THE KNOWLEDGE

How to build a CASTLE

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First published in 2012 by Orpheus Books Ltd.,
6 Church Green, Witney, Oxfordshire, OX28 4AW, England
www.orpheusbooks.com

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ISBN 978 1 7418 3790 5

Printed and bound in Singapore

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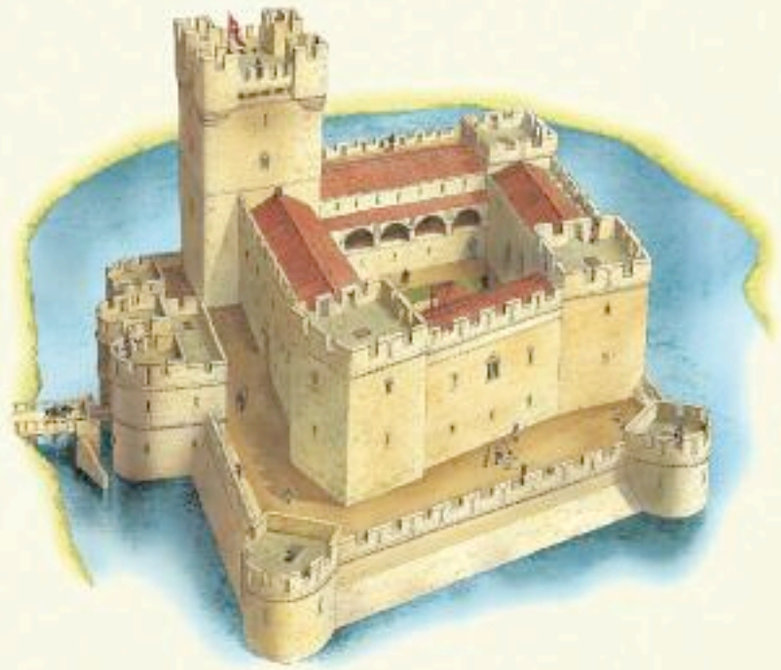

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Introduction

THE YEAR IS 1285. **A baron has hired you to design and build a new castle for him, his family and his followers. You are to use the latest techniques and machines to construct a building that is strong enough to withstand attack and, if necessary, survive a long siege. It must also be a desirable residence, equipped for luxurious living. How do you set about this task?**

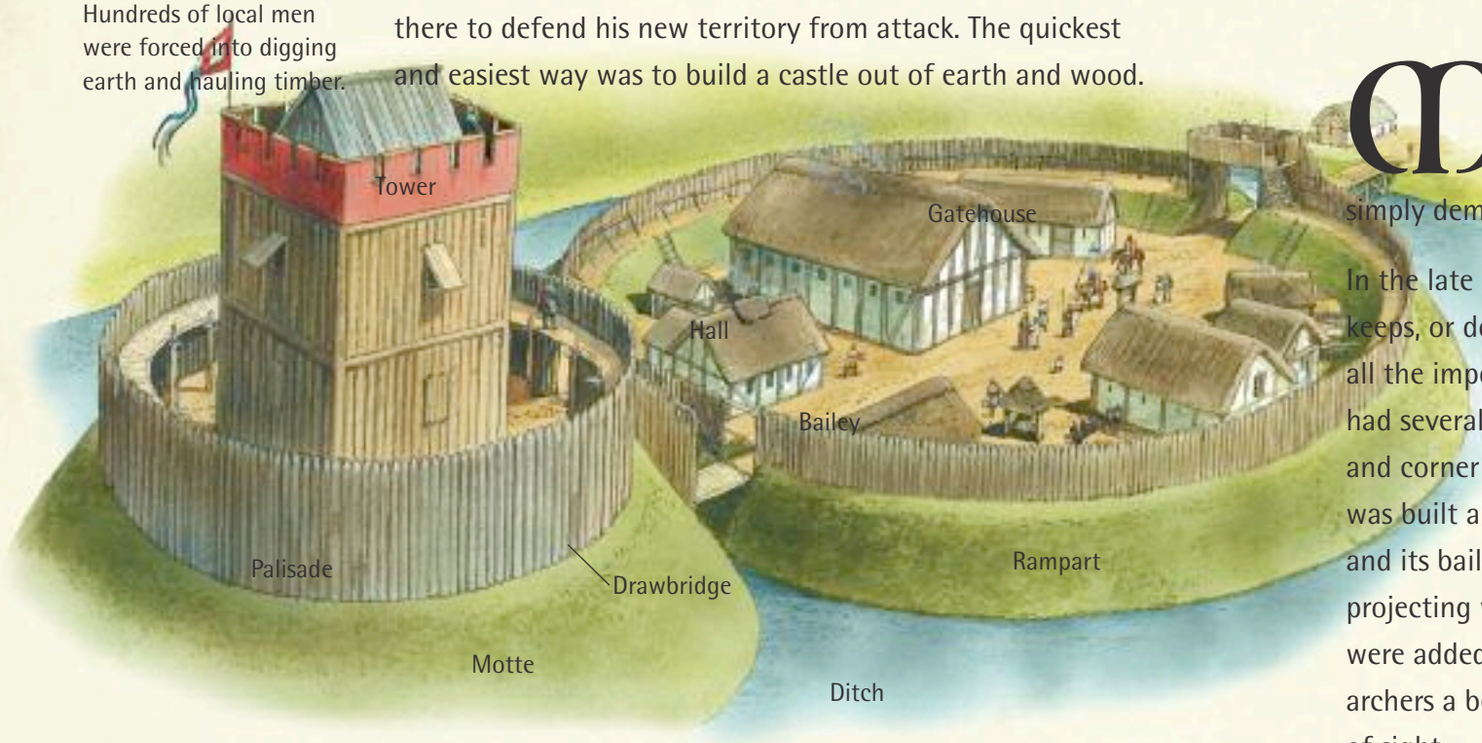
First, you must read up about the history of castles so you are familiar with up-to-date construction techniques and defence strategies. Next, you should research medieval warfare tactics and familiarize yourself with the weaponry that might one day be ranged against your castle. A working knowledge of the world of knights, the foremost warriors of the day, should also form part of your essential reading. Thirdly, carry out a review of the materials (mostly stone), tools, machines and the workforce you are going to need. Finally, you are ready to tackle the building works step by step, ensuring that all the defensive features of the castle are completed to the necessary specification.

1. The story of castles

BEFORE PLANNING a castle, it is important to know their history. Here you will learn when the first castles were built and what purpose they served.

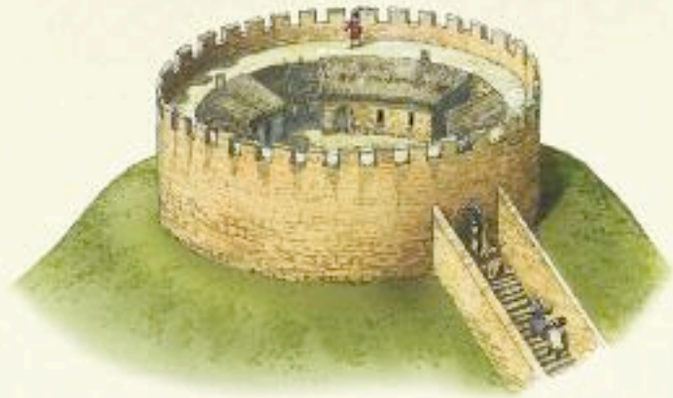
The first castles were probably built around AD 950. When a baron was granted land by the king, he quickly built a castle there to defend his new territory from attack. The quickest and easiest way was to build a castle out of earth and wood.

▼ In a motte and bailey castle, the motte was a steep mound of earth from 3 m to 30 m high and up to 100 m in diameter. Its top was flattened and a wooden tower, surrounded by a fence called a palisade, built on it. If there was no natural hill, the baron ordered one to be built. Hundreds of local men were forced into digging earth and hauling timber.



▲ Below the motte was a large open space, the bailey, which was also enclosed by a palisade, as well as a ditch sometimes filled with water. Inside the bailey were a hall, chapel, barn, stable and other buildings. A timber drawbridge linked the motte to the bailey.

Motte and bailey castles were the result *(below)*. The baron, with his family and guards, lived in a tower ringed by a fence at the top of a mound of earth. The castle was a base from which the baron could launch an attack or retreat to if he came under attack himself. The bailey, an open space below the mound surrounded by a fence and a ditch, was used to protect local villagers and their livestock in time of war. In peacetime, the bailey buildings were used

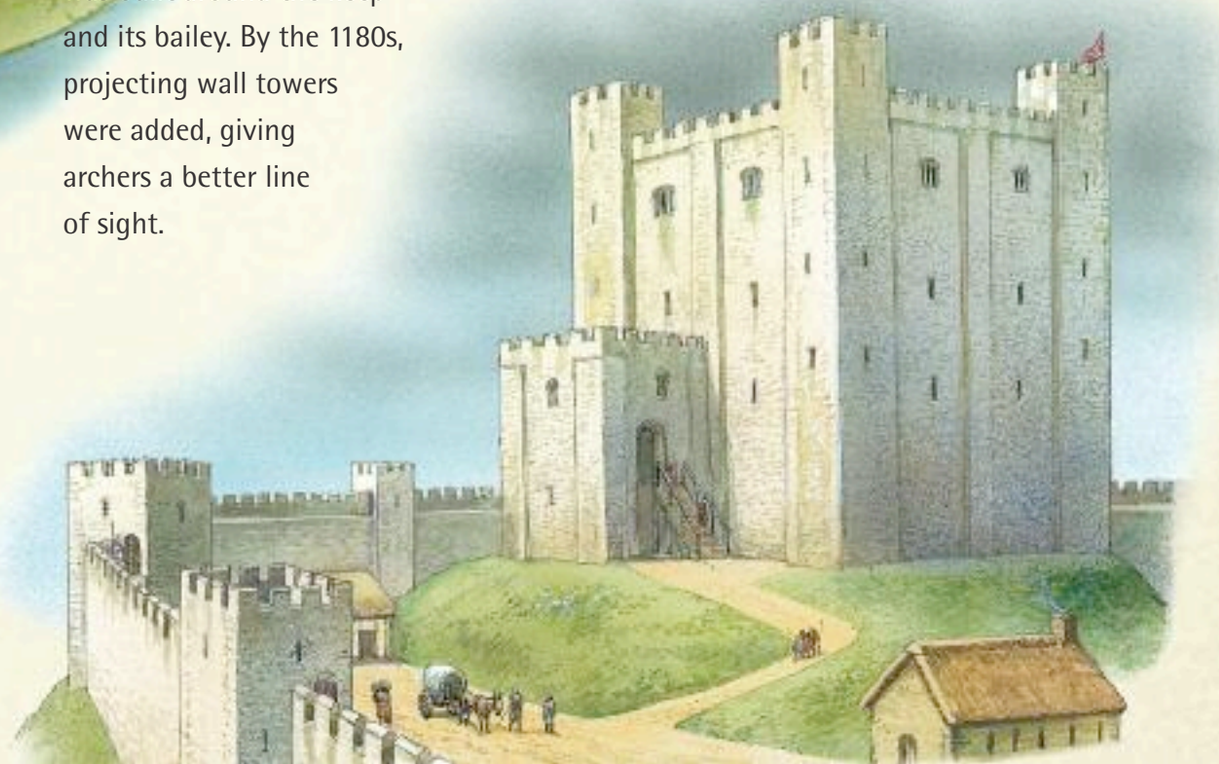


◀ Shell keeps first appeared around 1100. Where the foundations could support the heavier stone, thick circular walls replaced the old wooden palisades on top of mottes. Instead of a tower, the outbuildings and living quarters were built against the inside of the wall, leaving a small courtyard at the centre. The wall walk, patrolled by guards, was reached by stairways inside the walls.

