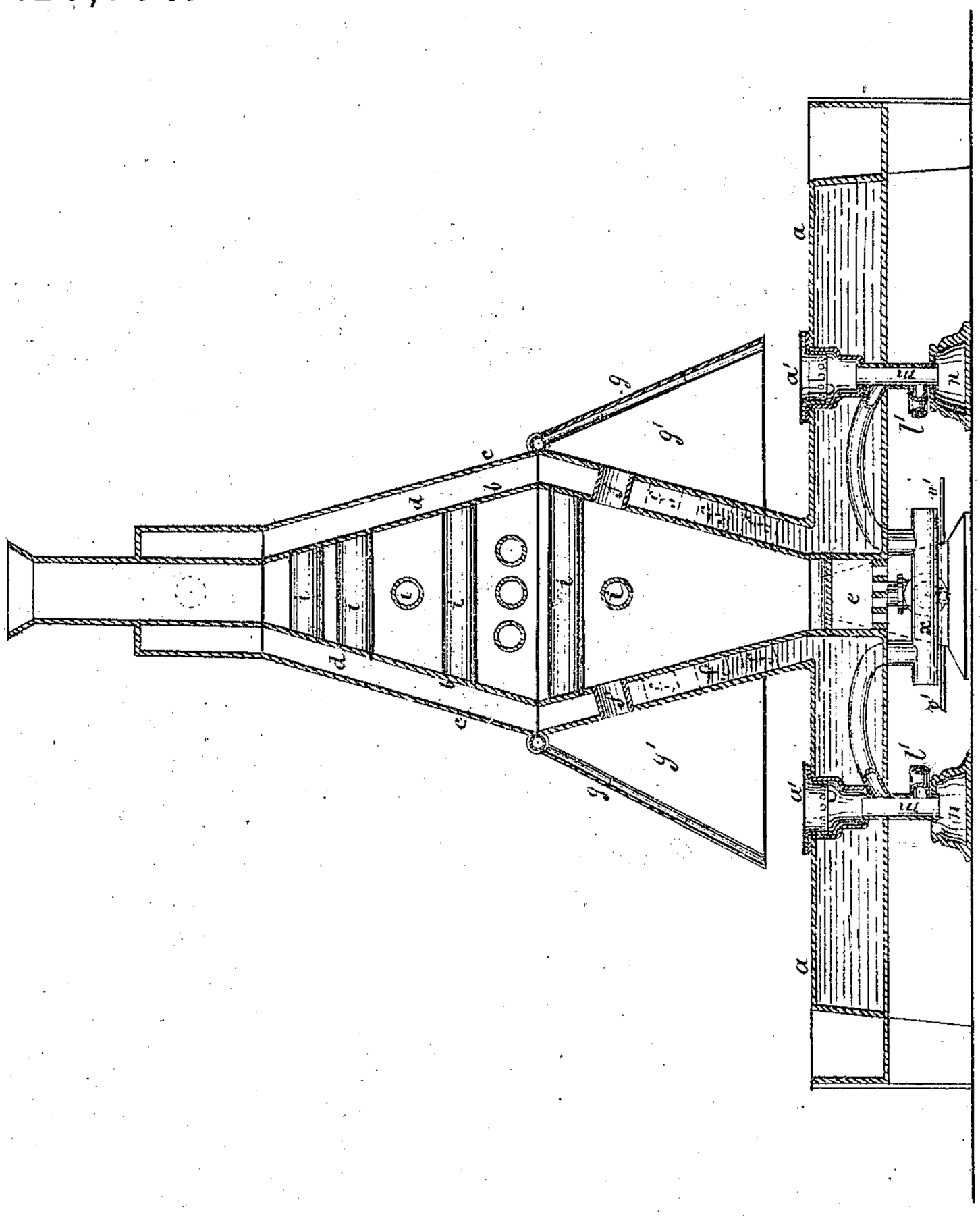
2 SHEETS. JOSEPH R. MORRIS. SHEET I

Improved Steam Forge.

No. 120,764. Patented Nov. 7, 1871.

FIG. 1.



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2 SHEETS.

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Improved Steam Forge.

SHEET II.

No. 120,764.

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FIG. 2.

