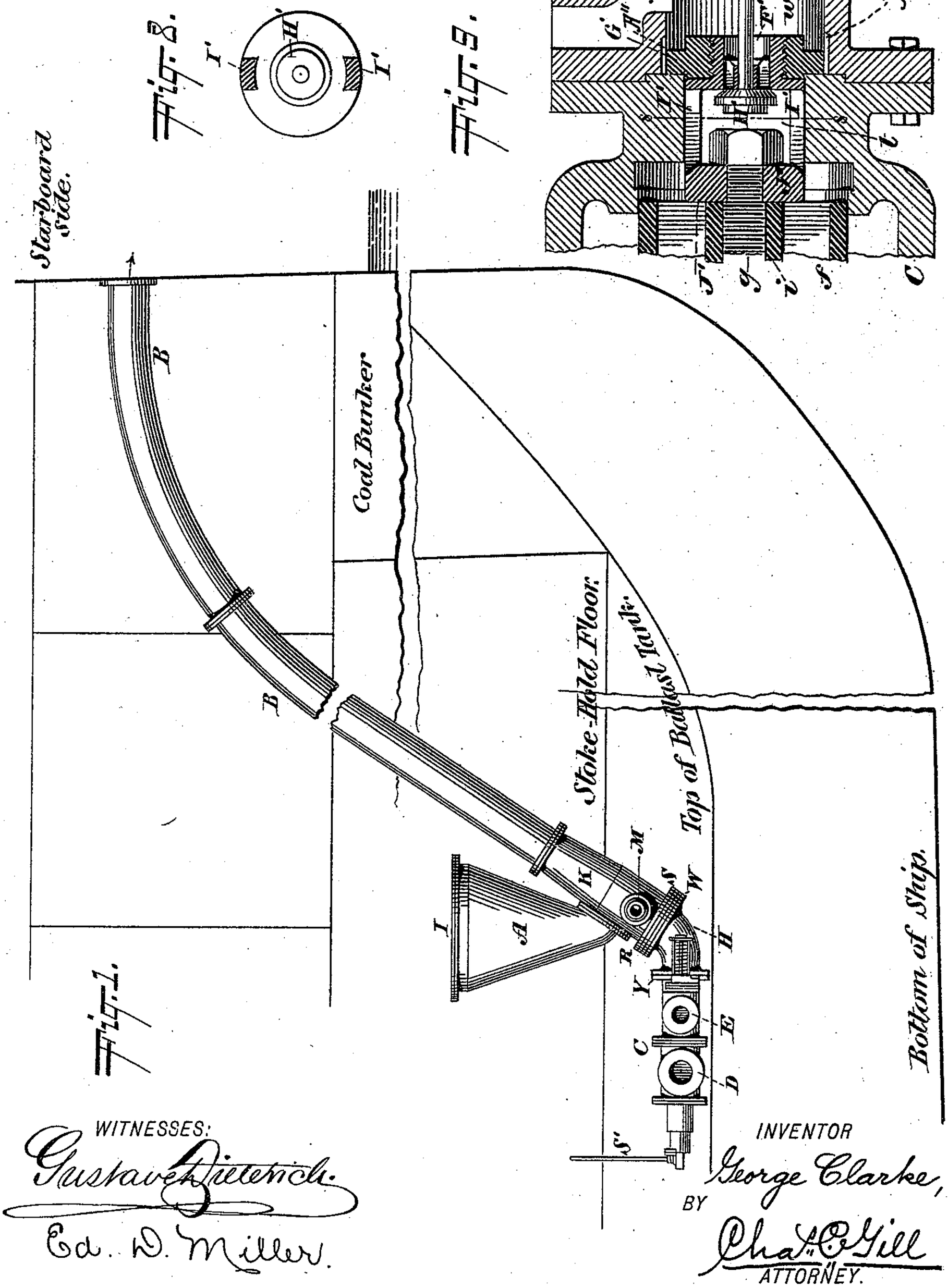
(No Model.) 3 Sheets—Sheet 1.

G. CLARKE.

ASH EJECTOR FOR STEAMSHIPS.

