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AD. FOR
QUINN GUNCOTTON
DRYING SYSTEM

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THE QUINAN SYSTEM OF DRYING GUN-COTTON, &c.

The improved method and apparatus for drying gun-cotton, nitro-cellulose and similar materials, is the subject of patents granted to Mr. Kenneth B. Quinan, who has had large practical experience in the manufacture of explosives. The following is a brief description of the apparatus and its operation.

NOTES ON THE OPERATION OF THE QUINAN DRYING APPARATUS FOR GUN-COTTON AND COLLODION COTTON AND OTHER MATERIALS.

As is well known, the process of drying gun-cotton, collodion cotton and similar substances is attended with danger of fire and even violent explosion, and very generally with a loss of stability in the substance. The danger of violent explosion is dependent upon the degree of confinement; on the quantity of the substance undergoing the process; on the number of superimposed layers (as in the well-known Cabinet Dryer or Plate Vacuum Dryer).

The loss of stability, other things being equal, may be taken as dependent upon the time of exposure to the heating process.

In the usual methods of drying, the danger from fire, which under certain circumstances may lead to a violent explosion, is mainly the result of electrification of the substance. This is caused by passing the current of warm air underneath, or directly over the surface, after the substance, or a portion of it, is absolutely dry. The removal or handling of the dry explosive in this state is a dangerous operation, on account of its great susceptibility to friction and the likelihood of disruptive discharge setting fire to the substance and sometimes causing a violent explosion.

The intensity of this electrification is dependent on the prolonged action of the current of air after the substance is dry.

In the new Dryer these dangers are overcome, the principle being to dry the substance rapidly and in small quantities, capacity being obtained by installing the necessary number of separate units.

Heated air is used as the drying medium, and to make it as effective as possible it is passed directly through the substance, which is spread out in a thin layer both to facilitate the passage

of the air and the carrying away of the moisture. As the air comes into intimate contact with the substance, it is necessary to purify it, to which end it is drawn through a filter to remove dust, acid fumes and all other impurities likely to affect the stability of the substance. It is then driven by a fan or blower through a heater (a box containing a manifold of steam pipes being preferred) and then, under suitable pressure, into a pipe main for distribution to the drying apparatus proper.

The diagrams will illustrate the arrangement of the plant employed.

A shallow holder or basket *a*, shewn in sectional elevation in Fig. 1, made of galvanised sheet iron, zinc, or other suitable material. has a bottom a^1 of fine wire screening or perforated sheet metal. This basket is made to fit tightly into the top of the supporter or distributor *d* (Fig. 2).

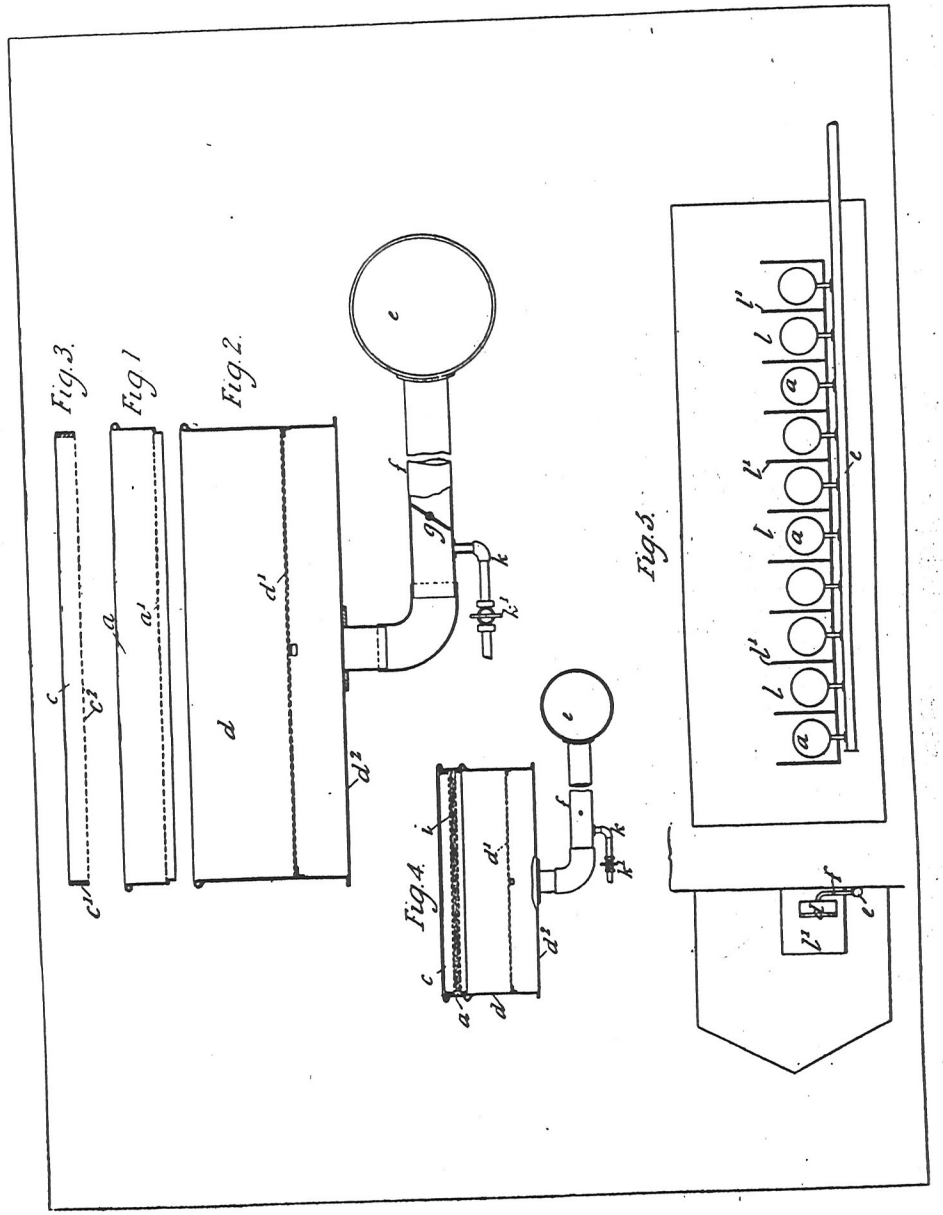
A cover or retaining screen *c* for the basket, which is shewn in sectional elevation in Fig. 3, consisting of a ring or frame of wood, metal or other suitable material, is arranged to fit tightly inside the basket, and preferably is for this purpose covered with flannel or similar material as at c^1, to prevent the escape of air or other matter. Over the bottom of the ring is tightly stretched silk bolting cloth of fine mesh, or other suitable material as at c^2, this being made fast to the flannel or other covering of the ring.

