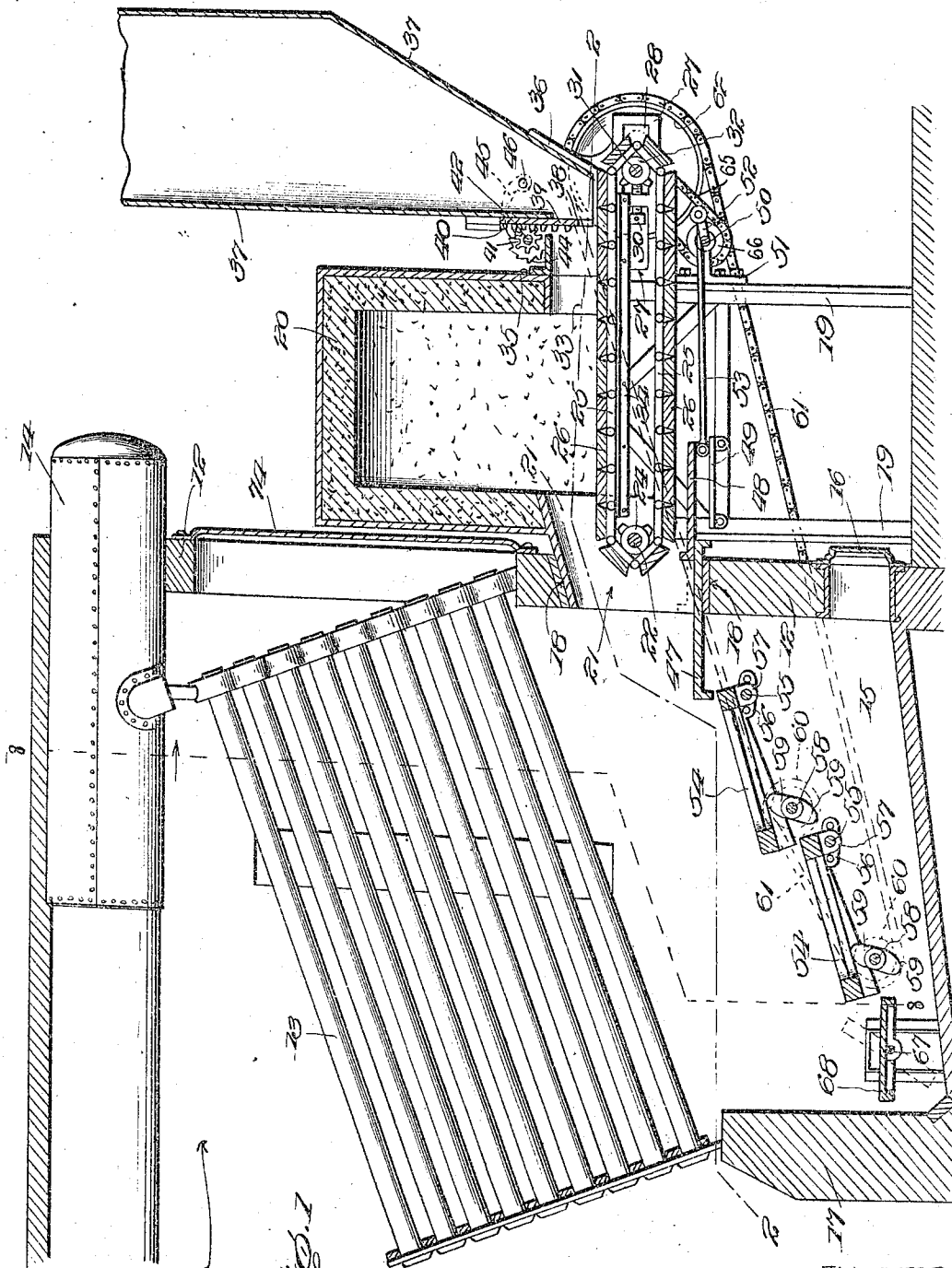


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STOKING AND COMBUSTION APPARATUS.
APPLICATION FILED FEB. 6, 1918.

