and taps the cap of this valve, a valve or cock P being introduced in said pipe to afford means for closing it when desired.

There is a petcock *o* placed near the center of the lid A′ of the trap-chamber A to exhaust air therefrom when the trap is being put into service.

It should be stated that chamber A, bucket C, and splash-cup D are preferably made of a metal that is not liable to rust.

The combined weight of the tappet-bar I, connecting-rod J, weight L, cross-arm H, and weight K in relation to that of the bucket and splash-cup and arm *a* should be such that the weight K will overbalance the weight of the empty bucket and cup, lifting them readily; and, further, when the bucket C is filled with water while the trap-chamber A is empty, or, at least, has not enough water in it to float the bucket, then the weight of the filled bucket should preponderate over that of the weights L K and supporting parts and vibrate the rock-shaft G, so as to carry the bucket down into the chamber, as shown in dotted lines in Fig. 4.

In Fig. 4 the bucket C is represented as full of water and the trap-chamber also up to the line *u*, the contact of the edge of the cross-arm H with the tappet *p′* having taken place while the bucket C was rising in the chamber by reason of its buoyancy, resulting from support afforded by the water in the trap-chamber surrounding it, thus allowing weight K to preponderate and elevate the bucket. It is evident that when a sufficient height is attained by the bucket C the tappet-bar I will vibrate on the shaft G and cause the connecting-rod J to change the position of the valve E, so as to open it, as shown in said Fig. 4. It is preferred to give the crank *n* a vertical position when the valve E is full open. This, with the inclined position of the tappet-bar I′, and consequent overhanging of the weight L, will hold the puppet-valves *k k′* full open until they are closed by the further operation of the machine.

In operation of the device as a whole we will suppose that the air-valve F is open. (See Fig. 5.) The steam-valve E will remain closed while water flows into the trap-chamber, fills the bucket, overflows it, and rises in the chamber. The bucket will be elevated by the weight K until the proper height is attained, when the tappet-bar I will be vibrated and the valves change position, the steam-valve being opened, as shown in Fig. 4. Steam then entering the chest B and upper portion of the chamber A will equalize pressure in the same with that in the boiler, so that the gravity of the water in the trap-chamber will open the check-valve N and cause the water to flow into the water-space of the steam generator or boiler, from whence it was drawn in the form of steam. After the water has been lowered in the trap-chamber, as just stated, the descent of the bucket C, by reason of the weight of water in it overbalancing the weight K, will cause the tappet-bar to be engaged by the rocking of the cross-arm H, so that the valve E will again be closed and air-valve opened. The trap-chamber, being relieved of pressure, will be quickly filled with condensed water from the radiator-coils (not shown) by reason of steam-pressure in said coils.

It is apparent from the foregoing description that the operation of the device is automatic and periodical in discharge of water of condensation from radiator-coils or other pipes which it is desired to relieve of such water accumulations, and that this water will be returned to the boiler in a reliable manner.

It has been found that there is at times an accumulation of air above the valve in check N, which if it remains may retard the discharge of water, especially if the trap is working under a reduced steam-pressure. To effectually remove such air accumulation, the cock P in the pipe O is allowed to remain open. This will discharge the air into the steam-chest B when the air-valve F is open, and thus prevent any impediment to the perfect action of the trap under any range of pressure of steam.

In Figs. 6, 7, 8, 9, 10, and 11 is shown a more simple form of steam and air valves, which may be preferred as being cheaper to construct, while equal efficiency of action is attained by their use.

Referring to Fig. 7, which exhibits an enlarged sectional elevation of the steam-valve, it will be seen that a main puppet-valve L^2 is provided, which engages with its disk a seat formed concentric with the cylindrical shell of the valve E. Said valve L^2 has integral winged projections *s′* formed upon its disk. The lower set of wings *u′*, extending downwardly, have sliding contact with the edge of the valve-seat to steady the valve when it reciprocates vertically. The upper wings *s′* are supported at their edges, so as to slide freely upward, by the integral flange or ring S′, formed on the interior of the shell of the valve E. The valve L^2 and its wings *u s′* are perforated through the longitudinal axis of the same to receive a stem or rod L′, upon which is formed the small valve-disk L, that is adapted to form a steam-tight joint upon a true seat which is produced on the upper surface of the center hub of the wings *s′*. A vertical stem s^2 projects from the upper surface of the valve L a sufficient length to enter an orifice s^3, that is formed in the cap *v* of the shell E, thus providing a guide for this valve L. From the lower surface of valve L a shank or stem L′ is downwardly extended through the longitudinal perforation of the main valve L^2 and its wings *u s′*, said stem being flattened, as shown in Fig. 10, to provide passages for steam through the axial perforation of the main valve L^2. The stem L′ is of sufficient length to receive the adjustable collars *g g*,

which may be set to bear loosely against the rounded ends f of the rocking bar R, as previously described. There is another movable collar mounted on the valve-stem L', which is secured by a set-screw a short distance below the lower edge of the wings u, so that when the valve-stem L' is elevated by the upward rocking of the bar R the small valve L will be opened for the passage of steam down through the main valve L^2 before said main valve is raised off its seat, which latter operation is manifestly effected by the abutment of the collar g with the lower edges of the wings u'. At a proper point between the flange S' and valve-seat of the main valve L^2 a steam-inlet or branch m is formed in the shell of the valve E, to which a steam-pipe may be attached, which will convey steam into the valve-shell from the steam-boiler. (Not shown.) An air-valve F (see Fig. 6) is secured on the lower side of the chest B at a suitable point to allow it to be opened by engagement of the collars g^2 with the rounded ends f of the rocking bar U.

