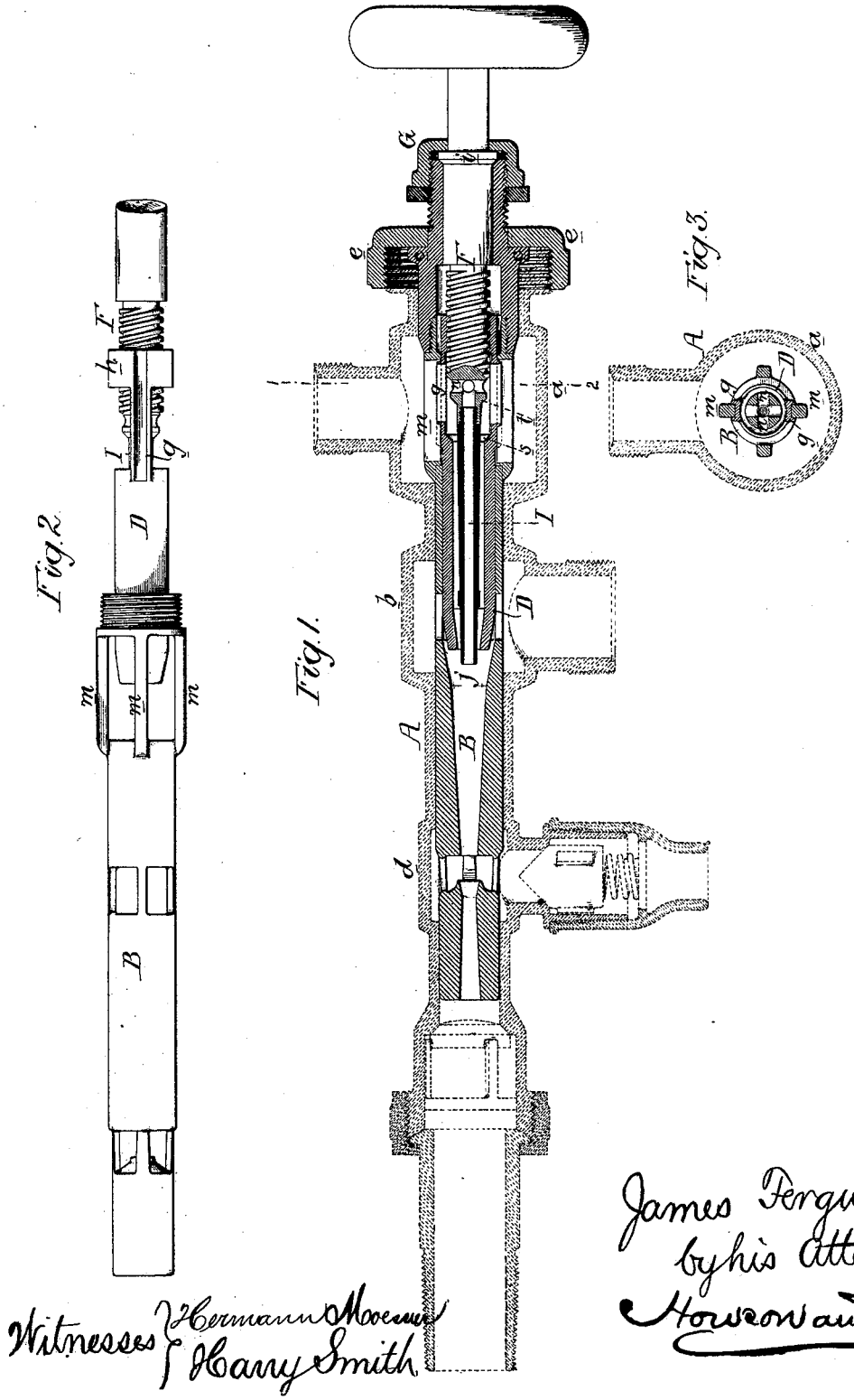
J. FERGUS.

INJECTOR.

No. 189,715. Patented April 17, 1877.



Witnesses: Hermann Moeller, Harry Smith

James Fergus, by his Attorneys Howson and Sons

UNITED STATES PATENT OFFICE.

JAMES FERGUS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF TWO-THIRDS HIS RIGHT TO GEORGE H. COLKET, OF SAME PLACE.

IMPROVEMENT IN INJECTORS.

Specification forming part of Letters Patent No. **189,715**, dated April 17, 1877; application filed November 17, 1876.

