B. J. ALLEN AND R. Y. AMES.

CASTING OF POTTERY AND OTHER LIKE ARTICLES.

APPLICATION FILED AUG. 14, 1917.

1,336,180.

Patented Apr. 6, 1920.

4 SHEETS—SHEET 1.

Fig. 1.

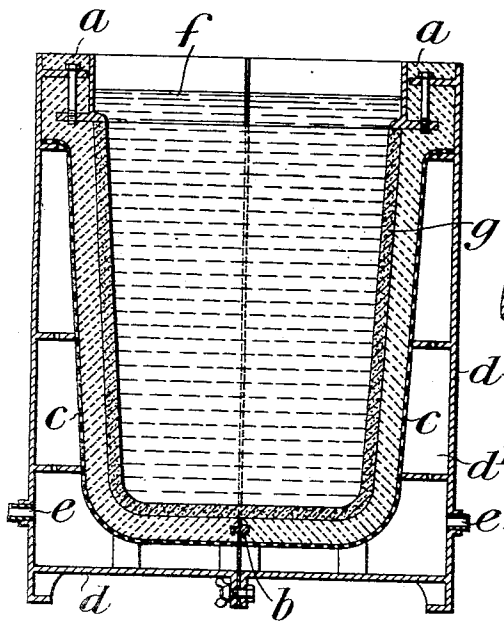


Fig. 3.

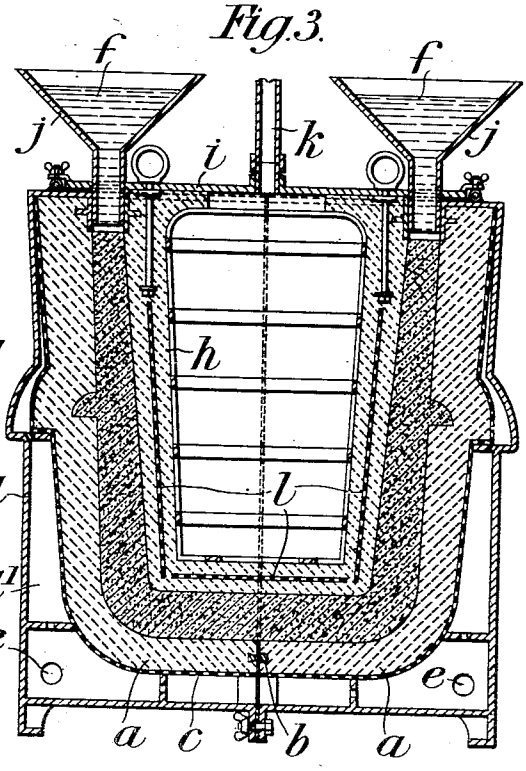


Fig. 2.

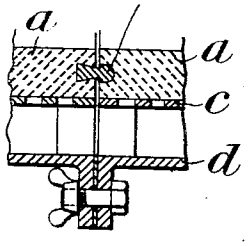
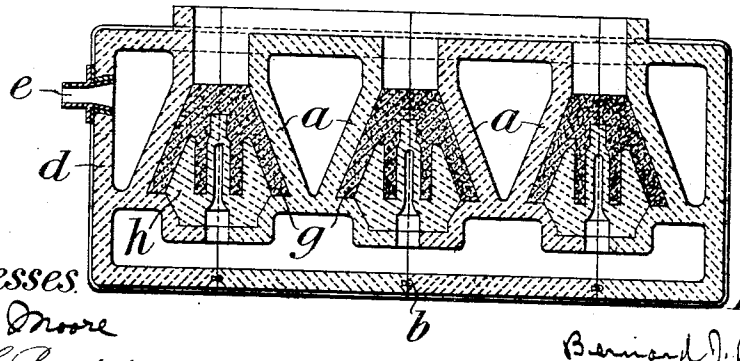


Fig. 4.



Witnesses

D. K. Moore

L. L. Burket

Inventors

Bernard J. Allen.

Robert Y. Ames.

by Whittemore, Hulbert & Belknap Attys.

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4 SHEETS—SHEET 2.

Fig. 6.

