

Explosion of the Grenelle gunpowder factory

August 31, 1794

Paris - [Seine]

France

Major accident
 Pyrotechnics
 Black powder
 Potassium nitrate
 Sulphur
 Charcoal
 Productivity
 Victims
 Regulations

THE INSTALLATIONS IN QUESTION

Geographic location

In 1860, the City of Paris annexed two communities, thus creating the XV district [7]:

- **Grenelle**

Grenelle, an essentially industrial city roughly 30-year olds old, had a population of 20,000, most of whom had come from the Greater Paris area.

- **Vaugirard**

A small labourer village for six centuries, Vaugirard had witnessed wars, famines and epidemics, followed by a relatively prosperous period during which country homes of Parisians and market gardens flourished.

History of the site [8]

Today, the "Château de Grenelle", as it is designated on XVII and XVIII century plans, would be located in Paris' XV district, between *place Dupleix* and *rue Desaix*. The manor house included a farm and nearly 115 hectares of land. During the reign of Louis XIII, it became the country home of the Count of Tréville, Captain of the King's musketeers, while the neighbouring farm of equal size belonged to the Canons of Sainte-Geneviève du Mont. In 1751, the French government purchased the property to generate income for the Military Training School. For more than ten years, the castle was used as the engineering offices of the architect Jacques-Ange Gabriel, then the *Convention* installed a **gunpowder factory** there. The gunpowder storage facility continued to operate until 1820, when the military gymnasium of Colonel Amoros took over the grounds. The last vestiges of the castle disappeared in 1860 with the construction of cavalry barracks that has just recently been demolished.

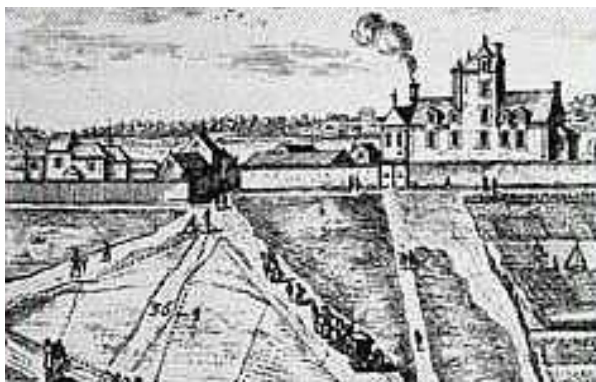



Figure 1 – Grenelle Castle

*Drawing by Sébastien Leclerc in practical geometry
 by Allain-Manneson-Malet, 1702, Volume III
<http://www.paris15histoire.com/chateau.html>*



Figure 2 - Jean-Antoine Chaptal
<http://www.1789-1815.com/chaptal.htm>

On February 26, 1794, Lazare Carnot, the head of military affairs for the *Comité de Salut Public* (Committee of Public Safety), and Pierre-Louis Prieur, Member of the Convention and the *Comité de Salut Public*, designated Jean-Antoine Chaptal to oversee the manufacture of gunpowder at the Grenelle site. Jean-Antoine Chaptal was also Professor of Chemistry at the Medical School. The new production methods that he recommended increased daily production of **potassium nitrate** from 8 to 35,000 pounds¹ (\approx 3.7 to 16.3 t) [5].



POSTASSIUM NITRATE


Potassium nitrate, KNO_3 (from the Latin *salptrae* – "stone salt" or possibly "Salt of Petra"), is also known as saltpetre, caliche or nitre. The Chinese developed a mixture of KNO_3 , sulphur and charcoal, which was originally used for cannon powder... The first text to mention it was a Chinese alchemy text from the X century.

<http://fr.wikipedia.org/wiki/Salp%C3%A2tre>


THE ACCIDENT, ITS BEHAVIOUR, EFFECTS AND CONSEQUENCES

The accident [2, 5, 6, 11]

On August 31, 1794, at 7.15 am, **65,000 pounds (\approx 30.2 t) [5] or 150 t [10] of powder**, depending on the sources, **exploded in the** powder store of *Château de Grenelle*, located near the Military Training School. Based on the direction that the severed trees had fallen and the demolished buildings, the explosion appears to have been initiated in the *Liberté* graining machine.