1,293,285.

Patented Feb. 4, 1919.
3 SHEETS—SHEET 1.



Witnesses

10

D.A. Wood

By

Hambees Attorney

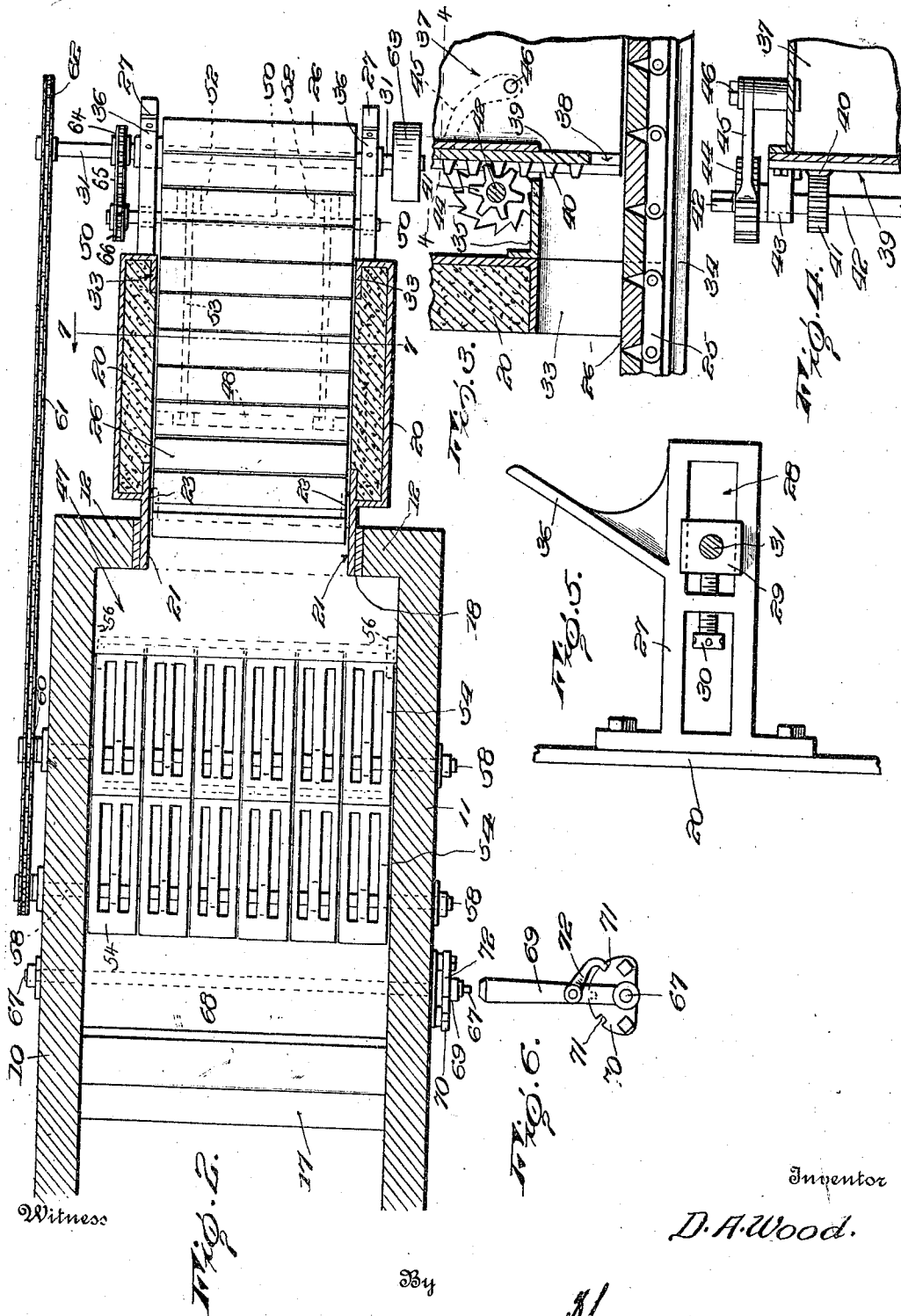
INVENTOR

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By *[Signature]* Attorney

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3 SHEETS—SHEET 3.

