(No Model.)

W. FOSTER.

STEAM BOILER CLEANER.

No. 565,733. Patented Aug. 11, 1896.

Fig. 1.

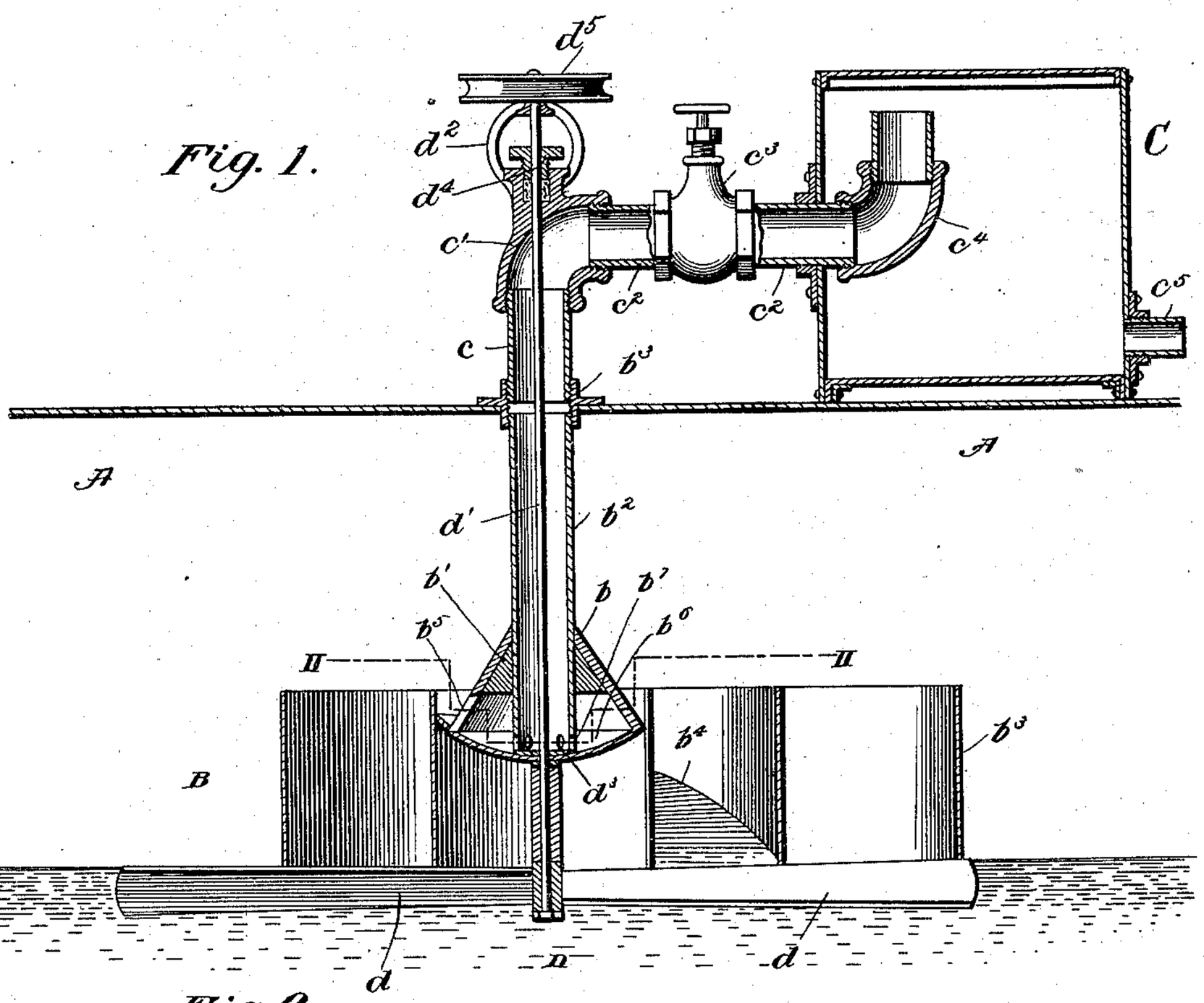


Fig. 2.

Fig. 4.

