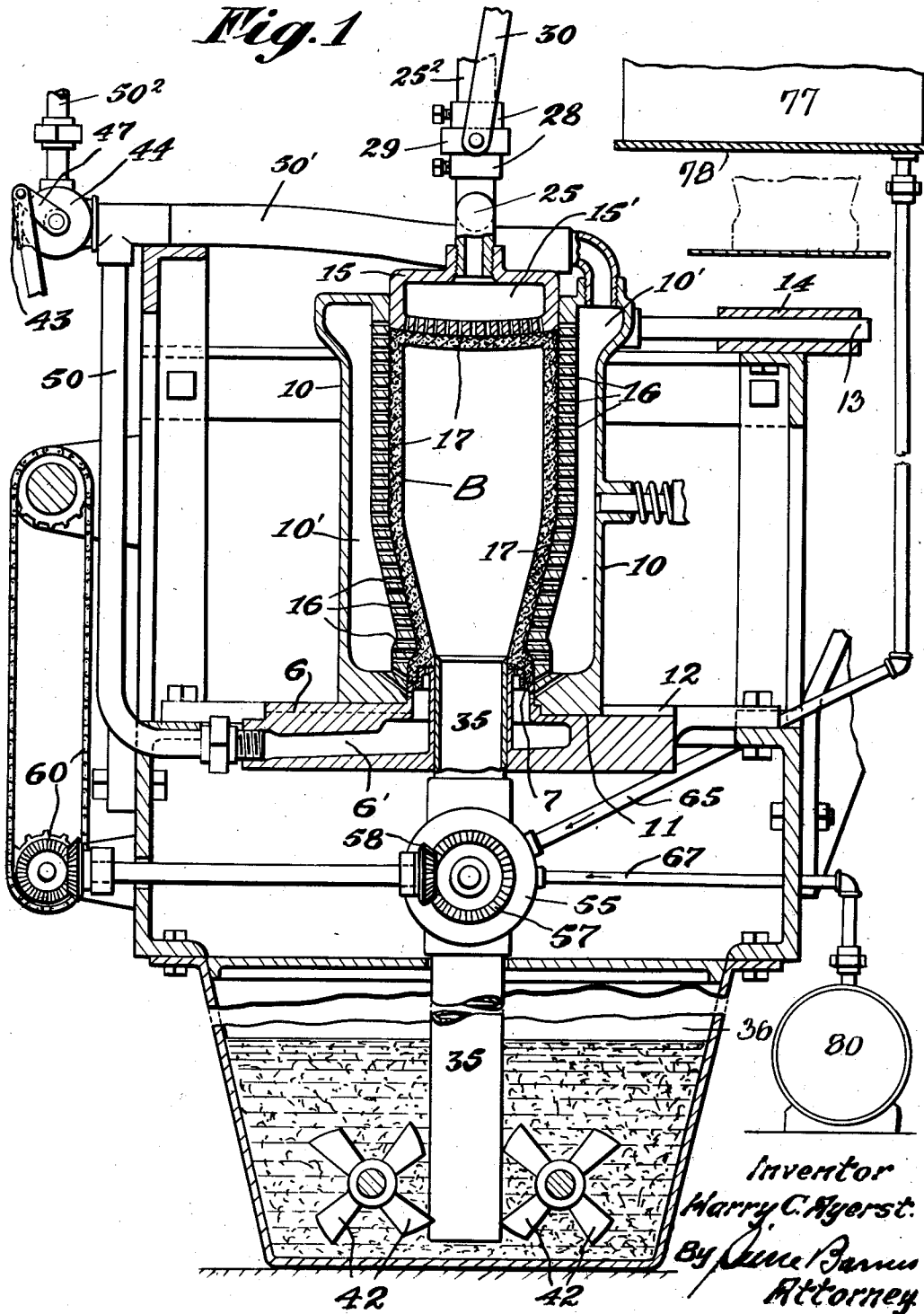


H. C. AYERST.
 PROCESS AND APPARATUS FOR MAKING BOTTLES FROM PAPER PULP.
 APPLICATION FILED JUNE 19, 1916.

1,265,162.

