(No Model.)

N. W. PRATT.

MEANS FOR CLOSING TUBES OF STEAM GENERATORS.

No. 571,016. Patented Nov. 10, 1896.

Fig-1.

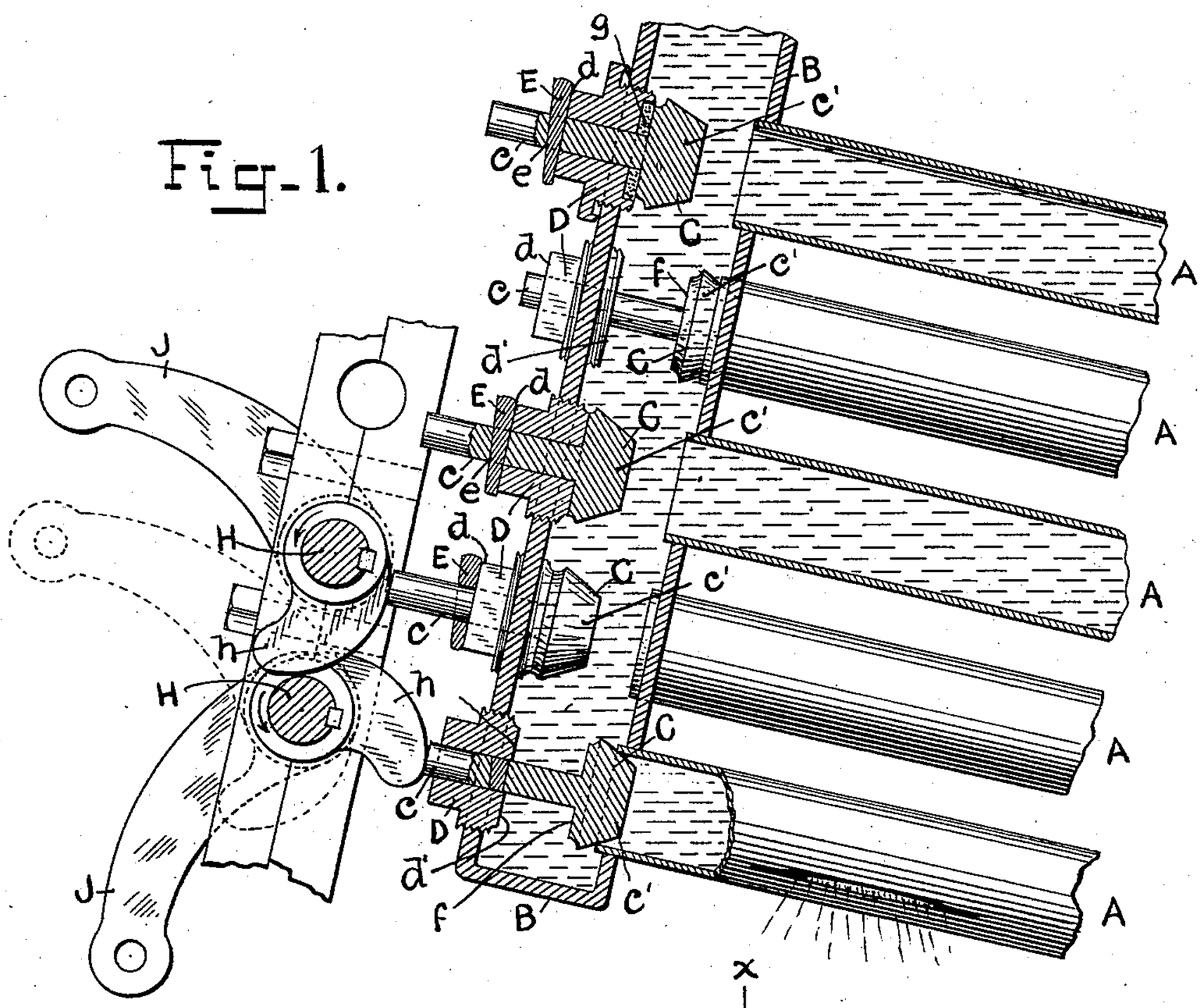
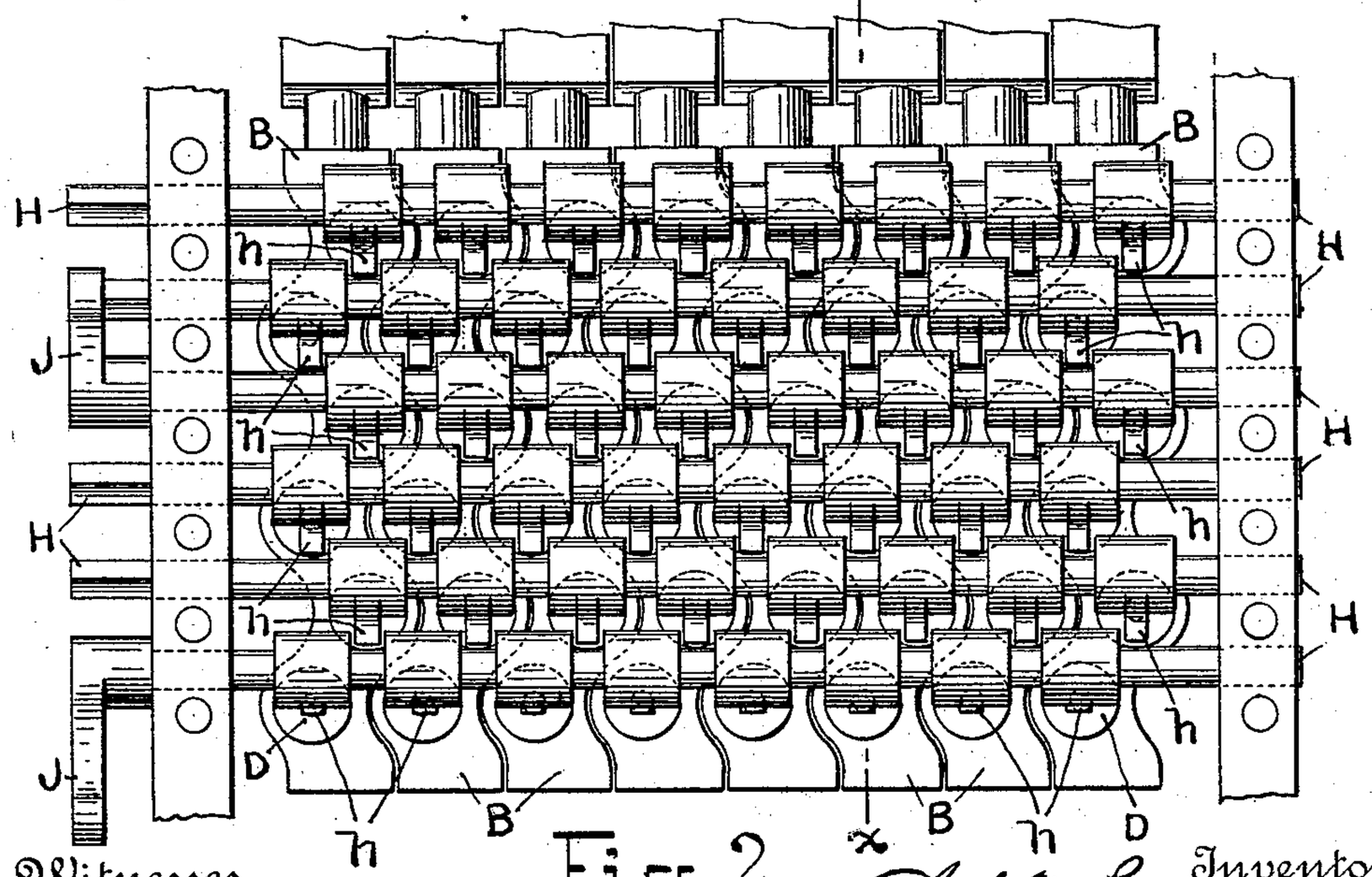


