59 On Her Majesty's Service

WASC 159

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FREDERIKSVÆRK C.P.
MUSEUM DOCUMENTS

E 161
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Cherish the past

Adorn the present

Create for the future

THE FAVERSHAM SOCIETY

Your Ref.: WAA/105/04 Our Ref.: CM4 *From the* Hon Secretary
42 Newton Road
26 July 1970 Faversham 3261 Faversham: Kent

Malcolm McLaren, Esq
Head of Information Service
ERDE
Waltham Abbey: Essex

+ HAGLEY & FREDERIKSVAERK

Dear Mr McLaren,

Apprentices - Smeaton drawings

Thank you very much for your letter of 2 July with the enclosure sent under separate cover. I am sorry I have not acknowledged this more promptly, but one of my Saturdays has been devoted to our annual Gunpowder Fete!

I am glad the apprentices got all they wanted. It is good news that a model of one of the Waltham Abbey mills is to be constructed for your historical collection and I hope I shall be able to see this when it is completed. I think my wife and daughter thoroughly enjoyed the visit. Certainly the Mills are very much a feature of little Helen's life and she will probably grow up with the idea that everywhere has its own Mills, just as everywhere has its own Park and Station!

The news about the Smeaton drawings and the Faversham maps is very exciting. We would certainly like photographs or photocopies of all these and will be pleased to meet any necessary cost. Another possible source of material is the Royal Society of Arts, but alas! I have no time for proper research these days.

I am not sure whether you are in touch with the Hagley Mills at Wilmington or the Gunpowder Museum at Frederiksvaerk and as I am writing to both this weekend I am sending them copies of this letter so that they can establish contact if this does not already exist. We recently saw Mr Ferguson of Hagley, and they are planning to reconstruct one of their mills. He made the point that the interest of the Chart Mills would be greater still if we could connect them with some famous engineer. I said that I imagined that the designs just evolved, but I did mention the Smeaton drawings and I suppose that somewhere there may be something similar for Faversham.

The two addresses in case you want them are Mr Eugene S Ferguson, Curator of Technology, The Hagley Museum, Greenwille, Wilmington, Delware 19807, USA and Mr Egon Eriksen, Curator, Tøjhusmuseet, 1220 København K, Frederiksholms Kanal 29, Denmark.

Kind regards,
Yours sincerely,

Arthur Percival

MAZBa 159

TP 2105

Title page;

The Arms Museum.

Gunpowder Mill Museum.

Frederiks Mill.

Heading of landscape picture is Frederiks Mill.

Gunpowder Mill - History

Owner: 1756-1761 Just Fabritius & J.F. Classen,
1761-1768 The State, 1768-1792 Classen,
1792-1846 The Royal Family, 1846-1965 again
the State (Army Gunpowder Mill)

Production; Black gunpowder during the whole life of the mill, brown prismatic gunpowder from 1884 until about 1900, smokeless nitro-powder 1890-1965 & also hunting cartridges 1919-1965.

Means of production: Water power only 1756-1886, then steam power driving a 25 H.P. engine. After 1920 electric motors were introduced. The ingredients of the black gunpowder were processed in stamping mills until the 1860s, after which rolling and pressing was used.

Production capacity for black gunpowder was yearly about 200 tons average until the introduction of smokeless gunpowder, but was in 1940/41 still 32 tons.

Printed by Aug. Olsens Successors, Book-printing Works, Hellerup.

8. Powder grains & sieve house built 1862. Hand & motor sieves for final grading of gunpowder quality & rejection of dust & lumps.

9. Composition warehouse, built 1894 for storage of finished gunpowder before it was conveyed to the gunpowder towers outside Frederiks Mill. Temporarily closed.

4. Mixing mill built 1862. Two rotary drums, one for "binary" mixing of charcoal plus sulphur & charcoal plus saltpetre (nitre) & one for "ternary" mixing of the two foregoing mixtures to make gunpowder (saltpetre plus charcoal plus sulphur).

3. Composition warehouse, built 1895 for storage of half-finished gunpowder, until it could be further processed in the next mill. Temporarily closed.

2B. Pulverising mill, built 1889. Rotary drum for pulverising of sulphur and wood charcoal separately.

2A. Gunpowder. Its invention, production, history & geography.

7. Drying house, built 1889, originally a gunpowder press--mill. Shelves with drying-trays, for gunpowder.

History of the Gunpowder Mill in pictures and cards.

6. Polishing mill with a Poncelet waterwheel of about 1850, The mill was built in 1888. Four rotary drums, driven by a water-wheel, for polishing gunpowder grains to make them shiny and hard.

continued.

5. Grain mill, built 1862, with a Lefebvre vibrating grain machine of 1854, originally driven by a waterwheel. Gunpowder cake was broken & pressed between copper & brass sieves and formed and graded thus into large & small grains of gunpowder for cannons, rifles etc.

10. Toilets, erected 1968.

1. Ticket &/post-card sales in former gunpowder magazine, Built around 1840.

Note: IT WILL PROBABLY BE PREFERABLE TO USE THE WORD "MAGAZINE" WHERE "WAREHOUSE" APPEARS.

