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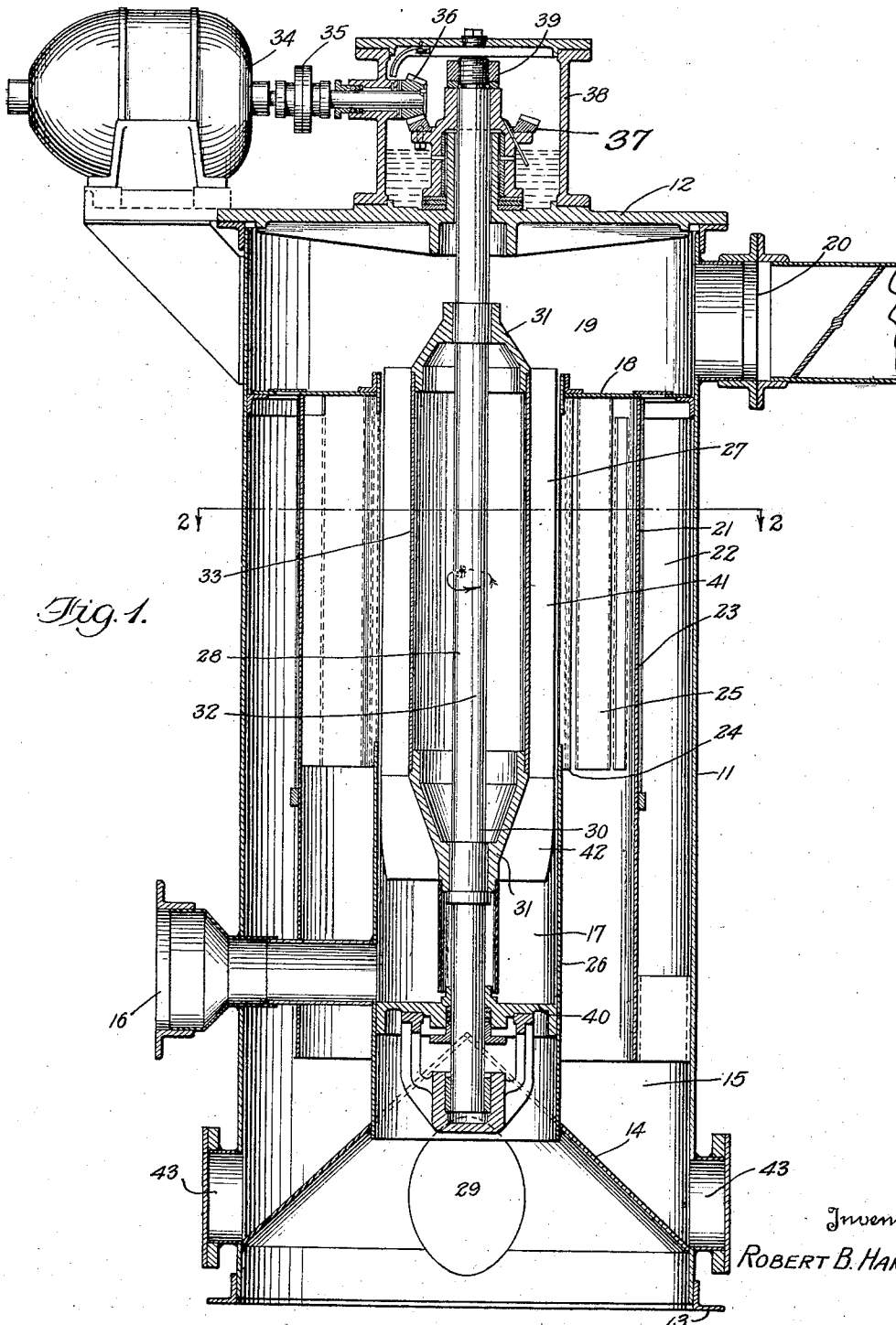
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CENTRIFUGAL DRY DUST ARRESTER

Filed June 6, 1930

2 Sheets-Sheet 1



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Fig. 2.