To all whom it may concern:

Be it known that I, JAMES FERGUS, of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Injectors, of which the following is a specification:

My invention relates to certain improvements in the injector for which Letters Patent of the United States No. 174,509 were granted to my assignees on the 7th day of March, 1876; and the main object of my present improvements is to so construct the injector that the area of the water-inlet can be increased simultaneously with the diminishing of the area of the steam-inlet, and vice versa, and so that the injector can be arranged for lifting its supply of water from various depths, a further object being to improve the mechanical construction of the injector. These objects I attain in the manner which I will now proceed to describe, reference being had to the accompanying drawing, in which—

Figure 1 is a longitudinal section of my improved injector, showing the outer casing in dotted lines; Fig. 2, a side view of part of the same; and Fig. 3, a transverse section on the line 1 2, Fig. 1.

A is the casing of the injector, having the usual steam-chamber *a*, water-chamber *b*, and overflow-chamber *d*, communicating with the steam, water, and overflow pipes, respectively.

To the interior of this casing is adapted a tube, B, having steam, water, and overflow passages communicating with the respective chambers of the injector, this tube being rendered detachable from the casing, for a purpose described in the above-mentioned patent.

In said patented injector this tube was capable of moving longitudinally to a limited extent, and the passages and openings in the tube were so arranged in respect to the chambers in the casing that this movement had the effect of governing the admission of steam and water to the interior of the tube.

In the present instance, however, the tube B is held in a certain fixed position within the casing by means of a threaded cap, *e*, adapted to the threaded end of the casing, and bearing upon a collar, *c*, on the tube B.

The central opening of the tube B is enlarged in diameter at and near the rear end, and to this enlarged portion is adapted a sliding plug, D, to which is attached, by means of arms *g*, a nut, *h*, adapted to a threaded stem, F, which can turn in the end of the tube B, but cannot move longitudinally, owing to a collar, *i*, on the same, this collar forming a valve adapted to a valve-seat in the end of the tube B, and being maintained in steam-tight contact therewith by means of the screw-cap G.

By this means the turning of the screw-stem F causes the movement of the sliding plug D to and fro within the tube B.

The front end of the plug D is tapered, and is adapted to a tapering valve-seat, *j*, formed in the interior of the tube B, adjacent to the opening in the same, which affords communication between the interior of the tube and the water-chamber. The central opening of the plug D is expanded at the rear end, thus forming a valve-seat, *s*, to which is adapted a valve, *t*, formed on the stem F.

The arms *g*, by means of which the nut *h* is connected to the plug D, are grooved and adapted to arms *m*, extending across the opening in the tube B, which corresponds with the steam-chamber of the casing A, these arms serving not only to guide the plug D in its longitudinal movement, but to prevent the turning of the same with the screw-stem F.

The front end of the stem F is made tubular, and into this front end is screwed the rear end of a tapering tubular nozzle, I, the front end of which extends, in the present instance, to a point slightly in advance of the opening through which water is admitted into the interior of the tube B. Steam is admitted into the tubular portion of the stem F and into the nozzle I through passages *n*. (See Fig. 3.)

By moving the plug D in one direction the water-space will be gradually enlarged and the steam-space simultaneously contracted, while, upon moving the plug D in the opposite direction, the steam-space is enlarged and the water-space contracted.

By this means the relative areas of the steam and water spaces can be varied so as to exactly suit different pressures of steam in the boiler.

When the valve *t* is closed against its seat the water-inlet of the injector is fully open, so that when steam is turned on it passes through

the nozzle I and acts as a jet to lift the water and fill the body of the injector before the latter is put in operation.

By making the nozzle I detachable from the stem F, the injector can be adapted for lifting water from varying depths by simply varying the length of said nozzle, without changing the relative arrangement of any of the other parts of the injector.

It will be evident that the sliding plug D may be applied directly to the interior of a casing properly constructed, instead of being applied to a detachable tube, B, as described.

I claim as my invention—

1. The combination of the tube B or the casing and the stem F, having a valve, *t*, with the sliding plug D and its valve-seat *s*, as described.

2. The combination of the tube B and its arms *m* with the sliding plug D and its grooved arms *g*, as specified.

3. The combination of the casing A of the injector and the tube B with the threaded cap *e*, as described.

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

JAMES FERGUS.

Witnesses:

HERMANN MOESSNER,

HARRY SMITH.