D E N M A R K
SWEDEN
KØBENHAVN (COPENHAGEN)
Malmö
Hälsingborg
Helsingør
Landskrona
Ängelholm
Laholmsbukten
Skälderviken
Kattegat
Sjællands Odde
Isefjord
Sejerø Bugt
Kalundborg
Holbæk
Roskilde
Køge
Køge Bugt
Ringsted
Slagelse
Korsør
Skælskør
Næstved
Store Heddinge
Stevns Klint
Fakse
Fakse Bugt
Vordingborg
Stege
Møns Klint
MØN
Smålandsfarvandet
SJÆLLAND (ZEALAND)
FREDERIKSBORG
HOLBÆK
SORØ
STORE BÆLT
Samsø
Samsø Bælt
Århus
Ebeltoft
Grenå
Randers Fjord
Djursland
Odense
Nyborg
Kerteminde
Svendborg
Fåborg
Rudkøbing
Marstal
Ærø
FUNEN
LANGELAND
Langelands Bælt
LOLLAND
FALSTER
Nakskov
Maribo
Nykøbing
Rødby
Gedser
Femer Bælt
Fehmarn
Heiligenhafen
Oldenburg
Preetz
KIELER BUCHT
MECKLENBURGER BUCHT
BORNHOLM (To Denmark)
Rønne
Allinge
Nexø
Åkirkeby
Svaneke
Christiansø
E
30′
F Longitude East 11° of Greenwich
G
30′
H
12°
P
15° East
R
5°
J
30′
K
16
17
18
19
20
21
4
6
7
12
56°
55°
61°
60°
59°

To lessen the risk of accidents, the gunpowder mill was built as a number of small, well-spaced buildings. During the 1800s, tree-covered ramparts were added between the buildings which were later constructed with solid walls on three sides and a much thinner fourth wall and roof. This design led the air pressure and flying debris out- and upwards toward the ramparts and the trees when a mill exploded.

Accidents did happen, and throughout the 200 years the mill was in operation they cost some 25 workers their lives and many others their health.

Denmark's *armed forces* were the mill's largest customer, but it also produced gunpowder for civilian purposes throughout its lifetime. This commercial gunpowder and the more peaceful use of gunpowder products for *hunting* and *fireworks* are also documented in the exhibitions.

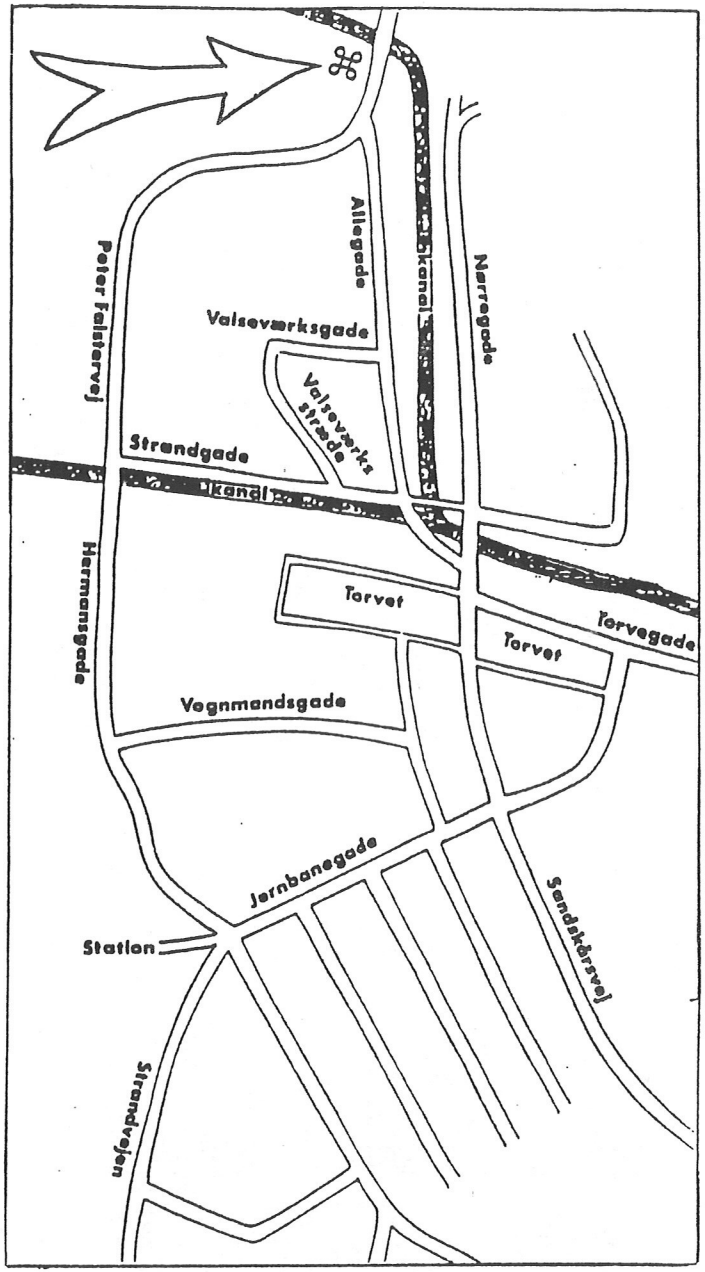
Opening times:
7 June - 15 September Tuesday to Sunday, 12.00-16.00
and second week in October.

Admission:
Adults DKK 20.00, children below 16 years are free.
Discount for parties of more than 10.