Motte and bailey castles were soon replaced by stone buildings, stronger and not so easily burnt down. In some castles, the motte palisades were simply demolished and replaced by stone walls.

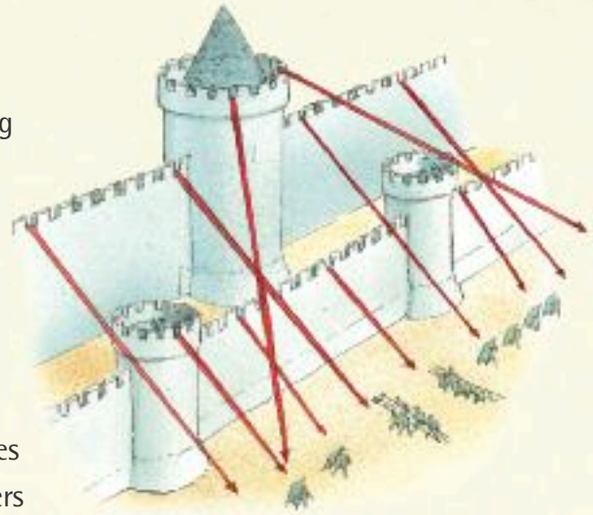
In the late 1000s and early 1100s, the first rectangular stone keeps, or donjons, were built. Rectangular keeps incorporated all the important parts of a castle in one tall building. They had several floors linked by spiral staircases, thick stone walls and corner towers. A curtain wall was built around the keep and its bailey. By the 1180s, projecting wall towers were added, giving archers a better line of sight.

▼ In a rectangular keep, stores and guards' quarters were situated on the lowest floor, the Great Hall above that, and the lord's private rooms and chapel on the top floor.



New designs

In the 1200s, curtain walls with projecting towers became a standard design. Rounded, rather than square towers were increasingly favoured, as they gave bowmen on the battlements an even better all-round view of the enemy below. With this kind of defence, the large rectangular keep soon became unnecessary. In many new castles of this period, rooms were built into the towers or gatehouse instead.



▲ In a concentric castle, two rings of curtain walls were built instead of one. The outer wall was lower than the inner one, so that bowmen on the inner wall could shoot at the enemy over the heads of those on the outer wall.

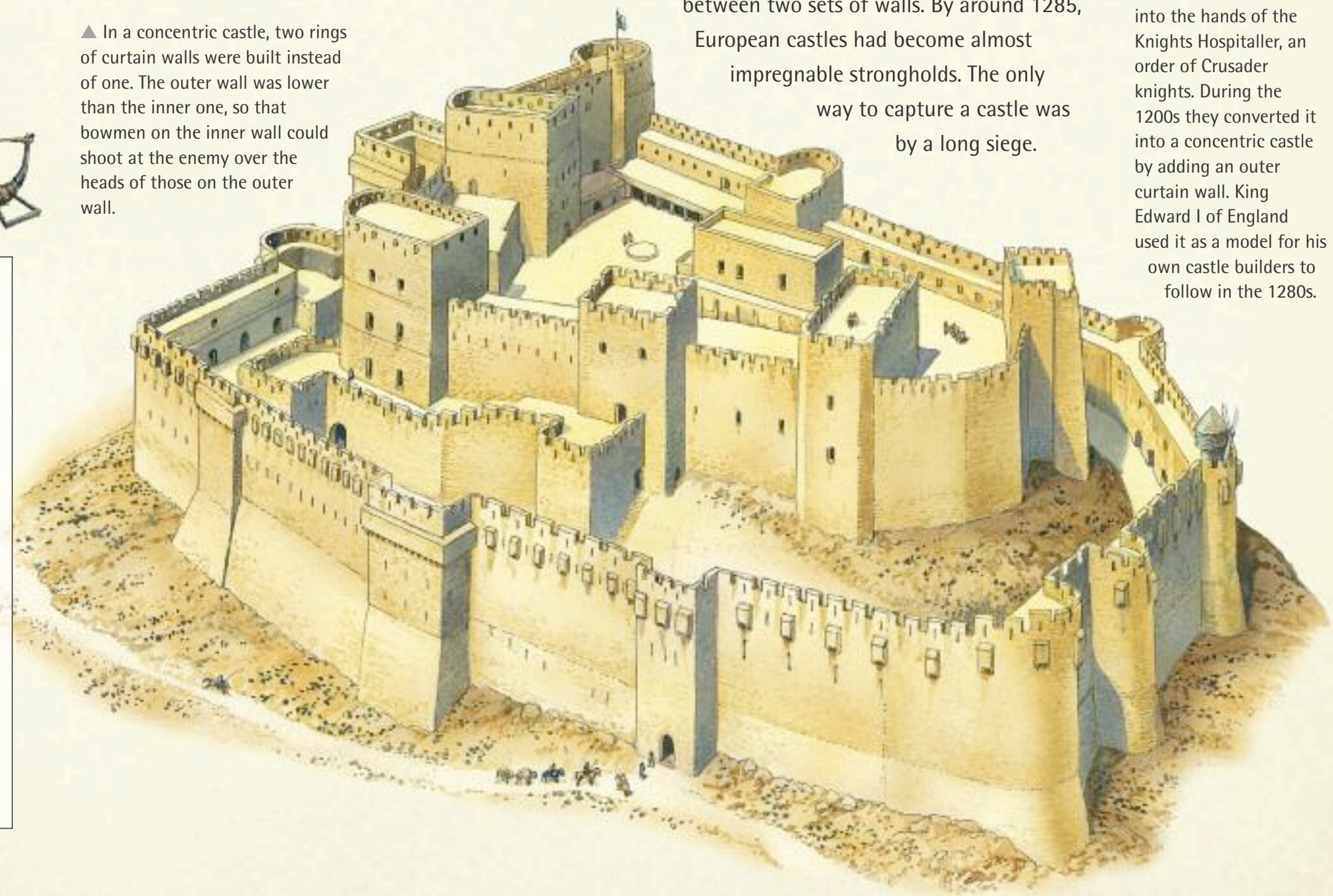
▶ The development of the crossbow in the 1100s had a major effect on castle design. Castle attackers had a new weapon – but, equally, defenders could fight back even more effectively.

Undermining

A good way to bring down castle walls was by undermining them. Miners dug a tunnel under the foundations of the walls (1). There they propped up the tunnel with wooden timbers which they then set alight (2). After the supports had burnt through, the tunnel soon collapsed, bringing down the wall above (3). To counter this threat, builders switched from square towers to round ones, so leaving no vulnerable corners. Adding broad plinths to the bases of the walls was another ploy: it made them too thick to undermine.

By the late 1200s, a new design started to appear: concentric castles. The inner ring of curtain walls was now encircled by an outer wall, built low enough to permit an unobstructed line of fire from the higher inner walls. The idea had come from observing the walls of Constantinople, which knights came across during the Crusades *(see page 46)*.

Attackers now came under increased fire and had now to break through several barriers if they were to take the castle – with the extra risk of finding themselves trapped between two sets of walls. By around 1285, European castles had become almost impregnable strongholds. The only way to capture a castle was by a long siege.



▲ Machicolations, stone overhangs, began to replace hoardings in the 1270s.

▼ Krak des Chevaliers in Syria was originally an Islamic fortress. It fell into the hands of the Knights Hospitaller, an order of Crusader knights. During the 1200s they converted it into a concentric castle by adding an outer curtain wall. King Edward I of England used it as a model for his own castle builders to follow in the 1280s.

▲ Medieval kingdoms depended on the feudal system. The king (1) granted land to barons (2) in return for their help in wars. The barons gave land to knights (3) who fought on their behalf. Barons and knights allowed peasants (4) to farm their land in exchange for rent.

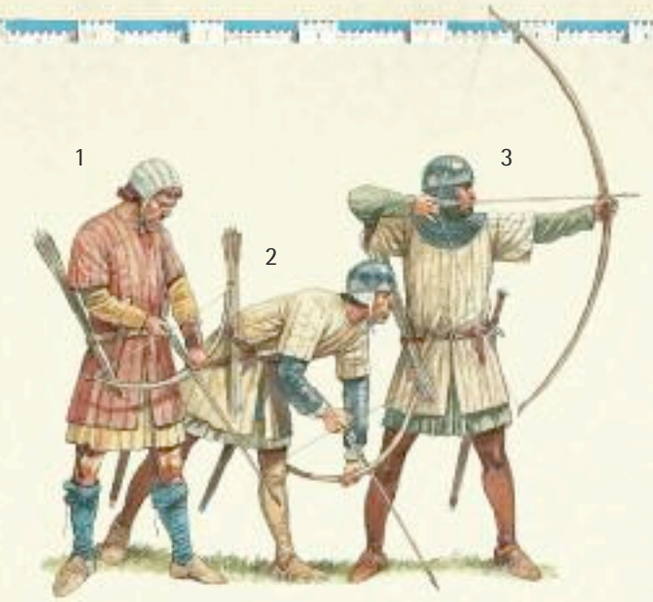
▼ Weapons included swords, axes, glaives and halberds (long poles with blades) and maces.

2. Medieval warfare

WHEN DESIGNING A CASTLE, it is good to know the role that castles play in the Middle Ages. It is also important to understand what weapons are available and what they are capable of, so that the castle's defences can be effective against them.

The Middle Ages, also known as medieval times, lasted from the 1000s to the 1400s. In those days, the most powerful person in the kingdom was the king. But even he had to rely on barons, the most important noblemen, to help him fight wars. In the Middle Ages, power and wealth came from the ownership of land. So, in return for the promise of an army to fight for him, the king granted barons land. To control their lands, the barons built castles on them.