No. 491,959. Patented Feb. 14, 1893.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

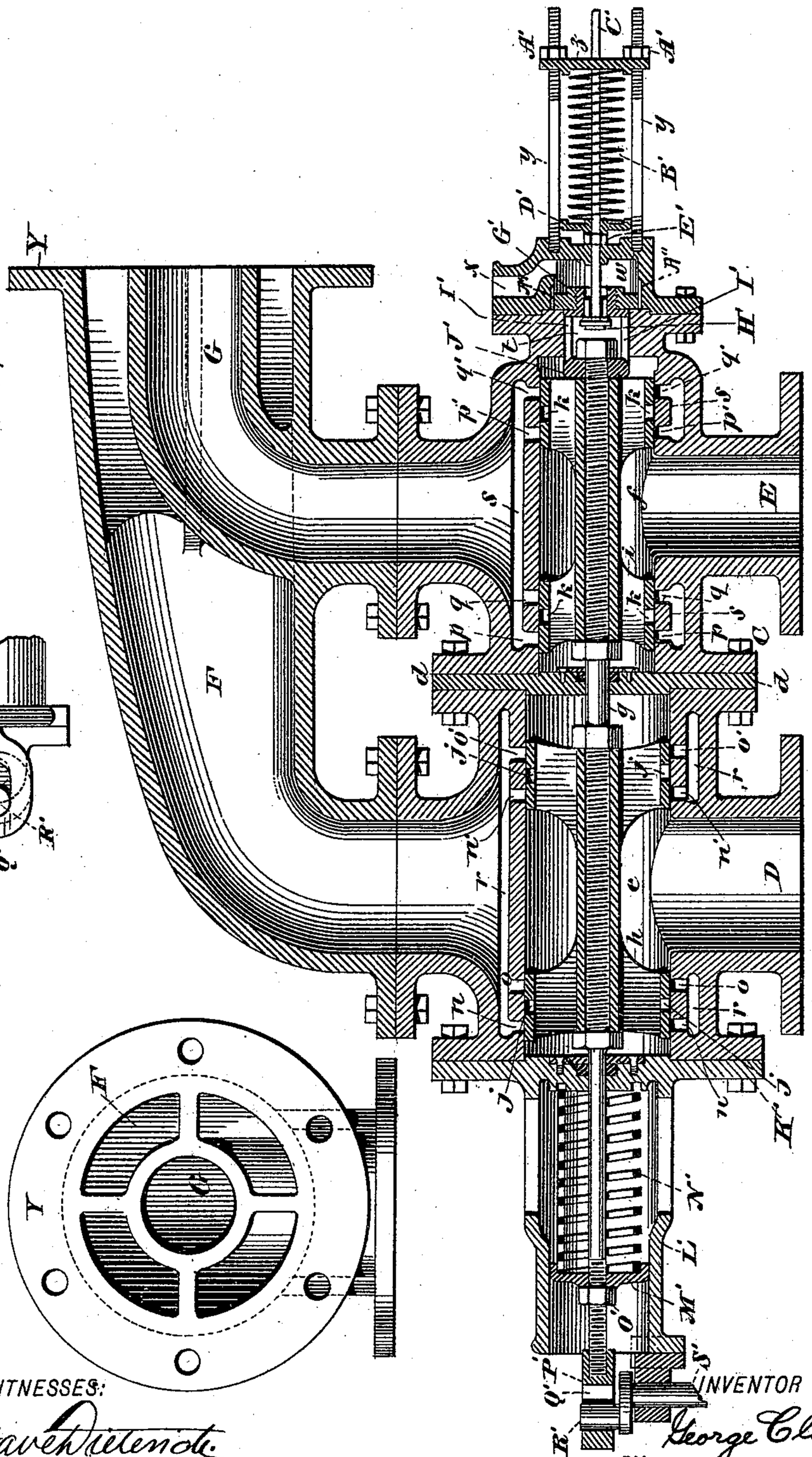

Fig. 7.

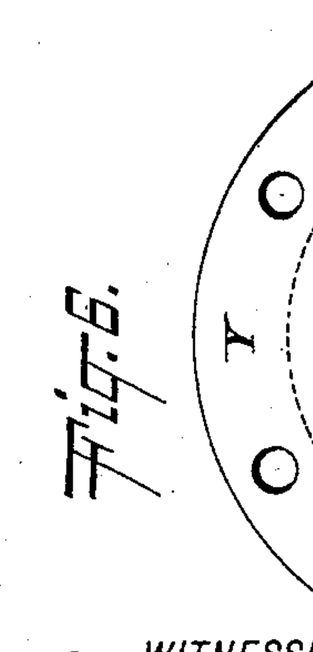

Fig. 8.