Fig-2.



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UNITED STATES PATENT OFFICE.

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MEANS FOR CLOSINC TUBES OF STEAM-GENERATORS.

SPECIFICATION forming part of Letters Patent No. 571,016, dated November 10, 1896.

Application filed November 23, 1895. Serial No. 569,893. (No model.)

To all whom it may concern:

Be it known that I, NAT W. PRATT, a citizen of the United States, residing in the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Means for Closing the Tubes of Steam-Generators, of which the following is a specification.

The object of this invention is to provide means whereby the ends of any of the water-tubes which form a part of the steam-generator may be tightly closed should the tube leak or burst at any time, so that the boiler may continue in use until a convenient time shall arrive for repairing the leak or replacing the tube with another.

To this end the invention consists in providing the headers with which the water-tubes are connected with valves or plugs located in alinement with the longitudinal axes of the tubes, respectively, which valves or plugs are normally held away from the ends of the tubes, so as not to impede circulation, but are arranged so that they can be forced inward to close the ends of a leaky or burst tube, as hereinafter described and claimed.

In the accompanying drawings, Figure 1 represents in vertical section on line *x x* of Fig. 2 a portion of the front header of a sectional steam-generator embodying the invention with a portion of the water-tubes connected thereto. Fig. 2 shows in front elevation on a smaller scale a series of such headers, and means which may be used for forcing inward the valves or plugs employed to close the ends of the tubes.

A denotes several of the water-tubes which form the main portion of the steam-generator, and B are the front headers to which such tubes are connected. In the drawings only the front headers are shown, but it is to be understood that the rear headers are similarly constructed and provided with the means now to be described.

Opposite each end of each water-tube A and in alinement with the longitudinal axis thereof is arranged a valve or plug C, the stem *c* of which passes loosely through a hole in a bushing or hand-hole plate D, that is screwed into or otherwise secured to the header. The head *c'* of the valve or plug is preferably made of a frusto-conical shape, its smallest diameter being less than and its largest diameter greater than that of the bore of the tube, so that when the valve or plug is forced inward its head will partially enter the end of the tube and securely close the same.

Preferably each of the valves or plugs C is normally held in a rearward position, or away from the end of its tube, by a soft-metal key E, which passes through a slot *e* in the valve-stem *c* and takes bearing upon the outer face *d* of the bushing D. The rear face *f* of the valve-head and the inner face *d'* of the bushing are preferably ground to form a steam-tight joint, so as to prevent any leakage around the valve-stem. In place of grinding these parts to form a joint, however, or in addition thereto, a soft packing *g* may be introduced between the valve-head and the bushing, as will be readily understood.

When a water-tube is found to be leaking and it can be determined which tube is defective, the valves at the ends of such tube are forced inward to close the tube, when the pressure upon the faces *f* of the valve-heads will hold the valves securely closed until the convenient time arrives for making repairs. The forcing of a valve inward to close the end of a tube may be effected by a hammer-blow upon the outer end of its stem of sufficient force to shear off the key E and drive the valve into place.

As it may be extremely difficult in some cases to determine the definite water-tube which is leaking, means may be provided for forcing inward all or a series of the valves in the same row, such means being duplicated, so that all the valves can be operated. Various devices may be employed for this purpose, as will be readily understood, but those shown in the drawings consist of shafts H, upon each of which is a series of levers or cams *h* in alinement with the valve-stems, respectively, each shaft being provided with a lever J or other suitable means for turning it. When a shaft H is turned in the direction of the arrow, Fig. 1, the cams *h* thereon will be swung upward, thereby shearing off all the keys E of the valves which said cams are to operate and driving the valves into their respective tubes. A reverse turning of the shaft will swing the

cams outward again and all the valves except the one which closes a leaky tube will be returned to normal position and will be held there by the pressure in the perfect tubes, while the valve which closes the leaky tube will be held closed, as hereinbefore described. The returned valves may then be keyed up again when opportunity permits.

It will be readily seen by any skilled mechanic that several of the shafts H may be geared or connected together and the cams thereon be so arranged as to force inward a large number of the valves at the same time, sufficient power being applied for the purpose.

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

1. The combination, with the headers of a sectional steam-generator, of valves or plugs loosely mounted in the outer faces of said headers and in alinement with the longitudinal axes of the water-tubes of the generator and adapted to slide inwardly and close the ends of the pipes, substantially as and for the purpose specified.

2. The combination, with the headers of a sectional steam-generator, of valves or plugs loosely mounted in the outer faces of said headers in alinement with the longitudinal axes of the water-tubes and adapted to slide inwardly and close the ends of the pipes and means for holding said valves or plugs in rearward, normal position, substantially as set forth.

3. The combination, with the headers of a sectional steam-generator, of bushings or plates secured to their outer faces; valves or plugs passing through said bushings or plates in alinement with the longitudinal axes of the water-tubes; and keys passing through said valves, for holding the same in normal position, substantially as set forth.

4. The combination, with the headers of a sectional steam-generator, of valves or plugs loosely mounted in the outer faces of said headers in alinement with the longitudinal axes of the water-tubes of the generator, and means for forcing a series of said valves inward at the same time, substantially as and for the purpose specified.

5. The combination, with the headers of a sectional steam-generator, of valves or plugs loosely mounted in the outer faces thereof in alinement with the longitudinal axes of the water-tubes of the generator; a series of shafts bearing levers or cams in alinement with the valves; and means for rotating said shafts, substantially as and for the purpose specified.

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