

Govt. of {1894} Madras.

JUDICIAL.

No. 1675 W. d. 5 July 1894

B

Commenced  
to the Comy. Amended  
for signature, with  
reference to para 2  
N. 10.

Issued

105.C

Recd.

27.6.94

Encl.

S 27

CLARK  
7/94

G.O., 11th June 1894, No. 1425.

JUNE.

Magazines for the Storage of  
Explosives.

Passing orders on the report of the Inspector-  
General of Ordnance on the — belonging to Messrs.  
Best and Co., Parry and Co., and Arbuthnot and  
Co. at Kurukkapet.

P 5/7

C. A. to Port.

168

24/7

25/7

10/7

5. As regards administration, Messrs. Best and Co. have, hanging up in each of their buildings, copies of the rules of the Nobel Explosives Company for the safe storage of their manufactures. These rules are virtually identical with those in force in the service for all magazines; and it is, therefore, safe to infer that the manufacturers consider that at least the same precautions as with gunpowder are necessary with dynamite and other explosive compounds: and this is all the more reasonable an assumption as regards the magazines in question, which contain gunpowder as well as other explosives, and of which the various buildings are interchangeable, as one or other class of explosives may predominate.

6. It is a commonly-accepted idea that dynamite, for instance, is not so liable to danger from sparks or friction as gunpowder; and that, therefore, all the precautions taken with the latter are not so necessary in dealing with it. As regards this, M. Eissler in his "Handbook of Modern Explosives" remarks—"Immunity from fire exists only to a certain extent. The statement that dynamite can be set on fire, and that it will burn away without exploding, is not quite correct. . . . unfortunately there have been instances where large quantities have been accidentally set on fire with most disastrous results. Small quantities, and sometimes even large ones, may possibly burn away with immunity, but there is always the danger that the burning explosive will heat the portion not ignited to its exploding temperature, especially when in large masses. One of the peculiarities of dynamite is that it burns or takes fire at a lower temperature than its explosion temperature. . . ." It is certainly wiser to take full precautions to ensure, as far as may be, immunity from danger on all sides.

7. As regards this point, the rules drawn out by the Nobel Company (copy attached) should be scrupulously carried out. They are not at present. The floors are not "clean" in a technical sense.

- (a) Barriers about 2 feet high should be fixed in a groove at each door, over which any one entering will have to step.
- (b) A bucket of water should be outside, in which every native should immerse feet, one after another, passing the first wet foot *immediately* over the barrier.
- (c) Those wearing boots or shoes should have them dusted outside the barrier, and at once pass the cleaned foot over it into the boot or golosh ready on the other side.
- (d) Natives should be searched before being allowed to enter, others should be cautioned to give up anything objectionable.
- (e) All working parts of bolts, locks, &c., and all keys should be of brass or gun metal.
- (f) No iron tools should, on any account, be stored (as now) even in the lobbies.
- (g) All windows and ventilators opening into the interiors should be protected by brass wire gauge on the inside to keep out dust, extraneous matter, &c.
- (h) In some of the magazines the "horses" are placed in iron sockets; these are quite unnecessary and most dangerous as will be mentioned further on.
- (i) The lightning conductors should be tested annually by a qualified operator, and the inspecting officials should see these test reports when visiting the magazines.

8. But in my opinion the main point where danger exists is in the arrangements of the lightning conductors. This point has always been held of vital importance as regards gunpowder, and it is laid down as a rule, without exception, that every portion of iron in a building must be connected with the conductor or conductors. I did not observe a single instance where this has been done in these buildings. Painting or galvanizing iron is no protection against the electric discharge; on the contrary, an iron rod *conductor* ought to be painted. As far as the number and position of the conductors as erected, they seem generally suitable, but I had no means of actually measuring the protected area from each rod. I learn from Messrs. Best and Co. that the number and position of their conductors were settled by Messrs. Siemens Brothers. I think the dynamite magazines of Messrs. Arbutnot and Co., and of Messrs. Parry and Co., should probably each have an extra conductor at the two ends; at present each has only one at one end. But this depends on the elevation of the points of the rods, for the axiom laid down by British authorities is that the area protected by

any conductor is a cone of which the apex is the point of rod, the radius of its base being equal to the height of the point. Judging by the eye, I do not think in these two magazines that the whole of each is included in this cone; possibly if the rods were shifted to the centre of one side, they might be sufficient.