SULPHUR



Sulphur (*sulvere* in sanskrit, *sulphur* in Latin), an odourless, tasteless and abundant multivalent non-metal, particularly known in the form of yellow crystals, is found in numerous minerals (sulphide and sulphate) and even in native form, particularly in volcanic regions. It is primarily used in numerous industrial processes such as the production of sulphuric acid (H_2SO_4) for batteries, fertiliser (sulphates), fungicides, matches, gunpowder, fireworks and in the vulcanisation of rubber.

The existence of Sulphur (S) has been known since antiquity. Homer indicated that it "kept vermin away" in the IX century BC and in -424, a tribe destroyed the walls of a city by burning a mixture of coal, sulphur and tar.

<http://fr.wikipedia.org/wiki/Soufre>

The day before, 50,000 pounds (\approx 23.3 t) of powder was sent to the outlying areas. Two days earlier, 100,000 lbs. (\approx 46.5 t) was shipped from the powder store. Over the last 3 months, there had not been such a small quantity of powder stocked at the gunpowder factor as at the time of the explosion.

The blast created by the explosion was heard all the way to Fontainebleau.

The rescue personnel attended to the injured and removed hundreds of victims from the rubble. The Charité and Gros-Caillou hospitals were overwhelmed by the massive arrival of the injured. At 11 am, all those injured in the blast had received first aid.

The police administration was in charge of monitoring public establishments, in particular. The Committee of Public Safety, responsible for monitoring the arsenal and prisons, **secured Meudon and the stocks of powder, potassium nitrate and sulphur that had been spared in the explosion.**

¹ A unit of mass which varies, depending on the region, between 380 and 550 grams (Le Petit Robert, version 1.2, 1996)

BLACK POWDER

Black powder or **gunpowder**, which most likely appeared in X century China., is an explosive mixture of two highly combustible elements (sulphur and charcoal) and a highly oxidizing agent (potassium nitrate). The powders used in contemporary firearms most often use a single base powder, referred to as smokeless powder (developed in 1884), which is not black powder. Black powder arrived to Europe in the middle of the XIII century via the Arabs.

Around 1230, Marcus Graecus published the weighted composition of black powder in the west in *Liber ignium ad comburendos hostes* (The Book of Fires for Burning Enemies): 1 part sulphur, 2 parts charcoal and 6 parts potassium nitrate (saltpetre). Later on, variable compositions were found depending on the use: 30% charcoal, 30% sulphur, 40% potassium nitrate for **blasting powder** (slow); 12%/10%/78% respectively for **sporting powder**; and 12.5% / 12.5% / 75% respectively for **gunpowder**. In fireworks however, the composition is rather 15% / 10% / 75%. The quantity of powder essentially depends on the quantity of charcoal used.

Black powder, inexpensive and stable, requires only a small amount of energy to initiate combustion (flame, impact, friction, spark or laser).

http://fr.wikipedia.org/wiki/Poudre_noire



CHARCOAL

Charcoal is obtained through the controlled burning of wood which is then ground. It is produced from the wood of trees such as aspen (poplar), alder or linden. Through distillation at 3,500°C, black charcoal is obtained (**gunpowder**), with distillation at 300°C producing red charcoal (**sporting powder**).

http://fr.wikipedia.org/wiki/Poudre_noire

http://fr.wikipedia.org/wiki/Charbon_de_bois

The consequences [2, 5, 6, 11]

The explosion caused **considerable property damage**. The blast shook homes in the surrounding area, cracked bridges and broke the seals on the underground doors of the Observatory.

The catastrophe resulted in the **death of more than 1,000 people**. The health officers ordered hospices to open their doors to the impoverished victims.

