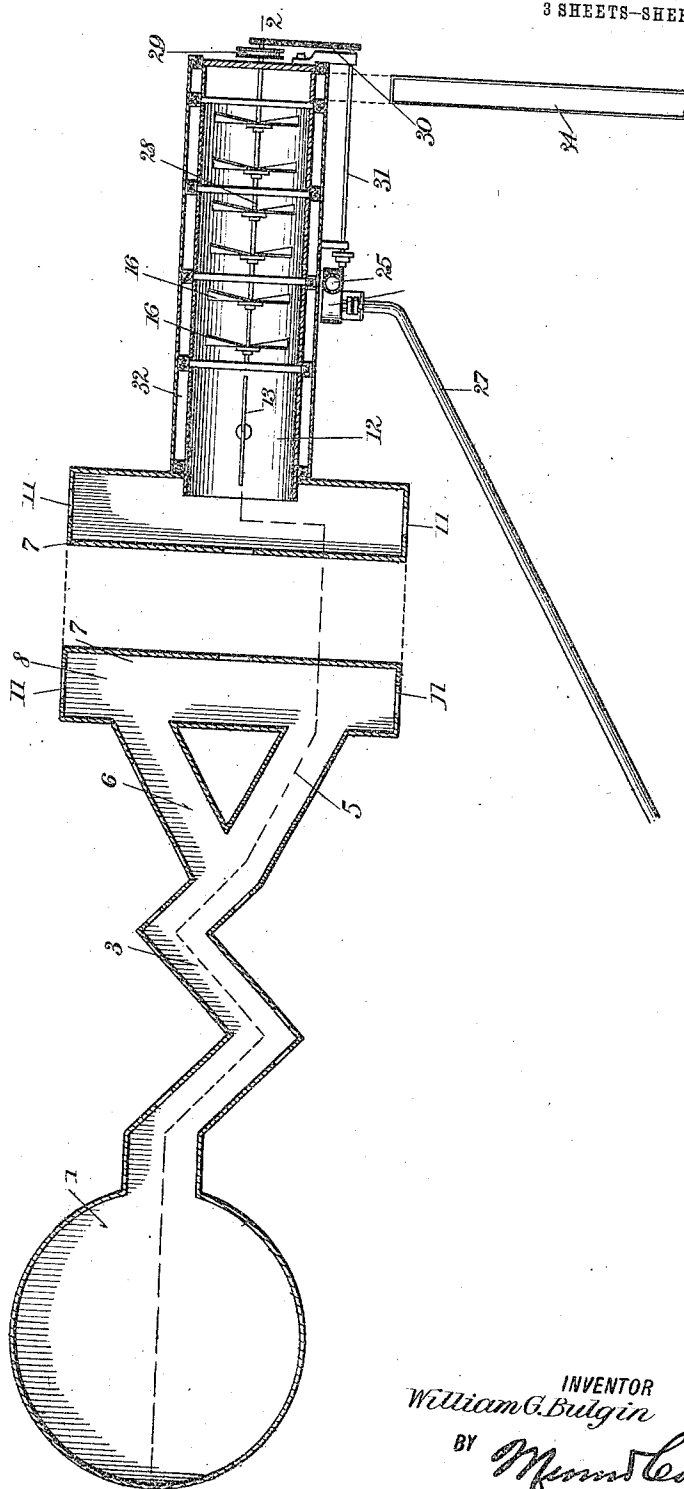


1,011,025

W. G. BULGIN.
SMELTER SMOKE WASHER.
APPLICATION FILED MAY 17, 1911.

Patented Dec. 5, 1911.
3 SHEETS-SHEET 1.