9. I have said this is the rule in respect of gunpowder magazines; and there is a stronger reason why it should hold good for other explosives, particularly dynamite, for it is one of the curious properties of this explosive that it is highly sensitive to electric phenomena. M. Eissler states it is asserted that all accidental explosions of dynamite (not caused by an individual act), are proved to have been connected with electrical atmospheric disturbances. So far is this true that on four occasions predictions of probable explosions were made, and were verified, and this not in thunderstorms, but from electrical disturbance. He then emphasizes the necessity of perfect connections and the rigid exclusion of all good conducting substances, of which iron and dust are the most in evidence here, from the interior of magazines, which is all the more imperative, because explosions during thunderstorms are caused by the return shock.

10. I noticed two instances of faulty storage. In Messrs Best and Co.'s fuze magazine, some coils of safety-fuze were lying quite exposed. In Messrs. Arbutnot and Co.'s dynamite magazine safety-fuze was stored without even a partition. The only rules I have as to the storage of explosives are those laid down for carriage of the same by sea; but these are generally applicable, and in them, it is ruled, that *no* explosives should be in the same magazine with *any* fuzes.

11. The traverses seem generally sufficiently large, though it is not possible to assert positively that they are so. I certainly think Messrs. Arbutnot and Co. would do wisely to throw up a traverse between their two main magazines, which are very adjacent and quite open to each other. If one were to explode, the other would certainly follow. And there is another point which struck me very much in the powder magazine belonging to this firm which is a small square building: when the door is open the whole of the contents are in full view. I should certainly recommend the addition of an inner-gauge door.

12. I have possibly entered more fully into all these points than my instructions warrant, but it seemed to me best to record my impressions, so that the Government might be able to judge more fully the whole question. I would only add that, as far as I could see, the only guard over these magazines is one watching peon for each group; possibly there is a relief, but I did not think of inquiring at the time.

13. The drawings and papers sent for my information are herewith returned.

No. 3060, Military.

Forwarded to the Judicial Department with reference to its P.G. No. 834, dated 6th April 1894.

OOTACAMUND,  
19th May 1894.

(Signed) D. J. McLEOD,  
Offg. Secy. to Government.

To the Judicial Department, with papers in original.

ORDER—dated 11th June 1894, No. 1425, Judicial.

This careful report for which Government is much indebted to Colonel Walker confirms the doubt expressed in G.O., dated 6th April 1894, No. 834, Judicial, whether the arrangements at Kurukkapet are adequate for the protection of the public against the risks of explosion. It seems clear that Messrs. Best and Co., Messrs. Parry and Co., and Messrs. Arbutnot and Co. have not complied strictly with all the conditions upon which their licenses to store explosives were granted.

These firms will therefore be requested by the Commissioner of Police to take immediate steps to supply the defects and remedy the irregularities which the Inspector-General of Ordnance has brought to notice and he will report the result of the communication within three months from the date of receipt of this Proceedings.

2. The Commissioner of Police will also arrange for the annual inspection of the lightning conductors by the Consulting Architect to whom the necessary orders will issue in the Public Works Department and he will himself pay occasional visits to the magazines for the purpose of ascertaining whether the provisions of the Explosives Act rules are being strictly observed.

3. With regard to paragraph 10 of the report, the Government notes that there is nothing in the Explosives Act rules prohibiting the exposure of safety-fuzes, and that it is expressly stated in the conditions endorsed upon license Form E that the storage of dynamite and fuzes in close proximity to one another is unobjectionable.

4. A copy of this Proceedings will be communicated to the District Magistrates of Malabar, Nilgiris and Coimbatore for information and guidance.

(True Extract)

J. F. PRICE,  
Chief Secretary.

To the Military Department.

- „ Public Works Department.
- „ Commissioner of Police, Madras, with plans.
- „ District Magistrate, Malabar.
- „ „ Nilgiris.
- „ „ Coimbatore.

Copy to the President of the Madras Municipal Commission.

Gobt. of {1894} Madras.

JUDICIAL.

Issued

Encl.

G.O., 11th June 1894, No. 1425.

JUNE.

Magazines for the Storage of  
Explosives.

Passing orders on the report of the Inspector-General of Ordnance on the — belonging to Messrs. Best and Co., Parry and Co., and Arbuthnot and Co. at Kurukkapet.