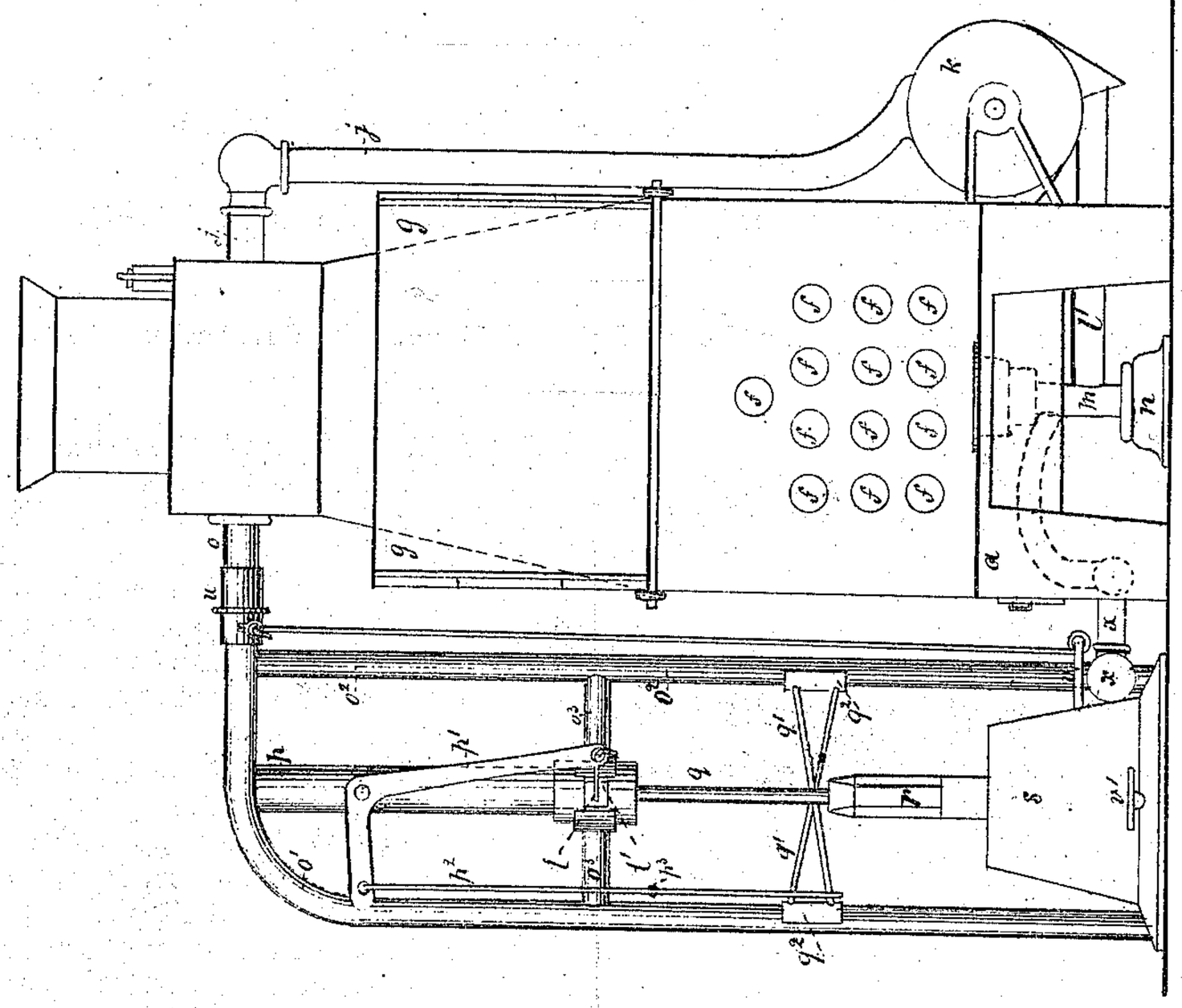