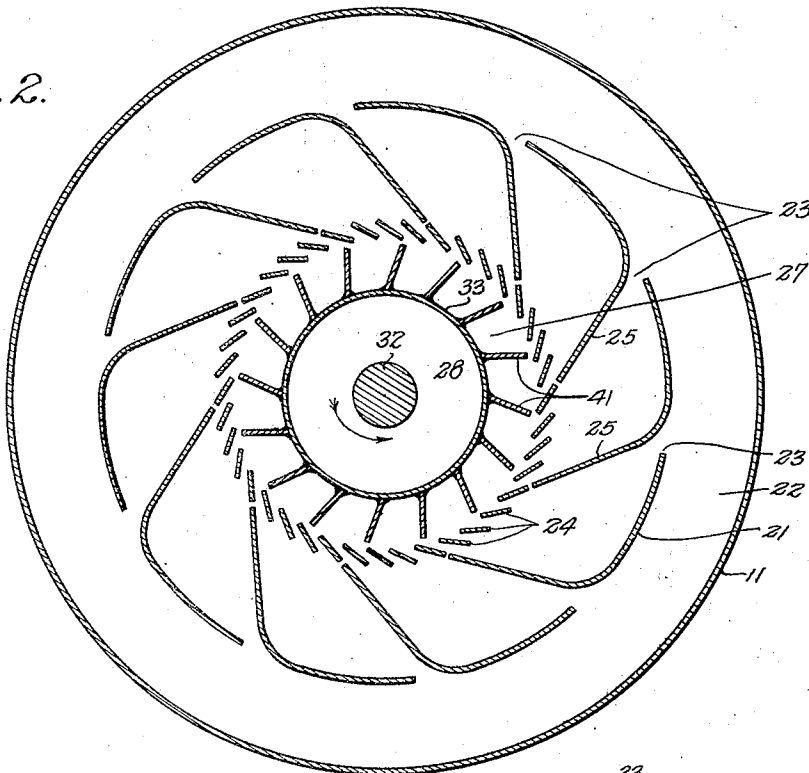
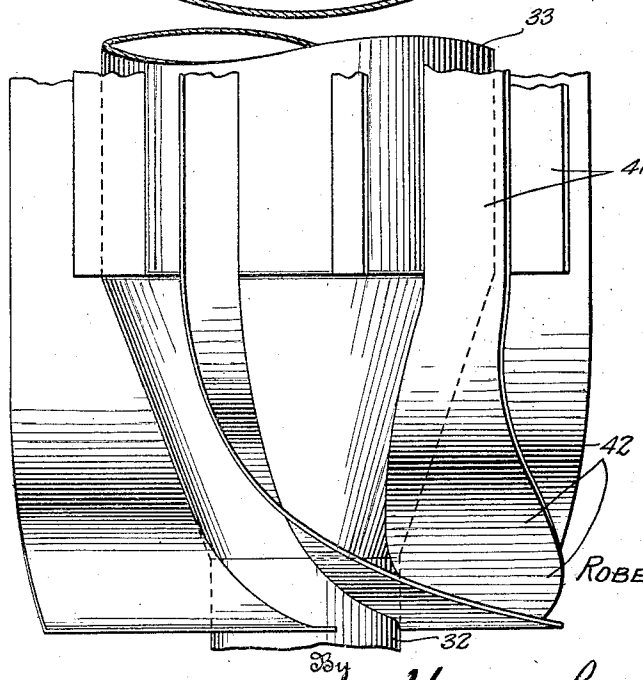


Fig. 3.



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CENTRIFUGAL DRY-DUST ARRESTER

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This invention relates in general to dust arresters of the centrifugal type such as are commonly employed in removing dust from air or other gas, and more particularly relates to improvements in dry dust arresters of the above-noted type especially adapted for dry cleaning of fuel gas such as blast or other furnace gas.

Objects of the invention are the provision of a dust arrester of the above-noted type adapted to efficiently clean large volumes of gas without requiring long flow paths for the flow of gas and in relatively small apparatus occupying a minimum of space in both horizontal and vertical directions; the provision of such apparatus adapted to accommodate larger or smaller volumes of gas at will without requiring alternation of existing apparatus for such purpose or increasing the back pressure on said gas; the provision of an arrester which will function more effectively than those heretofore employed for similar cleaning purposes; and the invention has for further objects such other advantages in construction or operation as may be found to obtain in the apparatus hereinafter described or claimed.