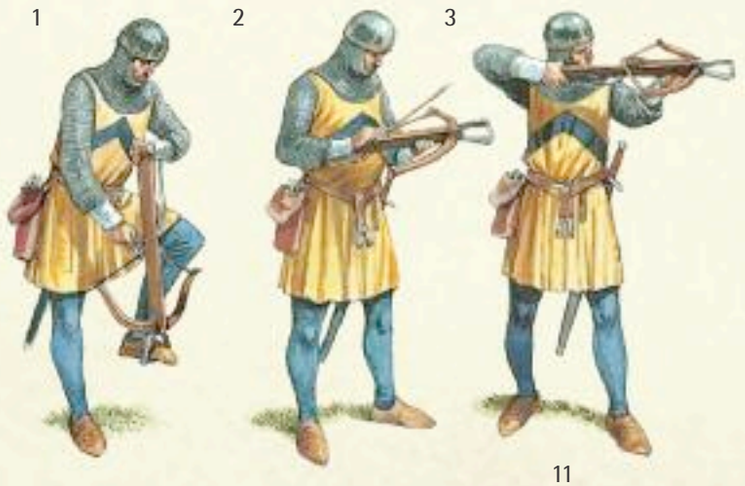
Wars between barons tended to break out frequently, usually to settle disputes over land. The castle, the home of the lord, his family and his followers, was a base from which he and his army could launch attacks on his enemies – or a stronghold to which he could retreat if he himself came under attack.



◀ To shoot an arrow with a longbow, the archer first "nocks" his arrow on to the bow string (1). He then draws back the string (2) and takes aim, looking directly down the arrow shaft, before releasing the arrow (3). This process demands great strength and accuracy.

Bowmen

Both castle garrison and besieging armies will rely on their bowmen when fighting begins. Longbows are as tall as a man. With training, a good longbowman can shoot 12 arrows a minute, achieving a high degree of accuracy over long range – 200 metres or more. No special training is required to shoot with a crossbow, but they are slower to repeat-fire. Crossbows fire metal-tipped bolts rather than arrows. They can be left "cocked": wound back with the bolt in place and ready to shoot instantly and with great power. This allows the crossbowman to aim better, using sights to fix his target.



◀ To shoot a crossbow the bowstring must be drawn back and locked in position by a trigger (1). A great amount of force is necessary to draw the bow, so in some designs a lever or winding device is used. The bolt is then placed in position (2). The crossbowman takes aim before releasing the trigger (3).

Arrowheads

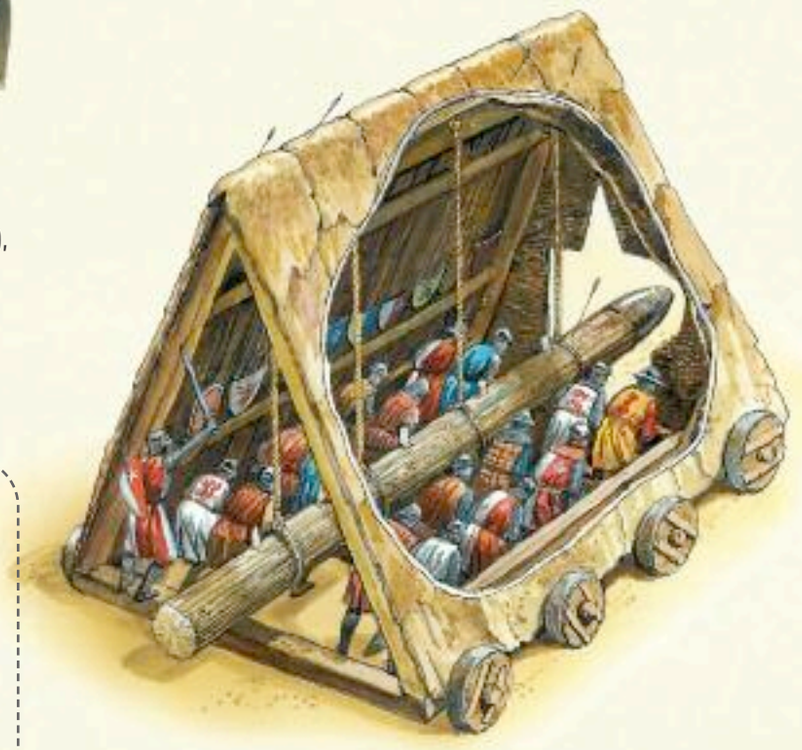
Different types of arrowheads are needed for different targets. A general arrowhead (1) can kill a man without armour. A needle-like bodkin (2) is sharp enough to pierce a mounted knight's armour. A broadhead's barbs (3) are difficult to pull out and are used to wound warhorses.

Battering ram

▲ Before a battering ram can be wheeled up to the castle gatehouse, the moat must be filled in. In order to get men close enough to complete this essential task, another penthouse is needed to give them protection.

The battering ram is used to break down the castle gate – but can be brought in to smash the walls as well. The ram is housed inside a timber carriage, called a penthouse, to protect the footsoldiers from the onslaught of arrows and crossbow bolts. Wet hides are fixed to the outside of the roof to prevent it from being set alight. Under the roof, a thick tree trunk is suspended on chains or ropes from the frame. The front end has been tapered to a blunt point and reinforced with iron. After the ram has been moved into position, the wheels are removed. The soldiers then swing the ram backwards and forwards against the target with as much force as they can muster.

▲ Under cover of the penthouse roof, the men drop earth, rubble and fascines (bundles of sticks), out of the front of it into the moat, creating a temporary bridge for the battering ram.



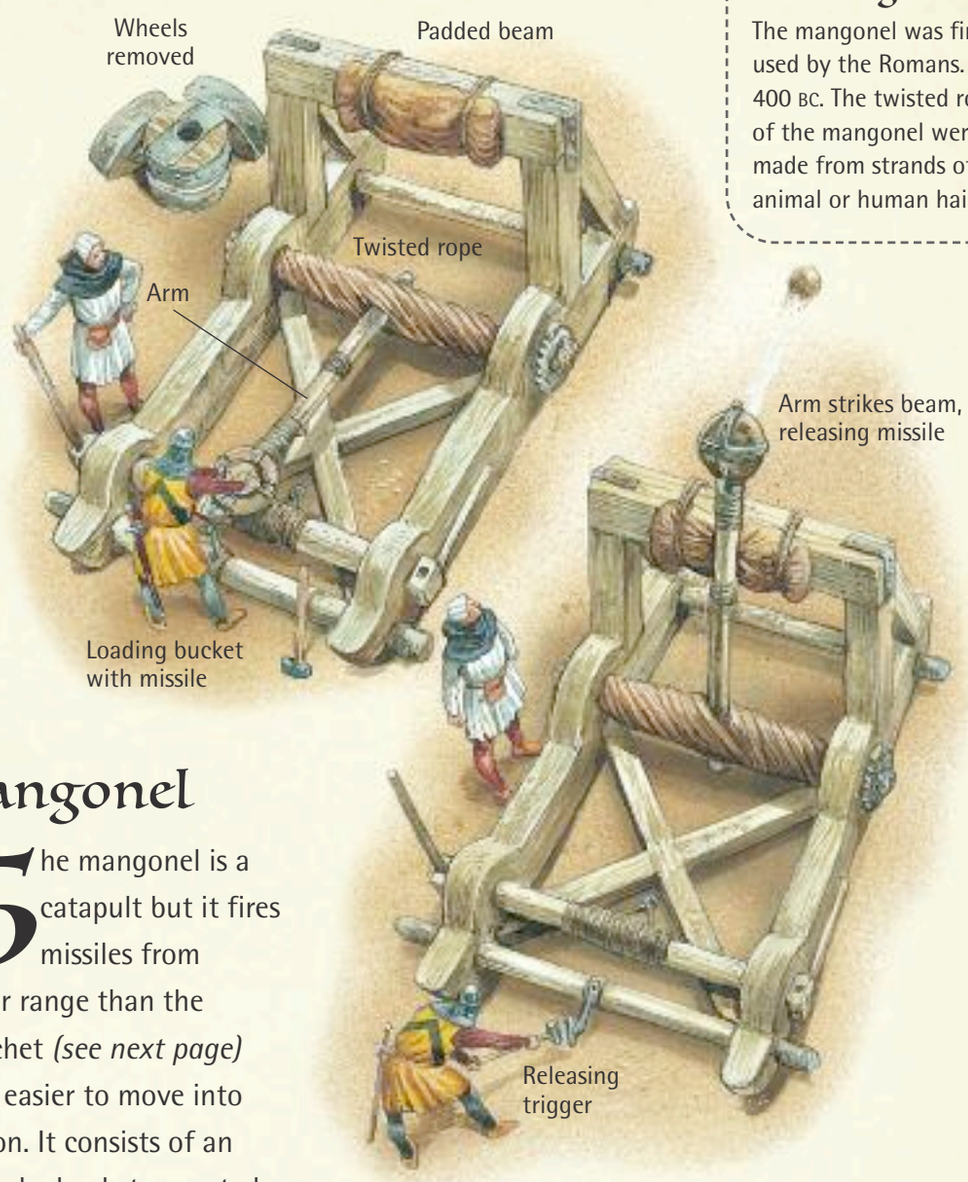
The battering ram, nicknamed the "cat", must do its work very close to the castle. Defenders may be able to lower grappling irons to pull it clear. Alternatively, a thick mattress can be slung between it and the gate to cushion the blows.

Overturning a battering ram

Muslim guards defending castles during the Crusades found a good way of dealing with the battering ram. They used a hook on a pole to overturn it. This method was so effective the crusaders later used it themselves to protect their own castles.