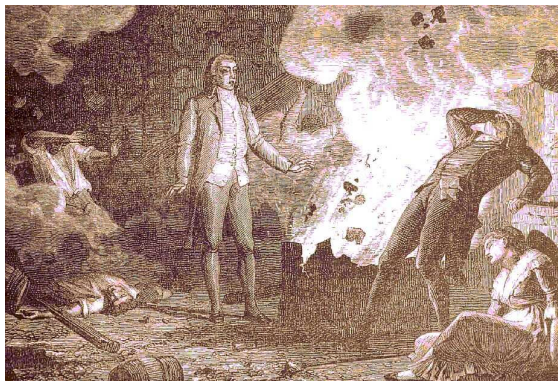


Figure 3 – Engravings illustrating the explosion

European scale of industrial accidents

Even though the European scale of industrial accidents was created two centuries after the explosion of the Grenelle gunpowder factory, it is used here to characterise the accident.

By applying the rating rules of the 18 parameters of the scale made official in February 1994 by the Committee of Competent Authorities of the Member States which oversees the application of the 'SEVESO' directive, the accident can be characterised by the following 4 indices, based on the information available.

The parameters that comprise these indices and the corresponding rating method are indicated in the appendix hereto and are available at the following address: <http://www.aria.ecologie.gouv.fr>

Dangerous materials released		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Human and social consequences		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Environmental consequences		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Economic consequences		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The 30.2 t or 150 t of black powder that exploded represents 60.4 to 300% of the corresponding Seveso threshold (50 t – explosive substances classified in a division other than 1.4 as per the European Agreement Concerning the International Carriage of Dangerous Goods (ADR) (United Nations)), which equals level 5 of the "quantities of dangerous substances" rating per parameter Q1 (Q1 between 1 and 10 times the threshold).

As the effects of the explosion had not been characterised and windows were broken at distances less than 300 m, parameter Q2 was given a rating of 1.

The overall "dangerous materials released" rating is thus 5.

Three parameters are involved in determining the level of the "Human and social consequences" rating: H3, H4 and H6.

- Level 6 of parameter H3 characterises the thousands of deaths (H3 > 50).
- Parameter H4 reaches level 1 by default: the number of seriously injured is unknown.
- Parameter H6 is 2 by default: the number of third parties without shelter or unable to work is unknown.

As a result, the overall "Human and social consequences" rating is 6.

ORIGIN, CAUSES AND CIRCUMSTANCES OF THE ACCIDENT

New working methods enabled daily production capacity to be increased. The Director of the Grenelle powder manufacturing operation, Jean-Antoine Chaptal, had continuously warned the Committee of Public Safety that the rapid increase in production was not without major risk. The 2,000 labourers, crowded into the workshop, manufactured black powder in an overheated atmosphere without any protective measures whatsoever. The catastrophe on the morning of August 31, 1794 was thus foreseeable. [5, 6]

DEVELOPMENT OF THE BLACK POWDER MANUFACTURING OPERATION

While the composition of black powder has changed very little over the centuries, its production techniques have undergone constant development. As a precaution, the sulphur and charcoal were ground separately until a homogenous powder was obtained. The potassium nitrate (saltpetre) was added only at the end, in the presence of water (1.5 l of water for 10 kg of powder). Additional water was added regularly to compensate for losses due to evaporation. The grinding and mixing were performed using pestles, very similar to tools used in metallurgy, which are placed into movement by hydraulic wheels equipped with cams. These powder making facilities were called "powder mills".

In France, during the revolutionary period and the First Empire, the need for powder was such that more expeditious albeit more dangerous means were favoured: the workers ground the ingredients by hand in rotating casks partly filled with bronze balls (marbles). The manufacturing techniques continued to improve and evolve over the centuries. [4]

ACTIONS TAKEN

Jean-Antoine Chaptal was not held responsible for this deadly explosion [5].



The report compiled by Treilhard on behalf of the Committees of Public Health and Safety on the Grenelle gunpowder factory explosion (meeting of the 15th *Fructidor* of Year II of the Republic) stipulates that certain measures be implemented [2]:

- **fabrication of powder in several locations** (powder mill) **and in locations far from all habitation**, thus reducing quantities and thus the risk at the source,
- replacement of labourers by new, recently developed "mechanisms",
- improvement of the quality of the substance produced.

Figure 4 - Example of a powder mill located in the northern part of the island, near what is now the Chaussée de Banlève – Toulouse.