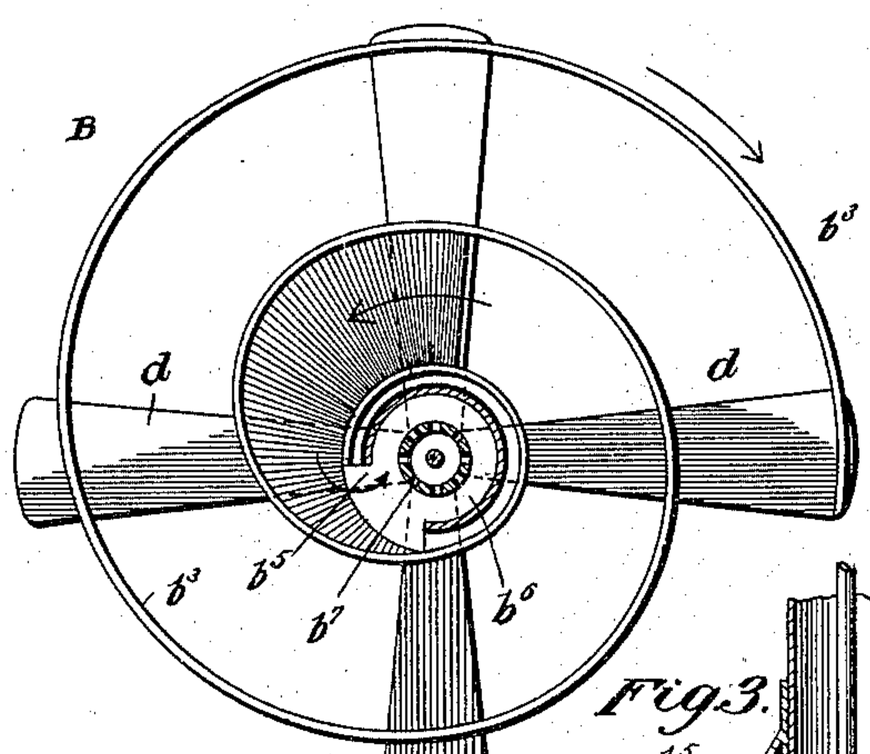
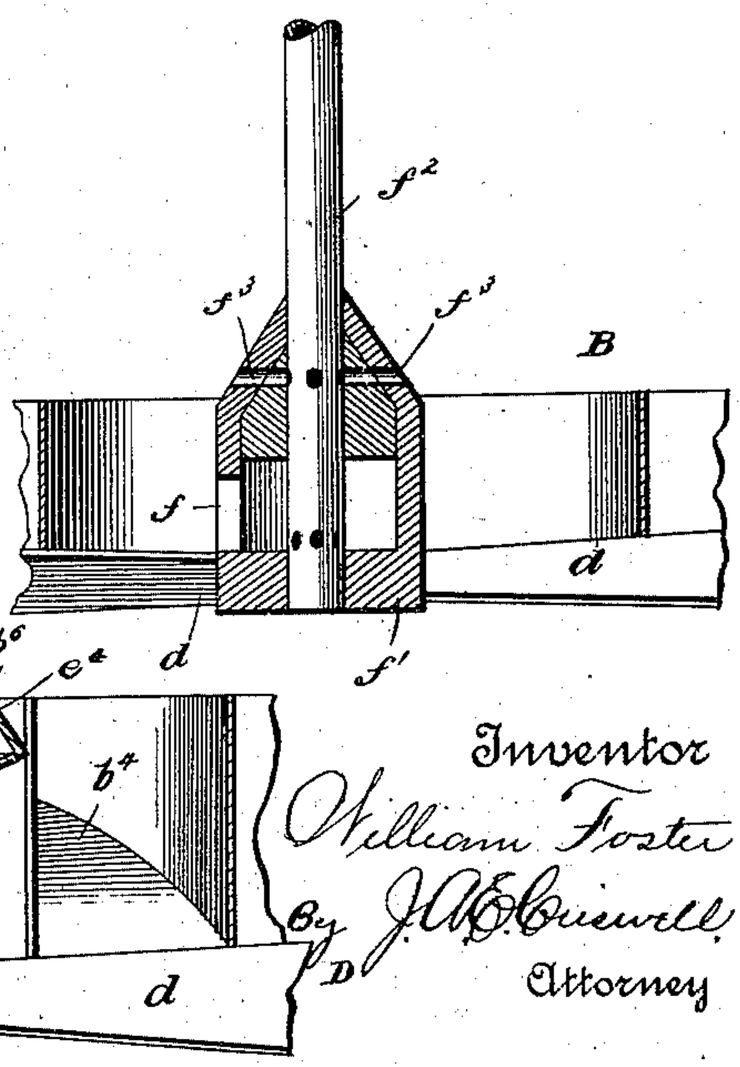


Fig. 3.



