Pentonville Cell drawing (signed Major Jebb c.1840): warm air (right) and foul air flues (left) with wash basin and WC; lighting by gas.

HISTORIC PRISONS
IN GREAT BRITAIN AND THE UNITED STATES
NOTES ON ENGINEERING SERVICES

BRIAN ROBERTS
MARSHALSEA PRISON, SOUTH LONDON
BOROUGH OF SOUTHWARK

1373-1842: originally a notorious private prison subjecting debtors to an extortion racket before being taken over and closed by the Government. Demolished in 1870.
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Prisoners on the tread wheels at Coldbath Fields Prison in London.

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BMR, Budleigh Salterton 2021.
GAOLERS, NEWGATE PRISON, CITY OF LONDON
Convicts working the treadwheel, c.1870s.
COUNTY GAOL, BODMIN, CORNWALL

1799: John Call's early plan for a County Gaol. Both plans show closets, baths and ovens.
HORFIELD PRISON, BRISTOL

1883: Wing shown originally for women prisoners. Now Bishopston Prison. Note the unusual external window shading devices.
1921: Cost £52,000, 175 prisoners. Picture centre- Laundry with chimney stack.

The Nursery with heating from an open (guarded) fireplace (left).
BRIXTON PRISON, SOUTH LONDON

Originally the Surrey House of Correction at Brixton, this prison was built by Thomas Chawner (the County Surveyor) at a cost of nearly £52,000, opening in 1821. It was designed to accommodate 175 prisoners. The governor’s octagonal house is all that survives of the original, being located so as to be able to monitor the prisoners working on treadwheels.

In 1853 transportation of female convicts to Australia ended. Previously they had been kept in Millbank prior to embarkation. To deal with this problem, the Government purchased the former Surrey House of Correction. Two new wings were erected, 4 storeys high, 15 window bays long, each wing containing 212 corrugated-iron sleeping cells. The cells shared one window between two, opening onto a central corridor, the upper floor being reached by galleries. Water closets and slop basins were located in the body of the cells, halfway along each side. (All this seems remarkably similar to Chatham, right down to the corrugated-iron cells).

Details of the heating and ventilating have not so far been discovered but a contemporary illustration shows a solid-fuel warm air stove on the floor of the central hall, with a number of the female convicts sitting close by.

The Ironing Room with gas lighting (right-hand wall).
CONVICT PRISON, CHATHAM, KENT

1856: Cells were constructed of corrugated iron (The Illustrated London News, 9 March 1861).

Josiah Jebb’s T-shaped block plan (Extended in 1866 by addition of a new cell block).
When the use of the infamous hulks (prison ships) was discontinued it more or less coincided with the introduction of penal servitude. In 1856, a public-works prison was opened on St Mary’s Island at Chatham. Prisoners previously held on the Defence and Warrior hulks, who were employed in the Royal Arsenal & Dockyard at Woolwich, were transferred to the new prison.

The design of Chatham Prison is attributable to Joshua Jebb. The main building was T-shaped in plan and had 3 wings radiating from a central hall. Internally, it had 4 storeys of galleried cells capable of housing 1135 prisoners. The cells were constructed of corrugated-iron. The front elevation of the north and south wings comprised of 36 window bays in length, each window being shared by two sleeping cells. The water closets were situated midway along each wing, but on one side only.

The scheme of heating and ventilating shows some of the ideas employed by Jebb, when working with G & J Haden, on Pentonville Prison in 1840. Chatham has basement fresh air intake tunnels feeding to a heater at floor level in the main hall (the heating apparatus was in the basement at Pentonville). Warmed fresh air was drawn into the cells through low level inlets, with foul air exhausted at high level into main foul air ducts in the roof space. There are also inlet ventilation louvres shown in the longitudinal section at roof level (right) and the horizontal foul-air ducts appear to connect to the central roof exhaust tower. No fire or steam coils are shown in the exhaust system drawings, but may have been used to assist the discharge of foul air.

Chatham was extended in 1866 when a new cell block was added, partly employing brick in place of corrugated iron. In 1870, a further wing for an additional 250 inmates was erected.
Convicts at hard labour operating the water-engine, c.1810.
HOLLOWAY PRISON, WEST LONDON

Photograph of 1896.

Undated Victorian photograph.
"At Lewes, where four boilers were ordered in March 1852 (from G & J Haden) a total of £1814 3s was spent on ventilation and hot water apparatus". The Haden system required one or more plenum towers for the waste air flues.
NEWGATE PRISON, LONDON
CITY OF LONDON

Drawing of 1777.