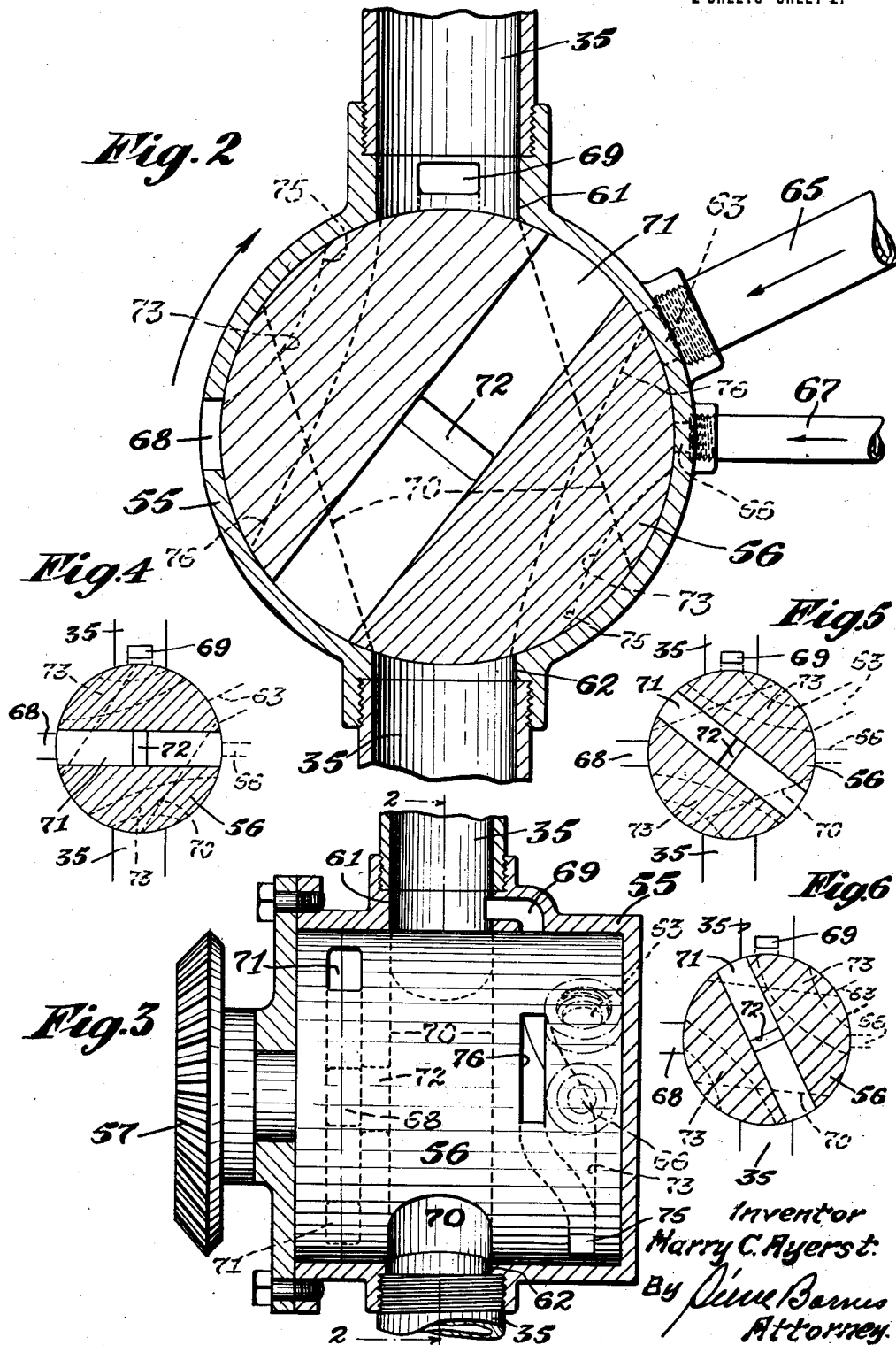
Patented May 7, 1918.
 2 SHEETS—SHEET 1.



