No. 896,360. PATENTED AUG. 18, 1908.

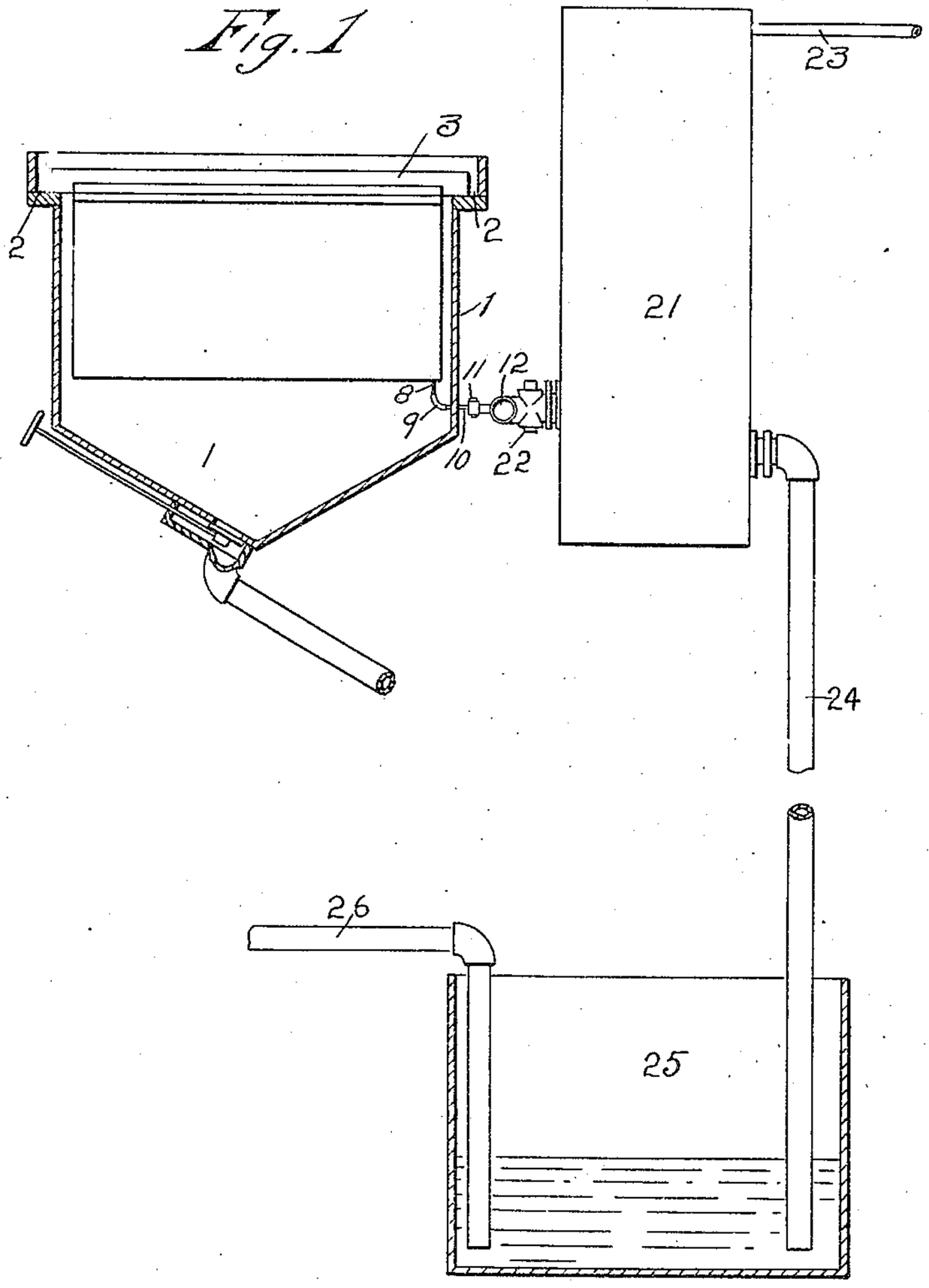
C. BUTTERS.

VACUUM FILTERING APPARATUS.