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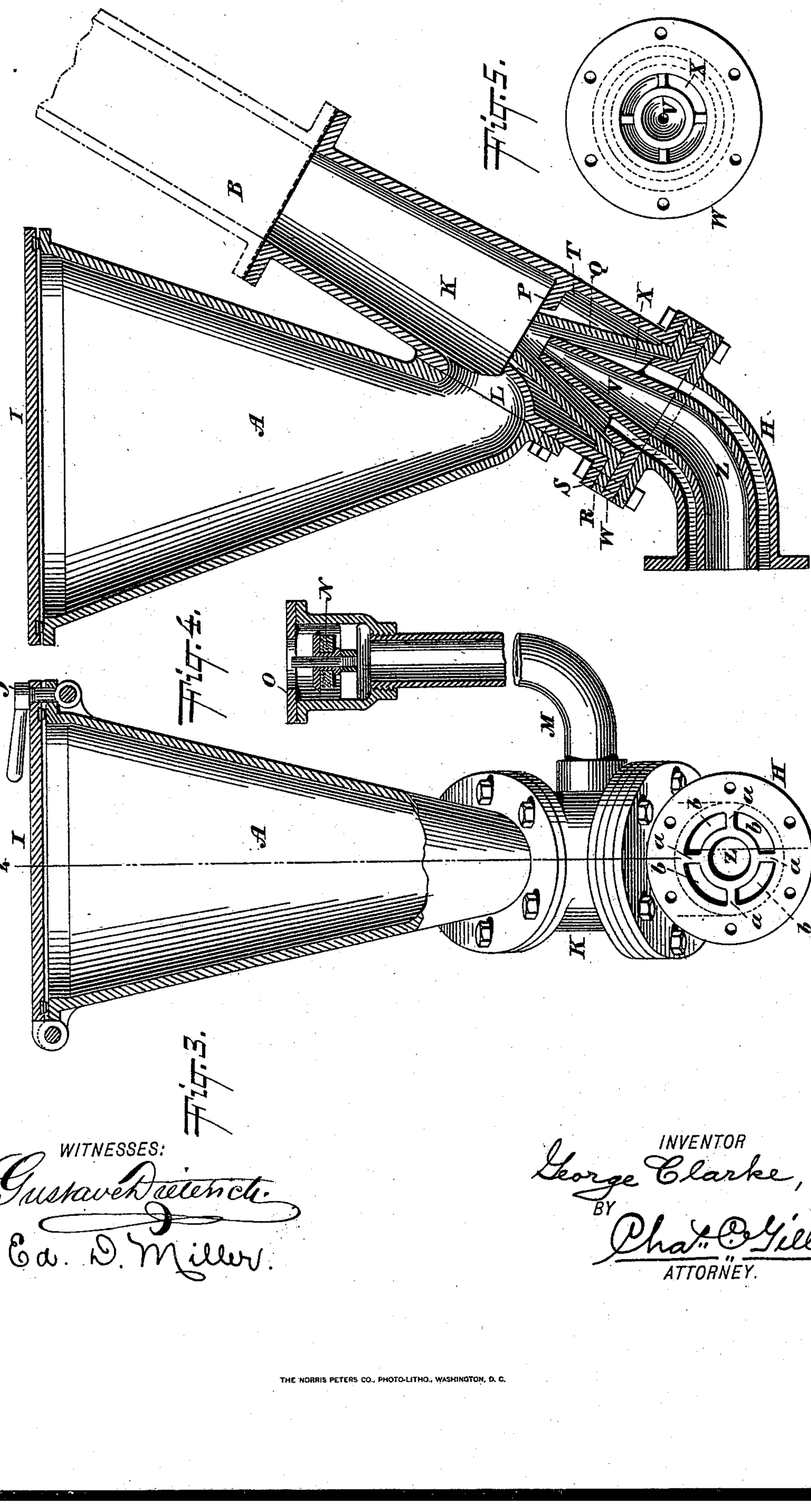

Fig. 3.

Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE.

GEORGE CLARKE, OF JERSEY CITY, NEW JERSEY.

ASH-EJECTOR FOR STEAMSHIPS.

SPECIFICATION forming part of Letters Patent No. 491,959, dated February 14, 1893.

Application filed September 3, 1892. Serial No. 444,955. (No model.)

To all whom it may concern:

Be it known that I, GEORGE CLARKE, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Ash-Ejectors for Steamships, of which the following is a specification.