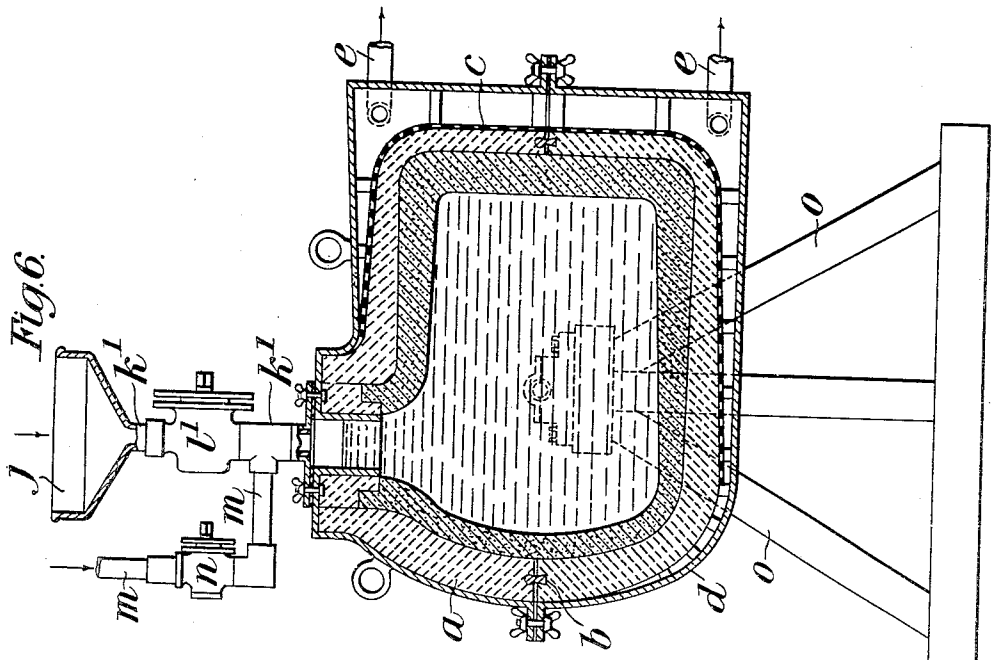
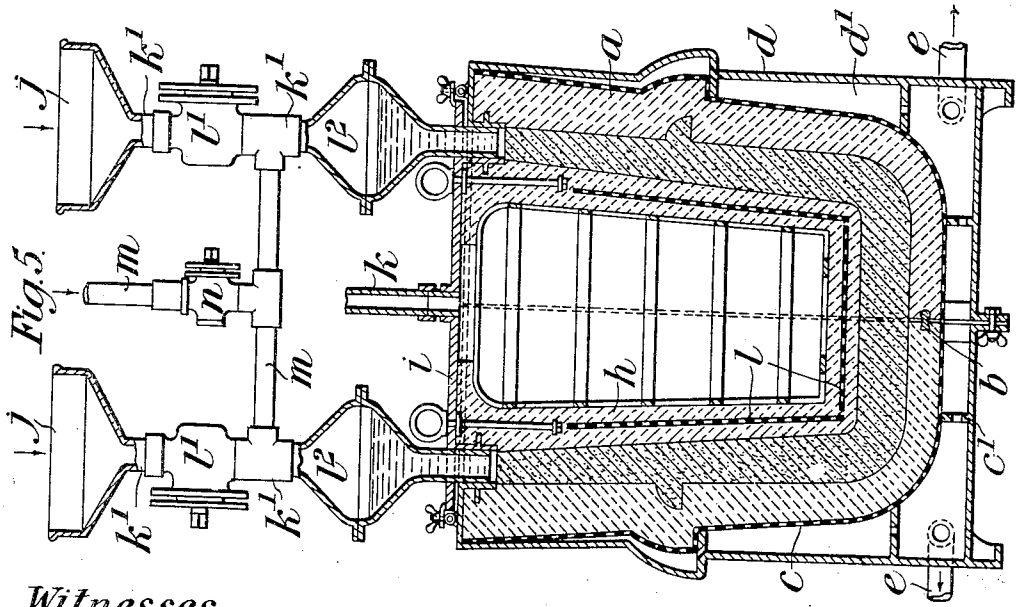


Fig. 5.



Witnesses.

D. W. Moore

L. L. Burket.

Inventors.