Plan Jouvin de Rochefort, vers 1678, détail. Musée Paul Dupuy

<http://www.culture.gouv.fr/culture/inventai/itiinv/ramier/Htm/edifices/poudre/poudr1.htm>

LESSONS LEARNED

This industrial catastrophe appears to have helped to define the foundations of our legislation concerning Classified Installations and Environmental Protection based on the principle of using techniques that are economically acceptable and respect of the sensitivity of the environment and surrounding region. In this case, the lessons learned from the explosion at the Grenelle powder works were:

- the use of procedures requiring little human interaction,
- and installations far from areas of housing.



Issued by the Committee of State, the Imperial Decree of October 15, 1810, relative to "manufacturing facilities and workshops that produce offensive or objectionable odours" [3], stipulates that these establishments cannot "be created without the permission of the administrative authority" and shall be divided into three classes [9, 10]:

- The **first class** concerns "facilities which must be located far from private housing". Permission for establishments of this class is granted in certain conditions **by decree issued by the Committee of State**.
- The **second** applies to "facilities whose location away from housing is not strictly necessary, although is subject to confirmation that the operations conducted do not discomfort the landowners of the surrounding area, or cause them damage". The implementation of these establishments requires **prefectoral approval, by the advice of the sub-prefects**.
- The **third** corresponds to establishments "that can be located near housing areas without problem, although are subject to monitoring by the police". Permission to create these establishments is granted **by the sub-prefect, by the advice of the mayors**.

Figure 5 – Ancient statutory instruments

<http://fondation-calvet.org/habillages/images/livres.jpg>

This imperial decree, which forms the initial foundations of a specific **nomenclature**, is completed by the order of January 14, 1815 which outlines the regulations governing manufacturing facilities, establishments and workshops that produce offensive or objectionable odours, and extends the information memorandum of the *commodo incommodo* procedure to 2nd class establishments [9].

Nowadays in France, the storage of explosive or pyrotechnic products, including fireworks, is governed by specific regulations which establish the technical specifications that an operator must respect to prevent accidents and ensure the protection of employees, the general public and the environment [1].

In France, large explosive product storage facilities are subject to legislation relative to texts governing installations classified for environmental protection [1].

More recently, section 1311 of the nomenclature of installations classified for environmental protection specifies the declaration procedures to which the establishment is subject, according to the quantities of powders, explosives and other explosive products stored on site.

Table 1 – Section No. 1311 – Storage of powders and explosives / *Section modified by decree No. 99-1220 of December 28, 1999* [3]

Powders, explosive and other explosive products (storage of):

The total quantity of active material likely to be present in the installation:

1. Greater than 10 t	AS ⁽¹⁾	6 ⁽²⁾
2. Greater than or equal to 2 t, but less than or equal to 10 t	A ⁽¹⁾	3 ⁽²⁾
3. Greater than or equal to 500 kg, but less than 2 t	A ⁽¹⁾	

⁽¹⁾ A: authorisation; D: declaration; S: authorisation with public easement.

⁽²⁾ Radius expressed in kilometres.

The authorisations with public easement enable a security perimeter to be established for urban development purposes within the commune(s) concerned by the risks, and foresees compensation to adjacent land owners aggrieved by the requirements. This compensation is borne by the warehouse operator [1].

Other texts are also applicable: notably, decree 90-153 establishing a prefectural certification for explosive warehouses, decree 90-897 which classifies fireworks from K1 to K4 according to their dangerousness, decree 79-846 issued as per Labour Regulations, and the interministerial order of September 26, 1980 [1].

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APPENDIX

REPORT COMPILED ON BEHALF OF THE COMMITTEES ON PUBLIC HEALTH AND SAFETY ON THE GRENELLE POWDER FACTORY

CONVENTION NATIONALE

R A P P O R T

F A I T


AU NOM DES COMITÉS DE SALUT PUBLIC
ET DE SURETÉ GÉNÉRALE,

Sur l'explosion de la poudrerie de Grenelle,

PAR TREILHARD;

Dans la séance du 17 fructidor, an II. de la République
française une & indivisible.