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UNITED STATES PATENT OFFICE.

HARRY C. AYERST, OF SEATTLE, WASHINGTON.

PROCESS AND APPARATUS FOR MAKING BOTTLES FROM PAPER-PULP.

1,265,162.

Specification of Letters Patent.

Patented May 7, 1918.

Application filed June 19, 1916. Serial No. 104,397.

To all whom it may concern:

Be it known that I, HARRY C. AYERST, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Processes and Apparatus for Making Bottles from Paper-Pulp, of which the following is a specification.

This invention relates to improvements in processes and apparatus for manufacturing bottles or containers from paper pulp, and is particularly an improvement on my prior patent application, Serial No. 48,422, filed September 1, 1915.

The object of my present invention is the provision of a simple and novel method of applying pressure upon the internal cavity of the bottle being formed simultaneously with the application of the suction upon its external surface, whereby the operations of forming a bottle are greatly facilitated and a more compact bottle-wall is provided.

Another object of the invention is the novel method of applying an internal surface coating to the bottle, of pore-filling material, whereby any interstices between the pulp fibers forming the bottle wall are clogged to prevent the passage of air, enabling the application of an external suction and an internal pressure to the bottle-wall without loss of efficiency.

Other objects and advantages of my invention will be apparent from the following description of my invention.

In the accompanying drawings;—

Figure 1 is a view in vertical section of apparatus showing the mechanical embodiment of my invention, and whereby my improved method may be carried out.

Fig. 2 is a transverse section of a valve employed in my invention taken on line 2—2 of Fig. 3.

Fig. 3 is a longitudinal section of the same.

Figs. 4, 5 and 6 are diagrammatic views illustrating valve mechanism included in my invention, shown in its operative positions.

In said views, similar reference numerals in the several views denote like parts, and also indicate like parts in my said prior application, Serial No. 48,422, to which reference may be made, only such mechanical elements of said former invention as are neces-

sary to an understanding of my new process and invention being illustrated and described in the present specification.

Referring to Fig. 1, the reference numeral 6 indicates a platform having centrally thereof an upwardly projecting cylindrical hollow portion 7 which constitutes a core upon which the mouth of a bottle is formed. Mounted upon the platform 6 is a number of hollow segmental mold blocks 10. These mold blocks are movable radially from the axis of the mold by means of guides such as by a rib 11 provided on the underside of each mold block and operating in slots 12 of the platform, and a rod 13 slidable in a socket member 14 of the machine frame.

Complementary to said mold blocks and adapted to fit into the space inclosed thereby when the blocks are in operative contacting positions, is a vertically movable hollow cylindrical cap member 15.

The aforesaid hollow portion 7, the blocks 10 and the cap member 15 constitute a mold having inner walls formed to the shapes of the respective portions of a bottle. Such walls are provided with perforations 16 for the passage of water into the chambers 6¹, 10¹ and 15¹ of the respective mold elements. Said perforated walls are each furthermore covered with a layer 17 of foraminated material such as finely woven wire gauze, which constitutes part of the mold and against which the pulp is deposited in producing a bottle.

The referred to radial movements of the block 10 are effected by mechanically operated means which are not herewith illustrated, but to which reference may be made in my said prior application. The vertical and lateral movements of the cap member 15 need not be specifically described in the present application. It is supported, however, by the downwardly directed extremity 25 of a tubular stem 25² which is slidably and rotatably supported in a superposed portion of the machine frame, not shown.

Cap 15 is raised and lowered with relation to the other mold members by means of links 30 secured at their lower ends to sleeve 29 which is, in turn, connected to the stem 25 by means of set collars 28.