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STEAM-BOILER CLEANER.

SPECIFICATION forming part of Letters Patent No. 565,733, dated August 11, 1896.

Application filed June 18, 1896. Serial No. 596,006. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM FOSTER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Steam-Boiler Cleaners; and I do hereby 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.

This invention relates to collecting and discharging impurities from liquid-containing vessels, but more particularly to collecting and discharging impurities from steam-boilers.

The primary object of my invention is to provide means for effecting the collection of the impurities in the water of steam-boilers as the same rises or floats upon the surface thereof, and to automatically discharge the collected impurities with as little loss of steam and water as possible, whereby the accumulation of scale or other foreign matter in the bottom of the boiler or the parts thereof subjected to heat may be materially reduced and the life and efficiency of the boiler materially increased.

A further object is to provide a simple, effective, and inexpensive means, which may be operated either mechanically or automatically, or by both means, if desired, so as to collect the scum or other impurities from the surface of the water and automatically discharge the same into a suitable receiver or vessel.

With these and other objects in view the invention consists in the construction and combination of the several parts, substantially as hereinafter described, and then pointed out in the claims at the end of the description.

Referring to the accompanying drawings, forming a part of this specification, Figure 1 is a vertical sectional view of the collecting and discharging device, illustrating a fragmentary portion of a steam-boiler with the invention applied thereto. Fig. 2 is a sectional plan view on a smaller scale, taken on the line II II of Fig. 1; and Figs. 3 and 4 are fragmentary views representing modified forms of collectors or skimmers.

In the drawings, A may designate a fragmentary portion of a boiler or other vessel, within which may be arranged one or more skimmers or collectors B. These skimmers may vary in number according to the size of the boiler and the requirements of each particular case, and though only one skimmer is shown it will be readily understood that any number may be employed, and that the invention may be put to analogous or other uses, if desired. Each skimmer is provided with a preferably conical hub portion b, adapted to fit over and be supported so as to rotate upon a similarly-formed bearing b', which is arranged upon or formed integrally with a pendent pipe or tube b^2, said pipe or tube being secured at one end to a coupling b^3 or supported in any other suitable manner.

The skimmer or collector is preferably formed from a sheet-metal strip or band b^3 of sufficient thickness and strength to withstand the maximum strain to which it may be subjected and may be secured to the hub or other portion rotating therewith. This strip or band is bent or otherwise formed in the shape of a helix or scroll, of one or more convolutions, and has its walls arranged vertically and preferably of a width something greater than the distance between the highest and lowest points which the water might reach from vaporization or other causes when the boiler is in operation, in order to be constantly in an operative position. The walls of the band or strip are separated by a suitable space, and have their lower edges immersed in the water a sufficient distance to close the entire lower surface of the skimmer, in order to form a track or helical passage for the scum and other impurities above the surface of the water between the walls of the skimmer, so that when the skimmer is revolved in any suitable manner in the direction indicated, the impurities which rise to the surface of the water will be forced or caused to pass inward toward the hub b. A plate or strip b^4 is preferably secured between the walls of the skimmer, so as to form a spiral incline plane, which extends from the hub portion near or at the upper edge of the skimmer downwardly around and between the walls thereof to or below the surface of the water, so as to collect and guide the impurities, forced inward by the rotary motion of the skimmer, above the surface of

the water through an opening b^5 in the hub portion into a pan or vessel b^6. This pan or receptacle may be secured to or formed integrally with the hub portion, or may be secured to or formed integrally with any other portion of the skimmer or collector. The scum or impurities collect in the pan or vessel b^6 and pass through apertures or openings b^7 in the lower portion of the tube or pipe b^2 through which it is forced by the steam. By this means the scum and other impurities are collected and carried above the surface of the water and forced out of the boiler with very little loss by reason of the water being carried therewith.