For further information, please contact:
Frederiksværkegnens Museum
Jernbanegade 4, DK 3300 Frederiksværk, Denmark.
Tel: + 45 47 72 06 05
Fax: + 45 47 72 06 93

Half and hour before closing-time the
sale of tickets is stopped.

"Print: Frederiksværk Kommune, own print".



The Gunpowder Mill Museum

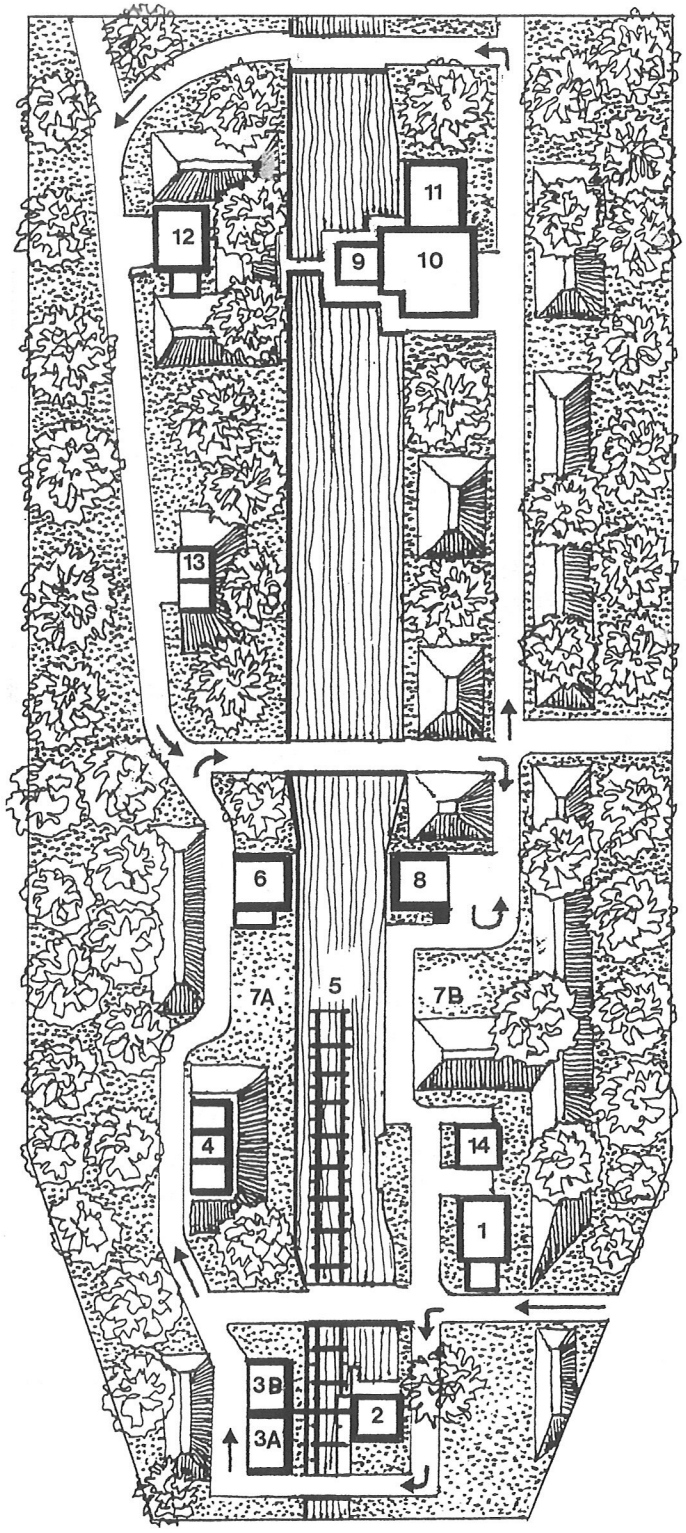
Krudtværksalléen 1
Frederiksværk

WASC 159
Received
from
Kristian
Venzen
Museum
Guide Dec. 2005

ill.: Jørgen Levinser

Tour of the Gunpowder Mill Museum

1. *Ticket sales* and *introductory exhibition* in powder storehouse from approx. 1840.
2. 'Holger Danske' *water turbine* from 1889 in reconstructed building. The turbine supplies 8 hp and drives the pulverizing drum in Building 3B.
3A-B. Erected in 1889 to house the mixing mills.
3A. *Exhibition* on the invention of gunpowder, the raw materials and their origins and the use of gunpowder in war.
3B. The building contains a *rotating drum* for pulverizing the raw materials. Saltpetre, charcoal and sulphur were crushed in separate drums.
4. *Powder magazine* built around 1895 for the storage of semi-finished gunpowder.
5. Demolished. The building was located at the end of the water tank (the millrace) and housed a *breast wheel* which supplied 8-9 hp and drove the machines in Buildings 6, 7A-B and 8.
6. *Mixing mill* with two rotating drums, built around 1862. The first was used for the 'binary' mixing of charcoal+sulphur or charcoal+saltpetre respectively. The second was used for the 'ternary' mixing of the two compounds to form ground gunpowder. In the left corner is a small *incorporating mill* used to knead and press the ground powder into gunpowder cakes.
7A-B. Demolished. Both buildings once housed *incorporating mills*.
8. *Corning mill*, built in 1862, with Lefèbvre swing corning machine from 1854, originally driven by the water wheel (5). The powder cakes are crushed by a wooden disc and pressed through different sieves to create powder grains of required sizes.
9. Poncelet *undershot water-wheel* from around 1850 (restored in 1995). Provides 8-9 hp and drives the drums in Building 10 and originally also the machinery in Building 12.
10. *Polishing mill* from 1888 with rotating barrels for glazing the powder grains.
11. Built in 1889 as a powder pressing mill, now a *gunpowder drying room* with an *exhibition* on gunpowder for civilian use (hunting, fireworks, etc.).
12. *Corning and sorting house*, built in 1862, with manual and motor-driven gunpowder sieves for the final sorting of the different types of powder, removal of dust, etc.
13. *Powder magazine* built in 1894 and used to store finished gunpowder before it was taken to the magazines outside the town.
14. *Lavatory building* from 1969.