The reference numeral 43 represents a pipe connected with a vacuum pump or with a tank (not shown) from which the air pres-

sure is reduced below that of the atmosphere and is communicatively connected with a vacuum or air-controlling valve 44. Said valve controls the application of the suction
 5 from pipe 43 into pipes 50, 50¹ and 50² which are communicatively connected with the chamber 6¹, mold chambers 10¹ and cap chamber 15¹, respectively. The pipe 50² is connected with said stem 25 through which
 10 suction is communicated into valve chambers 15¹.

Said valve is provided with an arm 47 which is actuated by suitable timing apparatus connected with moving parts of the
 15 machine, whereby the opening and closing of the valve ports may be timed.

35 represents a supply pipe extending through the platform 6 into the space within the mold from a reservoir 36 for the pulp
 20 material.

The material from which the bottles are produced in the mold is in the nature of a thin pulp, and is maintained in a comparatively homogeneous condition by stirring
 25 appliances such as revolving blades 42 provided in the reservoir.

55 indicates a valve casing provided in the supply-pipe 35 having a rotary valve member 56 contained therein controlling the pas-
 30 sage of pulp from said reservoir to the mold-chamber. Said valve-chamber is rotatably mounted in said casing and is provided with a bevel-gear 57 meshing with a bevel-pinion 58 which is suitably driven by operative
 35 mechanism indicated by 60 to be actuated in synchronism with the mold-actuating devices, not shown.

Said casing 55 is provided with ports 61 and 62 upon its opposite sides, communicat-
 40 ing with the opposite sides of said supply pipe 35. It is also provided with an opening 63 with which connection is made by pipe 65 with a tank 77, containing a supply of material for filling the interstices of the
 45 bottle walls to make the same impervious to air. Said tank is positioned at an elevation above the mold in order that the pore-filling material, when the same is of liquid consist-
 50 toward the mold. As illustrated in Fig. 1, the tank 77 is supported upon a floor 78 which may be the floor directly above the floor whereon the machine is mounted.

66 indicates an opening in the casing with
 55 which a pipe 67 makes connection with a tank 80 containing air under pressure. The casing is formed with another opening 68 which is connected directly with the atmosphere. A by-pass is formed in said casing,
 60 as shown at 69, having one end with an opening into the port 61 leading into the upper end of pipe 35 and its other end directed into the interior of the casing at a point offset from the passage 70.

65 The valve member 56 is formed with a

diametrically medial passage 70 of relatively large extent, making communication between the ports 61 and 62 of the supply pipe 35. Upon one side of said passage 70 another
 70 diametrical passage 71 is formed, which is transverse with said opening 68 and at or about its midlength is formed with an abrupt turn 72 opening into the passage 70. Upon the end opposite said passage 71 is a
 75 bore 73 which has one of its ends 75 arranged in a plane to register with the openings 63 and 66 and its other end 76 adapted to register with the opening of by-pass 69, whereby communication is made with the supply-pipe
 80 through said by-pass with the respective pipes 65 and 67.

The passage 71 is made to extend entirely across the valve member 56 and two bores
 73 are formed symmetrically upon opposite sides of the axis of the valve so that two
 85 complete bottle-forming operations are made upon each full revolution of the valve member.

The operation of the invention may be described as follows:—

The mold members 10 are moved into operative positions in which they are indicated in Fig. 1, and cap member 15 is also
 90 moved into the position in which it is shown in Fig. 1 whereupon, by proper timing devices (not shown), suction is instituted from
 95 pipe 43 through valve 44, pipes 50, 50¹ and 50², creating a vacuum in the various mold chambers 6¹, 10¹ and 15¹ and in the interior space between the mold members which, be-
 100 ing communicated through the supply pipe 35, causes the pulp mixture in the reservoir 36 to be drawn up into the mold space and, by reason of the suction through the aper-
 105 tures 16, the exterior portion of the pulp material is drawn against the foraminated lining 17 and, by the extraction of the water through the apertures 16, is deposited in a relatively thin sheet.