APPLICATION FILED DEC. 27, 1905.

2 SHEETS—SHEET 1.

Fig. 1



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2 SHEETS—SHEET 2.

Fig 2

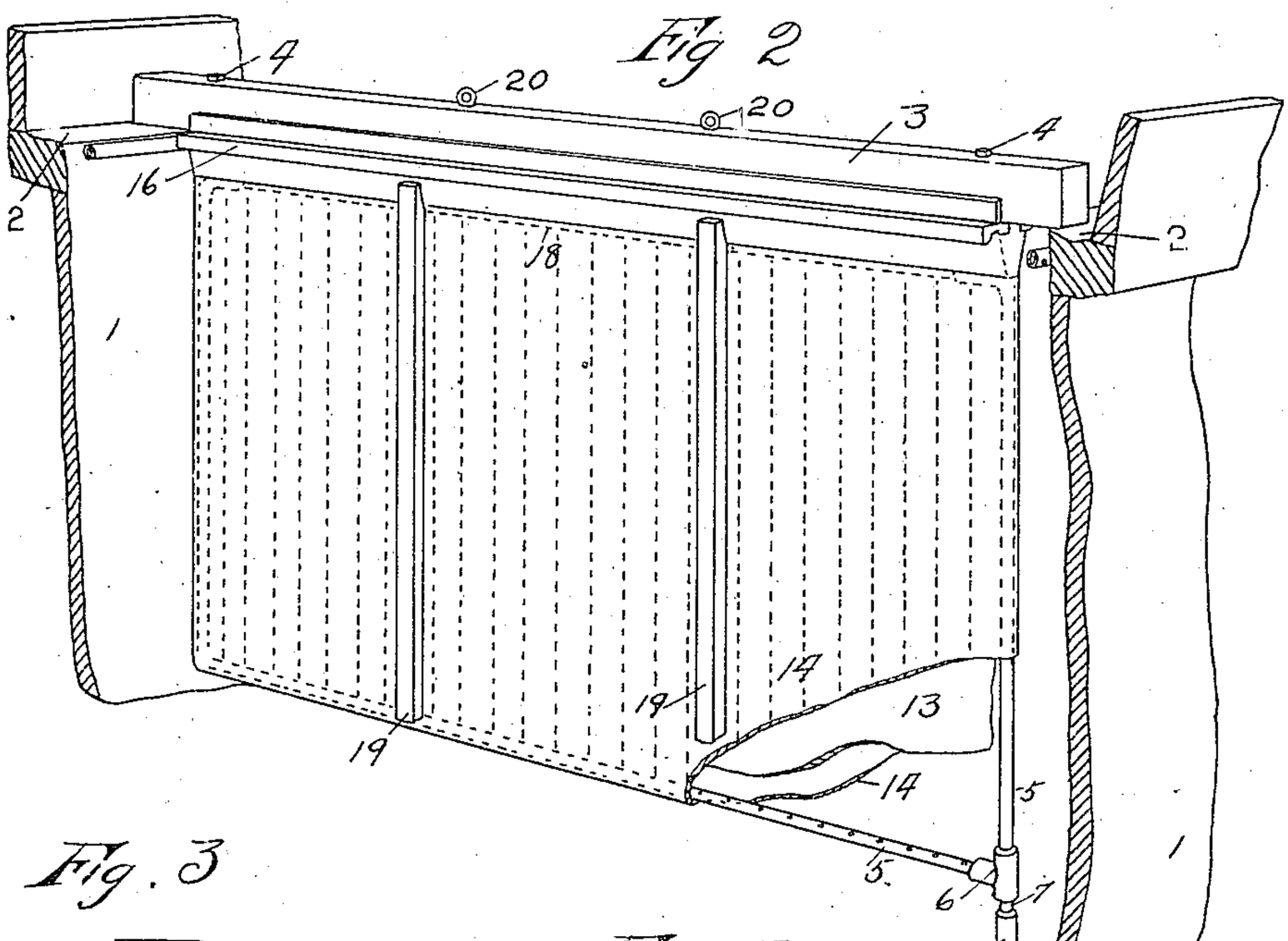


Fig. 3