Fig. 1



WITNESSES
H. D. Smith
A. G. Whiting

INVENTOR
William G. Bulgin
BY *Mumford & Co.*
ATTORNEYS

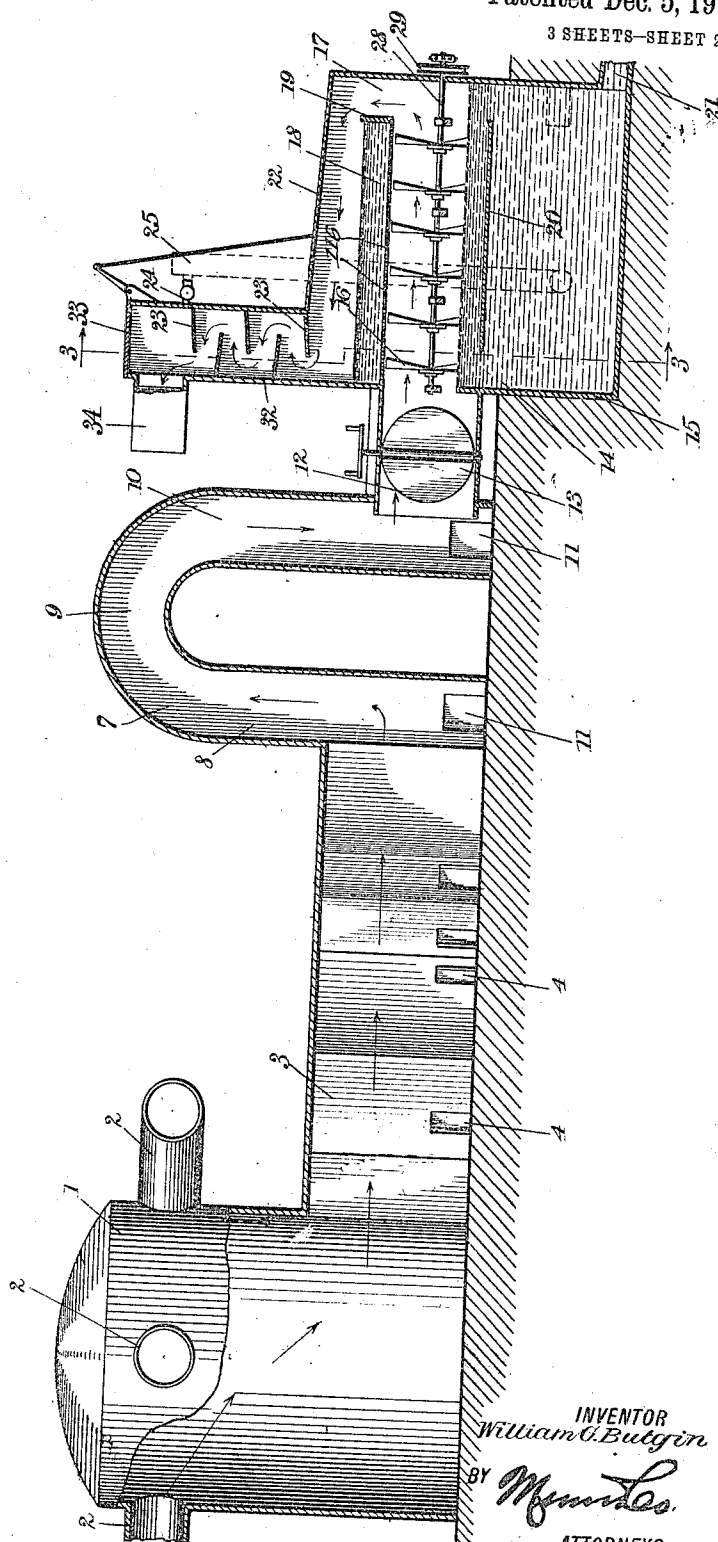
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3 SHEETS—SHEET 2.

Fig. 2.