An air distributor *d*, which also forms a basket supporter which is shewn in sectional elevation in Fig. 2 is made of galvanised iron, zinc, or other suitable material, and is provided with a perforated false bottom or diaphragm d^1 situated some distance above the closed bottom d^2. The intermediate space is connected with a hot air main *e* by a pipe *f* through which the flow of air into the distributor is controlled by the valve *g*.

Fig. 4 shews the different parts of the apparatus assembled, the double hatched portion *i* of the diagram indicating a layer of substance in position ready for drying.

Fig. 5 shews in plan and elevation the manner in which a number of units, such as have already been described, may be conveniently arranged for practical working; a plant consisting for example of ten units, each 4 ft. in diameter, when operated in the manner to be described, having a nominal capacity of 1,200 lbs. per day of eight working hours.

The basket *a* is placed on top of the supporter *d*; over the screen of fine wire or perforated sheet metal a^1 forming the bottom of the basket is laid a sheet of cheese cloth or other similar fabric, and on this is evenly spread a layer about $2\frac{1}{2}$ inches thick of the wet



nitro-cellulose, or other material to be dried, such material having previously been made as open or granular as possible, for example, by being rubbed through a screen or granulator. The cover or retaining screen *c* is now fitted into the top of the basket and pressed tightly upon the surface of the material to be dried. The hot air valve *g* is then opened, and the heated dry air is allowed to pass upwards through the wet material. When the substance is sufficiently dry, the valve is closed and the cover or retaining screen is removed, and the operator is enabled to remove the entire contents of the basket at one operation by catching hold of the corners of the sheet upon which the substance rests. The basket itself may, however, be removed and emptied, but this may be inconvenient unless it is of small diameter.

As a further precaution, the air distributor, or basket supporter, or the pipe *f* may be connected also with a supply of cold air, so that the substance may be cooled before being removed from the drying basket. A small pipe *h* with valve h^1 from any suitable compressed air supply may be connected with pipe *f* for this purpose. The expansion of the compressed air in passing through the apparatus produces a rapid cooling of the substance.

For greater safety, the separate units may be set in alcoves or recesses *l* with fireproof walls l^1 (Fig. 5) being thus isolated one from another, so that in case of a fire the flame will not be communicated from one charge to the next. Escape for the flame is provided for by leaving the top of the alcove or chamber open.

All the dangers due to the drying of large masses, to the breaking of metallic contacts, subjecting the warm (and therefore very sensitive) substances to friction, and other sources of danger are avoided by the above described method of drying; and in the case of nitro-cellulose, no appreciable decrease in stability as indicated by the heat test takes place.

All parts of the charge are brought to the dry point at the same time, which is easily noted by the attendant, and super-drying of the charge with its attendant danger of electrification, is avoided.