IMPRIMÉ PAR ORDRE DE LA CONVENTION NATIONALE.



UN jour de deuil vient se mêler à nos jours de triomphe: l'instant où nous apprenons que le sol de la République est purgé des hordes ennemies, éclaire un grand désastre, l'explosion de la poudrerie de Grenelle.

A

frères, & pour donner les ordres que comportent les circonstances.

Les secours à donner aux victimes infortunées ont attiré nos premiers soins; des hospices ont été ouverts pour les recevoir, les officiers de santé requis, les transferts préparés. A onze heures, tous les citoyens blessés avoient déjà reçu, soit au Gros-Cailou, soit à la maison des Invalides, où on les avoit transportés, les premiers secours & les pansements qu'exigeoit leur état.

Si notre premier mouvement a été enlevé par la sensibilité, notre attention s'est bientôt portée sur tout ce qui pouvoit intéresser la sûreté publique.

Des ordres ont été donnés au commandant de la garde nationale & au chef des pompiers: l'administration de police a été chargée de surveiller particulièrement les établissements publics, & de requérir de fortes patrouilles, & les comités des sections ont été réunis pour la prompte exécution de ces mesures. Plusieurs de nos collègues se sont chargés de la surveillance particulière de l'arsenal & des maisons de détention; d'autres ont dirigé les secours portés sur le lieu du désastre: ils ont plusieurs fois visité les citoyens blessés, & n'ont négligé aucun des moyens nécessaires pour sauver la poudre, le salpêtre, le soufre, tous les objets enfin qui avoient échappé à l'explosion.

Cependant la Convention étoit le centre où tout aboutissoit; elle écouloit tous les rapports; elle prenoit ensuite les grandes mesures qui devoient porter en même temps du soulagement à tous les maux. A l'instant où elle faisoit une proclamation pour calmer, pour rassurer tous les esprits, elle ouvroit le trésor public pour réparer les pertes particulières; & ceux de nos frères qui ont succombé sous leurs blessures, ont du moins emporté l'idée consolante que la patrie les rangeoit au nombre de ses défenseurs, & que leurs familles avoient un droit acquis aux bienfaits de la République.

Vos comités se sont sur-tout pénétrés de l'esprit qui avoit dicté ce décret: ils ont eu remplir vos vœux les plus ardens, en prévenant son exécution; & dès hier les mesures

A a

Faut-il attribuer cet événement à l'imprudence? est-il l'effet du plus horrible des complots?

Si, d'un côté, des accidents trop communs dans les ateliers où se prépara la poudre, l'imensité de l'établissement que nous regardons, la grande quantité d'ouvriers qui y sont employés, semblent nous permettre d'accuser le sort de ce malheur; d'un autre côté, l'active perfidie qui nous poursuit & qui nous enveloppe, nous donne le droit de tout craindre & de tout soupçonner.

Les comités dont je suis l'organe veulent sans cesse pour pénétrer ce terrible mystère: ils écoutent avec une attention tendre tout ce qui peut avoir rapport à cet événement; ils font les plus profonds replis des cœurs & des consciences; mais ils n'ont encore, sur ce point, obtenu aucun résultat digne d'être mis sous vos yeux. Des déclarations leur ont été faites, quelquefois insignifiantes, quelques fois combattues par des déclarations contraires; le patriotisme inquiet remarque tout, rapproche tout; s'alarme de tout: vos comités sont les dépositaires fidèles de ces précieuses sollicitudes; mais vous avez le droit d'attendre qu'elles seront peccées avec sagesse, & j'ose dire que vos espérances ne seront pas déçues.

Dans ce moment, les comités se bornent à vous faire connaître les suites de ce funeste événement, & à vous présenter le tableau rapide de ce qui a été fait & de ce qui en est prêt à faire pour le réparer.

L'explosion a eu lieu à 7 heures & un quart: on assure qu'elle a commencé dans les greniers de la Liberté; c'est ce que semble indiquer la direction des arbres coupés & des bâtimens renversés.