The invention relates to improvements in ash-ejectors for steam-ships, and consists in the novel construction and arrangement of devices hereinafter described and claimed, whereby the ashes may be discharged from a hopper in the stoke-hold upward through a pipe leading through the side of the ship, and thus be ejected into the ocean.

The invention involves the employment of water under pressure, sea-water and air as effectual means for safely and rapidly carrying the ashes upward through the discharge pipe; and incident to the use of the water under pressure and the sea-water a novel valve has been constructed and forms an important part of the invention hereinafter described and claimed.

The invention will be more fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which

Figure 1 is a side elevation of an ejector embodying the invention, the discharge pipe being partly broken away, and the ship being indicated in outline and partly broken away; Fig. 2 is a central horizontal longitudinal section on an enlarged scale through the valve constituting a part of the invention; Fig. 3 is an enlarged front view of the ash-receiving hopper and connecting air pipe and valve, the same being shown partly in section; Fig. 4 is a central vertical section of same on the dotted line 4—4 of Fig. 3; Fig. 5 is a detailed view of the lower end of the nozzles leading to the discharge pipe which passes upward from the lower end of the hopper; Fig. 6 is a like view on an enlarged scale of the end of the outlets from the valve casing; Fig. 7 is a detailed view of a portion of one end of the valve and referred to by reference letters hereinafter; Fig. 8 is a detached vertical section of a portion of the valve on the dotted line 8—8 of Fig. 9, and Fig. 9 is a central longitudinal section on an enlarged scale of a portion of the valve with its casing and connections.

In the accompanying drawings A designates the ash-receiving hopper; B the discharge pipe leading therefrom upward through the side of the ship, and C the valve casing having inlets D, E for sea-water and water under pressure respectively and connected with the lower portion of the discharge pipe B by the union of its outlets F, G, with the pipe-section H, which is bolted to the discharge pipe B below the hopper A.

The hopper A may be of any suitable form, but for convenience I recommend that it have the form of an inverted cone, as shown in Figs. 1, 3 and 4, its upper and enlarged end being provided with a hinged cover I, and hinged revoluble catch J, by which the cover may be locked in its closed position. The lower end of the hopper A opens into and is bolted to the lower section K of the discharge pipe B, which receives the ashes from the hopper and affords a means for directing them upward under the combined action of the air, sea-water and water under pressure.

The pipe B may be of any necessary length and will be composed of suitable sections bolted together, the lower section K having in one side the opening L connecting with the hopper A, and in another side a connection with the air pipe M, see Fig. 3, which is provided at its upper end with the valve N and valve seat O. The normal position of the valve N, is open, as shown, and said valve is only intended to close upward against the seat O in case of some accident occurring by which the contents of the pipe B should move backward down said pipe and upward into the air pipe M, at which time the ashes and water striking the valve N would lift and close it and be thereby prevented from escaping.

Within the lower section K of the pipe B there is provided the annular flange P, see Fig. 4, and also the tapered nozzle Q, the latter having at its lower end the flange R and being bolted to the flange S at the lower end of the section K.

Below the flange P and between the nozzle Q and surrounding walls of the pipe section K, is formed the annular chamber T, which is in direct communication with the air sup-

ply pipe M and has for its exit the contracted annular space left between the upper end of the nozzle Q and the inner edge of the flange P, as shown in Fig. 4.

Within the nozzle Q is centrally arranged the nozzle V, which is secured in place by the encircling flange W thereon being bolted to the flanges R, S, above referred to.

Between the nozzle Q and the nozzle V is formed the annular space X for the passage of the sea-water, and this space X is continued through the flange, W, as shown in Figs. 4 and 5, in which it will be seen that that portion of the flange W adjacent to the nozzle V is removed except at intervals at which connecting ribs remain to sustain the nozzle.

The outlets F, G, from the valve casing C are, for a portion of their length, one within the other, the parts being so arranged that the water under pressure, (the water from the pumps) will pass through the outlet G, and the sea-water through the outlet F; and these outlets F, G, are in communication respectively with the nozzle Q and the nozzle V through the medium of the connection H, which is bolted at one end to the flanges R, S, W, and at the other end to the flange Y encircling said outlets. The connection H has an interior tube Z supported by ribs *a* and passing directly between the outlet G and nozzle V, and around the tube Z is the space *b* which extends directly from the outlet F to the nozzle Q; thus it will be noted that the water under pressure from the pumps will pass from the valve casing C through the outlet G, tube Z and nozzle V to the discharge pipe B, and that the sea-water or other water not under pressure will pass to the discharge pipe B through the outlet F, space *b* and nozzle Q, while the air from the pipe M escapes to the said discharge pipe from the annular chamber T, and the ashes are moved upward by the combined elements and discharged through the side of the ship into the sea.