Mangonel

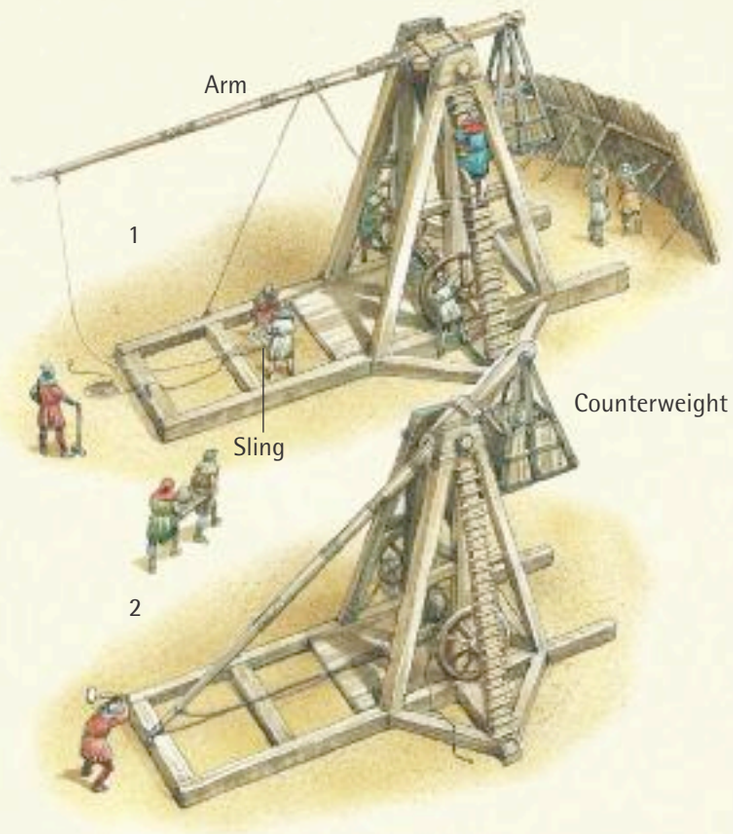
The mangonel was first used by the Romans. in 400 BC. The twisted ropes of the mangonel were made from strands of animal or human hair.



Mangonel

The mangonel is a catapult but it fires missiles from shorter range than the trebuchet *(see next page)* and is easier to move into position. It consists of an arm and a bucket mounted on a wooden frame. The power is provided by a tightly-wound rope. To operate, the arm is winched back and locked. This process also twists the rope. The bucket is loaded with a missile. When the operator releases the trigger, the twisted rope springs back, thrusting the arm forwards. The movement of the arm is halted by a padded beam, but the missile continues onwards under its own momentum. The mangonel is particularly effective for smashing walls.

▲ The mangonel requires only two men to operate it – one to winch back the arm, and another to load the missile and hammer the trigger. Rocks and fire pots are the most commonly used missiles.



▶ Here, a trebuchet is being prepared for firing. The operators turn the winding gear to lower the sling end of the arm (1). At the same time, the counterweight is cranked up and the ammunition loaded into the sling. When the order is given to fire, an operator aims his mallet at the release the mechanism (2). Not all trebuchets had winding gear. In some, several men pulled the arm down with ropes.

Trebuchet

The trebuchet is one of the largest and most powerful weapons in an enemy's armoury. It is a huge catapult capable of flinging objects with great force and deadly accuracy from distances of up to 300 metres. As well as hurling rocks at the castle walls, it can also lob various missiles into the castle. Rocks or boulders can cause severe damage, but other types of missile can harm or kill people inside the castle, start fires or even spread diseases. You will need to make sure that the castle's defences are strong enough to withstand this highly destructive weapon.

▶ Ammunition for use in a trebuchet may include: heads of executed prisoners (1), dead animals (2), firepots (3), rocks and rubble (4) and disease-ridden bodies (5). Sharp wooden poles, darts, burning sand or dung can also be used as missiles.

The trebuchet has a long arm with a sling at one end and a heavy counterweight at the other. Winding gear cranks the arm into position for loading. The sling end of the arm is locked in place at ground level by a trigger. The operators load the sling with ammunition. When the trebuchet is ready to fire, an operator releases the trigger by striking it with a heavy mallet. The weight drops rapidly, causing the arm to fly upwards.
The missile, contained by a guide chute to stop it falling out of the sling, is hurled on its way.

This enormous weapon is usually built on-site and at some distance from the castle. A screen, made of wooden mantlets, is erected in front of it to protect the operators from arrows. The largest trebuchets are more than 15 metres high with arms of about 20 metres long. They can fling rocks weighing up to 1500 kilograms, although the average weight of missiles is between 50 and 100 kilograms. Up to 2000 missiles can be fired in a day – easily enough to reduce your castle to rubble.

Invention

The trebuchet was invented by the Chinese in the 4th century. It stayed in use as a siege machine until the 16th century – well after the introduction of cannons.

◀ Fire! The trigger is released, the weight drops and the trebuchet's arm flies high into the air. The sling hurls its deadly missile towards the target. Immediately the operators set about winding the arm back into position for the next volley.

Protected by wooden boards called mantlets, archers aim their arrows at defending soliders on the castle battlements. They fire through narrow slits in the centre of each mantlet. The besieging army have set up camp at a safe distance from the castle and erected a number of trebuchets, which they use to bombard their target with various missiles. A column of soldiers wait behind a wall of mantlets for the signal to advance, should a breach successfully be made in the walls or gatehouse.

Trebuchets

Besieging army camp

Trebuchets

Soldiers

Mantlets

Bowmen

Ladders

Damage to walls from mangonel bombardment

Moat

Cutaway section revealing under-mining below ground

Props alight

Retreating miners

Tunnel entrance

Bowmen

Mangonel

Siege!

Peace negotations have failed and war is inevitable. The siege army surrounds the castle, preventing food and other supplies from getting in. But instead of waiting for the defenders to starve, the attackers set about forcing their way in using a formidable array of siege weapons. Arrows rain down on them, but the sheer power of their weaponry may win the day.

Men-at-arms have drawn up mangonels close to the castle, and use them to pulverize the walls with boulders. Although the drawbridge was raised long before, the besieging army has filled the moat and rolled their battering ram forward. The defenders drop a large mattress in front of the gate, cushioning it against the damaging blows, while they try to haul the "cat" away with a giant grabber. Elsewhere, soldiers start to scale the walls by ladder while, below ground, a daring plan to undermine one of the great towers has reached a critical stage ...

Scaling the walls

Now that wooden hoardings on the battlements have been largely destroyed by fire and bombardment, the besieging army prepares to scale the walls using a siege tower. The moat has been filled in with logs and rubble and winching posts are fixed in place.

Teams of oxen haul on ropes and the giant wooden "bear", draped with wet hides to protect it from catching fire, rumbles forwards. Under cover from its timber frame, the men clamber up a staircase and prepare to leap on to the castle battlements by means of a small drawbridge at the top ...

Grabber

Drawbridge up

Mattress

Battering ram inside protective "cat"

Damage to walls from mangonel bombardment

Moat infilled by logs, and rubble

Bowmen fire from behind mantlets

Firing a ballista, a giant crossbow

Siege tower drawbridge

Ladder being pushed away

Siege tower

Winching post

Mangonel

Oxen haul the siege tower

Moat infilled by logs, and rubble

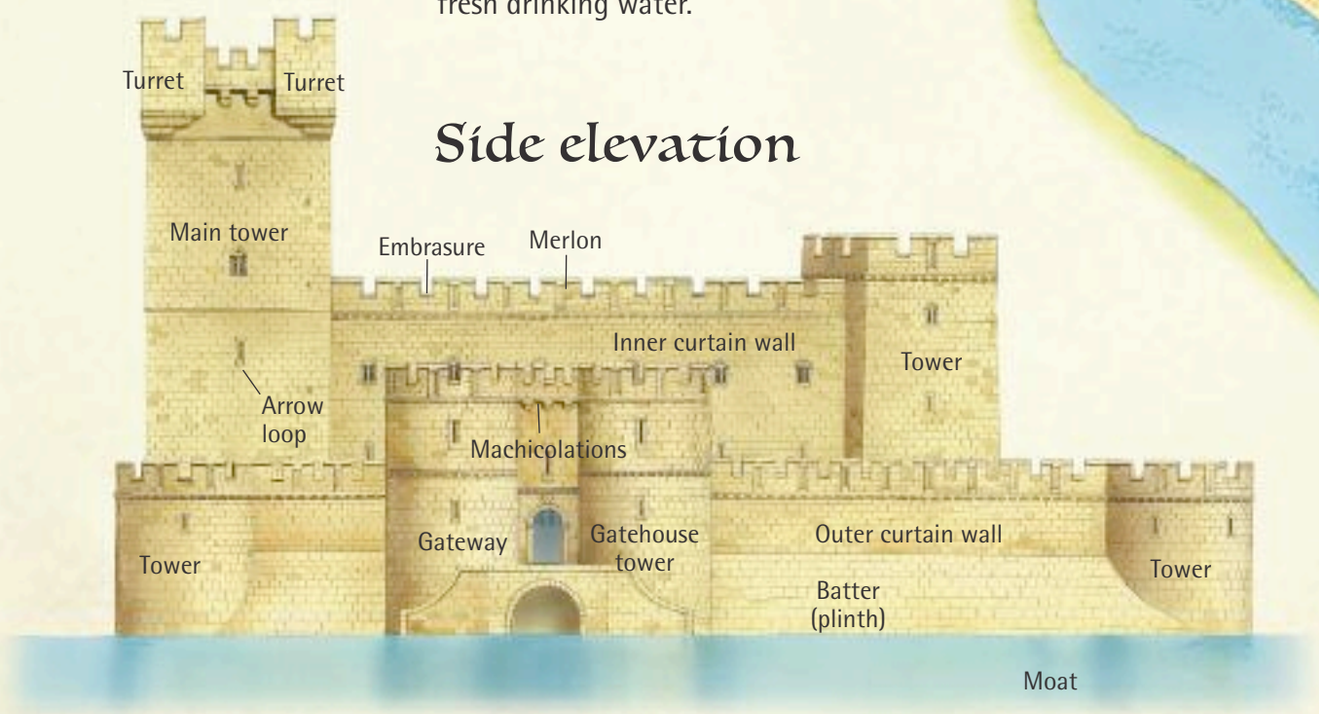
3. Building plans

THE MOST IMPORTANT factors to be taken into consideration when building a castle are that it should be able both to resist attack and to withstand a siege for at least several months.