Citoyens, vous n'apprendrez pas sans intérêt que la veille 50 milliers de poudre avoient été envoyés aux frontières, que les deux jours précédens il en étoit sorti 100 milliers, & que depuis trois mois il n'avoit pas existé moins de poudre dans la poudrerie qu'au moment de l'explosion.

Au premier bruit de ce funeste événement, les représentans du peuple se sont élancés à leur poste; plusieurs ont accouru sur le lieu même pour rassurer, pour secourir leurs

ont été prises pour que les secours pécuniaires fussent versés à l'instant, & que les maisons endommagées ou détruites fussent promptement relevées.

Justquici je n'ai parlé que de ce qu'avoient fait la Convention, les comités & les représentans du peuple; il est temps de vous faire connoître la conduite des sections de Paris.

Une impression générale de peine & de tristesse s'est d'abord manifestée; bientôt un mouvement rapide & unanime a porté tous nos concitoyens au lieu du désastre. Jamais on ne vit éclater plus de zèle & d'ardeur; jamais le patriotisme & l'humanité ne se manifestèrent par des traits plus touchans; & nous pouvons dire que, si quelques citoyens ont eu le bonheur de se rendre plus utiles, tous étoient accrus avec le même esprit. Le seul embarras des représentans du peuple étoit de contenir un zèle dont l'ardeur auroit pu devenir nuisible; mais la voix de la raison n'a pas un seul instant perdu son empire, & bientôt un simple cordon a suffi pour défendre l'enceinte qui renfermoit les citoyens en activité de service, & les objets qu'il falloit surveiller.

La force armée a rempli tout ce que vous étiez en droit d'attendre de cette ardeur infatigable qu'elle a tant de fois montrée. Les fonctionnaires publics de Paris & des communes voisines se sont tenus dans une continuelle surveillance. Les citoyens de toutes les sections porteroient ou envoioient en abondance des secours de toute espèce; & quoique nous nous soyons interdit de retracer en ce moment les traits particuliers de dévouement, nous ne pouvons cependant résister au désir de vous dire que tous les Invalides se sont empressés de céder aux blessés leur ayle, leurs maracas, & de porter l'aliment qu'ils alloient prendre à ceux qui étoient en état de le recevoir.

C'est à cet heureux concours de volontés & de sentimens que nous devons la conservation d'une forte partie de poudre, actuellement en sûreté à Meudon, ainsi que de tout le soufre & de tout le salpêtre qui étoient dans le magasin de Grenelle.

Mais quand je vous parle de ce que nous avons conservé, vos cœurs me demandent compte de ce que nous avons perdu.

Citoyens, ce n'est pas lorsqu'on parle à des républicains, lorsqu'on parle au nom de vos comités, qu'on peut chercher à déguiser ou à affaiblir des pertes; mais vous sentirez facilement que l'espoir fondé de rendre à la société une partie des blessés ne nous permet pas de fixer en cet instant le nombre des victimes; il me suffit d'annoncer qu'il est infiniment au-dessous de celui que la malveillance, qui grossit tout, qui empoisonne tout, se plaît à publier.

J'ai déjà observé que, depuis trois mois, il n'y avait pas eu moins de poudre dans la poudrerie. La perte en cette partie est légère; elle n'ôte rien à nos moyens d'attaque contre nos ennemis; Valenciennes & Condé nous en ont fourni dix fois plus que nous en avons perdu: aussi n'est-ce pas sur cet objet que pourra s'exercer la malveillance; elle répétera sans doute, avec complaisance, que l'établissement perdu ne se réparera jamais, ou du moins qu'il ne se réparera qu'avec une lenteur mortelle.

Je pourrais dire que le soldat républicain n'a pas besoin de poudre quand il a une baïonnette; cent actions l'ont assez prouvé: mais j'annonce hautement que les mesures sont prises pour que la fabrication des poudres ne soit pas ralentie; qu'elle sera distribuée sur plusieurs points dans des moulins déjà existants; que de nouvelles fabrications révolutionnaires succéderont aux anciennes dans des lieux éloignés de toute habitation; que de nouveaux mécanismes, qu'on venoit de perfectionner, vont économiser l'emploi des hommes; & qu'enfin, avant huit jours, le produit de la fabrication sera de niveau, peut-être supérieur à celui de la fabrication ancienne.