The interiors were poorly lit and badly ventilated.
NEWGATE PRISON, LONDON
CITY OF LONDON

Male wing built 1859, photograph c.1900 (after prison was closed).
PENTONVILLE PRISON, NORTH LONDON

Isometric drawing, c.1844, signed by Major Jebb.

Details of the Haden heating and ventilating system. The title block shows Jebb, now a Lt-Colonel.
The Central Hall (The Illustrated London News, 7 January 1843).
Within these walls
by Ken Dale

The model prison at Pentonville, built by Sir Joshua Jebb in the mid-19th century, is undergoing refurbishment. Ken Dale looks at the building services engineering of this pioneering structure.

With Christmas approaching, it may seem an inappropriate time to celebrate the 150th anniversary of the building of a prison. The excuse for doing so is to bring to the attention of present day building services engineers the work of a remarkable Victorian engineer, Sir Joshua Jebb.

The prison which he designed and built at Pentonville is still in use today. Modifications are now in progress and so Pentonville is likely to remain in use, basically as Jebb conceived it, for many decades to come.

Pentonville model prison and Jebb

Jebb, at the time a Major in the Royal Engineers, selected the site in 1849. He then produced the designs for the prison, including its building services, and supervised the construction and commissioning. The building was complete by September 1852, and was first occupied on 21 December of that year.

The 500-inmate prison became known as the Model Prison, and the model was used at home and abroad. Jebb himself oversaw the building of many similar prisons and after the first prisoners were installed at Pentonville, Jebb became chairman of directors of convict prisons. In 1859 he was knighted for his work.

Jebb’s report on the building of Pentonville and its first two years of operation forms the basis for this article. It was translated into French and German and was widely read by prison reformers in America.

The total area of the site was about six acres, with a garden at the rear. Four cell blocks, three stories high, radiated from a central hall behind the chapel. Each cell block had 175 cells, rising to a height of 6 feet.

A fourth storey was later added to the cell blocks, increasing the capacity to about 1,150 individual cells, and cellitory lights were incorporated into the new roofs. The building works increased the extent of the site to around 10 acres.

Besides the chapel there were houses for the governor, chaplains, 19 prison officers, a schoolmaster, a clerk of works and an engineer. Eight bathrooms, a kitchen, medical facilities, offices, library, store rooms and heating plant rooms were also provided.

The whole complex cost around £90,000, which, with £1 in 1841 being equivalent to £58.85 nowadays, works out at £1,500,000 at 1992 prices. Price per cell was £167, or £649 per cell at 1992 prices.

The building services element of the cost of the works was somewhere between £10,500 and £11,000 (£27,500 at 1992 prices), of 12% of the total cost.

Heating and ventilation

One of the major concerns of services engineers nowadays is that of indoor air quality. Jebb was very concerned about this; he was firmly convinced that the quality of ventilation of a cell had a direct influence on the health of a prisoner, and was therefore one of the most important factors in prison design.

He also felt that the warming of cells was necessary and inseparably connected with ventilation. His peers at the time were not convinced.

One, a certain Captain Williams, wrote a letter to Jebb in which he criticized him "for applying the luxury of heat to prisoners' sleeping quarters, the more especial-

by as the greater portion of the honest population in the country neither experience the want nor enjoy the possession of such advantage." Jebb, however, felt that it was neither difficult nor expensive to provide warming and ventilation, and recommended it for all new prisons.

The main objects of his design were:

- to withdraw a stated quantity of foul air from each cell — 30 cm3/14 (21 Stuttgart);
- the supply of an equal quantity of fresh air without causing draught;
- to find the means of warming the air when necessary, without "injuring the quality or affecting its hygrometrical condition" (52-60°F, ie 11-15°C, to be maintained in cold weather);
- that the air channels and flues should not be a means of communication between prisoners.

Jebb consulted Hadens of Trowbridge, and with them developed an apparatus for warming the air. A system of flues was designed (Figure 1) to allow outside air, warmed or not as necessary, to be introduced into each cell at high level. An extract grille was placed at low level in each

Author Ken Dale OBE was CIBSE President in 1974 and a member of the Heritage Group.
PENTONVILLE PRISON, NORTH LONDON

Figure 1: Jebb's design for the heating and ventilation involved a network of flues.

Washing and sanitary facilities
George IV (1820-1830) required that warm and cold basins should be introduced into all prisons. Jebb provided eight basins, enough to bathe 32 prisoners in an hour. Each prisoner bathed once a fortnight.