The Gunpowder Mill Museum in Frederiksværk

In 1965, the Danish state closed down its gunpowder mill in Frederiksværk after more than 200 years of operation. The mill was set up by *General Classen* in 1756-58, and together with a cannon foundry it gave rise to the birth of the town around it. The closing of the mill meant the end of the dangerous profession of the gunpowder-makers, a nearly 500-year-old Danish tradition.

Parts of the gunpowder mill have been turned into an *open-air museum* - just a stone's throw from the town's pedestrian street. The museum has about 10 buildings, all some 100-150 years old. These include several of the old black powder mills, along with a working water mill, in which the original machinery, equipment and other fixtures and fittings remain intact. The museum's exhibitions and its location near the canal mean that it provides a good insight into early industry in Denmark.

A visit to the Gunpowder Mill Museum begins in the old half-timbered powder storehouse where tickets are on sale. The building also houses an exhibition on the early water-power-based industry in Denmark and the growth of the small factory society which came to be known as *Frederiks-værk*. Visitors can follow the many stages of production, from raw materials to black powder, on a large interactive model of the museum.

From Building 1, the tour continues round the back of Building 2 with the water turbine to the wooden bridge across the approximately 45-metre long 'millrace'. As the water surges past below the bridge, it is easy to see why it was once such an important source of power. Ahead is the spinning axle which guides the water power from the turbine to the other side of the canal where wheels and belts feed the pulverizing mill with 'free' horsepower.

In Building 3A on the south side of the canal, an exhibition on the invention of gunpowder and the origins of the raw materials used in its production highlights links with earlier times and faraway places. The military uses of gunpowder and the horrors of war are illustrated in a section dealing with the bombing of Copenhagen in 1807.

The rest of the tour around the buildings follows the different *production stages* in which the raw materials are prepared and mixed to form ground gunpowder which is then pressed, corned, glazed and dried to produce the final, sorted gunpowder. The machinery in several of the buildings is still working, driven by water power or electric motors from the 1920s.

The gunpowder mill was a dangerous place to work. Dotted around the museum are reminders of the many *risks* which faced the gunpowder-makers, and the safety measures intended to prevent and contain accidents. The workers had to wear rush shoes to avoid bringing dirt and gravel on to the dangerous gunpowder dust on the floor - these shoes can still be seen in the mills. By the doors are the earthed metal balls they had to grip in order to discharge any static electricity. Fire fighting equipment and signs listing strict safety guidelines stress the gravity and danger.

the wooden roofs and the thin wood and glass of the fourth wall out towards the rampart and the tree crowns.

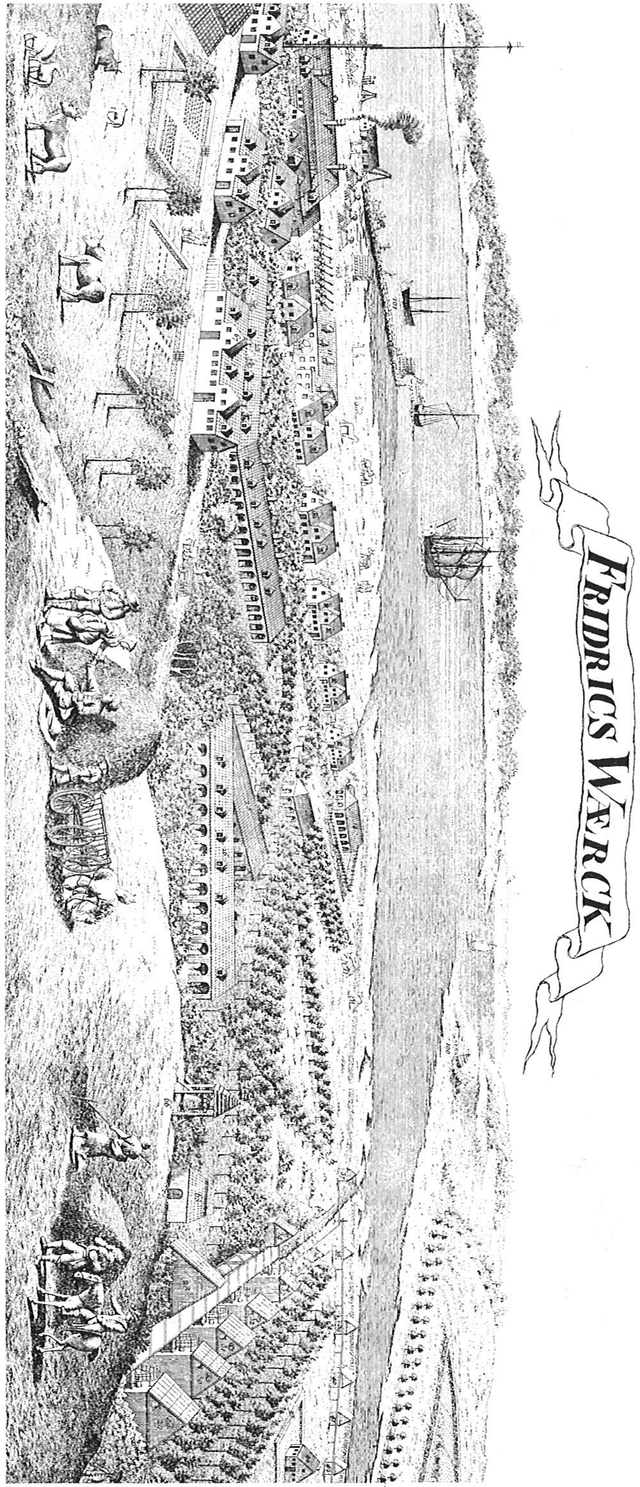
The history of the Gunpowder Factory is not forgotten in the midst of technical reading about powder production. In the drying room of house No. 7, at the water mill, we find on a wall a relief of general Classen under an enlargement of Winckler's famous engraving of Frederiksværk and pictures of directors and workers from the Army's Gunpowder Factory.