In the accompanying drawings forming a part of this specification and showing, for purposes of exemplification, a preferred form and manner in which the invention is embodied and practiced, but without limiting the claimed invention specifically to such illustrative instance or instances:

Figure 1 is a vertical sectional elevational view of one form of an arrester constructed in accordance with the present invention;

Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1, illustrating more clearly details of the interior of the arrester;

Fig. 3 is an enlarged detail view illustrating the curved blades for lifting the gas through the rotor.

In its present embodiment the invention is incorporated in a centrifugal dry-dust arrester that is especially designed for dry cleaning of blast furnace gas, or other furnace gas. For convenience, the present description will be confined to this use of the invention; features of the invention are, how-

ever, capable of other valuable application, for example, to apparatus adapted to treatment of other furnace gases; consequently the invention is not confined in its scope to the specific use and specific embodiment herein described as an illustrative example.

Referring to the drawings there are illustrated views of a dry-dust arrester of the type hereinabove mentioned. The dry-dust arrester embodies in its construction an upright cylindrical casing 11 enclosed at its top by a cap 12 forming a support for an electric motor driven mechanism hereinafter more particularly described. The casing 11 is supported at its bottom by a support 13 and is provided with a conical bottom 14 forming therewith a gas-tight dust collecting chamber 15 below the gas inlet 16 and gas inlet chamber 17 for the blast furnace gas to be cleaned.

Suitably secured within and near the top of the casing 11 is a flat plate 18 forming with the cap 12 a gas outlet chamber 19 in communication with a gas outlet 20 for leading off cleaned gas from the casing. An apron 21 is arranged annularly of and in spaced relation to the casing 11, as shown in Fig. 2, so as to form a quiescent or dead gas-space 22 adapted for collecting dust centrifuged outwardly towards the casing 11. The apron 21 extends from the plate 18 down to just below the inlet chamber 17 and is provided with a series of vertical dust-passages 23 adapted for passing dust from within the apron to the quiescent dust-collecting gas-space 22 and yet maintain a dead or quiescent gas condition within said space notwithstanding a centrifuging of gas within the annular apron. As shown in Figs. 1 and 2, there is provided within and concentric to the apron 21 an annular series of vertical louvers 24 extending downwardly from the plate 18 to just above the inlet chamber 17 and adapted for arresting dust from a centrifuged gas current and spaced apart to provide openings for passage of dust from the space within the annular series of louvers to the dust passages 23 of the apron 21. An annular series of vertical baffles 25 is provided between and concentric to the annular series of louvers 24 and the apron 21 for de-

flecting centrifuged dust through the passages 23 to the quiescent dust-collecting space 22. The baffles 25 preferably are curved inwardly as shown in Fig. 2 to correspond with the projectory lines during centrifuged gas flow for directing dust outwardly to the passages 23, and extend in spaced relation to each other from the top plate 18 to the lower ends of the louvers 24, just above the inlet chamber 17.

An annular plate 26 is disposed between the lower ends of the louvers 24 and the conical bottom 14 to seal off the space between the lower ends of the louvers, the conical bottom 14 and the casing 11, and form the gas inlet chamber 17 with which the gas inlet 16 communicates, and thereby cause all gas flow to pass through the gas flow space 27 within the series of louvers 24 in flowing from the inlet 16 to the outlet 20. Arranged within the gas flow space 27 is a rotor 28 adapted to be removed through the bottom of the inlet chamber 17 by means of access opening 29. The rotor is carried at its upper end as shown in Fig. 1 for rotation within the gas flow space 27 about the vertical axis 30 and comprises opposed heads 31 mounted on shaft 32 and connected by means of an intervening sleeve 33. The rotor is adapted to be driven at variable speeds by means of an electric motor 34 connected with the shaft 32 by driving mechanism including a flexible coupling 35 and driving and drive gears 36 and 37 which are contained in an oil housing 38 and are removably connected with the shaft 32 by means of an adjustable nut connection 39. At its lower end the shaft 32 is supported in a removable bearing 40 contained in the plate 26 and disposed below the inlet 16 so as to form thereby the bottom for the inlet chamber 17. An annular series of blades 41, mounted for rotation with the rotor 28, are welded to the sleeve 33 so as to extend lengthwise of the path of gas flow from the inlet 16 to the outlet 20 and thereby centrifuge the gas as it passes from the inlet to the outlet. The blades 41 extend from the top plate 18 to just above the inlet chamber 17 and are spaced from each other so as to effect gas flow through the centrifuging gas flow space 27 during rotation of the rotor about its vertical axis 30.