The suction in said mold space and the
 110 supply pipe 36 being thereupon broken by the opening of the vent leading to the atmosphere, the undeposited material is caused by its gravity to flow back through the supply pipe 35 into the reservoir. The suction
 115 in the mold chambers is continued during the period in which said vent is opened, whereupon a current of air is drawn through the relatively open pores of the deposited
 120 pulp material and causes a relatively rapid drying of the moisture in said pulp. Thus, substantially, is the mode of operation of my invention described in my said prior ap-
 125 plication. It has been found, however, to be desirable to accelerate the paper-forming functions of the mold by the provision of means to apply air under pressure to the interior of the bottle simultaneously with the application of suction to the exterior
 130 walls of the bottle, whereby the bottle walls

will assume a much firmer structure with greatly accelerated speed in the period of manufacture.

In order to prevent the passage of air through the pulp walls due to the porosity of the material, under the two-fold influence of the internal air pressure and external suction prior to the application of said air pressure, a charge of pore-filling material, either in powdered form or a liquid, is drawn or forced into the interior of the partly formed bottle and deposited upon the walls of the bottle by means of the combined suction through said walls, and force of gravity or other pressure exerted from the storage tank of said material, thereby closing the minute passages and compacting the texture of the bottle material.

The material with which the bottle walls may be treated in order to thus seal it from the percolation of air, may be of various kinds, such as colloidal casein, glue, starch in either powdered or liquid form, or powdered magnesia.

Referring particularly to Figs. 2 to 6, inclusive, wherein the valve mechanism controlling the supply pipe 36 is shown, it may be first stated that the valve mechanism herein shown is contemplated and illustrated as being rotated at a uniform speed in the direction indicated by the arrow in Fig. 2. In said view, the valve passage 70 is shown as being fully open with respect to the valve ports 61 and 62, establishing communication between the mold chambers and the reservoir 36, said passage 70 being indicated in dotted lines. In such rotary position of the valve and until the passage 71 registers with the opening 68, the pulp is drawn up into the space between the mold members, and is being deposited upon the walls thereof.

When the rotary movement of the valve brings the valve passage 71 in register with the opening 68, as shown in Fig. 4, and thus establishes communication with the atmosphere through the opening 72, the vacuum within the space between the molds is broken and the surplus charge within the interior of the bottle and the supply pipe flows by gravity back into the reservoir.

Continued rotary movement of the valve member 56 brings the end 75 of the bore 73 into register with the opening 63, as illustrated in Fig. 5, with which communication is made with the pipe 65 leading to the tank wherein is stored the pore-filling material, and the end 76 of said bore into register with the by-pass 69.

When such communication is made, the passage 70 is closed with reference to the supply pipe 35. Therefore suction is again maintained in the upper end of the pipe 35 and may assist, to some extent, the passage of said pore-filling material from the

tank through said bore and by-pass into the interior of the bottle. Pressure may also be exerted upon the tank containing said pore-filling material, whereby a reliable flow of such material may be provided. Such pressure may be supplied by the gravity of the pore-filling material when a liquid or partially liquid material is employed.

Communication is thus established for a sufficient length of time to permit of the same being deposited on the interior wall of the bottle through the effect of suction exerted upon the external surface thereof.

Referring to Fig. 6 illustrating the next and final step in the cycle of bottle-forming operations performed by said valve, the valve member 56 has progressed to bring the end 75 of the bore 73 into register with the valve opening 66 leading into the pipe 67, while the opposite end 76 of said valve still maintains its communication with the by-pass 69. Through such connections air pressure is introduced within the bottle cavity and effects the final compacting and solidification of the bottle walls.

As previously described, the valve member is formed with symmetrically arranged passages so that at each half-cycle of its revolution, a complete bottle is formed; the actuating mechanism rotating said valve is so timed with the other timed operative devices of the machine that its various functions are carried out in synchronism.