In order to prevent too great a loss of steam and to collect the water of condensation, I preferably provide a pipe c, which is secured to the pipe b, or, in this case, to the coupling b^3, so as to communicate with the pipe b^2. This pipe may have an elbow c' arranged upon the outer end, from which leads a pipe connection c^2 to a closed receiver or tank C, said pipe being preferably provided with a valve c^3 intermediate the receiver and elbow and a nozzle c^4 on its outer end, so as to convey the impurities upward within the receiver. The receiver may be located upon the shell of the boiler, as shown, or may be placed at the side thereof, or in any other suitable position, and may be of any desired form or construction. Any number of these receivers may be provided where more than one collector is employed, or a single receiver of sufficient size may be provided having a connection with each scum-conveying pipe, so that as the steam condenses in the receiver, steam from within the boiler will force the scum and other impurities into the pan, receptacle, or cup b^6 through the pipes b^2 and c^2 into the receiver C, thus utilizing the steam instead of the water to force the impurities out of the boiler and permitting the steam to escape only as it condenses in the receiver, so as to avoid as much waste as possible. A connection c^5 may be arranged at or near the bottom for removing the impurities as they collect in the receiver, and a trap (not shown) of the usual or of any preferred construction may be used for the purpose of conveying the water of condensation to a suitable vessel, so that it may be again fed into the boiler or utilized for other purposes.

As a means for revolving the skimmer I may provide either automatic or mechanical means, or both, as in Fig. 1, though ordinarily only one is employed at the same time. To automatically rotate the skimmer, a propeller D, having two or more blades d, is preferably secured to a portion of the hub b, or otherwise, so as to rotate with the skimmer. The blades of the propeller are placed at an angle, so that as the water rises from the violent ebullition, which takes place near or at the surface of the water or by the generated particles or circulation of the water in the boiler, the blades will offer an obstruction thereto, and owing to their inclination or angle will be forced around on their axis so as to rotate the skimmer. A shaft d' may be secured to the hub of the skimmer and the hub of the propeller, and may pass centrally through the scum-conveying pipes b^2 and c, through the elbow c^2. This shaft may be journaled in bearings d^2 and d^3, located, respectively, on the elbow c^2 and in the lower portion of the pendent or scum-conveying pipe b, and preferably passes through a stuffing-box d^4, arranged upon the elbow, the shaft being provided on its outer end with a pulley d^5 or other rotating means, so that by a belt, chain, or otherwise, rotary motion may be imparted to the shaft, so as to revolve the skimmer and collect and force the impurities into the pan or receptacle b^6 in the manner already described.

The manner of using and constructing the invention will be readily understood from the foregoing description when taken in connection with the accompanying drawings. Assuming the parts to be in the position shown and rotary motion imparted to the skimmer in the direction indicated by the arrow in Fig. 2 either by the shaft d' or by the propeller-blades d, as heretofore explained, it will be seen that the impurities within the path of travel of the skimmer will be gathered and caused to pass between the walls thereof, and forced inward toward the center as the skimmer continues to revolve. The scum and other impurities as they collect near the center of the skimmer will be forced up the inclined plate or plane b^4 into the pan or basin b^6, from which they are forced by the steam through the pendent pipe b^2, then through the pipe connections c and c^2 into the receiver C, as the steam condenses therein, which permits steam in the boiler to force the impurities through the scum-conveying pipes.

I thus provide simple and effective means for gathering the impurities as they rise or float upon the surface of the water and automatically forcing or discharging the same from the boiler with a minimum expenditure of steam and water, so that the accumulation of scale or other foreign matter may be prevented and the life and efficiency of the boiler materially increased.

Instead of having the skimmer fixed and of sufficient width for the varying heights of water, I may arrange the skimmer so as to automatically adjust itself with the rise and fall of the water. For this purpose either independent floats may be used, or the propeller-blades may be made in the form of floats or of such shape and material as to secure enough buoyancy to sustain the skimmer above the surface of the water at all times, so that only the lower edge thereof is immersed. The shaft d' may be stationary, so as to permit the hub portion to slide vertically thereon, or may be adapted to revolve, as in Fig. 1, in order to mechanically rotate the skimmer, in which case a spline or feather

e, Fig. 3, carried by the shaft engages a groove *e'* in the hub e^2, so that as the water rises or falls the skimmer will be permitted to adjust itself accordingly. The hub may have a sleeve e^3 adapted to slide upon the pipe b^2, so as to rotate thereon, in which are slots or perforations e^4 to permit the impurities to pass into said pipe whatever may be the position of the skimmer, in order to permit the steam to force the impurities from the boiler in substantially the same manner as heretofore described.