Surprisingly, perhaps, Jebb also provided a wash hand basin and a strong glazed earthenware pan (wc) in each cell. As figure 2 shows, water (six gallons per cell per day) for washing and flushing was provided from a cast iron sectionalized channel running beneath the galleries. Water from the basin drained via the soil pipe that was not wasted.

When describing these provisions, Jebb cautioned on the need to avoid freezing, and suggests that this can be accomplished if casters and pipes are placed in or near to the foul air flues and kept away from the influence of outside air.

It is unclear what point in the prison's history individual toilets were removed from cells and 'shouling out' became the norm, but it is interesting to note that it is only recently that such facilities have been reinstated as part of the programme of upgrading the prison.

Lighting and communications
Jebb employed Mr Faraday to provide gas-producing apparatus and light fittings to each cell, as well as the prison buildings. The lighting point in the cell can be seen in figure 2. Each point had a shade.

Though prisoners were not allowed to communicate with one another, it was considered essential that they should be able to gain the attention of the prison officer at any time. For this purpose, each cell had a handle attached to a spindle with a metal label at the gallery end. The label was normally horizontal but when it was turned vertically it indicated the prisoner's need for attention.

Nowadays design teams and contractors who manage to design and construct a building in 3-4 years talk of the project as being fast-track. Even though planners were probably not around to delay matters for Jebb, that he managed with his contractors and suppliers to build, fit-out and commission a prison for 500 officers in 18 months was a great achievement.

It makes you think why we, with the technology and machinery at our disposal today, take so long to produce buildings.

Readers will discern that Jebb was well ahead of his time in being concerned about indoor air quality, fuel consumption, energy conservation, public health engineering and the commissioning of the services he designed.

It is also striking that Jebb and his contemporaries put considerable emphasis on recording what they had done and how they did it, so that a record and guidance was available for others to follow and for us to contemplate 150 years after.
PENTONVILLE PRISON, NORTH LONDON

Prison Chapel, prisoners held in "Separate System", no communication permitted.
View of an empty "Separate" cell.
1840: The heating and ventilation by Major Jebb and G & J Haden.
Plan of the Goal & House of Correction (Shropshire Archives).
G & J Haden received an order for the heating system c.1842.
STRANGEWAYS PRISON, MANCHESTER

General view of F Wing.

Interior view of Cell Block.
The detached exhaust tower for the heating and ventilating system.
In 1863, Sir Edmund Frederick Du Cane, an officer in the Royal Engineers, was appointed Director of Convict Prisons as well as an Inspector of Military Prisons. In 1869, he became Chairman of the Board of Directors of Convict Prisons, Surveyor – General of Prisons and Inspector General of Military Prisons.

He was responsible for the building of the prison at Wormwood Scrubs in London (1874-91), the land having been obtained from the Ecclesiastical Commissioners. The prison was built by convict labour. It was based on the so-called “telegraph pole” plan, said to have originated in the layout of pavilion plan hospitals as recommended by Florence Nightingale, in particular the Herbert Military Hospital at Woolwich (designed by Captain Douglas Galton, also of the Royal Engineers).

There were cells for some 1400 convicts and the complex included a cookhouse, bakery, laundry, workshops, an infirmary, baths and an enormous chapel. The four main cell blocks were built parallel to one another, orientated north-south, with each block containing 351 cells, being linked by covered ways. Du Cane supervised the building works himself, charging a guinea (21 shillings) a day.

A description [VA, 235-37] reads, “Du Cane’s scheme is remarkable for its clean, logical plans, and for the heating and ventilating system which served each cell. Staircases, vents and sanitary stacks were expressed in the building, and the completed prison combined that direct integrity familiar from early warehouse and industrial buildings.” It is said that Du Cane’s model plan influenced the design of prisons for many generations afterwards.
Heating, ventilation and sanitation (from papers of A.W. Pullan). Shows (see Section) in attic beneath towers are (foul air flues); space between basement arches (fresh air); centre "smoke pipe from heating apparatus" connecting to right-hand tower,
SERVICES IN THE CLINK

Brian Roberts outlines the development of building services in prisons, going back to the days of prison reform and beyond.

The slang expression clink, meaning prison, is derived from London’s 16th century jail which used to stand in Clink Street in Southwark, and about which John Stow wrote in his Survey of London (1598): “…a goal or prison, wherein such as should brabble, frey or break the peace on the said bank (Bankside), or in the brothel houses’. Some of the earliest and most famous dungeons to be found in Great Britain are those in the Tower of London (started in 1078) destined to become “…a symbol of authority and strength as well as a place of imprisonment, torture and execution, the name of which inspired fear.”