Bernard J. Allen.

Robert Y. Ames.

by Richardson Conrad & Richardson

Attys.

B. J. ALLEN AND R. Y. AMES.

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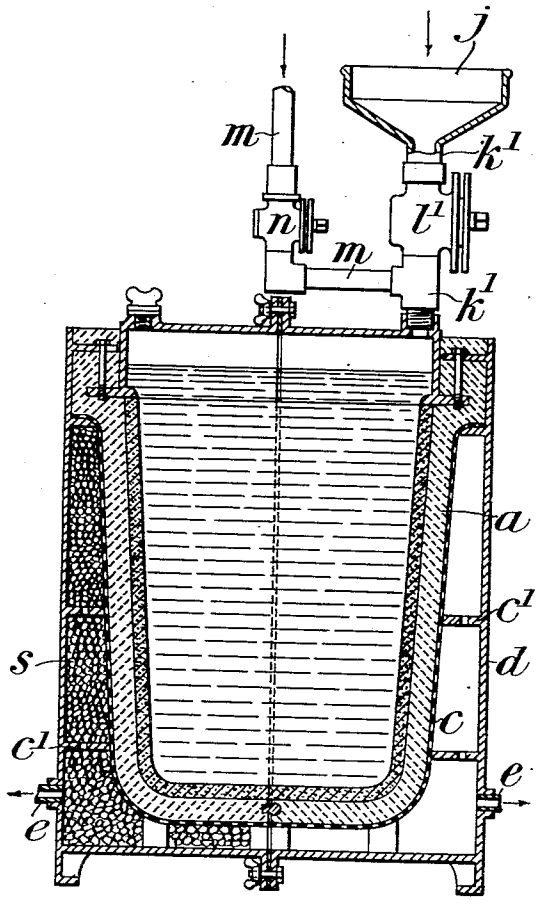
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4 SHEETS—SHEET 3.

Fig. 7.



Witnesses.

J. K. Moore

L. L. Burkett

Inventors.

Bernard J. Allen

Robert Y. Ames

by Edwin Lemert Attys.

B. J. ALLEN AND R. Y. AMES.

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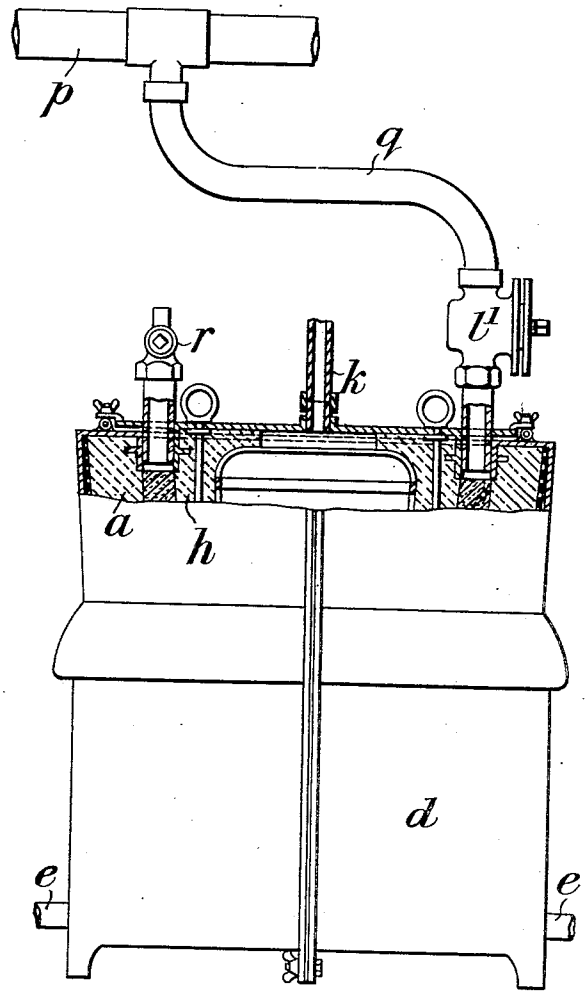
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4 SHEETS—SHEET 4.

Fig. 8.



Witnesses.

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L. L. Burket.

Inventors.

Bernard J. Allen.

Robert Y. Ames.