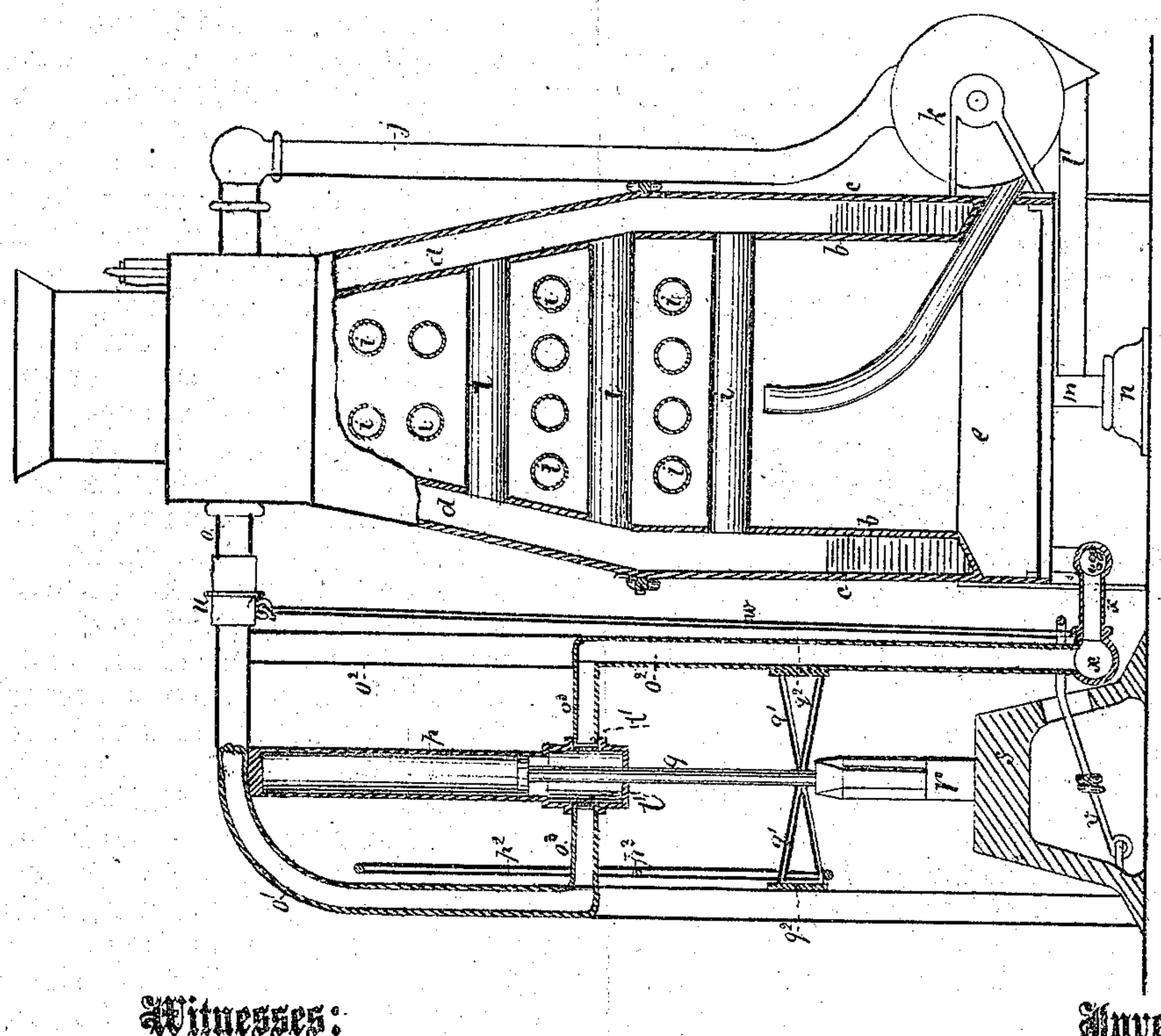