If the visitor is at the museum at closing time he will be reminded of it by hearing the tolling of general Classen's old powder-mill bell, one of the many bells that were placed on the mills, tolling all day long while the work was being done. The bell is suspended from an old bell-frame from the director's no longer existing garden.

The History of the Gunpowder-Mill

1756, 25/8	Royal decree concerning the establishment of a gunpowder-mill at the Arresø drainage canal. General J. F. Classen and Just Fabritius, merchant, were founders and owners.
1757	The first powder-mill is built.
1758, 24/8	The first explosion in the factory. The powder-mills were stamp mills with water wheels.
1761–68	The factory was government property. Classen was director.
1768–92	The factory again Classen's property, but had the government as guaranteed principal purchaser of the production (cannon, powder and balls).
1792, 24/3	General Classen dies, and is buried in Vinderød church. The Classen Trust is established.
1794–1846	The factory is the property of the royal family.
1844	The first steam engine is installed.
1846–1965	The factory is again government property.
1868	The last stamp mills disappear, and are replaced by incorporation mills and presses.
1887	Brown, prismatic powder is, for the first time, supplied for the new, breech-loading cannon.
1891	Smokeless guncotton powder is produced for the first time at the factory.
1916	A guncotton factory is established.
1919	A production of shot shells is started, but the production of black powder is continued till the last day, for making fireworks and explosives.
1965	The factory is closed down.

Aug. Olsens Eftf., Hellerup



WASC

TØJHUSMUSEET

(THE ROYAL ARSENAL MUSEUM)

THE GUNPOWDER-MILL MUSEUM

Frederiksværk

Open from April 1st to October 31st, daily from 11–17

1. *Ticket and picture postcard sale in, what was originally, a powder magazine from about 1840.*

2 A. *The invention, production, and history of gunpowder.*

2 B. *Pulverizing mill, built 1889. Rotating drum for pulverizing sulphur and charcoal separately.*

3. *Ignition powder magazine, built about 1895, for storing semi-manufactured powder till it could be treated further in the next mill. Closed temporarily.*

4. *Mixing mill, built 1862. Two rotating drums, one for binary mixing of charcoal + sulphur and charcoal + saltpetre, and one for ternary mixing of the two foregoing compounds into gunpowder (saltpetre + charcoal + sulphur).*

5. *Grain mill, built 1862, with Lefebvre swing grain machine from 1854, originally driven by a water wheel. The powder cakes were chrushed and pressed through sieves of copper and brass, thereby being shaped and sorted out to large and small powder grains for cannon, rifles etc.*