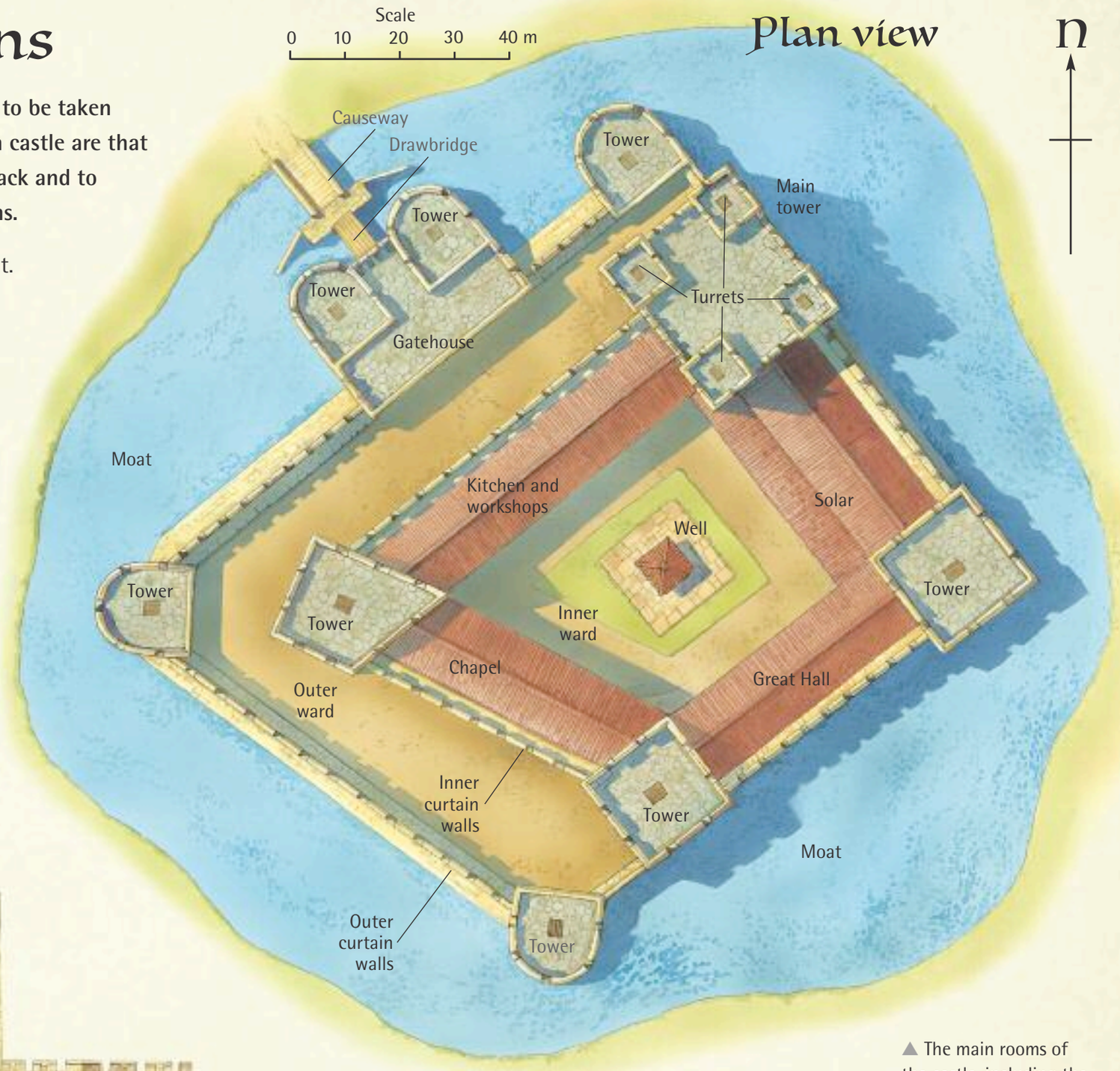
This castle is to be surrounded by a wide moat. It can only be entered by crossing a narrow causeway, connecting to a drawbridge that can, of course, be raised if danger threatens. There will be both outer and inner curtain walls on two sides of the castle. Projecting towers at all corners will allow unobstructed views for the defending guards along the lengths of every wall. A well is located safely inside the inner ward. This means that even if the castle is under siege, the castle residents will still have access to fresh drinking water.

▼ This is what the castle will look like in this side elevation view from the northwest. The turrets at the top of the main tower serve as good lookout positions for the castle garrison. Arrow loops in the walls will allow them to shoot arrows at the enemy from a relatively safe position.

Side elevation



Plan view

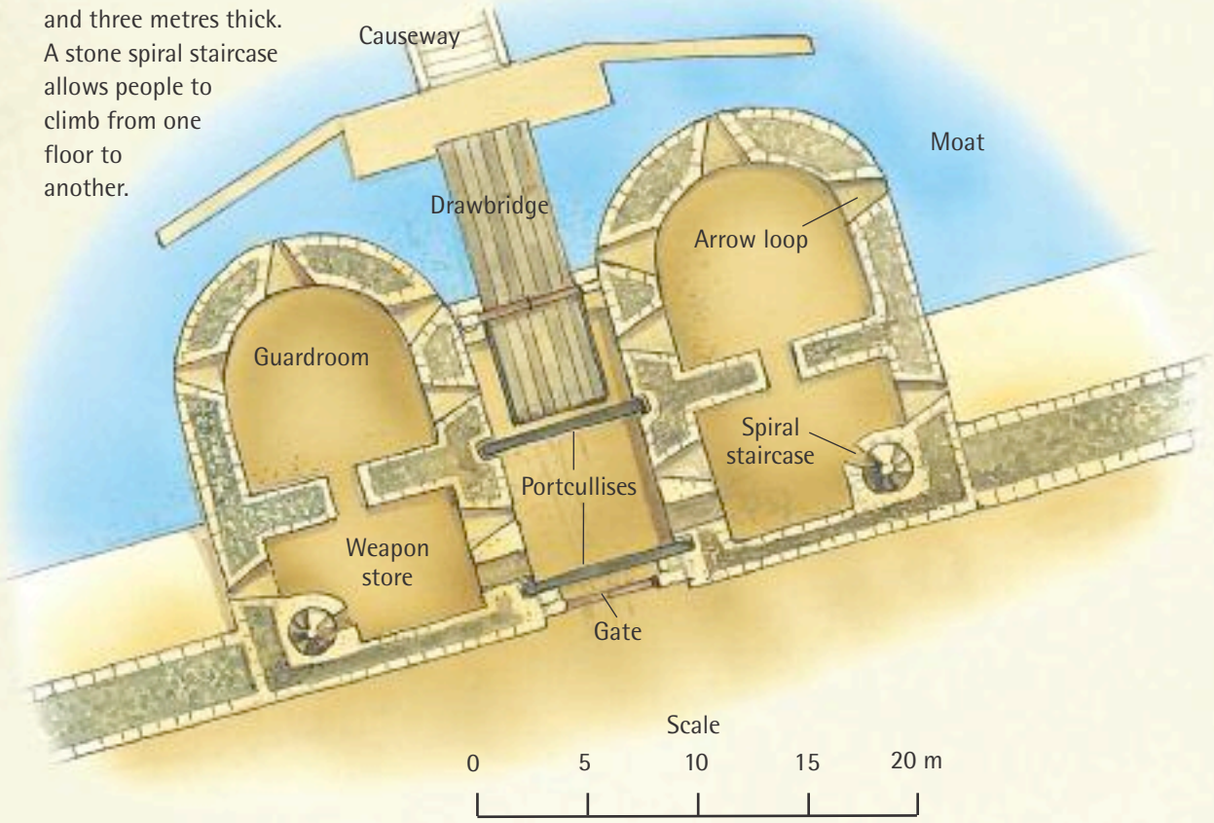


As with many castles of this period, there is to be no separate keep. Instead, one of the towers is designed to be much grander than the others and it will contain the bedchambers for the lord and his family.

▲ The main rooms of the castle, including the Great Hall, solar, chapel, kitchens and workshops are to be housed in buildings constructed against the walls around the inner ward.

Gatehouse plan

▼ This is a plan view of the castle gatehouse, showing the internal rooms at first floor level. The walls are between two and three metres thick. A stone spiral staircase allows people to climb from one floor to another.



Garrison

The castle's defending garrison included soldiers specially hired to guard the castle. They spent most of their time in the gatehouse and reported to the constable, also known as the castellan. The constable was the lord's second-in-command. He was responsible for the castle when the lord was away. His was the most luxurious room in the gatehouse.

A heavily fortified gatehouse is to be built at what would otherwise be the castle's weakest point: the entrance. The gateway is flanked by two rounded towers, from which guards can shoot down at enemy soldiers through arrow loops in the walls. There are two portcullises and a heavy gate in between the drawbridge and the outer ward of the castle.

Taking up space inside the towers are the guardrooms, weapon stores and the office and apartment for the constable. The gatehouse also contains the castle prison, called the dungeons. The damp, narrow cells are located in the basement, under one of the gatehouse towers.

4. Materials and equipment

A NEW CASTLE must have stone as its basic building material. The old earth and timber castles of the 11th century were quick and cheap to build, but they had several disadvantages. Timber lasts for only about 20 years. An attacking army can set fire to it, or smash it apart easily with their catapults and battering rams.

The stone is quarried from a suitable site, ideally not too far from the castle. If the quarry is near a river or the sea, the heavy stone can be transported by ship or barge. Most of the stone needed is rubble for the insides of the walls. The outside faces of the walls, towers and keep will be made of finer-quality dressed stone, called ashlar. This must be carefully cut from the bedrock then chiselled smooth.

▼ Quarrymen cut stone from the ground and load it on to oxcarts, which carry it to ships waiting at the quayside. The quarrymen study the rock face looking for lines where it will fracture easily. They then hammer iron wedges into the rock along these lines. This causes the rocks to split into smaller blocks that can be lifted.

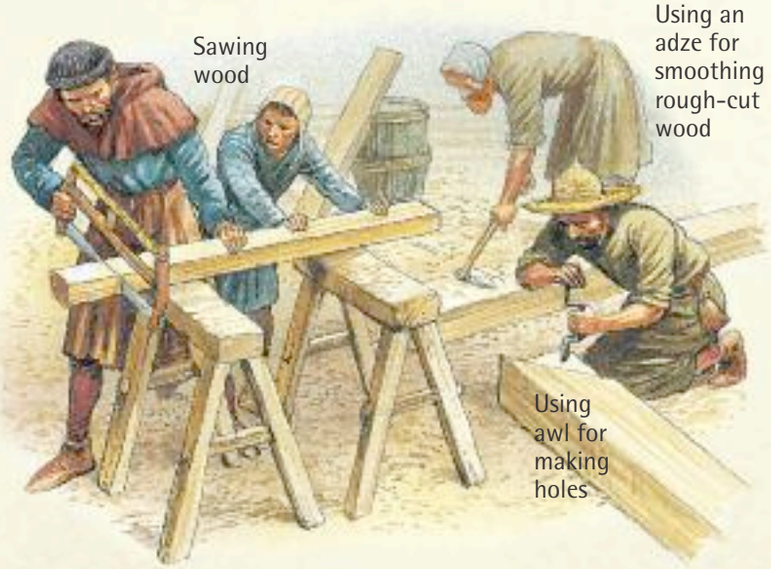
Counting the cost

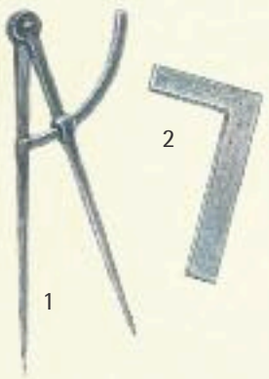
Castles were very expensive to build. Records from the building of Beaumaris Castle, Wales, dated 1295-6, show that 200 quarrymen, 400 stonemasons, 30 blacksmiths and 2000 labourers were hired for the project. The total cost was £14,500 (about $8-9 billion dollars in today's money).