Experience has shown that in the case of gun- and collodion cottons, it is best to work with a charge of about 15 to 17 lbs. (dry weight) per basket, such a charge requiring about 60 minutes for drying, when the temperature of the air is kept at or about 61° C, and a suitable pressure is maintained in the air main and distributors. The air main must be large enough to give a uniform pressure through the different branch pipes leading to the distributors.

As regards the temperature (60°—61° C.) this may be considered unnecessarily high; but it is held in principle that an explosive

can better withstand a relatively high temperature for a very short period, than a much lower temperature continued for some hours. In many factories it is certain that in avoiding the danger of overheating, the error of destruction of stability is fallen into by a prolonged heating. In the new system, however, there is no necessity for working at the temperature given above (and found quite safe by the inventor), for all the advantages of the process will be equally evident if working at 45°—50° C. if preferred.

A 12-unit installation with 4-ft. drying basket will dry 195 lbs. collodion cotton, or gun-cotton per hour easily. The consumption of air (reduced to 60° F.) with pressure of one quarter inch of water column is 11,166 cubic feet per hour per unit, or 687 cubic feet per pound of substance dried. A 12-inch fan driven by a 3 h.p. motor at 1,800 r.p.m., will supply the required air for 12 units. The steam consumption in heater is about 250 lbs. per hour for 12 units; and one man in charge with two assistants will operate the whole plant. From these figures it will be seen that the total cost of drying is very low indeed when compared with existing systems; and it is certainly safer. The product is more stable than that made by other methods, and buildings do not need the protection of safety-mounds. Drying over-night becomes unnecessary; and the cotton can be dried ready for use at an hour's notice. The cotton is most thoroughly dried; and there is no friction or risk in discharging the dryers, as the substance rests on a permeable cloth lifted by the four corners. The warm gun-cotton can be readily cooled, if desired, before removal from the basket by a compressed air connection to the air distributor, allowing cold dry air to enter the distributor. In practice this has not been found necessary, owing to the perfect safety of removal of the warm cotton by its supporting cloth.

One plant of 24 units has been in use at a modern explosive factory for two years, and over one-and-a-half million pounds of collodion cotton have been dried without accident of any description.

The material for the improved drying system can be furnished by Fraser & Chalmers, Ltd., who are licensed to manufacture and sell by Mr. Quinan.