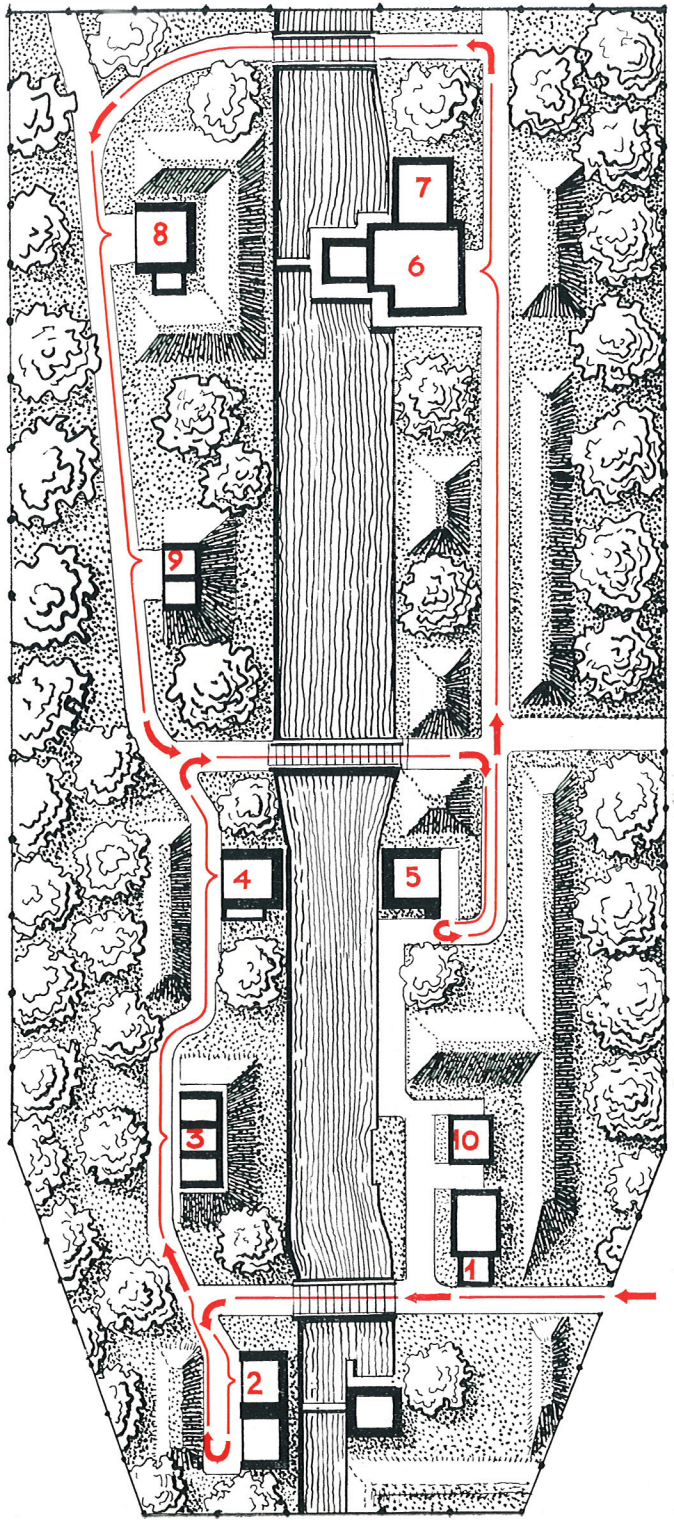
6. *Polishing mill with Poncelet water wheel from about 1850, built 1888. Four rotating drums, driven by the water wheel, for polishing the powder grains so as to make them bright and hard.*

7. *Drying room, built 1889, originally as a powder pressing mill. Shelves with drying trays for powder. The history of the Gunpowder Factory in pictures and plans.*

8. *Graining and sieving house, built 1862. Hand and motor operated sieves for final sorting of the various kinds of powder and separating off dust and impurities.*

9. *Ignition powder magazine, built 1894, for storing finished powder, before it was taken to the powder towers round Frederiksværk. Closed temporarily.*

10. *Lavatory house, built 1968.*



The Gunpowder-Mill Museum at Frederiksværk

In 1965 the army's gunpowder-mill at Frederiksværk discontinued operations. That was the end of the powder-mill founded by general J. F. Classen in 1756–58, and a nearly 500 years old, Danish trade, the gunpowder maker's dangerous work ceased to exist.

Several of the old blackpowder-mills with their workshops remain, together with a working water mill, all of them with their original drums, machinery and tools. With the canal and its bridges these, about a century old, buildings now form the Gunpowder-mill Museum.

A visit to the museum starts at Frederik VI's old timber-frame powder magazine, where tickets are bought. You walk across the new concrete bridge which spans the canal. The bridge was built particularly high with a view to plans for a future reconstruction of the turbine plant, which stood here in former days. In house No. 2 A, on the south side of the canal, the visitor will become acquainted with the history of gunpowder from about the year 1200 till our time, whereupon the composition and manufacturing processes of powder are shown by means of diagrams and copies of old powder-mill drawings, supplemented with samples of the three innocent constituents, saltpetre, sulphur, and charcoal, as well as the dangerous compound, the black powder.

The visitor may now proceed to the mills, most of which are open. Pulverizing, mixing and polishing drums can still work, operated by the water wheel, mentioned in the foregoing, and by electric motors from the nineteen hundred and twenties. The machines run idly, however, because powder is no longer being produced.

Everywhere will be found evidence of the danger that threatened the workers and employees of the factory, and the safety appliances used. In the mills are found the rush shoes they had to put on so as not to bring in gravel on the dangerous gunpowder dust that might be found on the floors. At the door is seen the earth-connected metal ball they had to clutch in order to discharge static electricity. Sign boards from Classen's days strictly forbidding cursing and swearing, and more modern notices with instructions in case of fire accentuate the seriousness. Explosions occurred, nevertheless, the first in 1758 and the last in 1957. The forest trees that were planted and the ramparts were intended in such cases to reduce the effect, and the three thick walls of the mill houses were to conduct explosions through