Tools and craftsmen

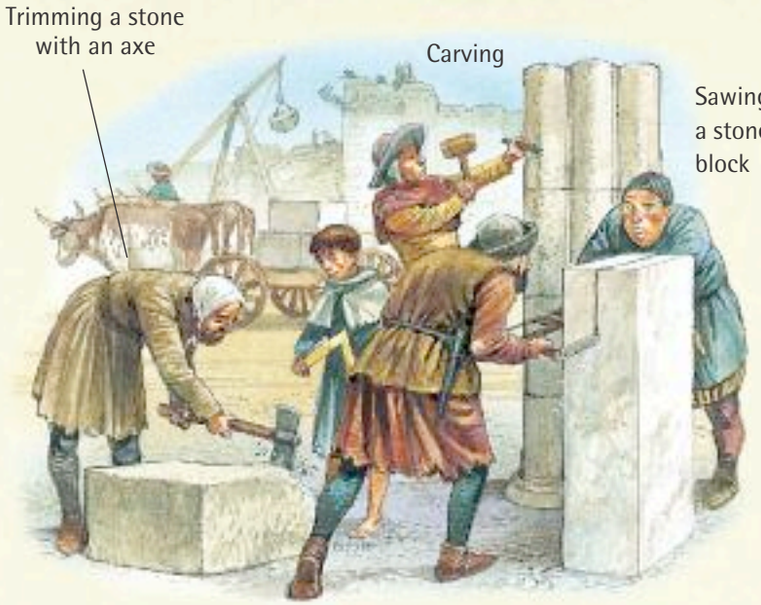
An army of workers is needed to build a castle. With only a few basic kinds of tool available, most of the work is achieved by a combination of skilled craftsmanship and muscle power. Between 2000 and 3000 men, including masons, blacksmiths, carpenters and labourers, may be required if the job is to be completed within 20 years.

Tools, chains and other ironwork are made and repaired by blacksmiths *(left)*. Using an iron anvil, the smith hammers metal heated over a hot charcoal fire in the forge into the desired shape. Carpenters *(below)* assemble wooden items including joists, floorboards, gates and scaffolding. If the castle comes under siege, they will need to make the timber hoardings to cover the battlements and turrets.





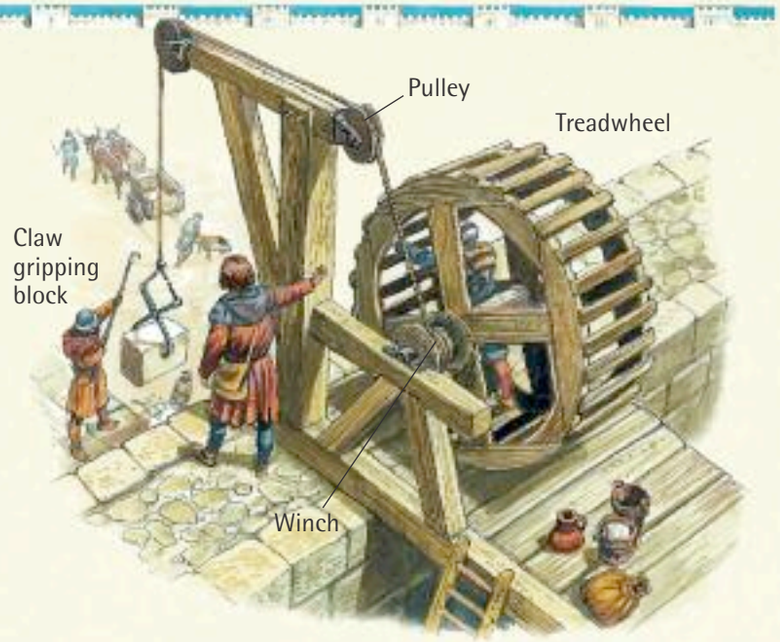
▲ Masons need to cut blocks of stone very precisely, especially when working with curved or intricate designs. They measure accurately using dividers (1), transferring the measurements from drawn-up plans to stones and scoring their surface ready for cutting. Using a set square (2) ensures corners are cut to exact right angles.



▼ A mason uses a range of tools to shape and lay the stones. He has a range of chisels (1) for splitting, smoothing and carving, and a special claw chisel (2) for scraping away stone. He uses a trowel (3) for laying mortar, while an axe (4) is needed for trimming large, rough blocks.

The stones are fashioned by masons. A master mason is in charge of the design of the castle and all the building operations. He works in a tracing house, built for him by carpenters, where he draws out the plans on a plaster floor. He oversees the work of the freemasons, who cut and carve the stones, and roughmasons, who build the walls. Once the stones arrive from the quarry, the rough blocks are cut down to size. Masons select higher-quality stone to form the outsides of the walls and pillars. Using small axes or saws, they trim and smooth the stones, before carving them with mallets and chisels.

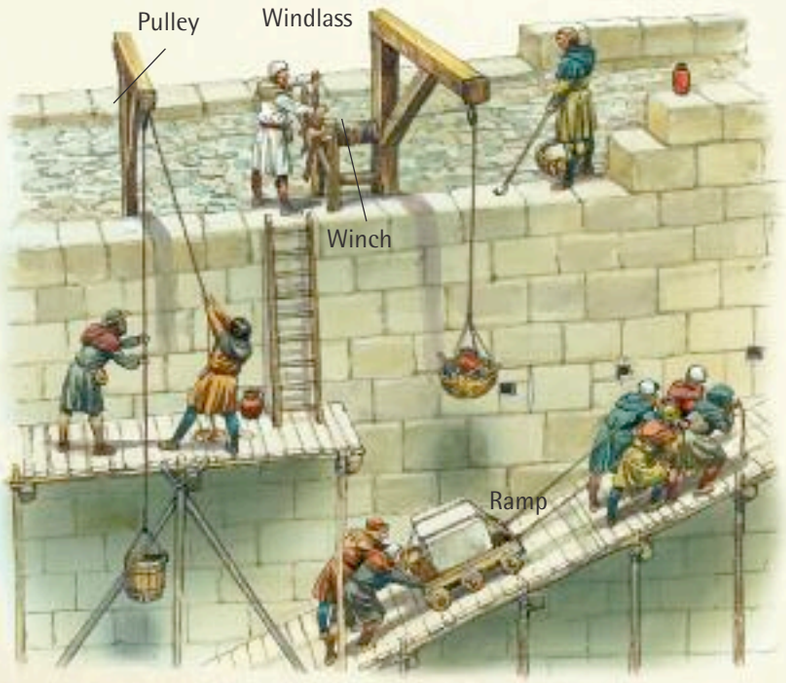
◀ Labourers carry the building stones to the walls. Others mix up the mortar, a mixture of sand, lime and water that will be used to fix the stones firmly in position. Standing on scaffolding, rough-masons lay the stones in rows, checking that they are absolutely level. The walls are made by packing rubble mixed with mortar between two outer layers of stones.



▶ Heavy loads can be winched up to the tops of the walls using a treadwheel. This turns a winch that pulls a rope through a pulley system. Attached to the end of the rope is a special lifting claw. Its pincers fit into tapered slots cut into the sides of the stone blocks, allowing the block to be gripped securely.

Lifting machines

It is hard work to lift heavy stone by hand, so various simple machines are needed. As the castle walls are built up, carpenters erect wooden scaffolding by lashing together planks and poles with rope. They drive supporting beams into putlogs, holes intentionally left in the stone walls. The scaffolding is now secured to the walls. Stones and mortar are then lifted to the upper levels using hoists, wooden frames with ropes fed through pulleys. Stone blocks may also be hauled up wooden ramps on sledges or trolleys by teams of workers. The heaviest stones are raised by more elaborate machines: treadwheels. These are driven by a man walking inside a giant wheel — rather like a hamster!

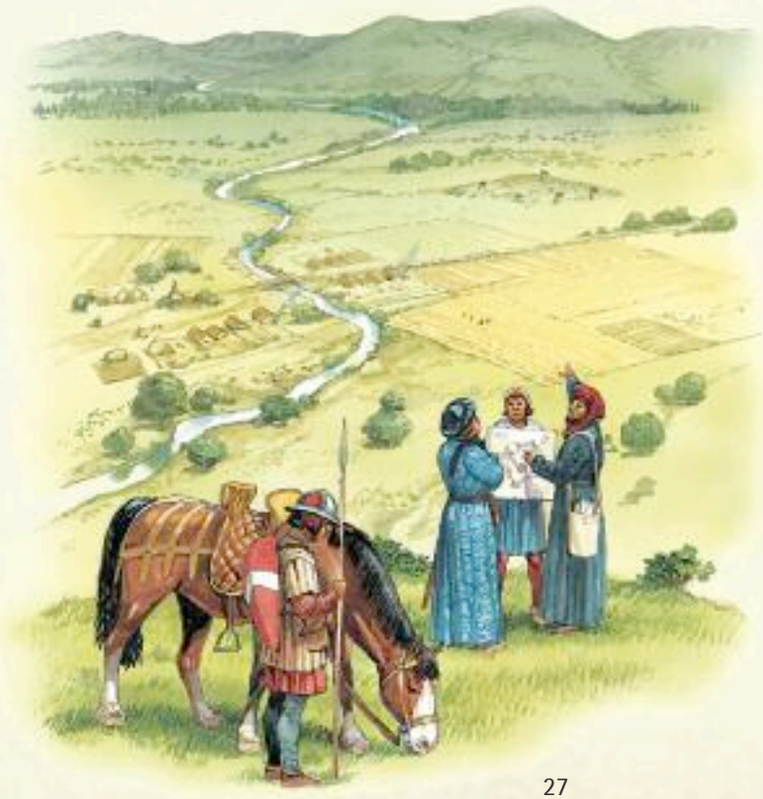


▼ Small loads can be raised by manually hauling on a rope through a pulley. Heavier loads are lifted using a windlass, in which a worker uses a wheel to turn a winch. This winds up a rope attached to the load via a pulley.