By

Whittemore Hulbert & Belknap Attys.

UNITED STATES PATENT OFFICE

BERNARD JAMES ALLEN, OF BLYTHE BRIDGE, AND ROBERT YETTON AMES, OF GIDEA PARK, ENGLAND.

CASTING OF POTTERY AND OTHER LIKE ARTICLES.

1,336,180. Specification of Letters Patent. Patented Apr. 6, 1920.

Application filed August 14, 1917. Serial No. 186,127.

To all whom it may concern:

Be it known that we, BERNARD JAMES ALLEN and ROBERT YETTON AMES, both subjects of the King of Great Britain, residing, respectively, at Llangladure, Blythe Bridge, Staffordshire, England, and 36 Broadway, Gidea Park, Essex, England, have invented new and useful Improvements in the Casting of Pottery and other like Articles, of which the following is a specification.

This invention relates to the casting of articles from slip mixtures in plaster, porous pottery or similar absorbent molds, and it has for its object to increase the absorbing power of such molds, so as to obtain a quick deposition of normal thickness or a deposition considerably thicker than could be obtained on molds as now used and also to enable clay or other mixtures which cannot be used satisfactorily under natural conditions to be cast.

To this end, according to the invention, we provide means whereby a difference of pressure is set up on the two sides of the mold so that the deposited material is held close against the mold and the water is caused to drain rapidly away from the slip.

In carrying out our invention we inclose the mold entirely or partially in a chamber or jacket arranged and adapted to provide a vacuum or partial vacuum on the outside face or outside and inside faces of the said mold, suitable apertures being provided in the latter to permit the introduction of the clay slip or other mixture. The vacuum or partial vacuum produced in the said jacket or chamber facilitates the evaporation from the mold of the absorbed liquid and permits further absorption to take place. The material in contact with the face of the said mold is the last to dry and as the moisture from the internal surface is drawn through the material the contraction due to drying is reduced to a minimum and cracking is almost eliminated.

Or, we may apply pressure to the clay slip or other mixture either in lieu of, or in addition to, the vacuum above described.

By our invention we overcome the difficulties of manufacturing, by the casting process, large thick articles, such as glass-house (dog-house) pots, retorts, crucibles, and the like homogeneously and without joints. Covered pots and the like articles having parts which, when drying, would recede from the mold and collapse, are kept in shape and position by the suction due to the difference of pressure on the two sides of the mold, and this condition can be maintained until the deposited material is dry enough to be strong and self-supporting.

To enable the invention to be fully understood we will describe it by reference to the accompanying drawings, in which:—

Figure 1 is a vertical section of a two-piece mold with an external vacuum chamber.

Fig. 2 is a section of the joint between the two parts of the mold, drawn to a larger scale.

Fig. 3 is a view similar to Fig. 1, illustrating a form of mold, having both an internally and externally applied vacuum.

Fig. 4 is a sectional view of a mold having a vacuum chamber cast integrally with it.

Fig. 5 is a view similar to Fig. 3 illustrating the employment of fluid pressure on the clay slip or other mixture.

Fig. 6 is a similar view of a one side mold designed for the production of articles of graduated thickness.

Fig. 7 is a view similar to Fig. 1 showing the application of fluid pressure to the clay slip; and

Fig. 8 is a sectional elevation of apparatus wherein mechanical pressure is applied to the slip.

Referring first to the construction shown in Figs. 1 and 2, *a*, *a* indicate the half molds, which are of plaster or other porous absorbent material, the joint between the meeting surfaces of the said two half molds being made by the rubber packing strip *b*, shown to a larger scale in Fig. 2. *c* is a metal reinforcement which is provided around the mold *a* and *d* is the jacket which incloses the said reinforced mold, which is suspended within it, the said jacket *d* providing a space d^1, which is in communication with a suitable vacuum chamber, by means of the connections *e*.