C. A. Govt.

No. 1675 W. d. 5 July 1894  
Communicated to  
the Consig. Architect for  
guidance with reference  
to para 2 of the G.O.  
(Ed.) J. P.  
W.

11TH JUNE 1894, No. 1425, JUDICIAL.

GOVERNMENT OF MADRAS.

JUDICIAL DEPARTMENT.

READ—again the following paper:—

G.O., dated 6th April 1894, No. 834, Judicial.

ABSTRACT.—Stating that Government is not satisfied that, in the case of the magazines for the storage of explosives belonging to Messrs. Best and Co. and Messrs. Arbuthnot and Co. at Kurukkapet, adequate arrangements are made for the safety of the public, and that arrangements will be made in the Military Department for the inspection of all the magazines at Kurukkapet by an officer of the Ordnance Department and the submission of a report thereon.

READ—also the following paper:—

From Colonel T. WALKER, R.A., Inspector-General of Ordnance, Madras Circle, to the Secretary to Government, Military Department, dated Fort St. George, 17th May 1894, No. 2646-O.

In compliance with Proceedings of Government, No. 2504, Military Department, dated 23rd April 1894, I have the honour to report, for the information of His Excellency the Governor in Council, that on the 9th instant I inspected the three groups of explosives magazines belonging to Messrs. Best and Co., Messrs. Arbuthnot and Co., and Messrs. Parry and Co., the Commissioner of Police kindly accompanying me.

2. The main object of my inspection being to report on the points connected with the magazines affecting the public safety; this had my first attention. The general situation is well adapted to secure that safety. The only human habitation at all adjacently situate is a farm steading to the east of Messrs. Parry and Co.'s group, but at such a distance as to probably negative any idea of danger. There is one point, however, to which I would direct attention: Cochrane's canal runs a little to the west of all the buildings and Messrs. Parry and Co.'s dynamite magazine closely approximates to it; there is a traverse on the south and west, but the western portion terminates rather abruptly; and if this magazine did explode, it would be very liable to blow in the bank of the canal. I would recommend the extension of the traverse to entirely enclose the west end, and to be brought round partly to cover the north side.

3. I am not, however, equally satisfied as to the safety of the magazines in themselves, and that in two respects—

First.—Construction.

Second.—Administration.

4. In regard to the construction generally this is suitable, and judging from the register of thermometric observations kept up by Messrs. Best and Co., is probably the best that could be. Generally, the roofs are terraced and the girders are of iron; the ventilators and windows are uniformly of iron and in one magazine only, as far as I could see, guarded with wire netting; the fittings of the doors and windows are in some cases brass, but even then the working parts of the locks and bolts are of iron; and throughout there is absolutely no connection established between the lightning conductors and the external iron work. All the doors of all the buildings, I think, open inwards: this is held to be a radical defect for our service magazines. Wood is a more suitable material for magazine floors than chunam, as the latter is friable, but cement is good. I think all the floors are sound.

5. As regards administration, Messrs. Best and Co. have, hanging up in each of their buildings, copies of the rules of the Nobel Explosives Company for the safe storage of their manufactures. These rules are virtually identical with those in force in the service for all magazines; and it is, therefore, safe to infer that the manufacturers consider that at least the same precautions as with gunpowder are necessary with dynamite and other explosive compounds: and this is all the more reasonable an assumption as regards the magazines in question, which contain gunpowder as well as other explosives, and of which the various buildings are interchangeable, as one or other class of explosives may predominate.

6. It is a commonly-accepted idea that dynamite, for instance, is not so liable to danger from sparks or friction as gunpowder; and that, therefore, all the precautions taken with the latter are not so necessary in dealing with it. As regards this, M. Eissler in his "Handbook of Modern Explosives" remarks—"Immunity from fire exists only to a certain extent. The statement that dynamite can be set on fire, and that it will burn away without exploding, is not quite correct. . . . unfortunately there have been instances where large quantities have been accidentally set on fire with most disastrous results. Small quantities, and sometimes even large ones, may possibly burn away with immunity, but there is always the danger that the burning explosive will heat the portion not ignited to its exploding temperature, especially when in large masses. One of the peculiarities of dynamite is that it burns or takes fire at a lower temperature than its explosion temperature. . . ." It is certainly wiser to take full precautions to ensure, as far as may be, immunity from danger on all sides.

7. As regards this point, the rules drawn out by the Nobel Company (copy attached) should be scrupulously carried out. They are not at present. The floors are not "clean" in a technical sense.