[illegible]

UNITED STATES PATENT OFFICE.

DAVID A. WOOD, OF PITTSBURGH, PENNSYLVANIA.

STOKING AND COMBUSTION APPARATUS.

1,293,285.

Specification of Letters Patent.

Patented Feb. 4, 1919.

Application filed February 6, 1918. Serial No. 215,648.

To all whom it may concern:

Be it known that I, DAVID A. WOOD, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Stoking and Combustion Apparatus, of which the following is a specification.

This invention relates to combined mechanical stoking and combustion mechanism, and has for one of its objects to improve the construction and produce a device whereby the combustible portions of the fuel may be economically and completely consumed and the generation of smoke prevented.

Another object of the invention is to provide a device of this character whereby the fuel is distributed over the entire grate surfaces in a continuous uniform layer during the operation of the apparatus, thereby equalizing the combustion and thoroughly consuming the combustible particles and preventing the generation of smoke.

Another object of the invention is to provide an apparatus wherein the fuel, such as bituminous coal, is first coked, or treated to extract and consume the smoke producing particles, and the coked fuel used to produce the requisite heat to generate steam in any suitable boiler or like generator, whereby the formation and escape of smoke and like products of the combustion is effectually prevented.

Another object of the invention is to provide a device of this character in which the parts are so arranged that the portions exposed to the fuel are supplied with uniformly distributed air currents whereby abnormal or unequal heating of the exposed surfaces is prevented.

Another object of the invention is to provide a device of this character wherein the strains are uniformly distributed so that unequal weight and strain is obviated.

With these and other objects in view, the invention consists in certain novel features of construction, as hereinafter shown and described and then specifically pointed out in the claims.

The improved combustion and stoking mechanism may be employed without material structural change in different forms of furnaces or generators to produce heat

for any required purpose, and it is not desired to limit the invention in any manner in this respect, but for the purpose of illustration the device is shown arranged in connection with a conventional steam generator of the water tube type, and in the drawings thus employed.

Figure 1 is a longitudinal vertical sectional elevation of the fire box portion of a steam generator with the improved apparatus arranged in connection therewith, the parts being in longitudinal section.

Fig. 2 is a plan view with the walls of the fire chamber and the coking portion in section on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged sectional detail of the fuel feed controlling mechanism.

Fig. 4 is a section on the line 4—4 of Fig. 3.

Fig. 5 is an enlarged detail of one of the bracket devices for supporting the outer ends of the chain grate.

Fig. 6 is a detail view of the dump grate operating mechanism.

Fig. 7 is an end elevation with the generator and inclosing walls in section.

Fig. 8 is a transverse sectional view on the line 8—8 of Fig. 1 looking in the direction of the arrows.

Figs. 9 and 10 are details illustrating the construction of the feed plate operating mechanism.

The improved apparatus includes a fuel holding receptacle or hopper, an initial grate device and a preliminary combustion chamber in which the fuel is partly consumed, or coked, a means for feeding the fuel from the receptacle to the initial grate device, a coking device to which the partly consumed or coked fuel is fed from the initial grate device, and a secondary grate device to which the partly consumed fuel is transferred from the coking device and upon which the combustion is completed, the secondary grate device holding the fuel while the heat rising therefrom is utilized to generate the steam.

The improved apparatus likewise includes a device for receiving the non-combustible particles such as ashes, clinkers, and the like, and from which they are dumped.

The initial grate device is preferably in the endless chain form and upon which the

fuel is received from the hopper and thence conducted after the preliminary combustion or coking to the coking device. The secondary grate device is preferably of the rocking or shaking form and disposed in downwardly inclined position toward the discharge end.