Rois, despotes, aristocrates, fanatiques de toute espèce, apprenez donc enfin à connoître cette nation dont le courage s'accroît dans le péril, dont le malheur centuple les ressources.

Les fages décrets que la Convention a rendus lier, celui qu'elle vient de rendre sur le rapport du comité des secours,

se hâtent à proposer, de la part des deux comités, qu'une mention honorable du zèle des citoyens de Paris & des communes environnantes.

D É C R E T

La Convention nationale, après avoir entendu le rapport de ses deux comités de sûreté générale & de salut public, décrète qu'il sera fait mention honorable du zèle que les citoyens de Paris & des communes environnantes ont manifesté dans la journée de l'explosion de la poudrerie de Grenelle.

Le présent décret & le rapport qui a précédé seront imprimés au bulletin, distribués & envoyés aux 48 sections de Paris.



DE L'IMPRIMERIE NATIONALE.

IMPERIAL DECREE OF OCTOBER 15, 1810 RELATIVE TO MANUFACTURING FACILITIES AND WORKSHOPS WHICH PRODUCE OFFENSIVE OR OBJECTIONABLE ODOURS

NAPOLEON, Emperor of the French, King of Italy, Protector of the Confederation of the Rhine, Mediator of the Swiss Confederation;

On the report by our Minister of the Interior;

In view of the complaints filed by various individuals against the manufacturing facilities and workshops whose operations produce offensive or objectionable odours;

The report compiled on these establishments by the chemical section of the Institute's physical sciences and mathematics department;

Recognised by our Committee of State;

We have DECREED AND DECREE as follows:

Article 1 of the decree of October 15, 1810

Effective upon publication of this decree, manufacturing facilities and workshops which produce offensive or objectionable odours require permission from the administrative authority to operate: these establishments shall be divided into three classes.

The first shall concern those which must be located far from private housing.

The second applies to manufacturing facilities and workshops whose location away from housing is not strictly necessary, but subject to confirmation that the operations conducted do not discomfort the landowners of the surrounding area, or cause damage".

The third corresponds to establishments that can be located near housing areas without problem, although are subject to monitoring by the police.

Article 2 of the decree of October 15, 1810

The permission required to establish manufacturing facilities or workshops of the first category shall be granted, with the formalities outlined hereinafter, by a decree established by our Committee of State.

Permission regarding establishments of the second class shall be granted by the prefects, by the advice of the sub-prefects.

Permissions for the operation of establishments located in the last class shall be granted by the sub-prefects, who will seek council with the mayors.

Article 3 of the decree of October 15, 1810

The permission for manufacturing facilities of the first class shall only be granted based on the following formalities:

The authorisation request shall be submitted to the prefect, and posted, by order, in all communities within a radius of five kilometres.

Within this period, any individual may oppose the decision.

The mayors of the communes concerned shall have the same right.

Article 4 of the decree of October 15, 1810

If opposition is voiced, the prefectural council shall give its notice, subject to the decision of the Committee of State.

Article 5 of the decree of October 15, 1810

If no opposition is voiced, permission shall be granted, if justified, based on the opinion of the prefect and the report of the Minister of the Interior.

Article 6 of the decree of October 15, 1810

Concerning soda fabrication facilities, or if the facility must be established in the jurisdiction of the customs authorities, our customs director shall be consulted.

Article 7 of the decree of October 15, 1810

Authorisation to operate manufacturing facilities and workshops of the second category shall be granted only after the following formalities have been fulfilled.

The entrepreneur shall first submit his request to the sub-prefect of his district, who will forward it to the mayor of the commune where the establishment is to operate, charging him to address questions relative to the commodo and incommodo decree. Once these procedures were complete, the sub-prefect drew up an order that was sent to the prefect. The prefect would then render a decision, subject to recourse to our Committee of State by all interested parties.

If opposition is voiced, it shall be ruled upon by the prefectural council, subject to recourse to the Committee of State.