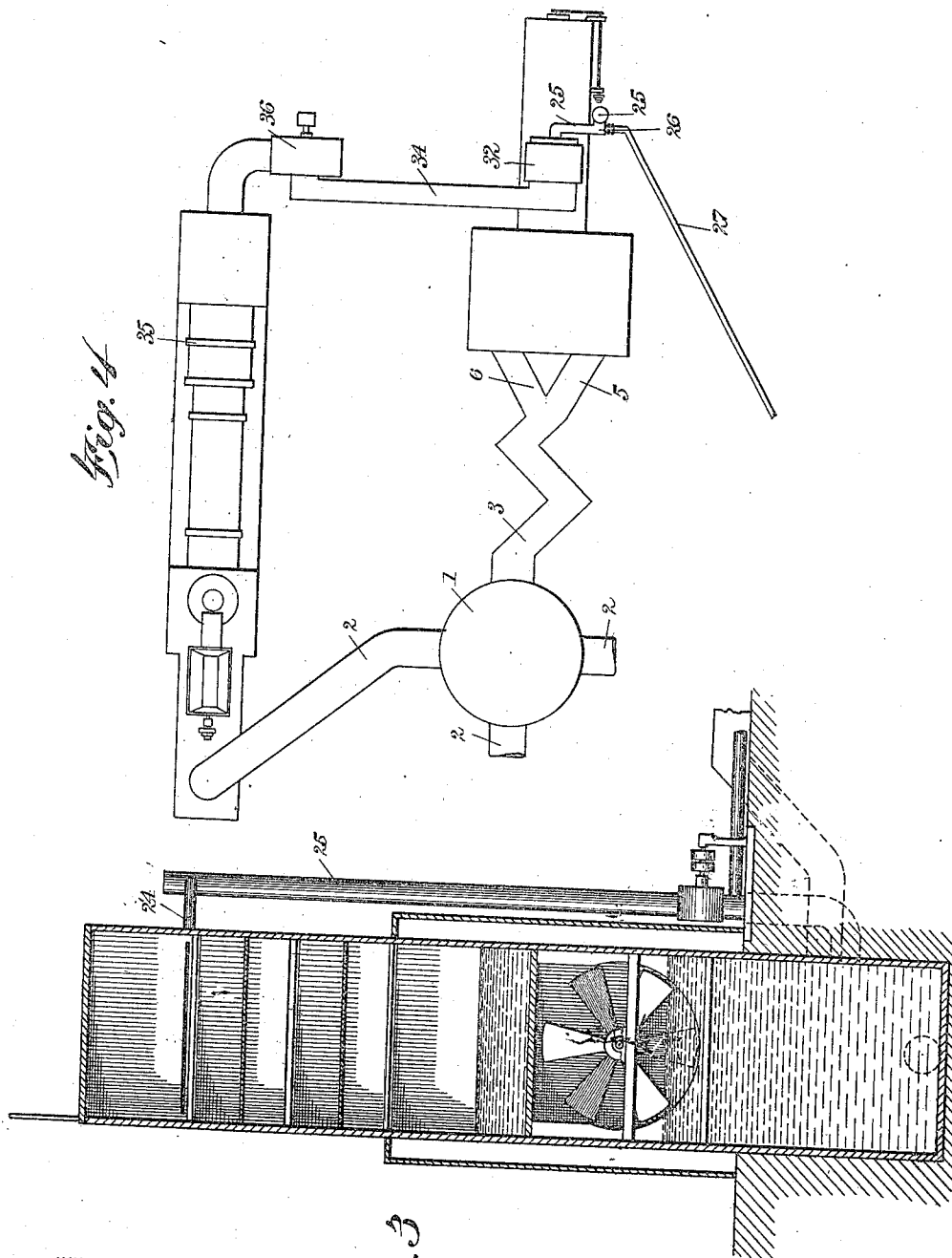
WITNESSES
J. D. Smith
H. Whiting

INVENTOR
William G. Bulgin
BY *M. M. Lee*
ATTORNEYS

1,011,025.

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3 SHEETS—SHEET 3.



WITNESSES
V. R. Smith
A. J. Johnson

Fig. 3

INVENTOR
William G. Bulgin
BY *M. J. McIndoe*
ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM GOULD BULGIN, OF FRANKLIN, NORTH CAROLINA.

SMELTER SMOKE-WASHER.

1,911,025.

Specification of Letters Patent.

Patented Dec. 5, 1911.

Application filed May 17, 1911. Serial No. 627,750.

To all whom it may concern:

Be it known that I, WILLIAM G. BULGIN, a citizen of the United States, and a resident of Franklin, in the county of Macon and State of North Carolina, have invented a new and Improved Smelter Smoke-Washer, of which the following is a full, clear, and exact description.