The apparatus is used as follows, that is to say, a vacuum being generated in the space d^1, the slip is poured into the mold, as shown at *f*, and is allowed to remain therein until the desired thickness of deposit *g* has been made upon the inside surface of the mold *a*. As will be understood, and as has been pointed out above, the vacuum which is formed in the space d^1, surrounding the out-

side of the mold exerts a suction action, so as to cause the deposited material to remain in close contact with the plaster of the mold and also rapidly to drain away the water from the clay slip, whereby articles can be not only rapidly cast, but can be obtained of greater thickness than has hitherto been practically possible. When the desired thickness of deposit is obtained the clay slip is run off from the center of the cast piece. The removal of the slip is facilitated by admitting air to the vacuum chamber d^1, while the unnecessary material is being run out.

In applying the invention to the casting of plumbago crucibles or refractory fire-clay, open-top, glass-house pots and the like, it is preferable to employ molds to give both the inside and outside shape of the article and consequently to apply the vacuum to both the inside and outside molds. Such a mold is illustrated in Fig. 3 and it comprises the outside mold *a* made in halves, as described with reference to Figs. 1 and 2, and strengthened by the reinforcement *c* and surrounded by the vacuum jacket *d*, and also the inside mold *h* which is suspended within the outer mold *a* by means of the cover *i*, clamped to the top of the vacuum jacket *d*, a space being left between the said inside and outside molds, which is to receive the slip for forming the article required, in this case, a glass-house pot. The slip *f* is supplied to the mold through the filling funnels *j* and the space within the inside mold *h* is in communication by the pipe *k* with the vacuum chamber, so that there is thus provided a vacuum chamber both on the outside and inside surface of the mold.

Where the article is of uneven or graduated thickness, as in the case of the glass-house pot here dealt with, means are advantageously provided for dealing with such uneven or graduated thickness and for this purpose we may saturate with water the part or parts of the mold where the least thickness is required, or we may supplement the absorbing power of the mold where the greatest thickness is required, say, by the application to those parts of perforated or porous vessels containing a substance, such as calcium chlorid, which can conveniently be mixed with asbestos or other suitable fire-proof material. Or, we may achieve the same result in the manner indicated in Fig. 3, by making the mold thickest where the thinnest clay parts are required and so designing the vacuum jacket that the maximum evacuation takes place where the greatest thickness of clay is wanted.

In the case of large gas retorts, furnace blocks and other articles where the maximum exhaustion of the vacuum chamber is necessary, we may reinforce the molds with steel bars, wire, expanded metal or the like, such as indicated at *l*, Fig. 3. Also the parts of the mold may be clamped together with metal bands fitted with tension screws. When these precautions are taken it is possible to make use of a mixture, too thick and heavy for use under natural conditions, and an open porous structure can be obtained, or alternatively, a mixture of material too plastic to cast under natural conditions may be employed.

Fig. 4 shows apparatus specially suitable for the production of pottery, such as electric insulators and similar articles. In this case the vacuum jacket *d* forms an integral part of the molds *a*. Both the vacuum chamber and mold are in pottery and have the outside surface only glazed to prevent air being sucked through the vacuum jacket.

In applying the invention to the production of small articles a partial vacuum produced by a laboratory filter is sufficient, whereas for large thick articles a mechanically driven vacuum pump of high power is necessary. With the latter arrangement it is preferable to exhaust the air from a vacuum cylinder and connect the vacuum chambers on the molds to the said cylinder with pipes having suitable stop and air admission valves.

In Figs. 1 to 4 above described the desired difference of pressure between the two sides of the mold is effected by the provision of a vacuum upon the outside surface or surfaces, but, as above stated, the same result can be obtained by the utilization of pressure applied to the clay slip or other mixture either alone or in combination with a vacuum as above described.

In Figs. 5 to 8 we have shown several forms of casting apparatus in which both a vacuum and pressure upon the clay slip or other material are made use of.

Fig. 5 shows a mold of the type above described and illustrated in Fig. 3, and in which, in addition to the external vacuum, there is also provided pressure upon the clay slip, this pressure being obtained by means of compressed air or other gas. The funnels *j* from which the slip is supplied, instead of directly communicating with the apertures in the mold, are fitted to connections k^1 having valves or stop-cocks l^1 and in communication with the reservoirs or containers l^2 through which the slip passes directly into the mold. The fittings or connections k^1 are also in communication below the valves or stop-cocks l^1 with a source of supply of compressed air or other gas by means of the pipe connection *m* fitted with the common valve *n*.