The inclosing side walls of the generator are indicated at 10—11, the front wall at 12, the water tubes at 13 and the steam drum at 14. The ash pit is represented at 15 having a combined air intake and ash pit door 16. Formed through the front 12 is an opening indicated at 18 which occupies the usual place of the fire door, but is wider than the ordinary fire door and of less height.

Supported upon a suitable stand 19 in advance of the front 12 of the generator is a preliminary combustion or coking chamber 20 lined with suitable refractory material such as fire brick, and open at the lower side and beneath which the chain grate extends. The chain grate thus forms the bottom of the coking chamber.

The coking chamber is provided with a sleeve-like projection 21 which fits into the opening 18 of the generator and thus provides means for detachably coupling the coking chamber to the feed door of the generator.

The chain grate includes a forward shaft 22 mounted for rotation in suitable bearings, indicated at 23, attached to the inner faces of the sleeve 21 and carrying chain wheels 24 over which endless chains 25 operate, the chains supporting the grate bars represented at 26.

Mounted upon members of the stand 19 are bracket devices 27 having longitudinally directed guideways or slots 28 in which bearing blocks 29 are movably mounted, each bracket being provided with an adjusting screw 30 whereby the blocks 29 may be adjusted within the guideways. A shaft 31 is mounted for rotation in the bearing blocks 29 and is provided with chain pulleys 32 to carry the outer terminal of the chains 25. The shaft 31 is thus disposed externally of the front of the coking chamber so that the chain grate operates through an opening 33 in the coking chamber and extends for a considerable portion beyond the front of the same. Attached to the inner faces of the members of the stand 19 are supporting brackets 34 upon which the upper sides of the chains 25 bear during the movements of the chains, thus preventing the sagging of the chains under the load of fuel. The brackets 34 as shown in Fig. 7 are utilized to support the side portions of the fire brick lining of the coking chamber.

Supported upon the coking chamber 20 by a sleeve 35 and also by an extension 36 from the brackets 27 is the fuel hopper rep-

resented as a whole at 37 and provided with a discharge opening 38 registering with the coupling plate 35. A closure plate or door 39 is associated with the hopper and adapted, when in its lower position, to close the opening 38 and to control the discharge of the fuel when adjusted. The closure member 39 is provided with gear racks 40 with which pinions 41 on a shaft 42 engage, the shaft being mounted for rotation in bearings 43 attached to the feed hopper. By this means the closure 39 may be adjusted to control the size of the opening 38 by rotating the shaft 42. By this arrangement it will be obvious that when the chain grate is actuated the fuel will be carried forward from the hopper in a layer of uniform thickness, covering the entire surface of the chain grate, and within the lower part of the coking chamber.

A ratchet 44 is carried by the shaft 42 and a stop pawl 45 is pivoted at 46 to the hopper 37, and operates to hold the shaft 42 and the controlling closure 39 in any adjusted position.

Extending between the side walls of the generator is a flat coking plate 47, one edge of the plate being extended to a point below the line of the shaft 22, so that the contents of the chain grate will be fed to the plate as the chain grate is revolved. Movably disposed within the sleeve 21 is another plate 48 resting by one edge upon the upper face of the plate 47 and supported at its other edge upon suitable supports 49 attached to members of the stand 19. By this arrangement the plate 48 is movable over the upper face of the plate 47 and will force the fuel deposited thereon from the chain grate over its edge, as hereafter explained.

A shaft 50 is supported by suitable brackets, one of which is shown at 51, from the stand 19 and provided with cranks 52, the latter being connected by rods 53 to the member 48, the rotation of the shaft 50 thus imparting reciprocatory movement to the member 48.