5. Building the castle

THE FIRST DECISION to make is where to build your castle. Some castles are perched high on crags or mountains, but most are located on low ground. There are several reasons for this. It will be useful if the people from local villages can visit the castle easily: supplies and labour will then be easier to come by. More importantly, the castle will be far better able to survive a siege if fresh water can be obtained from within the castle walls. Wells can be dug down to the water table more easily in a lowland location. It is also more difficult to dig tunnels in soft valley gravels, which will give the castle extra protection against undermining by a siege army. Even if the castle is then overlooked by higher ground, the castle would likely still be out of range for trebuchets (300 metres).

▲ If building a defensive stronghold is more important, then a location such as this could be ideal. Building a castle on a rocky promontory on the coast provides natural protection on three sides. At the same time, the height of the site assures an unbroken view of the nearby land. It is still vital to have a well within the castle walls.



◀ A good site for a castle might be here, on a small hillock close to a river crossing, but away from an area likely to flood. The site (marked by red flags) would command this important route and so control the surrounding area. The river might also usefully be diverted by your engineers to fill a moat. The village and cropfields are also close by, providing both local workers and food supplies for the castle.

Moats

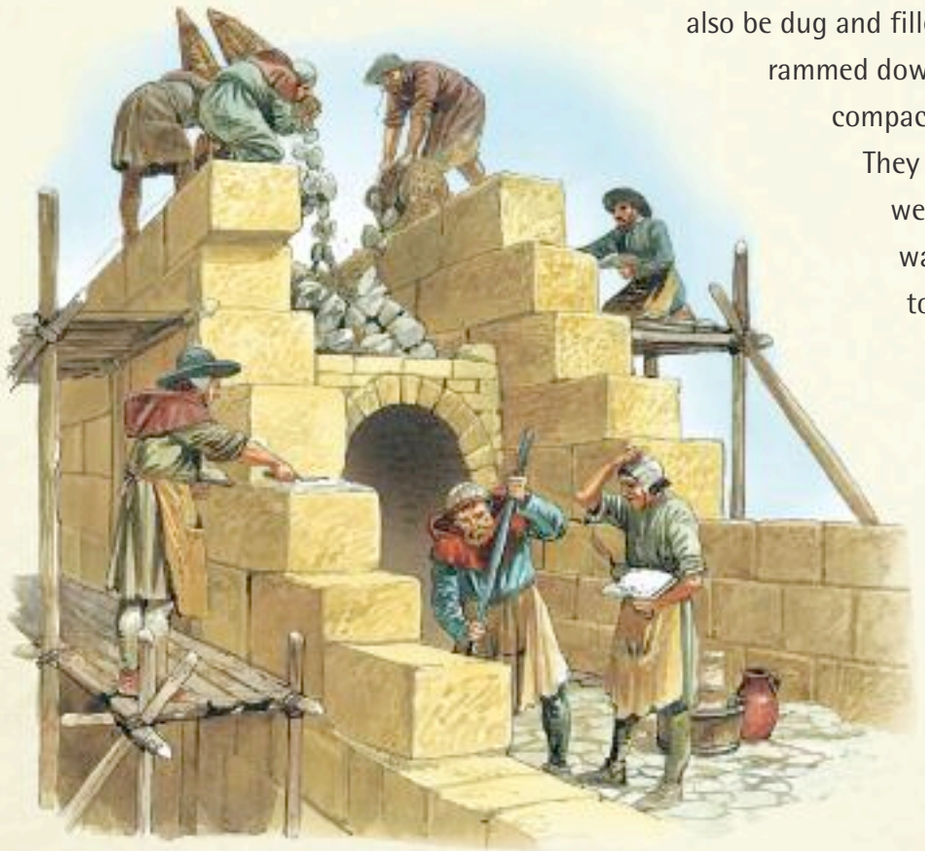
It was often difficult for water from a river or lake to be diverted around a castle to form a moat. Water-filled moats could also be foul-smelling as waste from kitchens and garderobes was frequently dumped in them. Many castles therefore had a dry ditch around them.

▼ While roughmasons work on laying the stone blocks, labourers start to fill in the space between inner and outer faces with rubble and mortar.

Ditches and walls

Before any stone can be laid, workers must dig a ditch around the perimeter of where the castle will be built. If filled with water to form a moat, it should be deep enough to prevent enemy soliders wading through it and wide enough to prevent them leaping over it. A deep, wide moat will also make it difficult for the walls to be undermined.

Next come the foundations. Trenches must also be dug and filled with rubble, rammed down to be as compact as possible. They will bear the weight of the thick walls to be built on top of them.



◀ This wall is to be constructed with an arched passageway running inside the wall itself.

Now the walls and towers can be built. The wall will vary between three to five metres in thickness. The inner and outer faces are constructed first. The stones are carefully fitted and mortared in place *(see page 25)*. The space in between is then filled in with rubble mixed in with mortar. The base of the wall, called the plinth, is angled outwards. This design both makes it harder for a siege army to undermine the walls, and increases the chances that any boulders dropped from the top of the walls will bounce off the plinth into the ranks of enemy soldiers below.

Licence to crenellate

A baron held land granted to him by the king, but did not own it outright. Any lord seeking permission to build a castle was obliged to seek the permission of the king. This was given as a "licence to crenellate": battlements could be added to the walls.

The design of the tops of the walls and towers, the battlements, is a key part of your castle's defence. Running along the top of the wall is a wallwalk, sometimes called an allure. Soldiers can use this to reach any section of the wall under attack. Both the wallwalk and the top of the towers are protected from enemy fire by a higher wall called a parapet. This has gaps in it called crenels or embrasures, sometimes fitted with hinged covers allowing archers and crossbowmen to shoot their arrows while being protected from return fire. The solid parts of the parapet, the merlons, have narrow slits built in them, called arrow loops, which perform a similar function. The gap-tooth design of a castle's battlements is called crenellation.

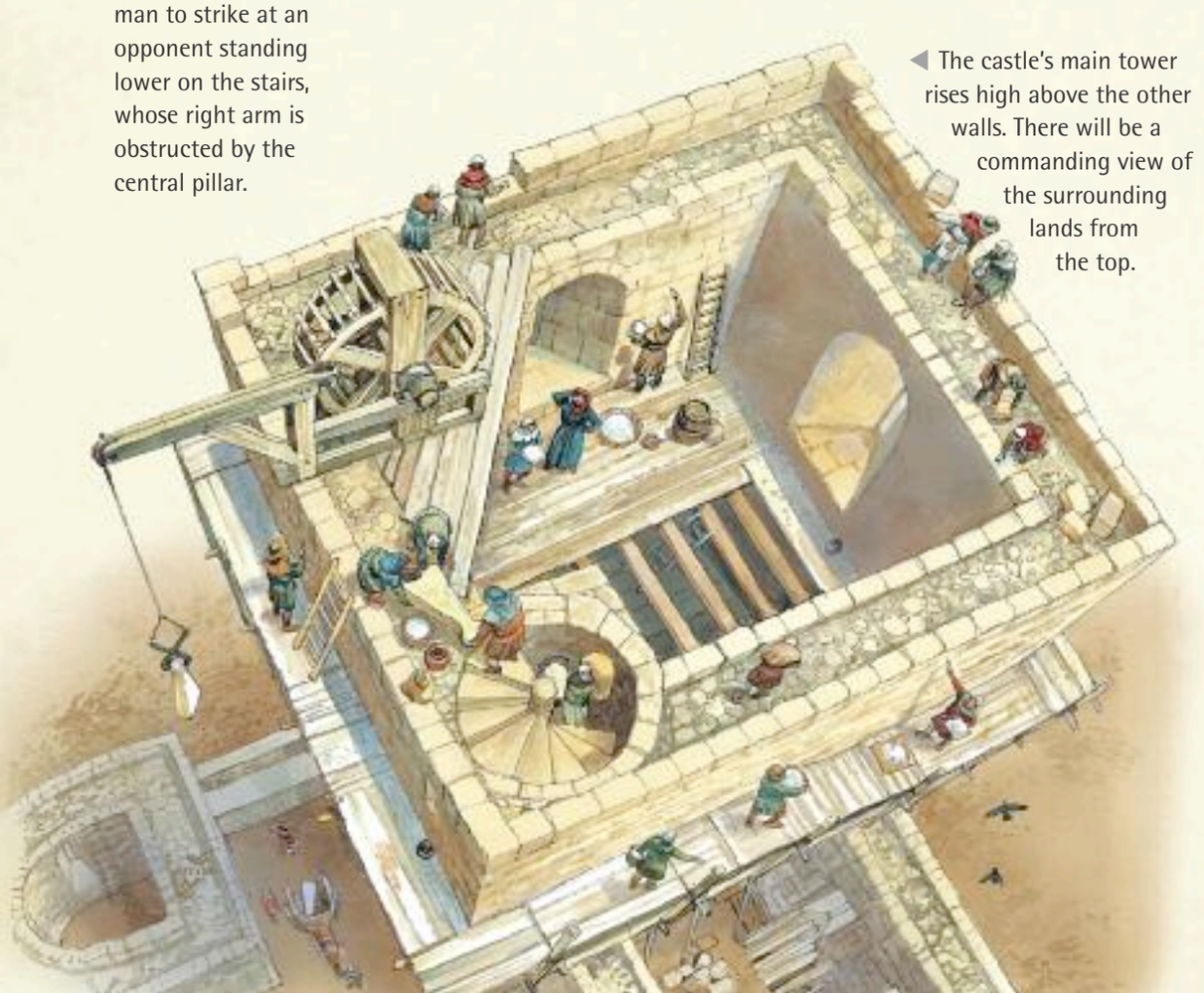
▲ The narrow openings in the walls – too narrow for anyone to climb through – are called arrow loops. They are splayed inside so the archer can shoot comfortably and not be exposed to return fire.

▼ Cross slits are designed for crossbows.

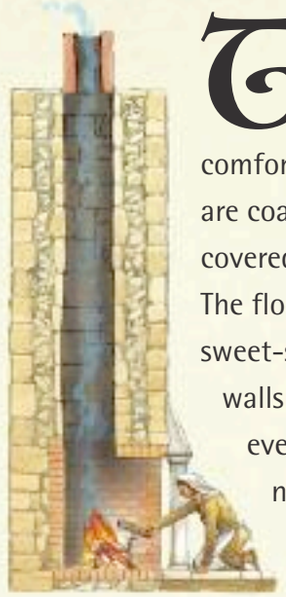
▲ Castle staircases usually spiral upwards in a clockwise direction. This gives the advantage to the castle's defenders—provided they are right-handed. This is because it is easier for a swordsman to strike at an opponent standing lower on the stairs, whose right arm is obstructed by the central pillar.