This invention relates to a new and improved device for washing the smoke from smelting, roasting, blast furnaces and the like, in order to remove the particles of ore and dust carried over, and also to cleanse the smoke and remove poisonous fumes and gases.

An object of this invention is to provide a system which will offer a considerable cooling surface, by passing the smoke and gases through tortuous passages, thereby cooling the products of combustion and roasting down to between 120 and 140 degrees Fahrenheit before passing the same to the washing part of the system proper.

A further object of this invention is to provide a system in which the products of combustion and roasting can be taken care of from a plurality of roasters or furnaces, and in which the gases, after being cooled to the proper point, are drawn through a plurality of rotating fans which dip in water, so as to have always a wet surface, and also carrying the same over wet shelving in a zig-zag tortuous manner, so as to eliminate the poisonous matter by washing, and further, which can be so arranged as to carry the gases, if any poisonous material remains therein, back to the furnace to be used over again.

A still further object of this invention is to provide a smoke consumer and washer which will have a large capacity, which will be simple in construction, inexpensive to manufacture, and highly efficient in its operation.

These and further objects, together with the construction and combination of parts, will be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a horizontal section; Fig. 2 is a vertical section on the line 2—2 of Fig. 1; Fig. 3 is a vertical section on the line 3—3 of

Fig. 2; and Fig. 4 is a diagrammatic view of a continuous connected system.

Referring more particularly to the separate parts of this invention as embodied in the form shown in the drawings, 1 indicates a collecting chamber, to which the gases from the various furnaces are supplied by means of flues 2. From this chamber 1, which may be of any suitable form and is indicated in the form of a cylindrical receptacle, the gases and other products of combustion, together with some particles of ore dust carried over by the draft, pass out of the chamber into a tortuous passage 3, which is shown in the form of a zig-zag passage as indicated in Fig. 3, with the walls thereof changing abruptly in either direction, to offer a considerable amount of cooling surface to the on-coming gases, which aids in reducing the gases to the desired temperature. These walls also, in changing the direction of movement of the gases, causes particles of ore dust to drop from the rushing gases to the floor of the passage, where they can be removed through doors 4.

The passage 3, at its end, may be divided or forked into supplementary passages 5 and 6, which connect with an extensive cooling chamber 7. In this chamber, there is a direct rise, indicated at 8, which is connected by an arch 9 to a down-take 10. This arrangement affords considerable cooling surface to the gases, and by the constant turning motion thereof, exposes all portions of the gases to the cool walls of the cooling chamber. The U-shaped form of the cooling chamber permits the inner walls as well as the outer walls to be close to the outside air, and thereby maintained comparatively cool. It will be also seen that in view of the large capacity of this cooling chamber, it will slow up the rush of the gases, thereby causing particles of ore and other matter to fall out and collect at the bottom of the cooling chamber, where they can be removed by means of doors 11. After the gases and smoke have been cooled down to about 120 degrees Fahrenheit, by its continuous circulating motion against cooling surfaces, it leaves the down-take 10 of the cooling chamber 7 and enters a damper chamber 12. Here, the admission of the gases can be controlled by means of a damper 13, which can be operated in any suitable manner. After passing through the damper chamber 12,

the gases pass over the surface of a suitable fluid, such as water, indicated at 14, in a tank 15.