According to the architectural historian Nikolaus Pevsner in his book A History of Building Types, originally imprisonment was prior to trial, or prior to execution, or for debt, or as a cruel form of revenge. Imprisonment as a form of punishment seems to have originated in the monasteries around the 11th century, where offenders were put into the carcer (hence incarcerated), this being only accessible from the top by a ladder and without a door or windows. Records from the late Middle Ages and early Renaissance illustrate a few dungeons at the bottom of round towers in castles or town walls, but prisons with cells came later. The Italian Filarete, in his Treatise (early 1640’s), refers to a design for a large prison where the prisoners are in cells according to class or crime. Pevsner states that the building usually credited as being the first prison planned with cells and a large workroom is the S. Michele Prison in Rome (1703). It had 20 cells to each of 3 storeys and each cell had a lavatory.

In London, the Fleet was a notorious city prison from 1397 until it was demolished in 1846. It was said to be the largest brothel in the kingdom and the scene of cruelty, depravity and extortion. But it was the writings of the well-to-do Bedfordshire squire and prison reformer, John Howard (1726-90), which tell us most about the state of the prisons of that period. Time and again he found prisons with no water, no sewers and no fires. In 1774, he talks of prisoners being “almost suffocated”, but the large box bellows designed by Stephen Hales for ventilating purposes, and operated by two men working at a lever, is said to have significantly reduced the incidence of fever in the Winchester Hospital and Gaol (1744). Edwards, commenting on this (1881), wrote: “A constant objection to the ventilating cell, ascend from these flues.

Vitiﬁed air is drawn out via low level extract grilles from each cell into a common foul air shaft which joins the boiler smoke flues at attic level. The power for foul air extraction in summer was provided by a hand-driven fan in the attic. The fan of G. N. Haden sent Jebb a drawing indicating how the boiler feed water could be pumped by hand by 12 men in 9 cells; an arrangement later installed in a number of prisons.

Jebb noted that he had to overcome the diﬃculty of ventilating the prison with no opening windows due to the problems of…” their being destructive of discipline (and) in favouring the transmission of sound”. The principal medical oﬃcer carried out a series of tests in which he established that between 50 and 76 m³/h of fresh air was supplied to each cell “with extraordinary regularity”. It was noted that this ventilation and a temperature between 11 and 15°C could be maintained in the coldest weather, for a cost of less than a farthing a cell a day. Jebb also discovered a fact which is often overlooked, that since a newly-built structure has not thoroughly dried out, its initial fuel consumption is higher than normal. “Hence”, he stated, “the necessity of not trusting any results in connection with the power of an apparatus until all the flues and the building are perfectly dry”.

The most famous of the London prisons were Millbank Penitentiary (1833-41), Pentonville (1840-47) by Sir Joshua Jebb, Surveyor General of Prisons (and author of Notes on the Construction and Ventilation of Prisons); Holloway, built a few years later (1849-52) by Bunning, and Wormwood Scrubs (1874). Jebb’s scheme for Pentonville was a landmark in the heating and ventilating of prisons. A drawing of the system, shown overhead, reveals that at the centre of the installation is a boiler and heat exchangers. Fresh air is drawn through underground ducts to the heating coils, and then passes to main horizontal warm air ﬂues. Vertical riser ducts, with a branch leading to each
SERVICES IN THE CLINK

The French engineer Pecklet, in his book *Traité de la Chaleur* (1861), makes reference to the Prison Mazas. It seems to have been common practice to appoint a commission to examine proposals for the heating and ventilating of large public buildings, not necessarily with complete success. Pecklet observes: "...one knows that in France, it sometimes happens that the commissioners have too little time to accomplish their task, and make their decision after an examination by, or on the opinion of, only one member". A sub-committee stated that ventilation was the principle requirement for prison hygiene, and recommended that the temperature should be at least 10 m³/h per prisoner with the cell temperature kept at 15°C. Air was to be extracted from the cells via the waste pipes of the toilets in each cell (these were not WC’s and were not trapped).