In Fig. 4 the scum and other impurities, as they are gathered and forced toward the center, are caused to pass through an aperture or opening *f* in the lower portion of the hollow hub *f'*, from which they pass into the pipe f^2, so as to be forced therefrom. This hub may have a conical upper portion, and be supported upon a similarly-formed bearing formed integrally with or secured to the pipe f^2, and in the hub, preferably the conical portion, is arranged one or more apertures f^3, adapted to register as the skimmer revolves with similar apertures in the bearing and pipe, so that steam may be intermittently admitted to the pipe to force the impurities therethrough. Though this figure does not show the inclined plate or plane for conveying the impurities to a cup, basin, or other receptacle located above the surface of the water, it is obvious that such may be employed, or that in either of the other constructions the inclined plane or plate may be dispensed with, if desired.

It is obvious that the invention may be employed in connection with other vessels than steam-boilers; that the form and manner of constructing the skimmer, as well as the manner of supporting it and the pan or receptacle within the boiler or other vessel may be changed in some instances, and that some of the parts may be dispensed with or others substituted therefor without departing from the spirit of my invention.

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

1. In a device of the character described, the combination with a suitable vessel, of a support arranged within said vessel, a skimmer journaled upon the support, a receiver, connections between the skimmer and the receiver adapted to permit the impurities to be forced into the latter, and means for rotating the skimmer; said skimmer being in the form of a coil or helix and adapted to gather and force the impurities toward the center thereof, substantially as described.

2. In a device of the character described, the combination with a suitable vessel, of a support arranged within said vessel, a skimmer journaled upon the support, a receiver, a receptacle for the scum carried by the skimmer and located above the surface of the water, connections between the scum-receptacle and the receiver adapted to permit the steam to force the scum from said receptacle to the receiver as the steam in the latter condenses, and means for revolving the skimmer; said skimmer having a helical or scroll-like form adapted to gather and force the impurities into the receptacle, whereby the impurities may be gathered and automatically forced from the vessel with very little loss of steam, substantially as described.

3. In a boiler-cleaner, a skimmer having a helical or scroll-like form provided with a pan or receptacle arranged upon the skimmer above its lower surface, and an inclined plate or plane extending from or near the lower edge of the skimmer between the walls thereof to the entrance or upper edge of the receptacle, substantially as described.

4. In a boiler-cleaner, a skimmer having a helical or scroll-like form of one or more convolutions, provided with a hub portion having an opening therein, a pan or receptacle arranged upon the skimmer above its lower surface and beneath the opening in the hub, and an inclined spiral plate or plane arranged between the walls of the skimmer and extending from or near the lower edge thereof to the opening in the hub portion adapted to convey the scum or other impurities forced inward by the skimmer above the surface of the water into the pan or receptacle, substantially as described.

5. In a boiler-cleaner, the combination with a suitable support, of a skimmer journaled upon said support, adapted to have its lower edge immersed in the water, together with blades secured beneath the skimmer and arranged at an angle so that the agitation or ebullition of the water in the boiler acting upon the blades will rotate the skimmer, substantially as described.

6. In a boiler-cleaner, the combination with a tubular support, of a skimmer having a helical form provided with a pan or receptacle located above the lower edge of the skimmer so as to communicate with said support, and a spiral inclined plate or plane extending from the lower edge of the skimmer between the walls thereof to the receptacle, together with means for rotating the skimmer, substantially as described.

7. In a boiler-cleaner, the combination with a tubular support, a receiver and connections between the support and receiver, of a skimmer having a helical form journaled upon the support and provided with a receptacle communicating with the tubular support for the scum or other impurities, together with propeller-blades arranged at an angle and secured so as to rotate with the skimmer, substantially as described.

8. In a device of the character described, the combination with a boiler, of a pendent tubular support arranged within said boiler having an opening or openings in its lower end, a skimmer having a helical or scroll-like form journaled upon the support and provided with a pan or receptacle located above

the lower edge of the skimmer so as to communicate with the support, and a spiral inclined plate extending from the lower edge of the skimmer between the walls thereof to the receptacle, a receiver and connections between the tubular support and the receiver, together with propeller-blades arranged at an angle and secured so as to rotate with the skimmer, whereby the impurities may be automatically gathered and forced into the receiver, substantially as described.

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

WILLIAM FOSTER.

Witnesses:
J. A. E. CRISWELL,
W. D. C. BOGGS.