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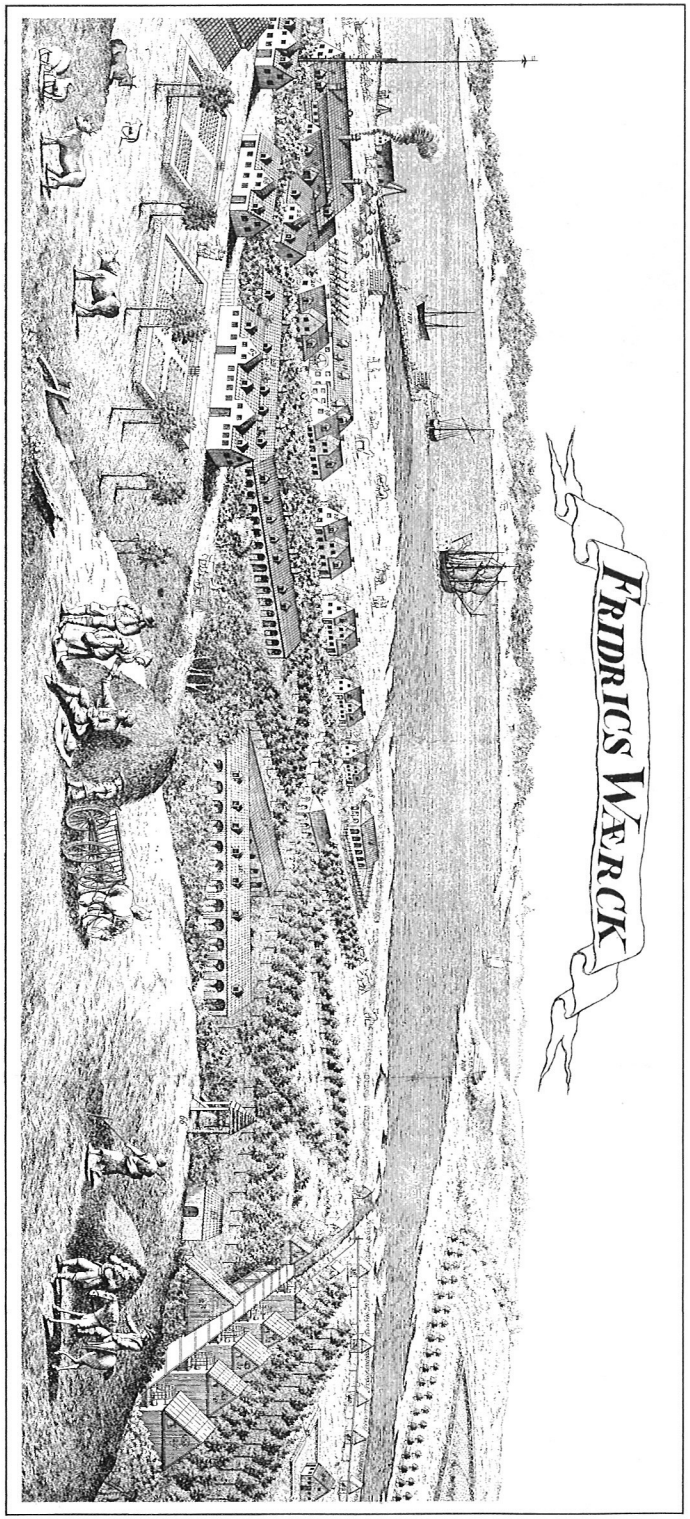
WASC 159



Krudtværkets historie

Ejere: 1756—1761 Just Fabritius og J. F. Classen, 1761—1768 staten, 1768—1792 Classen, 1792—1846 kongefamilien, 1846—1965 atter staten (Hærens Krudtværk).

Produktion: Sortkrudt i hele værkets tid, brunt prismatisk krudt 1884— ca. 1900, røgsvagt skydebomuldskrudt 1890—1965 samt jagtpatroner 1919—1965

Produktionsmidler: Vandkraft enerådende 1756—1886, da dampkraft toges i brug med en 25 HK maskine. Efter 1920 indførtes elektriske motorer. Sortkrudtet stampedes i stampemøller lige til 1860'erne, hvorefter det valsedes og pressedes.

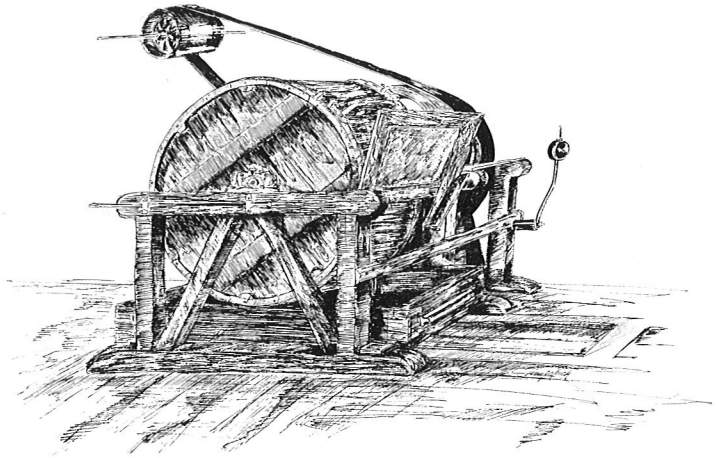
Produktionsstørrelse for sortkrudt var årligt ca. 200 tons gennemsnitligt til indførelsen af røgsvagt krudt, men var i 1940/41 endnu 32 tons.