A disadvantage of early steam heating was that the pipes were the high and uncontrollable surface temperatures in the system. To overcome this, the mixed system was developed. This used the steam to heat water in radiators or calorifiers. It was first used by Grouvelle in the Prison Mazas. The stoves each had an expansion vessel and could work at steam pressures up to 500 kPa. Steam systems required constant attendance but the mixed system used two separate systems: the stoves were heated by steam during the day and during the night the water was allowed to cool from around 90°C down to room temperature. Grouvelle’s design used hot water circulation to heat air by contact with pipes enclosed in a duct, which was divided into sections corresponding to the cells.

Fresh air entered the duct section, where it was warmed, escaping into the cells through low level grilles. Extraction was induced by a large centrally heated chimney communicating with the sewage collecting tank into which the toilets discharged. The operation was monitored for several years. The use of 13.5 kg/h of coal produced a steam flow rate of nearly 1500 m³/h at a total cost of 24 francs per prisoner per year.

The Prison de Tours was warmed by Duvois-Leblanc’s system of pressurized hot water and warm-air calorifiers with ventilation (as in Prison Mazas) by extracting air from the cells through the waste pipe of the toilet in each cell. It was found that the prisoners could talk too loudly by speaking down the toilets, which were probably simple pan or holler closets. To prevent this and to preserve discipline the soil pipes were trapped in water or sand, but this also prevented the ventilation. An alternative extract was tried, failing due to insufficient pull. It was found that air was entering the cells via the cess tanks and toilet pans, due to poor building construction. Little wonder that a cholera outbreak in 1849 decimated prisoners and prison officers alike. Remedial action was attempted by Segey, the extract ducts from each cell being connected to a heated upcast shaft: this also proved inadequate. Next, a four-bladed fan (1.3 m diameter) was installed. This was turned at 2 rmp by a prisoner, who paid 10 centimes for 2 hours work, but satisfactory ventilation was only achieved after the toilets were altered.

About this time, the United States took the lead in prison design. There were two competing systems: Auburn, New York (1816-25) and the Eastern Penitentiary at Cherry Hill, near Philadelphia (designed in 1825). Auburn had cells used at night with prisoners kept in common workrooms during the day, but under strict conditions of silence. Cherry Hill operated on the principle of solitary confinement day and night with work performed in the cells.

Charles Dickens, on his American journey (1842) visited many prisons and on the whole praised America’s "great wisdom, great benevolence, and exalted policy"; but he found Cherry Hill "hopeless…cruel and wrong". In spite of this, Cherry Hill was progressively equipped, for each cell had hot-water heating, a latrine and a tap; it was widely accepted as the model prison of the 19th century.

Similarly, the Victorian reformed prisons sought to impose discipline on the inmates by long periods of solitary confinement and through a rigorous programme of forced labour, such as the treadwheel installed at Coldbath Fields where each treadmill was in its own compartment, not attached to any formers. Despite this, by the end of the day the prisoner had achieved nothing except the clench of 6600 feet”. By way of contrast, in some prisons the wheels were used to raise water.

The most famous of Mayhew’s "The Criminal Prisons of London" (1862), depicted a dismal world of cage-like cells where the prisoners are separated from one another, even to the point of wearing hoods and masks. At London’s Old Bailey, built on the site of the infamous Newgate Prison, the plant installed between 1904 and 1907 was a warm-air plenum system. The main heaters consisted of continuous 32 mm pipe fed with steam; there were secondary heat exchangers at the base of each vertical supply air shaft; the condensate ran to waste. Steam was generated in a hand-fired Lancashire boiler, 2.5 m diameter and 8.5 m long. The steam was used not only for heating, but also to drive the fan engines, the centrifugal pump and the recirculating boiler feed pump. In addition, the steam was used to heat the water and steam for the steam engine and the boiler feed pump. In addition, the steam was used to heat the water and steam for the steam engine and the boiler feed pump. In addition, the steam was used to heat the water and steam for the steam engine and the boiler feed pump.
STATE PRISON, AUBURN
NEW YORK STATE

The prison was built 1816-25.

Auburn's galleried cells.
An early drawing. The prison was dark and dismal. The cells had no outer windows, receiving light from the general areas.
Designed 1825 by John Haviland (print of 1855).

The prison was built 1829-36 to house 450 prisoners. An early colour print.
EASTERN STATE PENITENTIARY
CHERRY HILL, PHILADELPHIA

Eastern State Penitentiary's radial plan served as the model for hundreds of later prisons.