The valve casing C is divided by a partition *d* into two compartments *e*, *f*, the former being between the inlet D for sea-water and the outlet F for same, and the compartment *f* being between the inlet E for the water under pressure and the outlet G for same, as shown in Fig. 2. The inlet E will be connected by a pipe, not shown, with the usual pumps which will supply the water under pressure to create the upward current through the discharge pipe B, and the inlet D will be connected with an ordinary pipe, not shown, passing through the bottom of the ship to the sea or to any other preferred source of water supply.

Centrally within the valve casing C and extending longitudinally through the compartments *e*, *f*, is the reciprocating rod *g*, on which are secured the hollow valves *h*, *i*, which at their ends closely fit the walls of the compartments *e*, *f*, and are provided with ports *j*, *k*, extending entirely around the valves with the exception of the spaces occupied by the plain ribs (shown in Fig. 2) intermediate the hub and outer shell of said valve. The ports *j*, *k* co-operate with the annular ports *n*, *o*, *n'*, *o'*, and *p*, *q*, *p'*, *q'*, respectively located at opposite ends of the compartments *e*, *f*, and being in communication with the annular chambers *r*, *s*, surrounding said compartments and leading respectively into the outlets F, G.

The valves *h*, *i*, are shown in their closed position in Fig. 2, in which it will be observed that the ports *j*, *k*, are intermediate the ports *n*, *o*, *n'*, *o'*, and *p*, *q*, *p'*, *q'*, and communication between the inlets D, E, and outlets F, G, is cut off. When, however, the rod *g* and valves *h*, *i*, are moved to the right a definite distance, the ports *j* will come into line with the ports, *o*, *o'*, and the ports *k* into line with the ports *q*, *q'*; and under this condition of the ports free communication is established from the sea-water inlet D to the outlet F, and from the inlet E for water under pressure to the outlet G. During this open communication between the inlets D, E, and outlets F, G, the water under pressure passes from the inlet E into the hollow valve *i*, and thence through the ports *k*, *k*, and *q*, *q'*, and also through the open ports *p*, *p'*, to the surrounding chamber *s*, which opens into the outlet G, as shown; while the sea-water or water not under pressure from the pumps passes from the inlet D into the hollow valve *h* and thence through the ports *j*, *j*, and *o*, *o'*, and also through the open ports *n*, *n'*, to the surrounding chamber *r*, which directly opens into the outlet F. The ports *n*, *n'* and *p*, *p'*, are uncovered when the valves *h*, *i*, are open and they with the chambers *r*, *s*, form increased facilities for the free passage of the water from the inlets D, E, to the outlets F, G.

At the right hand end of the valve casing C there is formed the reduced cylinder *t* centrally in line with the adjoining compartment *f* and the cylinder *w*, which is of increased area and provided at its outer end with the discharge port *x*. The cylinder casing *w* is bolted to the end of the valve casing C and supports the longitudinal bolts *y*, loosely receiving the head *z* which is adjustably held in place by the nuts A' and forms a stop for the coiled spring B'. The spring B' encompasses the valve stem C' and is held between the head *z* and the head D', the latter being on the valve stem C' and backed by the nut E', as shown more clearly in Fig. 9. The force exerted by the spring B' may of course be regulated by the adjustment of the nuts A', and the throw of the valve stem C' may be regulated by the nut E'. The outer end of the valve stem C' passes freely through the head *z*, and said stem at its inner end passes through the central port F' in the piston valve G' and carries the small valve H', whose seat is on the inner edges of said port F'.

The piston valve G' has its seat against the outer end of the cylinder *t* and is itself lo-

cated in the cylinder *w*, and said valve G′ is connected with the right hand end of the main valve rod *g* through the medium of the arms I′ and head J′, the latter being held on the rod *g* and against the end of the valve *i* by a nut, as shown in Fig. 9. The valve G′ is thus connected with the main valve rod *g* and its movement is simultaneous with that of the valves *h*, *i*, as hereinafter more fully explained. The small valve H′ has an outward movement simultaneously with that of the valve G′ when actuated by the due amount of the pressure of the water from the pumps, but said valve H′ is independent of the valve G′ and capable of moving inward in advance of the same when the pressure of the water from the pumps against said valve H′ has become reduced below the opposing force exerted by the spring B′ during its compression between the heads D′, *z*.