Mounted between the side walls of the fire box 15 are a plurality of shaking grates over which the coked fuel discharged from the plate 47 by the operation of the plate 48 will be fed. The shaking grates are preferably inclined toward the bridge wall portion 17 of the generator, and likewise arranged in independently operating sets, two sets of the grate device being shown for illustration. The shaking grates may be arranged to be vibrated or shaken in any suitable manner, but for the purpose of illustration they are shown arranged to be vibrated vertically at one end by a plurality of cam like devices. The grate sections are precisely alike and arranged side by side, each section being indicated by the character 54. A shaft 55 is supported by bearings 56

attached to the inner faces of the side walls of the fire box beneath the upper ends of each set of grates. Each grate section is provided with a bearing 57 mounted for rotation respectively upon the shafts 55, so that the grate sections may be oscillated at one end upon the shafts 55 as centers. Mounted for rotation through the side walls of the fire box portion of the generator near the lower or free ends of the grate sections, are other shafts 58 each shaft carrying a plurality of cam devices 59 adapted to engage the under faces of the grate sections near their free ends to cause them to swing upon their respective shafts 55 when the shafts 58 are rotated. Preferably the cam devices will be arranged to cause the grate sections to be vibrated or oscillated alternately to produce the requisite shaking action to the fuel passing thereover.

Any suitable means may be employed for actuating the chain grates, and shaker grates, but an approved arrangement of mechanism is illustrated for accomplishing the desired result and comprising chain wheels 60 connected to the shafts 58 externally of the walls of the generator and over which a chain 61 operates, the latter leading over a chain wheel 62 on the extended end of the shaft 31.

Mounted upon the shaft 31 is a drive pulley 63 to which a suitable motor is adapted to be applied. The motor is not illustrated as it forms no part of the present invention.

Attached to the shaft 31 is a chain wheel 64 from which a chain 65 leads to another chain wheel 66 on the shaft 50. By this means the requisite motion is imparted to the crank shaft to operate the feed plate 48.

The connecting rods 53 are coupled to the cranks 52 by easily detachable devices illustrated at 73 in Figs. 9 and 10, so that the coking chamber and its attachments including the feed hopper, chain grate and the operating mechanism may be removed by simply disconnecting the couplings 73 and the main drive chain 61.

By this means the closure 74 of the front 12 of the generator is rendered readily accessible.

Mounted for rotation upon a shaft 67 extending through the side walls of the ash pit 15 is a plate 68, adapted to receive the material passing over the shaker grate sections, said plate being mounted to rotate with the shaft 67 to enable the material to be dumped into the ash pit.

The shaft 67 is extended at one end and provided with an operating lever 69. Attached to the adjacent portion of the ash pit 15 is a segmental plate 70 having a plurality of notches 71 with which a pawl 72 on the lever 69 engages to lock the dumping member 68 either in its horizontal position as

shown by full lines in Fig. 1, or in a tilted position as shown by dotted lines, to enable the material to be dumped therefrom.

Having thus described the invention, what is claimed as new is:

1. In an apparatus of the class described, a combustion chamber having an opening in the wall thereof, a coking chamber provided with a tubular extension fitting within said opening, a coking plate projecting within the combustion chamber, an endless grate operating within the coking chamber, a hopper for supplying fuel to the endless grate, and means for feeding the material from the coking plate into the combustion chamber.

2. In an apparatus of the class described, a combustion chamber having an opening in the wall thereof, a coking chamber having a tubular extension fitting within said opening, an endless grate forming the bottom of the coking chamber, a hopper for supplying fuel to the endless grate, a coking plate projecting within the combustion chamber, and means movable over the surface of the coking plate for feeding the material into the combustion chamber.

3. In an apparatus of the class described, a combustion chamber having an opening in the wall thereof, a coking chamber having a tubular extension fitting within the opening, an endless grate operating within the coking chamber, a coking plate disposed within the tubular extension and having one end thereof projecting within the combustion chamber, means for supplying fuel to the endless grate, and a reciprocating plate movable over the surface of the coking plate for feeding material from said coking plate into the combustion chamber.