(a) Barriers about 2 feet high should be fixed in a groove at each door, over which any one entering will have to step.

(b) A bucket of water should be outside, in which every native should immerse his feet, one after another, passing the first wet foot *immediately* over the barrier.

(c) Those wearing boots or shoes should have them dusted outside the barrier, and at once pass the cleaned foot over it into the boot or gosh ready on the other side.

(d) Natives should be searched before being allowed to enter, others should be cautioned to give up anything objectionable.

(e) All working parts of bolts, locks, &c., and all keys should be of brass or gun metal.

(f) No iron tools should, on any account, be stored (as now) even in the lobbies.

(g) All windows and ventilators opening into the interiors should be protected by brass wire gauge on the inside to keep out dust, extraneous matter, &c.

(h) In some of the magazines the "horses" are placed in iron sockets; these are quite unnecessary and most dangerous as will be mentioned further on.

(i) The lightning conductors should be tested annually by a qualified operator, and the inspecting officials should see these test reports when visiting the magazines.

8. But in my opinion the main point where danger exists is in the arrangements of the lightning conductors. This point has always been held of vital importance as regards gunpowder, and it is laid down as a rule, without exception, that every portion of iron in a building must be connected with the conductor or conductors. I did not observe a single instance where this has been done in these buildings. Painting or galvanizing iron is no protection against the electric discharge; on the contrary, an iron rod *conductor* ought to be painted. As far as the number and position of the conductors as erected, they seem generally suitable, but I had no means of actually measuring the protected area from each rod. I learn from Messrs. Best and Co. that the number and position of their conductors were settled by Messrs. Siemens Brothers. I think the dynamite magazines of Messrs. Arbuthnot and Co., and of Messrs. Parry and Co., should probably each have an extra conductor at the two ends; at present each has only one at one end. But this depends on the elevation of the points of the rods, for the axiom laid down by British authorities is that the area protected by

any conductor is a cone of which the apex is the point of rod, the radius of its base being equal to the height of the point. Judging by the eye, I do not think in these two magazines that the whole of each is included in this cone; possibly if the rods were shifted to the centre of one side, they might be sufficient.

9. I have said this is the rule in respect of gunpowder magazines; and there is a stronger reason why it should hold good for other explosives, particularly dynamite, for it is one of the curious properties of this explosive that it is highly sensitive to electric phenomena. M. Eissler states it is asserted that all accidental explosions of dynamite (not caused by an individual act), are proved to have been connected with electrical atmospheric disturbances. So far is this true that on four occasions predictions of probable explosions were made, and were verified, and this not in thunderstorms, but from electrical disturbance. He then emphasizes the necessity of perfect connections and the rigid exclusion of all good conducting substances, of which iron and dust are the most in evidence here, from the interior of magazines, which is all the more imperative, because explosions during thunderstorms are caused by the return shock.

10. I noticed two instances of faulty storage. In Messrs. Best and Co.'s fuze magazine, some coils of safety-fuze were lying quite exposed. In Messrs. Arbuthnot and Co.'s dynamite magazine safety-fuze was stored without even a partition. The only rules I have as to the storage of explosives are those laid down for carriage of the same by sea; but these are generally applicable, and in them, it is ruled, that no explosives should be in the same magazine with *any* fuzes.

11. The traverses seem generally sufficiently large, though it is not possible to assert positively that they are so. I certainly think Messrs. Arbuthnot and Co. would do wisely to throw up a traverse between their two main magazines, which are very adjacent and quite open to each other. If one were to explode, the other would certainly follow. And there is another point which struck me very much in the powder magazine belonging to this firm which is a small square building: when the door is open the whole of the contents are in full view. I should certainly recommend the addition of an inner-gauge door.

12. I have possibly entered more fully into all these points than my instructions warrant, but it seemed to me best to record my impressions, so that the Government might be able to judge more fully the whole question. I would only add that, as far as I could see, the only guard over these magazines is one watching peon for each group; possibly there is a relief, but I did not think of inquiring at the time.

13. The drawings and papers sent for my information are herewith returned.

No. 3060, Military.

Forwarded to the Judicial Department with reference to its P.G. No. 834, dated 6th April 1894.

OOTACAMUND,  
19th May 1894.

(Signed) D. J. McLEOD,  
Offg. Secy. to Government.

To the Judicial Department, with papers in original.

ORDER—dated 11th June 1894, No. 1425, Judicial.