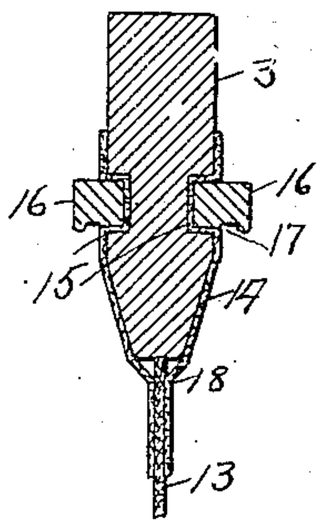


Fig. 5

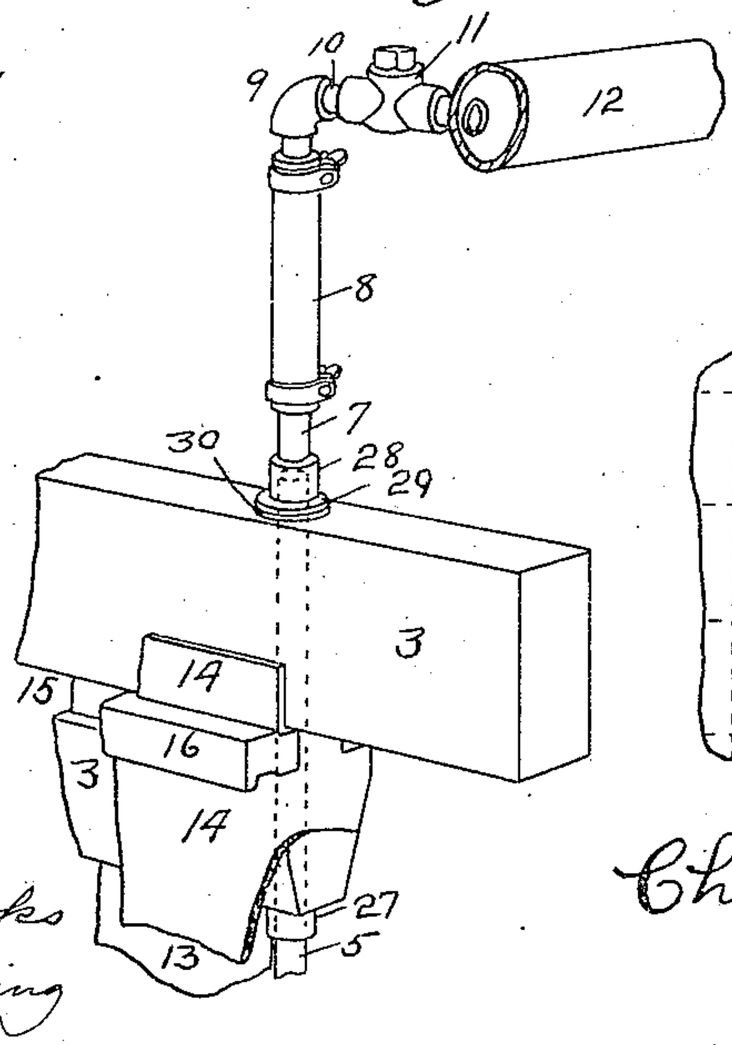
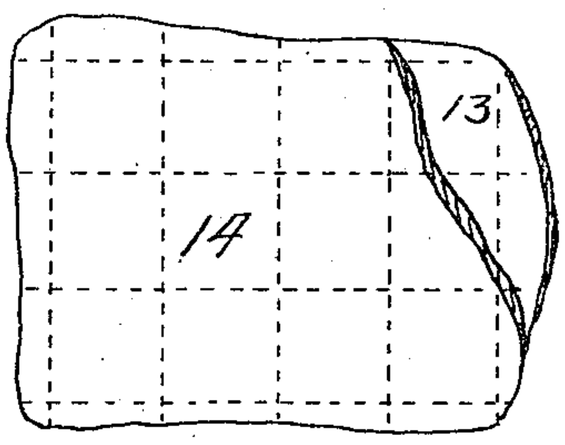


Fig 4



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UNITED STATES PATENT OFFICE.