In order to lift the gas through the gas space during rotation of the rotor and blades, means are arranged within the inlet chamber 17 so as to be rotated coincidentally with the rotor 28 and thereby be adapted to effect gas flow from the inlet 16 to the outlet 20 during the rotation of the rotor 28. Preferably a portion 42 of the blades 41 are extended into the inlet chamber 17 and disposed at an angle to the path of gas flow from the inlet to the outlet, as shown in Fig. 3, for accomplishing such lifting of the gas, and the remaining portion disposed vertically paral-

lel with respect to the path of gas flow. As thus arranged the gas is lifted and also will be subjected to a more effective centrifuging action than it would were the blades disposed at such angle throughout their total height. Were the blades disposed at such angle throughout their total height the blades would exert the lifting action throughout their length and the gas would pass through the space at a greater velocity and therefore be subjected to lesser number of revolutions of the rotor. Consequently with the blades arranged as shown, centrifuging of the dust is more effectively accomplished. The rotor is so constructed, as shown, that gas cannot pass through it and thereby by-pass the spaces between the blades, and as the top plate 12 and the lower plate 26 seal the gas from passing through the space between the blades and the casing, all gas must flow through the space between the individual blades 41, and every particle of dust is subjected to centrifugal force of the rotor and blades.

The gas on entering the inlet 16 passes through the spaces between the curved portions 42 of the blades and is thereby lifted upwardly towards the outlet 20. During the passage of the gas through the space 27 the rotation of the blades 41 sweeps the gas annularly about the vertical axis 30 and thereby imparts a rotary motion thereto. During such passage the particles of dust are acted upon by the centrifugal force of both the rotor 28 and the rotary motion of the gas and are thereby thrown out into the space between the louvers 24 and the apron 21. The louvers 24 arrest the dust from the gas current and prevent such dust from following or returning to the gas current once thrown out of the primary path of flow to the gas outlet. Upon passage through the louvers 24, the dust is deflected by the baffles 25 toward the dust passage 23 through which the dust passes into the dead or quiescent dust-collecting gas-space 22. The gas in the dead gas space 22 being free from turbulence, the dust readily settles to the open bottom of such space into the dust-collecting compartment 15 from whence it is removed through the dust discharge openings 43. Dust that may also pass downwardly through the space between the apron 21, baffles 25 and louvers 24 also settles through their open bottoms into the compartment 15 together with the dust from the dead gas space 22.

An important advantage of the above noted construction is its ready adaptability for handling increased or decreased volumes of gas without increasing or decreasing the cross-sectional area of the flue passages or gas spaces or increasing or decreasing the length or height of the apparatus. When it becomes necessary to handle greater volumes of gas, all that is required to be done

is to increase the speed of the motor 34 to increase the number of revolutions per minute. The increase in rate of rotation obviously therefore increases the rate of flow through the space, and also the centrifugal force to which the dust is subjected. Conversely a decrease in the rate of rotation will accommodate lesser volumes of gas. In the event that it is desired to subject the lesser volumes of gas to the same rate of rotation and thereby subject the dust in such lesser volumes to the same degree of centrifugal force as with larger volumes, the same may be effected, without, however, increasing the rate of flow, merely by throttling the gas flowing through the outlet by means of a throttling valve of any well known construction.