By the described method of closing the pores of the bottle wall, the pore-closing material is deposited upon the inside of the bottle and does not come in contact with the foraminated lining of the mold, which would be the case if the pore-closing material was incorporated with the pulp as it is first applied.

When added to the pulp material, the pore-closing constituents are drawn through the relatively fine mesh of the lining 17 and tend to clog the same and hinder the successful and continuous operation of the apparatus.

It may be mentioned that after the bottle has been removed from the mold, it is dried and then treated to an interior coating of heated paraffin which overlays the pore-filling material and prevents the same being objectionable even though the latter may be of a soluble nature.

What I claim as my invention, is—

1. A process for making bottles from paper pulp, which consists in, first, introducing a quantity of pore-filling material into the interior of a bottle, second, causing said material to be deposited against the internal surface of the bottle by means of suction acting through the pores of the latter, and subsequently applying an internal pressure to the bottle wall to compact the same against the mold lining.

2. A process for making bottles from paper pulp, consisting in, first, depositing a layer of pulp material upon the interior of a perforated mold to form a bottle, second, 5 introducing by suction a charge of pore-filling material and depositing the same upon the interior walls of the bottle, and applying an internal pressure upon the bottle walls.
- 10 3. A process for making bottles from paper pulp, consisting in, first, depositing a layer of pulp material upon the interior of a foraminated mold through suction exerted through the apertures of said mold, second, 15 introducing a charge of pore-filling material within the bottle, and causing the same to be deposited upon the walls of said bottle, and third, exerting an outward pressure upon the interior walls of said bottle and simultane- 20 ously continuing the suction upon the external walls of said bottle.
4. A process for making bottles from paper pulp, consisting in, first, depositing a layer of pulp material upon the interior of 25 a foraminated mold, second, breaking the partial vacuum within said mold causing the surplus pulp material to flow out of said mold, third, introducing a charge of pore-filling material within the bottle to be de- 30 posited upon the bottle walls to prevent the passage of air through said walls, and lastly, exerting an internal pressure upon the bottle walls.
5. A process for making bottles from 35 paper pulp, consisting in, first, depositing a layer of pulp material upon the interior of a foraminated mold, through suction exerted through the apertures of said mold, second, breaking the partial vacuum within said 40 mold causing the surplus pulp material to flow out of said mold, third, simultaneously renewing the suction and introducing a charge of pore-filling material within the bottle to be deposited upon the bottle walls 45 to prevent the passage of air through said walls, and lastly, exerting an internal pres-

sure upon the bottle walls simultaneously with the continued external application of suction.

6. In apparatus for forming bottles from 50 pulp material, in combination with a mold having perforated walls, a reservoir for pulp material, a pipe making communicative connections between the interior of said mold and said reservoir, and suction devices hav- 55 ing operative communication with the exterior of said mold, of a tank for storing pore-filling material, tubular connections between said tank and said mold, a source of storage or supply of air under pressure greater than 60 the atmosphere communicatively connected with said mold, and regulative devices interposed between said mold and the respective connections.

7. In apparatus for forming bottles from 65 pulp material, in combination with a mold having perforated walls, a reservoir for pulp material, a pipe making communicative connections between the interior of said mold and said reservoir, and suction devices hav- 70 ing operative communication with the exterior of said mold, of a tank for storing pore-filling material, tubular connections between said tank and said mold, a source of storage or supply of air under pressure greater than 75 the atmosphere communicatively connected with said mold, and a valve provided in said pipe for regulating the operations of all said connections with said mold.

8. A process for making bottles from 80 paper pulp, consisting in forcing a quantity of pore-filling material upon the interior wall of a bottle, and applying an internal pressure and an external suction simultaneously to the bottle wall. 85

Signed at Seattle, Washington, this 13th day of June 1916.

HARRY C. AYERST.

Witnesses:

E. PETERSON,
HORACE BARNES.