Article 8 of the decree of October 15, 1810

The manufacturing facilities or establishments placed in the third category may not operate without the permission of the Chief of Police, in Paris, and without the permission of the mayor in other cities.

If there are claims against the decision made by the Chief of Police or the mayors, relative to a request for operation by manufacturing facility or workshop, they shall be judged by the prefectural council.

Article 9 of the decree of October 15, 1810

The local authority shall indicate the location where the manufacturing facilities or workshops of the first category may operate, and shall specify its distance from private dwellings. Any individual erecting

constructions in the immediate area of these manufacturing facilities and workshops once their implantation has been granted, shall no longer be able to request their removal.

Article 10 of the decree of October 15, 1810

The triple breakdown of facilities that produce offensive or objectionable odours shall be performed in accordance with the table in the appendix hereto. It shall be used as a guide when ruling on requests relative to the installation of these establishments.

Article 11 of the decree of October 15, 1810

The provisions of this decree shall not be applied retroactively: in consequence thereof, all establishments that are currently active shall continue to operate freely, excluding damages, for which the entrepreneurs may be liable, that prejudicially affect the property of their neighbours; damages shall be arbitrated by the courts.

Article 12 of the decree of October 15, 1810

However, in the event of serious consequences for public health, crops, or general interest, the manufacturing facilities and workshops of the first category which cause them may be removed, under the authority of a decree by the Committee of State, after having heard the local police, consulted the prefects, and heard the defence of the manufacturers.

Article 13 of the decree of October 15, 1810

The establishments mentioned in article 11 shall no longer benefit from this advantage upon transfer to another location, or they shall shut down their operations for a period of six months. In either case, they shall be considered as newly-created establishments and may resume activity after having once again obtained permission, if required.

Article 14 of the decree of October 15, 1810

Our Ministers of the Interior and the police, are responsible for the enforcement of this decree, within the scope of their duties, which shall be included in the collection of laws.

NAPOLEON

By the Emperor:

Minister Secretary of State,

H. B. DUC DE BASSANO

APPENDIX:
**NOMENCLATURE OF MANUFACTURING FACILITIES, ESTABLISHMENTS AND WORKSHOPS
 PRODUCING AN OFFENSIVE OR OBJECTIONABLE ODOUR, THE INSTALLATION OF WHICH CANNOT
 TAKE PLACE WITHOUT AUTHORISATION FROM THE ADMINISTRATIVE AUTHORITY**

Establishments and Workshops that can no longer operate near private dwellings, and whose creation requires authorisation from the Minister of the Interior.

Starch manufacturers	Lime-burning kilns
Explosives manufacturers	Hog farms
Prussian blue	Sewage powder
Tripe houses	Hemp retting
Purified mineral coal	Ammonium chloride
Purified mineral coal	Artificial soda
Scavengers	Taffeta and varnished cloth
Glue	Slaughterhouses
Musical instrument string	Carbonised sod
Linen cloth manufacturers	Tripe processors
Rendering works	Scalding vats
Etching, sulphuric acid, etc.	Patent leathers
Brown tallow	Paperboard makers
Menagerie	Varnish manufacturers
Minium	Neat's foot or horn oil
Gypsum kilns	

Establishments and workshops whose location away from housing is not strictly necessary, but subject to confirmation that the operations conducted do not discomfort the landowners of the surrounding area, or cause damage. Prefectoral authorisation is required for these establishments to operate.

Ceruse	White tallow
Candlesticks	Ivory black
Curriers	Lamp black
Blanket manufacturers	Lead works
Green hide depots	Lead shot
Brandy distillery	Dissection halls
Metal foundries	Tobacco manufacturers
Refining of metals in a cupola furnace	Silk oilcloths
	Cow barns

Establishments or workshops which can operate near private dwelling without problem, requiring only permission from the Sub-Prefect.

Alum	Printing characters
Buttons	Metal gilders
Breweries	Wallpapers
Wax producers	Soap manufacturers, etc.
Parchment and starch adhesive	Vitriols
Transparent horns	

Certified correct:

Minister Secretary of State,

H. B. DUC DE BASSANO