4. In an apparatus of the class described, a combustion chamber having an opening in the wall thereof, a secondary grate arranged within the combustion chamber, a coking chamber having a tubular extension fitting within the opening in the wall of the combustion chamber, a primary grate disposed within the coking chamber, a hopper for feeding fuel to the primary grate, a coking plate disposed in advance of the primary grate and discharging into the combustion chamber above the secondary grate, and means for feeding the material from the coking plate onto the secondary grate.

5. In an apparatus of the class described, a combustion chamber having an opening in the wall thereof, a coking chamber independent of the combustion chamber and provided with a tubular portion extending within the opening in the wall of the combustion chamber, an endless chain grate forming the bottom of the coking chamber, a coking plate resting on the tubular portion of the coking chamber and projecting within the combustion chamber, a hopper

for supplying fuel to the endless grate, means for regulating the quantity of fuel delivered from the hopper to the endless grate, and a plate mounted for reciprocation on the coking plate for feeding material into the combustion chamber.

6. In an apparatus of the class described, a combustion chamber having an opening in the wall thereof, a coking chamber having an open bottom and provided with the tubular portion extending within the opening in the wall of the combustion chamber, an endless grate operating within the coking chamber and forming the bottom thereof, a hopper for supplying fuel to one end of the endless grate, a coking plate disposed at the tubular portion of the coking chamber and projecting within the combustion chamber, a reciprocating plate movable over the surface of the coking plate, brackets secured to the coking chamber, a shaft journaled in the brackets and provided with a crank arm, and a pitman forming a connection between the crank arm and reciprocating plate.

7. In an apparatus of the class described, a combustion chamber having an opening in the wall thereof, a coking chamber having a tubular portion fitting within the opening of the combustion chamber, there being an opening in the wall of the coking chamber at a point opposite the tubular portion, an endless grate operating within the coking chamber, a hopper disposed at the opening in the coking chamber for supplying fuel to the endless grate, means for regulating the quantity of fuel from the hopper, a coking plate seated within the tubular portion of the coking chamber, and means for feeding material from the coking plate into the combustion chamber.

8. In an apparatus of the class described, a combustion chamber having an opening in the wall thereof, a coking oven having an opening registering with the opening in the wall of the combustion chamber, an endless grate operating within the coking oven, a secondary grate operating within the combustion chamber, a coking device located at the opening in the wall of the combustion chamber and having one end there-

of projecting into said combustion chamber, means for feeding fuel from the coking device onto the secondary grate, and means for simultaneously actuating the endless grate, secondary grate and feeding means.

9. In an apparatus of the class described, a combustion chamber having an opening in one wall thereof, a secondary grate disposed within the combustion chamber, a coking chamber arranged at the exterior of the combustion chamber and provided with an opening registering with the opening in the wall of said combustion chamber, a tubular member forming a connection between the combustion chamber and coking chamber and fitting within said openings, a primary grate arranged within the coking chamber, means for feeding fuel to the forward end of the primary grate, a coking device disposed in advance of the primary grate and projecting within the combustion chamber above the secondary grate, and means for feeding material from the coking device onto the secondary grate.

10. In an apparatus of the class described, a combustion chamber having an opening in one wall thereof, standards arranged exteriorly of the combustion chamber, a coking chamber supported on said standards and provided with an opening registering with the opening in the wall of the combustion chamber, a tubular member fitting within the openings and forming a source of communication between the coking chamber and combustion chamber, an endless grate operating within the coking chamber, a coking device projecting within the combustion chamber and adapted to receive material from the endless grate, a hopper for delivering fuel to the endless grate, brackets secured to the standards, a feeding device movable over the surface of the coking device, a shaft journaled in the brackets and provided with a crank, a rod forming a connection between the crank and feeding device, a shaking grate disposed within the combustion chamber, and means for simultaneously actuating the chain grate, shaking grate and feeding device.

In testimony whereof I affix my signature.
DAVID A. WOOD. [L. s.]