With this construction, when the mold has been filled with slip mixture the stop-cocks l^1 are closed so as to prevent entrance of further slip into the reservoirs or containers l^2. Compressed air or other suitable

gas is then admitted through the valve *n* on to the upper surface of the slip mixture and exerts pressure upon the said slip so as to force the water contained therein through the walls of the outer and inner molds *a* and *h*, the tendency being for the slip at the narrowest part of the mold to be maintained soft, while that of the thickest part is cast solid, thereby facilitating the manufacture of a sound and homogeneous article.

In the arrangement illustrated in Fig. 6 a one-side mold *a* only is made use of so that the internal vacuum chamber in the inside mold *h* is dispensed with. Furthermore, the vacuum jacket *d* is so disposed relatively to the mold that a deposit of graduated thickness is obtained, as illustrated. The mold is mounted on a tilting frame *o* for the purpose of convenience in emptying out the superfluous and residual slip when a sufficiently thick deposit has been obtained. The mold shown in Fig. 7 is designed for the casting of articles of even thickness throughout, and is a one-side mold so that only the external vacuum jacket *d* is made use of. In other respects this mold is similar to, and acts in the same way as, that illustrated in Fig. 6.

In the mold described with reference to Figs. 5, 6 and 7 the pressure upon the slip is obtained from a fluid medium, such as air. As above stated, however, direct mechanical pressure may be made use of and a mold operating on this principle is shown in Fig. 8. In this case the slip reservoirs l^2, funnels *j* and the air supply connections *m*, *n* are dispensed with and the slip is fed to the mold from the main supply pipe *p* from a pressure pump or storage tank and through the flexible pipe *q* and tap l^1. The pressure is maintained until the liquid has been filtered from the slip in the mold. *r* is a valve to allow the air to escape when the mold is being filled.

The great pressure on the absorbent mold when using pressure on the slip in combination with a vacuum around the mold has as a result that the mold itself must be considerably reinforced and supported evenly over its surface, and in cases where all the support necessary cannot be obtained from the studs c^1 carried by the vacuum jacket *c*, owing to the design of the article to be cast, we may employ pebbles or balls of a suitable size which are filled into the space inclosed by the vacuum jacket, and thus give the required strength. Such an arrangement is shown at *s*, Fig. 3.

Claims:

1. An apparatus for casting pottery and the like, comprising an absorbent mold including means for varying the thickness of the pottery cast, and a vacuum chamber arranged on one side of said mold and through which air and moisture are adapted to be drawn.

2. An apparatus for casting pottery and the like, comprising an absorbent mold, the thickness of which varies in accordance with the varying thickness of the article to be produced, and a vacuum chamber arranged on one side of said mold and through which air and moisture are adapted to be drawn.

3. An apparatus for casting pottery and the like, comprising an absorbent mold including means for varying the thickness of the pottery cast, and vacuum chambers arranged on each side of the mold and through which air and moisture are adapted to be drawn.

4. An apparatus for casting pottery and the like, comprising an absorbent mold, the thickness of which varies in accordance with the varying thickness of the article to be produced, a casing surrounding said mold and arranged at varying distances from the mold, and a vacuum chamber located between the mold and casing.

5. A method of molding substances such as clay or like material, consisting in introducing the said material suspended in a liquid into a porous absorbent mold, and simultaneously causing the solid matter of said mixture to be gradually deposited upon the mold and the fluid to be withdrawn from the mixture by maintaining a vacuum on one side of the mold until the desired thickness of the deposited matter is obtained.

6. A process of casting pottery from clay or like material consisting in introducing the said material suspended in a liquid into a porous absorbent mold, and simultaneously causing the solid matter of said mixture to be gradually deposited on the mold and the liquid to be withdrawn from the mixture by maintaining pneumatic pressure on said mixture until the desired thickness of the deposited matter is obtained.

7. A process of casting pottery from clay or like material consisting in introducing the said material suspended in a liquid into a porous absorbent mold, and simultaneously causing the solid matter of said mixture to be gradually deposited on the mold and the liquid to be withdrawn from the mixture by maintaining pneumatic pressure on the mixture and simultaneously maintaining a vacuum on one side of the mold until the desired thickness of deposited matter is obtained.

BERNARD JAMES ALLEN.
ROBERT YETTON AMES.