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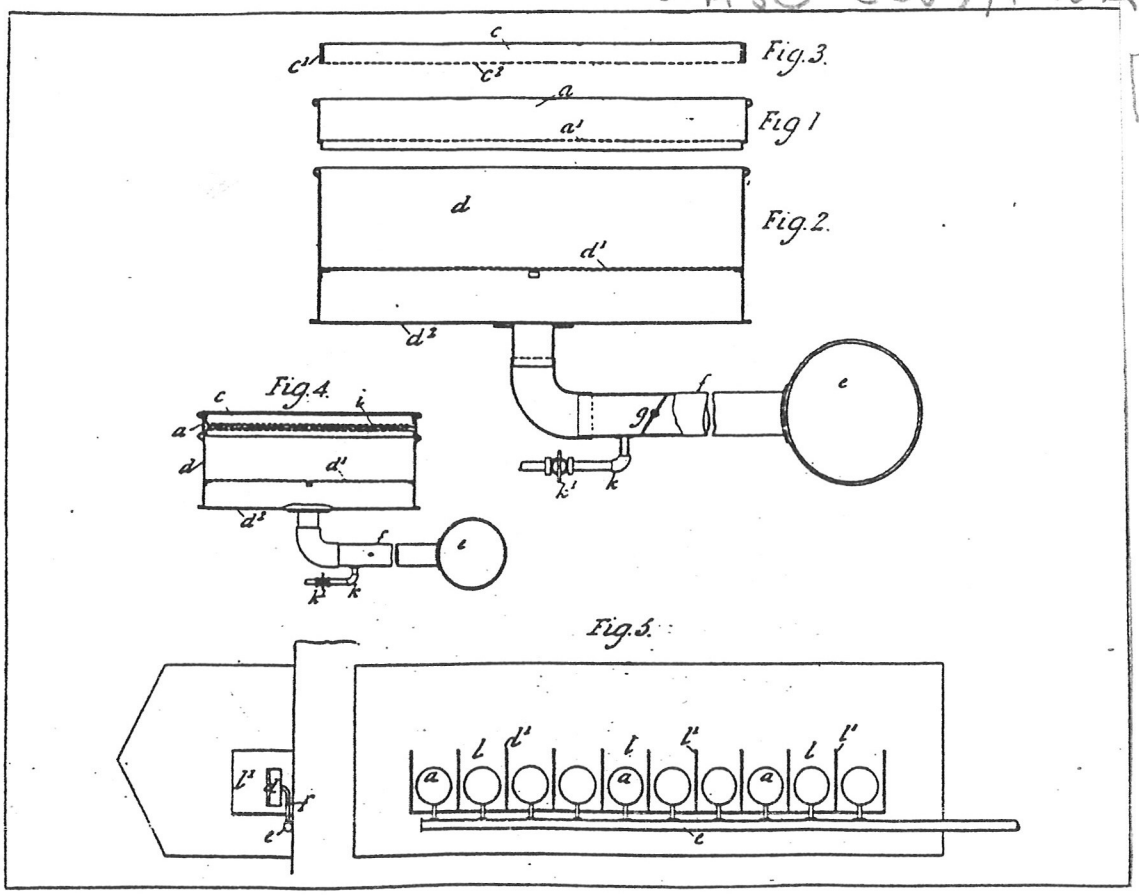
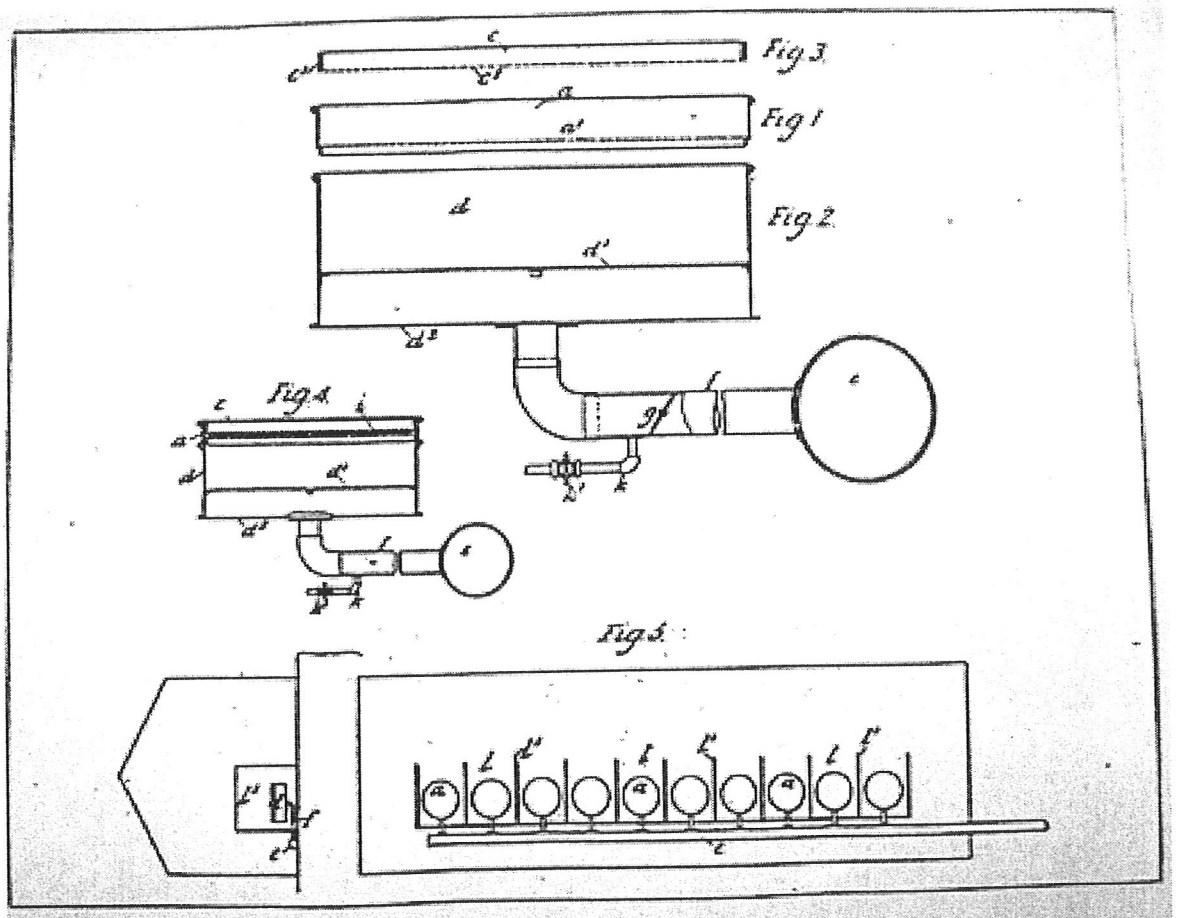
[Diagram only]



A Fraser and Chalmers schematic diagram of a Quinan Guncotton drying installation with 10 drying bays

a - basket
a1 - perforated sheet metal
c - basket retaining screen
c1 - basket retaining ring
c2 - cover for basket
d - galvanised iron air distributor/basket support
d1 - perforated false bottom
d2 - closed bottom
e - hot air main
f - hot air pipe
g - hot air valve
k - compressed air pipe
k1 - compressed air valve
l - alcoves
l1 - fireproof walls



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