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VACUUM FILTERING APPARATUS.

No. 896,360. Specification of Letters Patent. Patented Aug. 18, 1908.

Application filed December 27, 1905. Serial No. 293,461.

To all whom it may concern:

Be it known that I, CHARLES BUTTERS, a citizen of the United States, residing at Berkeley, in the county of Alameda and State of California, have invented certain new and useful Improvements in Vacuum Filtering Apparatus; 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 vacuum filters and has for its object to provide an apparatus for the economical separation of solutions from the fine particles of material held in suspension therein.

Another object of this invention is to provide a vacuum filter frame whereon the layer of material to be filtered may be homogeneously deposited and not be liable to crack or be subject to injury.

Still another object of this invention is to provide a vacuum filter apparatus wherein the vacuum may be created by the weight of a column of water, it being only necessary to exhaust such air as may be contained in the water and that entering through leakage in the apparatus.

Referring to the drawings, Figure 1 represents an elevation of the apparatus, partly in section, with portions broken away; Fig. 2 represents a perspective view of the filter frame, with portions of the tank in which it is adapted to be used and portions of the filtering and supporting fabrics cut away; Fig. 3 represents an enlarged, sectional, detail view of the top member of the frame; Fig. 4 is a fragmental view, showing one form of sewing; and Fig. 5 is a detail of an alternate form of the pipe connections.

The numeral 1 designates the side walls of a tank or vat with an offset portion 2, on which rests top member 3 of the vacuum filter frame. To the bottom of the member 3 of the frame, (Fig. 2), by means of bolts 4, is affixed a rectangular frame of pipe or tubing 5, the bottom portion of which is perforated on its upper side.

A tee may be provided at one of the lower corners of the frame into which may be inserted a nipple, over which the end of a piece of flexible tubing 8 is drawn, the other end of which is similarly connected with an ell 9, the latter being connected to a pipe 10, passing through the side of tank 1, connected to a shut-off 11, which is in turn connected to the supply and discharge pipe 12.

A piece of fibrous or woven material 13 is fitted to the inside of the tubular frame 5, on each side of which material a layer of filtering fabric is stretched, the fabric and fibrous material being sewed or fastened together at frequent intervals.

Applicant has found in practice that sewing or quilting at intervals of one-half inch gives the best results, the said sewing being in either vertical lines or intersecting lines at that distance apart, as shown in Fig. 4.

In the top member of the frame are formed grooves 15, in which, by means of strips 16, the upper part of the filtering fabric 14 is held, as indicated in Fig. 3. On the under side of strips 16 are formed grooves 17, so that any water or other fluid will be deflected and drop from the edge, in place of running down over the surface of the filtering fabric, and thereby eroding the cake of material deposited thereon.

The filtering fabric is brought down over the lower surface of the frame member 3, and sewed together as at 18, Fig. 2. The upper portion of the fabric down to the line of sewing and also the portion of the fabric surrounding the pipe, is coated with waterproofing solution, such as asphalt paint. The sides of the filter frame are braced by wooden strips 19. In the upper part of the frame are provided eye bolts 20, by means of which the frame can be removed from the vat for repairs or other purpose.

Discharge pipe 12 is connected with a drum 21, a stop cock 22 being provided in said connection, from which a pipe 23 leads to an exhaust pump, not shown. Near the lower part of the drum 21 is connected a pipe 24, the lower portion of which terminates below the surface of the liquid contained in the sump, which may be provided with a pipe 26, by means of which the liquid may be withdrawn therefrom.

In Fig. 5 there is shown an alternative construction in which the tee 6 in the original construction is replaced by an ell or bend and the top of the tube is passed through the mem-

ber 3, having a collar 27 to prevent it being drawn too far through.

A coupling 28 is screwed on to the upper portion of the pipe 5, washer 29 and gasket 30 being interposed between said coupling and the frame. Into the upper portion of coupling 28 is screwed a nipple 7, to which is fixed a piece of flexible tubing 8, connected to the discharge pipe 12, as previously described.