The movement of the valves *h*, *i*, is controlled by the pressure of the water from the pumps and the action of the valves G′, H′, and hence the operation of said valves *h*, *i*, is automatic, but owing to accident or other circumstance an occasion might arise in which it would be desirable or necessary to effect the reciprocation of the valves *h*, *i*, by hand and to meet this emergency I have provided the left hand end of the valve rod *g* with means presently to be described by which the said rod and valves *h*, *i*, may be operated by hand when desired, and which will not interfere with the automatic movement of said valves.

In the arrangement of the means shown in Figs. 1 and 2 for operating the valves *h*, *i*, by hand the left hand end of the main valve rod *g* extends through the head K′ into the casing L′ and carries a head M′ between which and the head K′ there is retained the coiled spring N′, whose tension may be regulated by the adjustment of the nut O′ which retains the head M′ on the rod and against the spring. The outer extremity of the rod *g* carries the plate P′ having the opening Q′ adapted to receive and permit the movement of the crank pin R′, which on being rotated by a rod S′ in a well known manner will impart a reciprocating movement to the rod *g* and valve *h*, *i*, thus bringing the ports *j*, *k*, of said valves into line with the ports *o*, *o*′, and *q*, *q*′, respectively and establishing communication between the inlets D, E, and the outlets F, G, respectively, for the water under pressure and the sea-water. Upon the release of the rod S′ the tension of the spring N′ will move the rod *g* and valves *h*, *i* sufficiently to bring the ports *j*, *k*, to an intermediate position, as shown in Fig. 2, and cut off the communication between the inlets D, E, and outlets F, G.

The spring N′ is of importance apart from the manual means provided for reciprocating the rod *g* and valves *h*, *i*, in that its force is always exerted to retain the valves *h*, *i* and valve G′ in their closed position shown in Fig. 2 except at such times as its force is overcome by the pressure created against the valve G′ by the water from the pumps.

In the operation of the apparatus constituting the invention the water from the pumps is the pressure utilized to act upon the valves G′, H′, for opening the main valves *h*, *i*, and it is to be remembered that this pressure must be sufficient to overcome the counter pressure exerted by the springs B′, N′, in order that both valves G′, H′, may move outward together. The water from the inlet E passes through the hollow valve *i* and against the valves G′, H′, which after the pressure of the water has been raised to the proper degree will move outward toward the right, opening communication from the inlets D, E, to the outlets F, G, and permitting the water under pressure to pass through the outlet G, tube Z, and nozzle V, with sufficient force to move up through the discharge pipe B and carry a sufficient body of the water from the sea through the outlet F, space *b* and nozzle Q to form a volume filling the pipe B and carrying upward whatever ashes or other matter that may pass from the lower end of the hopper A. The valves G′, H′, will not move outward to open the valves *h*, *i*, until the pressure of the water from the pumps is great enough to effectually move the volume of water and ashes upward through the discharge pipe B, and said valves G′, H′, will only remain in their outward position so long as the required amount of pressure is maintained against them by the pumps, since any reduction of said pressure would permit the spring B′ to instantly move the valve H′ inward from the valve G′, thus opening the port F′ and reducing the effective surface area of the valves G′, H′ to such an extent that the spring N′ immediately retracts the valves *h*, *i*, G′, to their closed position, where they remain until the pressure from the pumps has increased sufficiently to again overcome the force of the springs B′, N′, and move the valves G′, H′ and *h*, *i*, outward to the right again. The discharge pipe B is thus not opened to the influx of water until a force has been created sufficient to elevate and keep in upward motion the volume filling the discharge pipe B.

The required amount of pressure from the pumps to accomplish the effectual discharge of the ashes and water through the pipe B will of course vary with the size of the pipe, its position and other circumstances, and hence the force of the springs B′, N′, will also vary in accordance with the conditions of their use.