FIG. 3.



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UNITED STATES PATENT OFFICE.

JOSEPH R. MORRIS, OF HOUSTON, TEXAS.

IMPROVEMENT IN GAS-FURNACES AND FORGES.

Specification forming part of Letters Patent No. 120,764, dated November 7, 1871.

To all whom it may concern:

Be it known that I, JOSEPH R. MORRIS, of Houston, in the county of Harris and State of Texas, have invented a new and useful Improvement in Forges; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing making a part of this specification, in which—

Figure 1 is a longitudinal vertical central section. Fig. 2 is an end elevation, and Fig. 3 is a section lengthwise of the hammer apparatus.

This invention relates to an apparatus in which the gases from one or more forges, instead of passing off unconsumed into the atmosphere, enter a furnace and are burnt therein, thereby furnishing heat for the generation of steam in a boiler connected with said furnace, which steam is used to drive a fan that impels a blast into each forge, and is also used to propel an engine that operates a hammer, the exhaust from the engine being conducted to the tuyeres of the forges through pipes in which are placed red-hot iron plates, which decompose the steam, taking up the oxygen, and liberating the hydrogen which is burnt in the forges.

Referring to the drawing, *a a* are the forges, of which four might be used with one chimney as well as two, half on each side of the chimney. The latter consists of an inner skin, *b*, and an outer skin, *c*, with a water-space, *d*, between. Between the forges and *a* and below the bottom of the chimney is a furnace, *e*. Flues *f* run through the opposite sides of the chimney, at the lower part thereof, to conduct the gases from the duck's-nest *a'* into the space within the chimney immediately above the furnace, where they may be consumed. Flaps *g*, having triangular ends *g'*, are hinged to the opposite sides of the chimney and extend over the duck's-nest *a'*, their function being to conduct gases from the latter to the flues *f*. Pipes *i* connect the water-spaces at the sides and ends of the chimney to facilitate the circulation of water. A pipe, *j*, leads from a point near the top of the space *d*, for the purpose of conducting therefrom the steam generated from the water by the heat of the furnace to a fan-blower situated within a case, *k*, opposite the rear end of the furnace, from which case a pipe, *l*, extends, the same, at any suitable point beneath the furnace, dividing into two branches, *l' l'*, which lead to pipes *m* that pass vertically through the forges *a*, opening at their upper ends into the duck's-nests *a'*. The pipes *l l' m* convey the blast which fans the fire in the forges. At their lower ends the pipes *m* are furnished with removable receptacles *n* for the ashes and cinders of the duck's-nests. The exhaust from the case *k* passes up into the chimney, terminating within the same at a point suitable for promoting the draught. A pipe, *o*, leads from a point near the top of the space *d*, at the opposite end from the upper extremity of the pipe *j*, which pipe divides into two vertical branches, o^1 o^2, which are connected near their middle points by a cross-pipe, o^3, between which and the upper part of the branch o^1 is situated a vertical cylinder, *p*, within which works a piston whose rod *q* bears at its lower extremity a hammer, *r*. Between the lower ends of the pipes o^1 o^2 is an anvil, *s*, for the hammer *r* to strike on. Arms q^1 extend one to each side of the piston-rod *q*, and have curved plates q^2 at their outer ends which fit the pipes o^1 o^2, so that the latter serve as guides for the rod *q*. To the side of the cylinder *p* an elbow-lever, p^1, is pivoted, the lower end of which is connected with an arm, *t'*, that projects from a cut-off valve, *t*, placed at the center of the cross-pipe o^3 and at the lower end of the cylinder *p*. The other end of the lever p^1 is jointed to the upper extremity of a loop, p^2, which incloses the arm q^1 beneath. The loop p^2 has a cross-bar, p^3, against which the arm q^1 strikes when rising under the action of steam introduced into the cylinder *p* from the space *d* through the pipes o^1 o^2. This striking takes place about at the end of the upstroke, and turns the valve *t*, through the medium of the lever p^1, so as to cut off steam from the cylinder *p*. As the piston descends the arm q^1 strikes the lower end of the loop p^2 and causes the latter to open the valve *t* so as to admit steam to the cylinder *p*. The pipe *o* is surrounded by a tube, *u*, which contains a register extending across the pipe *o*, and thus regulates the amount of steam that passes through said pipe to the cylinder *p*. A lever, *v*, jointed at one extremity to the inside of the hollow anvil *s*, at the lower part of one end thereof, has the inner extremities of two treadles, *v v'*, jointed to it near its middle, said treadles extending through the opposite sides of the anvil. That extremity of the lever *v* that extends outside the anvil *s* encircles in

ring-form the pipe o^2, and to said ring is jointed the lower end of a rod, w, whose upper end is connected with an arm that extends outward from the tube u. Therefore, by means of the treadles v', lever v, and connecting-rod w, the tube u can be readily turned either way, so as either to shut off steam from the cylinder p or to increase or diminish the flow thereunto. The exhaust from the cylinder p passes through the pipe o^2. At its bottom this pipe opens into a horizontal pipe, x, whence the exhaust steam is conducted in branches that run through the forges a to the tuyeres. In these branches are placed pieces of red-hot iron, which decompose the steam as it passes them. The oxygen resulting from this decomposition serves to keep up the heat of the iron, while the hydrogen is consumed in the duck's-nests.

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

1. The combination of one or more forges with a furnace which consumes the gases evolved from such forges, and with a boiler in which steam is generated by the combustion of such gases in the furnace, such steam being applied to the driving of machinery of any kind, substantially as specified.

2. The combination of the chimney b c, flues h, flaps g g', and forges a a', as described.

3. The combination of the cut-off t, elbow-lever p^1, loop p^2, arm q^1, and piston-rod q, as set forth.

4. The combination of the anvil s, lever v, treadles v', connecting-rod w, tube u, and pipe o, as explained.

Witnesses: JOSEPH R. MORRIS.

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