Aug. Olsens Eftf. Bogtrykkeri, Hellerup

TØJHUSMUSEET

KRUDTVÆRKS MUSEET

Frederiksværk



8. *Korne- og sigtehus, bygget 1862. Hånd- og motorsigter til endelig sortering af krudtsorterne og frasigtning af støv og skaller.*

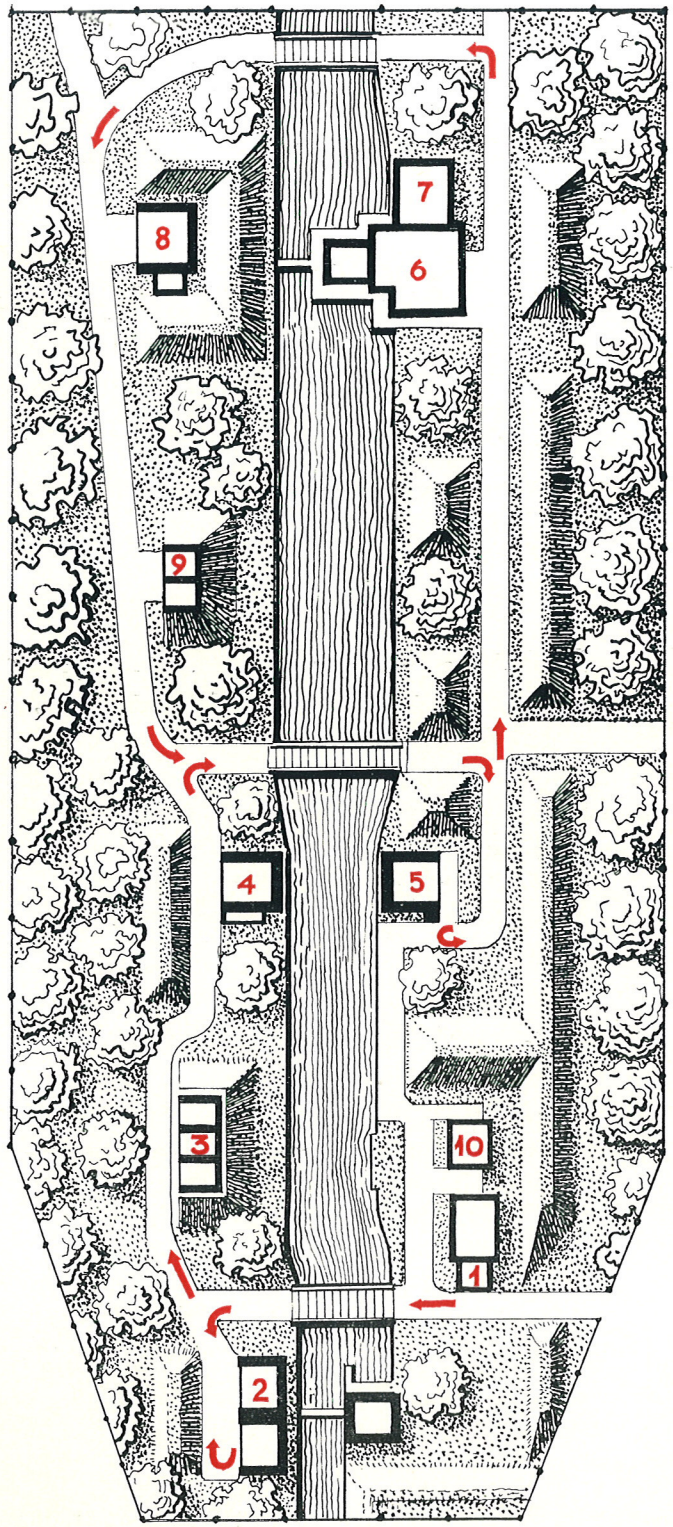
9. *Satsmagasin, bygget 1894, til opbevaring af færdigt krudt, før det førtes til krudttårnene uden om Frederiksværk. Midlertidigt lukket.*

4. *Blandingsmølle, bygget 1862. To roterende tromler, en til »binær« blanding af kul + svovl og kul + salpeter, og en til »ternær« blanding af de to foregående blandinger til krudt (salpeter + kul + svovl).*

3. *Satsmagasin, bygget ca. 1895, til opbevaring af halvfærdigt krudt, indtil det kunne blive videre-behandlet i næste mølle. Midlertidigt lukket.*

2 B. *Pulveriseringsmølle, bygget 1889. Roterende tromle til pulverisering af svovl og trækul hver for sig.*

2 A. *Krudtets opfindelse, fremstilling, historie og geografi.*



7. *Tørrestue, bygget 1889, oprindelig som krudt-pressemølle. Reol med tørrebakker til krudt. Krudtværkets historie i billeder og kort.*

6. *Polérmølle med Poncelet'sk vandhjul fra ca. 1850, bygget 1888. Fire roterende tromler, drevet af vandhjulet, til polering af krudtkornene, så de blev blanke og hårde.*

5. *Kornemølle, bygget 1862, med Lefebvre'sk svingkornemaskine fra 1854, oprindelig drevet af et vandhjul. Krudtkagerne knustes og pressedes gennem kobber- og messingsigter og formedes og sorteredes derved til store og små krudtkorn til kanoner, geværer o. s. v.*

10. *Toiletbygning, opført 1968.*

1. *Billet- og kortsalg i oprindeligt krudtmagasin fra ca. 1840.*