From the foregoing description it will also be apparent that the above construction makes advantageous provision for removal, for repair and replacement, of the rotor through one end of the gas flow space (the lower end) without disturbing the driving mechanism or dismantling of the louvers, baffles and dust compartment or other chambers of the apparatus, which is of particular merit in the ease with which adjustment and repair of such apparatus may be made.

The invention as hereinabove set forth is embodied in a particular form of construction but may be variously embodied within the scope of the claims hereinafter made.

I claim:

1. A centrifugal dry-dust arrester comprising, a casing having a gas inlet and outlet therefor; a rotor mounted in spaced relation to said casing for rotation therein and adapted for centrifuging a current of gas passing through said casing from the inlet to the outlet thereof; an apron mounted in spaced relation to and interposed between said rotor and casing, said apron being adapted to form a quiescent dust-collecting gas-space between said casing and said rotor and having openings therein for passage of centrifuged dust from said rotor to said dust-collecting gas-space; a series of stationary louvers arranged between said rotor and said apron and adapted for arresting dust from the centrifuged gas current and for passage of such dust to the openings in said apron; and means for rotating said rotor.

2. A centrifugal dry-dust arrester comprising, a casing therefor; a rotor mounted in spaced relation to said casing for rotation therein and having a series of spaced blades adapted for centrifuging a current of gas passing through said casing from the inlet to the outlet thereof; a gas inlet and outlet communicating directly with the spaces between said blades at the opposite ends of the series thereof respectively; an apron mounted in spaced relation to and interposed between said rotor and casing, means for shutting off

the space between said apron and said casing from the gas inlet and outlet so as to form a quiescent dust-collecting gas-space between said casing and said rotor, said apron having openings therein for passage of centrifuged dust from said rotor to said dust-collecting gas-space; a series of stationary baffles disposed between said rotor and said apron and disposed closely adjacent the outer extremities of said blades for deflecting centrifuged dust from said rotor through the openings in said apron; and means for rotating said rotor.

3. A centrifugal dry-dust arrester comprising, a casing having a gas inlet and outlet therefor; a rotor mounted in spaced relation to said casing for rotation therein and adapted for centrifuging a current of gas passing through said casing from the inlet to the outlet thereof; an apron mounted in spaced relation to and interposed between said rotor and casing, said apron being adapted to form a quiescent dust-collecting gas-space between said casing and said rotor and having openings therein for passage of centrifuged dust from said rotor to said dust-collecting gas-space; a series of stationary louvers arranged between said rotor and said apron and adapted for arresting dust from the centrifuged gas current and for passage of such dust to the openings in said apron; a series of stationary baffles disposed between said series of louvers and said apron and adapted for deflecting the centrifuged dust through the openings in said apron; and means for rotating said rotor.

4. A centrifugal dust arrester comprising, a casing, an apron providing dust passages arranged within said casing and connected thereto so as to form therebetween a quiescent dust-collecting gas-space; a series of stationary baffles within said apron and adapted to deflect dust from a centrifuged gas current through the openings in said apron; a rotor mounted for rotation within said series of baffles in the path of gas flow therein; a gas inlet and outlet communicating with the space within said series of baffles so that the gas flow therethrough, from the gas inlet to the gas outlet, is lengthwise of the axis of rotation of said rotor; a peripheral series of blades mounted on said rotor for rotation therewith, said blades being spaced from each other for flow of gas therebetween and being disposed lengthwise of the path of gas flow for centrifuging a gas current passing from said inlet to said outlet; and means for rotating said rotor.

5. A centrifugal dust arrester comprising, a casing, an apron providing dust passages arranged within said casing and connected thereto so as to form therebetween a quiescent dust-collecting gas-space; a series of stationary louvers arranged within said apron and adapted for arresting and passage to the openings in said apron of dust from a cen-

trifuged gas current passing to said outlet; a rotor mounted for rotation within said series of louvers in the path of gas flow therein; a gas inlet and outlet communicating with the space within said series of louvers so that the gas flow therethrough, from the gas inlet to the gas outlet, is lengthwise of the axis of rotation of said rotor; a peripheral series of blades mounted on said rotor for rotation therewith, said blades being spaced from each other for flow of gas therebetween and being disposed lengthwise of the path of gas flow for centrifuging a gas current passing from said inlet to said outlet; and means for rotating said rotor.