In passing over the water in the washing tank 15, the gases come into contact with a plurality of rotating fans, the blades of the juxtaposed fans being staggered relative to each other, as indicated in Fig. 3, so as to at all times offer a surface against which the gases can impinge. It will be noted that the blades of these fans dip into the water 14 in the tank 15, so that, as they rotate, they will carry moisture with them, spraying the gases to a slight extent, and at any rate offer moist surfaces to the on-rushing gases, whereby these gases are washed and cleaned. These fans themselves act to draw the gases along and force them up to a passage 17, over a water-bath 18 located in a tank 19 superposed in parallel relation to the tank 15. Before leaving this portion of the washing mechanism, it is to be noted that a horizontal partition or false bottom 20 is provided for the tank 15, which divides the water in this tank, so that, as the fans rotate and dip into the water, they will cause the water to move around, and thus circulate in the tank 15, thereby taking away the top surface of the water which receives the dust and other material washed out of the gases, so that it can be deposited at the bottom and drawn out through a spillway, indicated at 21. The gases are deflected down in close contact with the water in the bath 18 by the roof 22 of this portion of the system, which may be termed the washer proper. The bottom of the tank 19 has slots 116, through which streams of water fall between fans. After passing over the bath 18, the gases travel in a zig-zag path, up through a series of inclined shelves or partitions 23, arranged in staggered spaced relation in a tower or chimney 32. Water is supplied to the uppermost of these shelves 23 by means of a nozzle 24, so that it is permitted to trickle down these shelves in the opposite direction to the path of travel of the gases, so that the gases are constantly rolled or circulated over the moist shelves and through the trickling water dropping from one shelf to the other. The water to the nozzle 24 may be supplied in any suitable manner, as by means of a riser 25, which gets its supply from a pump 26 connected to the water reservoir by a pipe 27.

The series of fans 16, which are mounted on a common shaft 28, may be driven in any suitable manner, as by means of a belt connected to a pulley 29. This shaft in turn drives, through a chain-and-sprocket connection indicated at 30, a shaft 31, which is connected in driving relation with the pump 26.

If the gases, after passing over the washing surface 23, are entirely free from poi-

sonous material, such as arsenic fumes, sulfuric acid or the like, they may pass directly out into the air through the member 32, which is then in the form of a chimney. However, if the gases contain poisonous matter, the member 32 can be cut off to form the tower, by means of a movable gate 33, and the gases carried back through a conduit 34, to the furnaces indicated at 35. For this purpose, a fan 36 may be provided to create the necessary draft. The air, in its cooling and washing in the system, will have come back to substantially its original vitality, and can be readily used in the furnace 35.

The operation of the device will be readily understood when taken in connection with the above description. The products of combustion or roasting from the furnaces indicated at 35, pass through the flue 2 into the collecting chamber 1, from whence they pass through the zig-zag passages 3 and 4 to the cooling chamber 7, where they are cooled by the constant change in direction and exposure to the cool surfaces of the passages and the cooling chamber. The particles of ore carried along by the draft are deposited by coming in contact with the angularly-disposed surfaces, and may be removed from the passages and the cooling chamber by means of the doors 4 and 11. The supply of gases from the cooling chamber and the washer can be controlled by the damper 13, so as to regulate, and even shut off, these gases entirely. After passing beyond the damper 13, the gases impinge on the rapidly-rotating fans 16, which draw them through, and these fans, being moistened by constantly dipping in the bath 15, will wash the gases thoroughly and remove particles of solid matter carried thereby and deposit them in the tank 15, where they can be carried away by the circulating motion of the water in the tank, and drawn up by the spillway 21.

From the action of the fans, the gases pass up over the bath 18, where they are further cleansed and purified and zig-zagged back and forth into the sphere of washing action of the water trickling down over the staggered overlapping shelves 23. The water from these shelves falls into the bath 18, and overflows into the tank 15, so that the supply is constantly changing. From the tower 32, the gases, if completely free from poisonous matter, may pass directly out into the air, or may be drawn through the conduit 34 by the fan 36, back to the furnace 35, where they can be reused.

While I have shown one embodiment of my invention, I do not wish to be limited to the specific details thereof, but desire to be protected in various changes, alterations and modifications which may come within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. The combination with a washer, of means for supplying said washer with the gases or products of combustion, said washer comprising a tank having a liquid therein, over which said gases are adapted to pass, and a plurality of fans rotatably mounted above the level of the liquid in said tank but so as to dip into said liquid and to draw said gases above said liquid, whereby said gases will impinge on the wet exposed surfaces of said fans, and thereby be washed.

2. The combination with a washer, of means for supplying said washer with the gases or products of combustion, said washer comprising a tank having a liquid therein, over which said gases are adapted to pass, and a plurality of fans rotatably mounted above the level of the liquid in said tank but so as to dip into said liquid and to draw said gases above said liquid, whereby said gases will impinge on the wet exposed surfaces of said fans and thereby be washed, and a partition in said tank, located beneath the surface of the liquid in said tank, whereby the rotation of said fans will cause a circulation of the liquid in said tank in opposite directions above and below said partition, thus affording a constantly changing and clean upper surface to the liquid in said tank.