This careful report for which Government is much indebted to Colonel Walker confirms the doubt expressed in G.O., dated 6th April 1894, No. 834, Judicial, whether the arrangements at Kurukkapet are adequate for the protection of the public against the risks of explosion. It seems clear that Messrs. Best and Co., Messrs. Parry and Co., and Messrs. Arbuthnot and Co. have not complied strictly with all the conditions upon which their licenses to store explosives were granted.

These firms will therefore be requested by the Commissioner of Police to take immediate steps to supply the defects and remedy the irregularities which the Inspector-General of Ordnance has brought to notice and he will report the result of the communication within three months from the date of receipt of this Proceedings.

2. The Commissioner of Police will also arrange for the annual inspection of the lightning conductors by the Consulting Architect to whom the necessary orders will issue in the Public Works Department and he will himself pay occasional visits to the magazines for the purpose of ascertaining whether the provisions of the Explosives Act rules are being strictly observed.

3. With regard to paragraph 10 of the report, the Government notes that there is nothing in the Explosives Act rules prohibiting the exposure of safety-fuzes, and that it is expressly stated in the conditions endorsed upon license Form E that the storage of dynamite and fuzes in close proximity to one another is unobjectionable.

4. A copy of this Proceedings will be communicated to the District Magistrates of Malabar, Nilgiris and Coimbatore for information and guidance.

(True Extract)

*W. H. P. M.*  
*Chief Secretary.*

To the Military Department.

- " Public Works Department.
- " Commissioner of Police, Madras, with plans.
- " District Magistrate, Malabar.
- " " Nilgiris.
- " " Coimbatore.

Copy to the President of the Madras Municipal Commission.

11TH JUNE 1894, No. 1425, JUDICIAL.

GOVERNMENT OF MADRAS.

JUDICIAL DEPARTMENT.

READ—again the following paper:—

G.O., dated 6th April 1894, No. 834, Judicial.

ABSTRACT.—Stating that Government is not satisfied that, in the case of the magazines for the storage of explosives belonging to Messrs. Best and Co. and Messrs. Arbuthnot and Co. at Kurukkapet, adequate arrangements are made for the safety of the public, and that arrangements will be made in the Military Department for the inspection of all the magazines at Kurukkapet by an officer of the Ordnance Department and the submission of a report thereon.

READ—also the following paper:—

From Colonel T. WALKER, R.A., Inspector-General of Ordnance, Madras Circle, to the Secretary to Government, Military Department, dated Fort St. George, 17th May 1894, No. 2646-O.

In compliance with Proceedings of Government, No. 2504, Military Department, dated 23rd April 1894, I have the honour to report, for the information of His Excellency the Governor in Council, that on the 9th instant I inspected the three explosives magazines belonging to Messrs. Best and Co., Messrs. Arbuthnot and Co. and Messrs. Parry and Co., the Commissioner of Police kindly accompanying me.

2. The main object of my inspection being to report on the points of the magazines with the magazines affecting the public safety; this had my first attention. The general situation is well adapted to secure that safety. The only human habitation at all adjacently situate is a farm steading to the east of Messrs. Parry and Co. group, but at such a distance as to probably negative any idea of danger. There is one point, however, to which I would direct attention: Cochrane's canal runs a little to the west of all the buildings and Messrs. Parry and Co.'s dynamite magazine closely approximates to it; there is a traverse on the south and west, but the western portion terminates rather abruptly; and if this magazine did explode, it would be very liable to blow in the bank of the canal. I would recommend the extension of the traverse to entirely enclose the west end, and to be brought round partly to cover the north side.

3. I am not, however, equally satisfied as to the safety of the magazines in themselves, and that in two respects—

*First.*—Construction.

*Second.*—Administration.

4. In regard to the construction generally this is suitable, and judging from the register of thermometric observations kept up by Messrs. Best and Co., is probably the best that could be. Generally, the roofs are terraced and the girders are of iron; the ventilators and windows are uniformly of iron and in one magazine only, as far as I could see, guarded with wire netting; the fittings of the doors and windows are in some cases brass, but even then the working parts of the locks and bolts are of iron; and throughout there is absolutely no connection established between the lightning conductors and the external iron work. All the doors of all the buildings, I think, open inwards: this is held to be a radical defect for our service magazines. Wood is a more suitable material for magazine floors than chunam, as the latter is friable, but cement is good. I think all the floors are sound.