Cross Section of Cell Block

When the Eastern State Penitentiary, or Cherry Hill as it was known at the time, was erected in 1829 in Francisville (the idea of this new prison was created in a meeting held at Benjamin Franklin's house in 1787) it was the largest and most expensive public structure in the country. Its architectural significance first arose in 1821, when British architect John Haviland was chosen to design the building. Haviland found most of his inspiration for his plan for the penitentiary from prisons and asylums built beginning in the 1780s in England and Ireland. He gave the prison a neo-Gothic look to instill fear into those who thought of committing a crime.

These complexes consist of cell wings radiating in a semi or full circle array from a center tower whence the prison could be kept under constant surveillance. The design for the penitentiary which Haviland devised became known as the hub-and-spoke plan which consisted of an octagonal center connected by corridors to seven radiating single-story cell blocks, each containing two ranges of large single cells—8 × 12 feet × 10 feet high—with hot water heating, a water tap, toilet, and individual exercise yards the same width as the cell.

There were rectangular openings in the cell wall through which food and work materials could be passed to the prisoner, as well as peepholes for guards to observe prisoners without being seen. To minimize the opportunities for communication between inmates Haviland designed a basic flush toilet for each cell with individual pipes leading to a central sewer which he hoped would prevent the sending of messages between adjacent cells.

Despite his efforts, prisoners were still able to communicate with each other and the flushing system had to be redesigned several times. Haviland remarked that he chose the design to promote "watching, convenience, economy, and ventilation". Once construction of the prison was completed in 1836, it could house 450 prisoners.

Haviland completed the architecture of the Eastern state penitentiary in 1836. Each cell was lit only by a single lighting source from either skylights or windows, which was considered the "Window of God" or "Eye of God". The church viewed imprisonment, usually in isolation, as an instrument that would modify sinful or disruptive behavior. The time spent in prison would help inmates reflect on their crimes committed, giving them the mission for redemption.
Section and Plan.
EASTERN STATE PENITENTIARY
CHERRY HILL, PHILADELPHIA

Now derelict and unused, but open for tourists.
A crumbling corridor.
Remains of a radial cell wing.
Section showing heating and ventilating arrangements. The design is modelled on the Pentonville system (*The Sanitary Engineer*, 26 April 1883).

An early drawing.
"The Elmira Reformatory, or Penitentiary, is modelled on the Pentonville (or Auburn- the American equivalent) system where the cells are arranged in blocks of several tiers in height, this block being surrounded by an outer building. Between the walls of the outer building and the doors of the tiers of cells and their walkways is an open hall, stretching in height from the lowest to highest levels of the tiers of cells.

Heating is provided by round, vertical tube steam radiators set under the windows, with openings in the centre of the bases. In corresponding openings in the stone flags are set strong cast-iron pipes, with flanges built into the masonry. These pipes extend up through the openings in the bases of the radiators which they fit closely, connecting the fresh-air ducts with the radiators and preventing water (when washing the floors) from entering the ducts.

The number of concentric rows of tubes in the radiator is four. The two outer rows are separated from the inner pair by a galvanized sheet-iron partition, the object being to divide the inside rows from the outer ones so as to make each radiator practically an indirect heater, the air from the duct coming only in contact with the inner rows, while the outer rows warm the air already within the halls and give direct radiation.

Elmira has 500 cells, each with two 4x4-inch flues, one near the ceiling, the other in a cast-iron niche near the floor. The one near the ceiling is fitted with a heavy cast-iron frame built into the walls, while the lower one connects with the top of the “night-bucket” niche. The flues are separate their whole length, each terminating in and main exhaust chamber. There are no means of closing them. Steam coils of 1 1/4-inch tubes within the exhaust chamber extend over the upper ends of all the flues, providing heat-assisted ventilation. This exhaust air is discharged through a series of roof chimneys (aspirators).

Fresh air is drawn in near the top of a ventilation intake tower (left on drawing) and descends to basement tunnels where it is discharged upwards through the under-window radiators into the hall, being drawn through the cells by the action of the independent flues and out through the aspirator. The aspirator steam coils are on a separate steam system to enable summer ventilation where the radiator system is off. It is recorded that this system caused difficulties in cell temperature control, either overheating the upper cells, or underheating the lower ones."
STATEVILLE PRISON, CREST HILL
NEAR CHICAGO, ILLINOIS

Opened 1925, 1500 inmates. The exercise yard with circular prison blocks behind.

Central guard tower in open internal space surrounded by tiers of cells.
STATEVILLE PRISON, CREST HILL
NEAR CHICAGO, ILLINOIS

Built on the Panopticon system, a design for prisons proposed by the British Prison Reformer Jeremy Bentham.
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