In the operation of this invention any desired number of these filter frames are arranged at frequent intervals in a vat. The material to be filtered, which may consist of the slimes in hydro-metallurgical processes, is allowed to flow into the vat until it rises slightly above the top 3 of the filter frame. The air in the drum 21 being exhausted through pipe 23, the atmospheric pressure will cause the liquid to rise in pipe 24 until the weight of the liquid in said pipe creates a sufficient vacuum to cause the liquid portion of the material in the vat 1 to pass through the filtering fabric 14 into the interstices of the fibrous material 13, through which it flows by gravity to the holes in the upper portion of pipe 5 and through pipe 5 and connections 6, 7, 8, 9, 10, and 11 to the pipe 12, and thence to the drum 21 and through the pipe 24 to the sump 25. The pulp is then withdrawn from the tank, leaving a cake or layer of the residuum on the surface of the filter, which layer, however, contains a certain percentage of value bearing solution. After the tank is rinsed with a solvent, it is refilled with water and a vacuum again formed in pipe 12, whereby these values are drawn from the cake on the filter frame. The final operation consists in emptying the tank once more and forcing water under pressure through the pipe 12 and the connections before mentioned, the stop cock 22 being closed, into the interior of the filter-frame, whereby the cake is loosened and discharged and the filter cleansed ready for reuse.

The strips 17, in addition to bracing the filter and preventing it bagging, perform an important function in aiding to hold the cake of material being filtered in position on the filter frame, these strips being in practice much more numerous than shown in the drawing.

Claims.

1. A filter frame having a porous material interposed between two sheets of filtering fabric, being sewed through or fastened at intervals.

2. A filter frame having filtering material inclosing a mass or masses of porous material through which the filtrate can percolate, said filtering material and mass of porous material being sewed through or fastened at intervals, and passageways for drawing off the filtrate from the said porous material.

3. The combination in a filter frame of a fibrous material interposed between two sheets of filtering fabric, the fibrous material and filtering fabric being sewed or fastened together at intervals, and a perforated pipe for withdrawing and admitting fluid to and from the filter.

4. A filter frame having filtering material inclosing a mass or masses of porous material said filtering material and mass of porous material being sewed through at intervals, and strips forming an external bracing for the active portions of the filter, adapted to assist in supporting the layer of precipitated matter on the exterior of the filter.

5. A filter frame having a top member or rail, grooves therein, retaining strips having the under outer edge lower than the portion next to the frame, adapted in combination with said grooves to hold filtering fabric.

6. A filter frame having a top member or rail, grooves therein, retaining strips having the under outer edge lower than the portion next to the frame, adapted, in combination with said grooves, to hold filtering fabric, and means for producing a vacuum in the interior of said frame.

7. A filter frame provided with a filtering fabric, portions of which are impervious to fluid.

8. A filter frame provided with a filtering fabric, a narrow rim around the sides of which is impervious to fluid.

9. A filter frame having two sheets of filtering fabric and a porous material interposed between the two sheets, portions of the said sheets of filtering material being impervious to fluid.

10. A filter frame having a top member or rail, grooves therein, retaining strips adapted, in combination with said grooves, to hold filtering fabric, and grooves in said retaining strips adapted to deflect fluid from the surface of said filter frame.

11. A vacuum filtering apparatus having a receptacle, a filtering frame, a drum, connections between said drum and filter frame, an outlet pipe from said drum a water seal at the lower end of said outlet pipe and means for exhausting the air from said drum.

12. A vacuum filtering apparatus having a receptacle, a filtering frame, a drum, connections between said drum and filter frame, an outlet pipe from said drum, a supply and discharge pipe connected to said filtering frame, means for connecting and disconnecting said supply and discharge pipe from said vacuum drum and means for exhausting the air from said drum.

13. A filter frame having a top member or rail provided with depending portions for deflecting the fluid from the surface of the filtering fabric.

14. A filter frame having a top member or rail provided with means for deflecting the fluid from the surface of the filtering fabric.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses at San Francisco, State of California, this 30th day of November, A. D. 1905.

CHARLES BUTTERS.

Witnesses:

Jos. C. Hopper,

A. Macdonald.