6. A centrifugal dust arrester comprising, a casing having a gas inlet and outlet therefor; an apron providing dust passages arranged within said casing and spaced therefrom to form therebetween a quiescent dust-collecting gas-space; a series of stationary baffles within said apron and adapted to deflect dust from a centrifuged gas current through the openings in said apron; a series of stationary louvers arranged within said series of baffles and adapted for arresting and passage of dust from a centrifuged gas current passing from said inlet to said outlet; a rotor mounted for rotation within said series of baffles in the path of gas flow from said inlet to said outlet; a peripheral series of blades mounted on said rotor for rotation therewith, said blades being spaced from each other for flow of gas therebetween and being disposed lengthwise of the path of gas flow for centrifuging a gas current passing from said inlet to said outlet; and means for rotating said rotor.

7. A centrifugal dust arrester comprising, a casing having a gas inlet and outlet therefor; an apron providing dust passages arranged within said casing and spaced therefrom to form therebetween a quiescent dust-collecting gas-space; a series of stationary louvers arranged within said apron and adapted for arresting and passage to the openings of said apron of dust from a centrifuged gas current passing from said inlet to said outlet; a rotor mounted for rotation within said series of louvers in the path of gas flow from said inlet to said outlet; a peripheral series of blades mounted on said rotor for rotation therewith, said blades being spaced from each other for flow of gas therebetween and being disposed lengthwise of the path of gas flow for centrifuging a gas current passing from said inlet to said outlet; and a portion of said blades being so disposed at an angle to the path of gas flow from said inlet to said outlet as to effect said gas flow during rotation of said rotor and said blades; and means for rotating said rotor.

8. A centrifugal dust arrester comprising, a casing having a gas inlet and outlet therefor; an apron providing dust passages ar-

ranged within said casing and spaced therefrom to form therebetween a quiescent dust-collecting gas-space; a series of stationary louvers arranged within said apron and adapted for arresting and passage to the openings of said apron of dust from a centrifuged gas current passing from said inlet to said outlet; a rotor mounted for rotation within said series of louvers in the path of gas flow from said inlet to said outlet; a peripheral series of blades mounted on said rotor for rotation therewith, said blades being spaced from each other for gas flow therebetween and being respectively disposed lengthwise of the path of gas flow for centrifuging a gas current passing from said inlet to said outlet; means arranged to be rotated coincidently with said rotor and adapted to effect thereby gas flow from said inlet to said outlet during rotation of said rotor and said blades; and means for rotating said rotor.

9. In a centrifugal dust arrester comprising, a casing, a chamber forming a gas passage within said casing for flow of gas from an inlet to an outlet therefor, a gas inlet and outlet for said chamber, comprising the aforesaid inlet and outlet and a dust-collecting chamber means for collecting dust from gas centrifuged in said gas passage, the combination of a rotor mounted in the chamber of said gas passage for centrifuging gas in said gas passage, and means for rotating said rotor, said rotor being removable and replaceable at will through one end of the chamber of said gas passage and independently of removal of said means for rotating it, the inlet and the outlet, and of the gas passage and other compartments of the arrester.

10. In a centrifugal dust arrester comprising a casing, a chamber forming a gas passage within said casing for flow of gas from an inlet to an outlet therefor, a gas inlet and outlet for said chamber, comprising the aforesaid inlet and outlet and a dust-collecting chamber means for collecting dust from gas centrifuged in said gas passage, the combination of a rotor mounted in the chamber of said gas passage for centrifuging gas in said gas passage, and means for rotating said rotor; said rotor being removable and replaceable at will through one end of the chamber of said gas passage and independently of removal of said means for rotating it and of said gas passage and said dust-collecting chamber; and a bearing for said rotor disposed within the chamber of said gas passage adjacent the inlet thereto, said bearing being removable from the chamber of the gas passage with said rotor and forming a gas-tight closure for the gas passage when mounted therein.

In testimony whereof I have hereunto set my hand.

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