3. The combination with a washer, of means for supplying said washer with the gases or products of combustion, said washer comprising a tank having a liquid therein, over which said gases are adapted to pass, and a plurality of fans rotatably mounted above the level of the liquid in said tank but so as to dip into said liquid and to draw said gases above said liquid, whereby said gases will impinge on the wet exposed surfaces of said fans and thereby be washed; and a partition in said tank, located beneath the surface of the liquid in said tank, whereby the rotation of said fans will cause a circulation of the liquid in said tank in opposite directions above and below said partition, thus affording a constantly changing and clean upper surface to the liquid in said tank, said partition being spaced apart at opposite ends from the sides of said tank, so as to permit said circulation.

4. The combination with a washer, of means for supplying said washer with the gases or products of combustion, said washer comprising a tank having a liquid therein, over which said gases are adapted to pass, a plurality of fans rotatably mounted above the level of the liquid in said tank but so as to dip into said liquid and to draw said gases above said liquid, whereby said gases will impinge on the wet exposed surfaces of said fans and thereby be washed, a

plurality of staggered vertically-spaced partitions located in the path of said gases, and means for supplying a liquid to the uppermost of said partitions, so that said liquid may trickle down in the opposite direction to the path of travel of said gases and wash the same.

5. The combination with a washer, of means for supplying said washer with the gases or products of combustion, said washer comprising a tank having a liquid therein, over which said gases are adapted to pass, a plurality of fans rotatably mounted above the level of the liquid in said tank but so as to dip into said liquid and to draw said gases above said liquid, whereby said gases will impinge on the wet exposed surfaces of said fans and thereby be washed, a plurality of staggered vertically-spaced partitions located in the path of said gases, means for supplying a liquid to the uppermost of said partitions, so that said liquid may trickle down in the opposite direction to the path of travel of said gases and wash the same, and a liquid bath interposed between said partitions and said fan.

6. The combination with a washer, of means for cooling gases to be treated in said washer, said washer comprising a tank containing a washing liquid and having a partition located below the surface of said liquid, a plurality of propellers rotatably mounted above said liquid and adapted to dip into said liquid, a bath located above said propellers and connected to the chamber in which said propellers are located, and a tower superposed above said bath and having a plurality of vertically-spaced inclined partitions arranged in staggered overlapping relation.

7. The combination with a washer, of means for cooling gases to be treated in said washer, said washer, comprising a tank containing a washing liquid and having a partition located below the surface of said liquid, a plurality of propellers rotatably mounted above said liquid and adapted to dip into said liquid, a bath located above said propellers and connected to the chamber in which said propellers are located, a tower superposed above said bath and having a plurality of vertically spaced inclined partitions arranged in staggered overlapping relation, means for supplying water to said last-mentioned partitions, a conduit connected to said tower, and a gate for closing the top of said tower, said bath having openings in the bottom, between said fans.

8. The combination with a receiving chamber, of a plurality of flues adapted to supply gases or products of combustion from furnaces to said chamber, a zig-zag passage adapted to offer an angular cooling surface to said gases, an inverted U-shaped cooling chamber surrounded on all sides by air,

adapted to cool said gases, and connected
to said zig-zag passage, a washer for treat-
ing the gases coming from said cooler, and
a damper interposed between said washer and
5 said cooler, for regulating the supply of gas
passing from said cooler to said washer, said
washer comprising a tank containing a wash-
ing liquid, a plurality of propellers rotatably
mounted above said liquid and adapted to
10 dip into said liquid, a bath located above
said propellers and connected to the chamber
in which said propellers are located, a tower
superposed above said bath and having a

plurality of vertically spaced inclined par-
titions arranged in staggered overlapping
relation, means for supplying water to said
last-mentioned partitions, a conduit con-
nected to said tower, and a gate for closing
the top of said tower.

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

WILLIAM GOULD BULGIN.

Witnesses:

M. A. GASTON.

M. B. McGUIRE.