The operation of the steam-valve just described is perfectly efficient, and is substantially as follows: When steam is introduced into the shell of the valve E, it fills the space around the wings s' of the main valve L^2 and passes up between said wings, so as to press on the small valve L. Now, the area of the small valve is such that it will offer but little resistance to the action of the valve-operating mechanism, so that when the bucket C is elevated the arm H will be rocked and engage the tappet p', tilting the tappet-bar I from the position shown in Fig. 6, which action will elevate the small valve L in an obvious manner. As soon as the valve L is opened steam will flow down through the central orifice of the main valve L^2 and fill the chest B, thus nearly equalizing pressure on each side of the main valve L^2. Consequently when the further rocking action of the bar U raises the main valve but little resistance is offered to its upward movement, the heft of the pea or movable weight K being sufficient to effect this desired result.

The operation of the air-valve F is self-evident, and that of the trap as an entirety is identical with that already described.

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

1. In a return-trap, the combination, with a trap-chamber, a steam-chest, a hollow base-column, a water-inlet pipe, and a water-discharge pipe, of a check-valve in the inlet-pipe, a check-valve in the discharge-pipe, and an air-discharge pipe that connects the top of the check-valve shell that is on the water-discharge pipe with the steam-chest, substantially as set forth.

2. In a return-trap, the combination, with a trap-chamber, a rocking shaft, an arm on this shaft, an open bucket suspended on this arm on its free end, and a splash-cup, of a water-inlet pipe, a check-valve in this pipe, a water-outlet pipe, a valve in this pipe, a steam-chest, a pipe that connects the chest and trap-chamber, a cross-arm secured on the rock-shaft outside the trap-chamber, a tappet-bar loosely mounted on the rock-shaft and in position to engage the cross-arm with the tappets, a connecting-rod, a link-plate, a shaft bearing an inside and outer crank-arm, a slotted link-plate secured to a rocking bar and loosely connected to the pin of the inner crank-arm, a rocking bar having its ends engaged by flanged collars on the stems of an air-valve and a steam-valve, an air-valve that is nearly balanced, and a nearly-balanced steam-valve, substantially as set forth.

3. In a return-trap, the combination, with a steam-chest, a shaft working steam-tight in the side of this chest, an outer crank-arm affixed to this shaft, an inner crank-arm also secured to this shaft, a slotted link-plate engaged by the pin of the inner crank-arm, and a rocking bar secured to the link-plate rigidly, of a nearly-balanced steam-valve and a nearly-balanced air-valve, each having their stems loosely connected to the rounded ends of the rocking bar, and thus adapted to be opened and closed alternately by the vibration of the rocking bar, substantially as set forth.

4. In a return-trap, the combination, with a steam-chest, a shaft working in a stuffing-box on the side of the chest, an outer crank-arm, an inner crank-arm, both arms secured on the ends of this shaft, and the inner arm provided with a wrist-pin, of a slotted link-plate which is engaged by the pin of the inner crank-arm, a rocking bar secured rigidly to the link-plate and furnished with rounded ends slotted, an air-valve, a steam-valve, both valves nearly balanced and having depending stems, and adjustable collars mounted on the valve-stems of both valves and having loose engagement with the rounded slotted ends of the rocking bar, substantially as set forth.

5. In a return-trap, the combination of a trap-chamber having a removable cover provided with a petcock, an open-top bucket provided with a perforated-bottom splash-cup D, an arm connected to a rock-shaft, a link-connection b, a water-inlet pipe, a water-discharge pipe, check-valves in each of these pipes, a steam-chest, steam and air valves, and connection devices whereby the said valves are operated, as specified.

6. The combination of the two chambers A and B, the gravitating bucket and its splash-cup in the chamber A, suspended from the arm of a rock-shaft, the two air and steam valves, the weighted tappet-bar I and cross-arm H, fast on said shaft, and adjustable connection of this arm with the actuating crank-arm n of the shaft d, as specified.

7. The tappet p^2, adjustably applied on the limbs p of the vibrating tappet-bar I, in combination with the cross-arm on rock-shaft G,

the air and steam valves, and a weight adjustably applied on said cross-arm, as specified.

8. In the return steam-trap, the combination, with the steam-chest B and its steam and air valves, as described, of the slotted plate *e*, keyed on a rocking shaft, means for rocking this shaft, the rocking bar R, having rounded ends *f*, and the adjustable collars *g* on the stems of said valves, as specified.

9. The combination, with the stems of the air and steam puppet-valves and collars adjustably applied thereon, of the rocking bar R, the slotted plate *e*, pivotally connected to this bar, near one end thereof, and applied on a rock-shaft *d'*, the two cranks *d n*, and the connecting-rod J, adjustably connected to a tappet-bar I, actuated by means specified.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES McGWIN.

Witnesses:
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W. M. ENGLISH.