The valves G′, H′, will under all circumstances be sufficiently loaded by the springs as not to yield to the pressure of the water from the pumps until that amount has been created fully adequate to accomplish the upward movement of the volume through the pipe B. When the valves G′ H′, are in their closed position, as shown in Fig. 2, their full

surface area is not exposed, but when they start to move outward toward the right the valve G′ leaves the edges of the cylinder *t* and exposes its full surface area in the larger cylinder *w*, hence it moves outward quickly after starting and the water is allowed a sudden impetus to the outlets F, G, and nozzles V, Q. During the upward movement of the volume through the pipe B the air enters through the pipe M and chamber T and facilitates the operation of the apparatus.

It will be observed on reference to Figs. 2 and 9 that the cylinder *w* is provided with small ports A″, which are open to the discharge *x* when the valve G′ is closed and thus permit any leakage around said valve to escape to the said discharge and be conducted away. When the valve G′ is open or in its outward position to the left, it will pass beyond the ports A″ and thus cut off their communication with the outlet *x*.

The apparatus made the subject of this application has been described as an ash ejector, but it is to be understood that its use is not exclusively confined to elevating and carrying away ashes, since other materials or refuse may also be successfully discharged by it.

What I claim as my invention and desire to secure by Letters Patent, is—

1. The hopper and discharge pipe, combined with the inlet for water under pressure, the nozzle communicating therewith and leading to said discharge pipe, the inlet for water not under pressure, the nozzle communicating with said last named inlet and leading to said discharge pipe, and a valve intermediate said inlets and nozzles; substantially as set forth.

2. The discharge pipe and the hopper leading into the same, combined with the nozzle Q below said hopper, the smaller nozzle V within said nozzle Q, the air chamber surrounding the nozzle Q, the inlet for water under pressure communicating with the nozzle V, and the inlet for water not under pressure communicating with said nozzle Q; substantially as and for the purposes set forth.

3. The hopper and discharge pipe, combined with the inlet for water under pressure, the nozzle communicating therewith and leading to said discharge pipe, the inlet for water not under pressure, the nozzle communicating with said last named inlet and leading to said discharge pipe, and an air inlet leading to said discharge pipe; substantially as and for the purposes set forth.

4. The hopper and discharge pipe, combined with the inlet for water under pressure, the nozzle communicating therewith and leading to said discharge pipe, the inlet for water not under pressure, the nozzle communicating with said last named inlet and leading to said discharge pipe, and a valve intermediate said inlets and nozzles and subject to the pressure of the water from the pumps; substantially as and for the purposes set forth.

5. The hopper and discharge pipe, combined with the inlet for water under pressure leading to said pipe, the inlet for water not under pressure leading to said pipe, and the valve intermediate said pipe and said inlets and dependent on the pressure of the water from the pumps; substantially as and for the purposes set forth.

6. The hopper and discharge pipe, combined with the inlets for water under pressure and water not under pressure leading respectively to said pipe, the valve casing connected with said inlets with a separate compartment for each, the valve rod carrying valves in said compartments, the valve G′ connected with said rod, the valve H′ seated against said valve G′, the spring acting on the valve H′ and the spring acting on the valve G′; substantially as and for the purposes set forth.

7. The hopper and discharge pipe, combined with the inlets for water under pressure and water not under pressure leading respectively to said pipe, the valve casing connected with said inlets with a separate compartment for each, the ports *n*, *o*, *n′*, *o′*, *p*, *q*, *p′*, *q′*, and chambers *r*, *s*, in said compartments, the reciprocating valves having ports *j*, *k*, in said compartments, and means substantially as described for operating said valves *j*, *k*, by the action of the water under pressure; substantially as and for the purposes set forth.

8. The hopper and discharge pipe, combined with the inlets for water under pressure and water not under pressure leading respectively to said pipe, the valve casing connected with said inlets with a separate compartment for each, the valves in said compartments, and means substantially as described for resisting the opening of said valves except above a definite pressure of the water from the pumps; substantially as and for the purposes set forth.

9. The hopper and discharge pipe combined with the inlets for water under pressure and water not under pressure leading respectively to said pipe, the valve casing connected with said inlets with a separate compartment for each, the valve rod carrying valves in said compartments, the cylinders *t*, *w*, at the end of said casing, the valves G′, H′, in said cylinders, and the springs acting on said valves; substantially as and for the purposes set forth.

Signed at New York, in the county of New York and State of New York, this 2d day of September, A. D. 1892.

GEORGE CLARKE.

Witnesses:
CHAS. C. GILL,
ED. D. MILLER.