Towers and shafts

The castle's towers are designed so that, should enemy forces get inside the castle, each can be sealed off and defended independently. The main tower has two entrances, both with heavy wooden doors: one at the base, opening into the inner ward, the other at the top, and reached only from the wallwalk. There are several rooms in the tower, built one above the other and connected by a spiral staircase in one corner. The floors are made from wooden planks nailed to heavy wooden beams called binding joists. These are either inserted into holes left in the walls by the masons, or supported by corbels, stones projecting from the walls. The planks with their supporting joists also serve as the ceilings of the floors below.



◀ The castle's main tower rises high above the other walls. There will be a commanding view of the surrounding lands from the top.



The main tower is where the lord and his family live, so it is important that the rooms are as comfortable as possible. The stone walls are coated with plaster, painted, and covered with wall hangings or tapestries. The floors are strewn with reeds and sweet-smelling herbs. The thickness of the walls will keep inside temperatures fairly even, but in winter open fires are needed to heat the rooms. Fires were lit in hearths in the middle of single-storey rooms in earlier times. Now, in rooms on upper floors, fireplaces are built into the walls with a flue *(above, left)* that draws the smoke from the fire up to a chimney on the wallwalk.

A bathroom is not essential: even the wealthiest lord would bathe no more than twice a year. Water can be heated in the kitchen and carried up in jars. Toilets, or garderobes, are built into the walls. They consist of a seat made of either wood or stone above a chute leading down either directly into the moat or into a cesspit. It is the job of workers called gong farmers to clean out the pit about twice a year.

◀ A room may be cut into the rock at the base of one of the castle towers to form a secure prison cell or dungeon. It can be reached only through a trapdoor in the guardroom above. The light comes through a narrow slit in the walls. The dungeon is sometimes called an *oubliette*, from the French word "to forget".

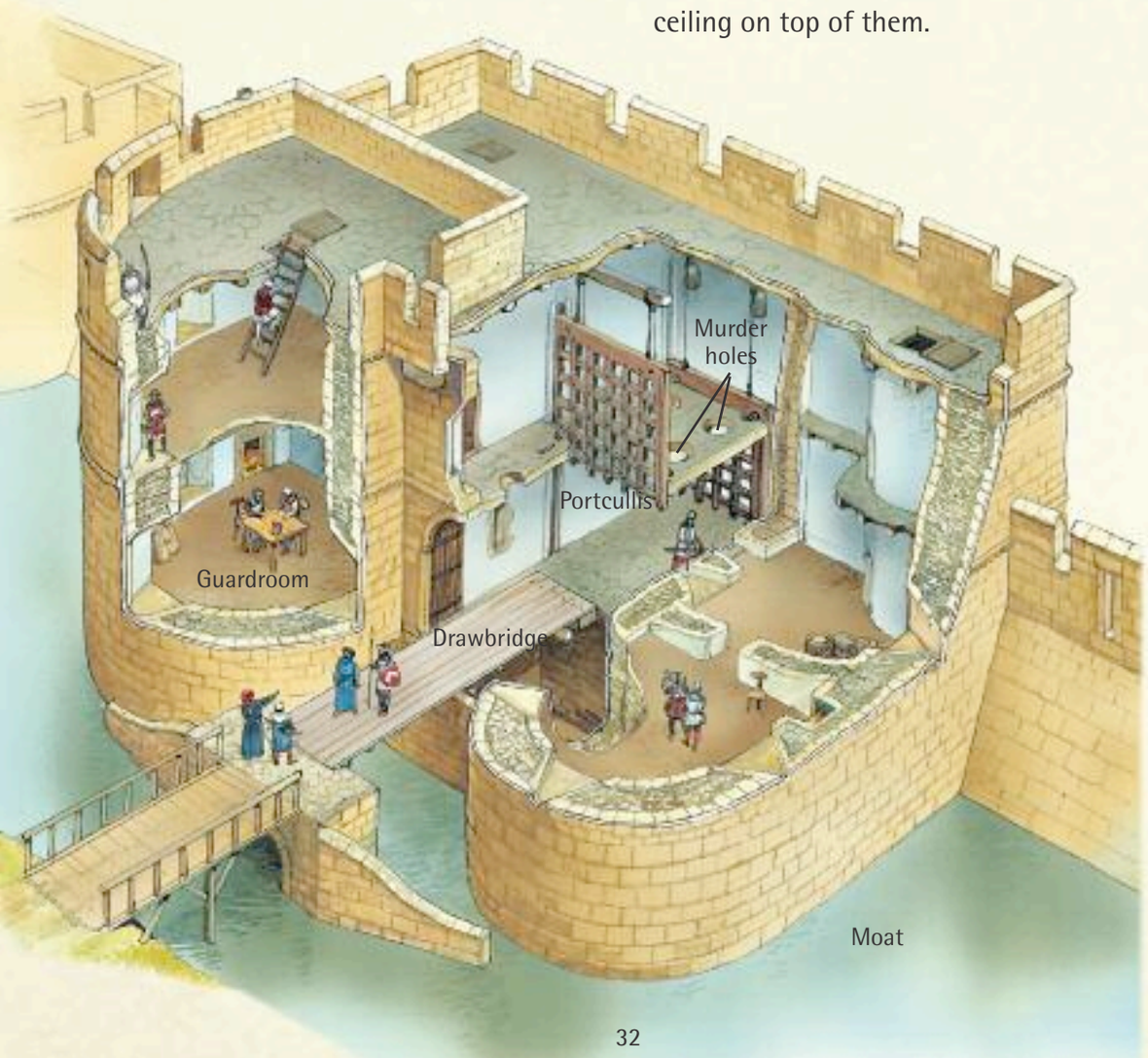
▼ The garderobe is lit by a small arrow loop. The seat is a wooden board with a hole in it.

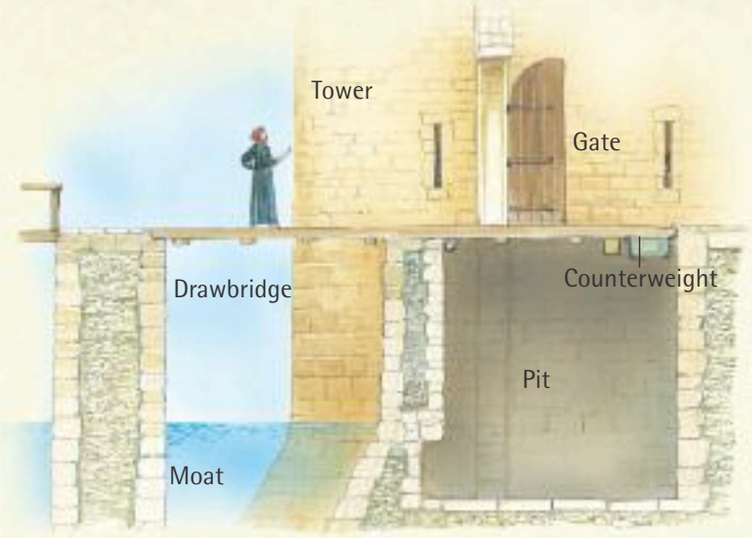
▼ Cross-section through the chute leading down from the garderobe to the cesspit.

Gatehouse

▼ In this view of the gatehouse, the walls have been cut away so we can see the layout inside, including the portcullis raising mechanism and murder holes. The gatehouse towers provide accommodation for the castle garrison. Most of these men are specially hired to defend the castle in times of war.

The gatehouse, the point of entry into the castle, requires extra defences. Two towers stand close by on either side of the entrance, which, when under attack, can be blocked with a raised drawbridge, two portcullises and heavy gates. Portcullises are heavy wooden grilles that slide down grooves in the stone walls on either side. They are raised or lowered using winding gear linked to ropes or chains on the floor above. Trapping the enemy between the two portcullises gives the defending guards opportunities to shoot arrows and drop boulders or hot sand down through the "murder holes" in the gatehouse ceiling on top of them.





▼ If attackers manage to get through the gate, defending guards standing above the entrance can pour hot liquids or oil on them through murder holes in the ceiling. Hot sand finds its way through chinks in armour and scorches the skin.

The first barrier against attack is the drawbridge over the moat. Made of heavy wood, it covers the entrance when raised. Some drawbridges can be operated either by chains or winches. Others, such as this one *(illustrated above)*, are called turning bridges. They are raised by means of a counterweight attached to the inside edge of the bridge. When this weighted end is released, it drops into a pit and the other end rises up sharply.

The parapet above the gateway has a slight overhang. In the floor are square holes for dropping missiles. These are called machicolations *(left)*.

In preparation for a siege, additional defensive structures called hoardings can be fixed to the battlements. They are wooden frames that project from the wall in front of the crenellations and are covered by roofs. Wet animal hides are nailed to them *(right)* to prevent them from being set alight. Hoardings protect the defenders from arrows, while the floor has openings through which defenders can drop missiles.

Ancient fortifications

Strong gatehouses, with drawbridges and portcullises, were used by the Romans in forts dating back to the 3rd century BC.

Great Hall

▶ Once the masons have completed the walls for the Great Hall, the carpenters get to work. They construct large timber frames called trusses that will span the width of the room. Each truss is made in the shape of the letter "A" for maximum strength. The trusses are mounted in position, with each leg resting on a corbel, a stone projecting from the walls already put in place by the masons.

The Great Hall is the largest and grandest room in the castle. For this reason, special care is to be taken over its construction. It will serve a number of different functions. It is the general gathering and dining area for everyone in the castle. It is also the place where the lord of the castle receives his guests. It functions as an office and courtroom, the place where the lord and his steward, who is responsible for managing the castle and its estates, deal with tenants' disputes, receive rent and hand out punishments.

The solar

The lord and lady's private living room was called the solar. This was often situated just off the Great Hall. The lord might retire to this room after a hearty meal and relax by playing a board game.

▶ Other timbers, called rafters, are fixed in position. Roofers then hammer slender battens to these and start to attach the roof tiles. Eventually, the whole roof space is covered and and made watertight.

The Great Hall is, above all, the showpiece of the castle, the room where the lord can show off his great wealth and throw extravagant feasts. For the lowlier castle inhabitants, the floor of the Great Hall is also where they bed down for the night.

The Great Hall is built to generous proportions: about 30 metres long, 10 metres wide and 15 metres high. Large windows make this one of the lightest spaces in the castle.

At one end there is a raised platform, called a dais, where the top table – for the lord and lady and their special guests – is placed. It has a minstrels' gallery at one end, where musicians will entertain the guests during feasts.

◀ Now the plasterers get to work. Lime plaster is made from a powder called quicklime, mixed with water and sand to form a thick paste. Plasterers spread this paste on to the walls. It sets to form a hard smooth coating, which is then painted.

▼ Once the painting is done, tapestries and heraldic shields are hung. In preparation for the feast, trestle tables are erected, and the entertainers practise their acts.

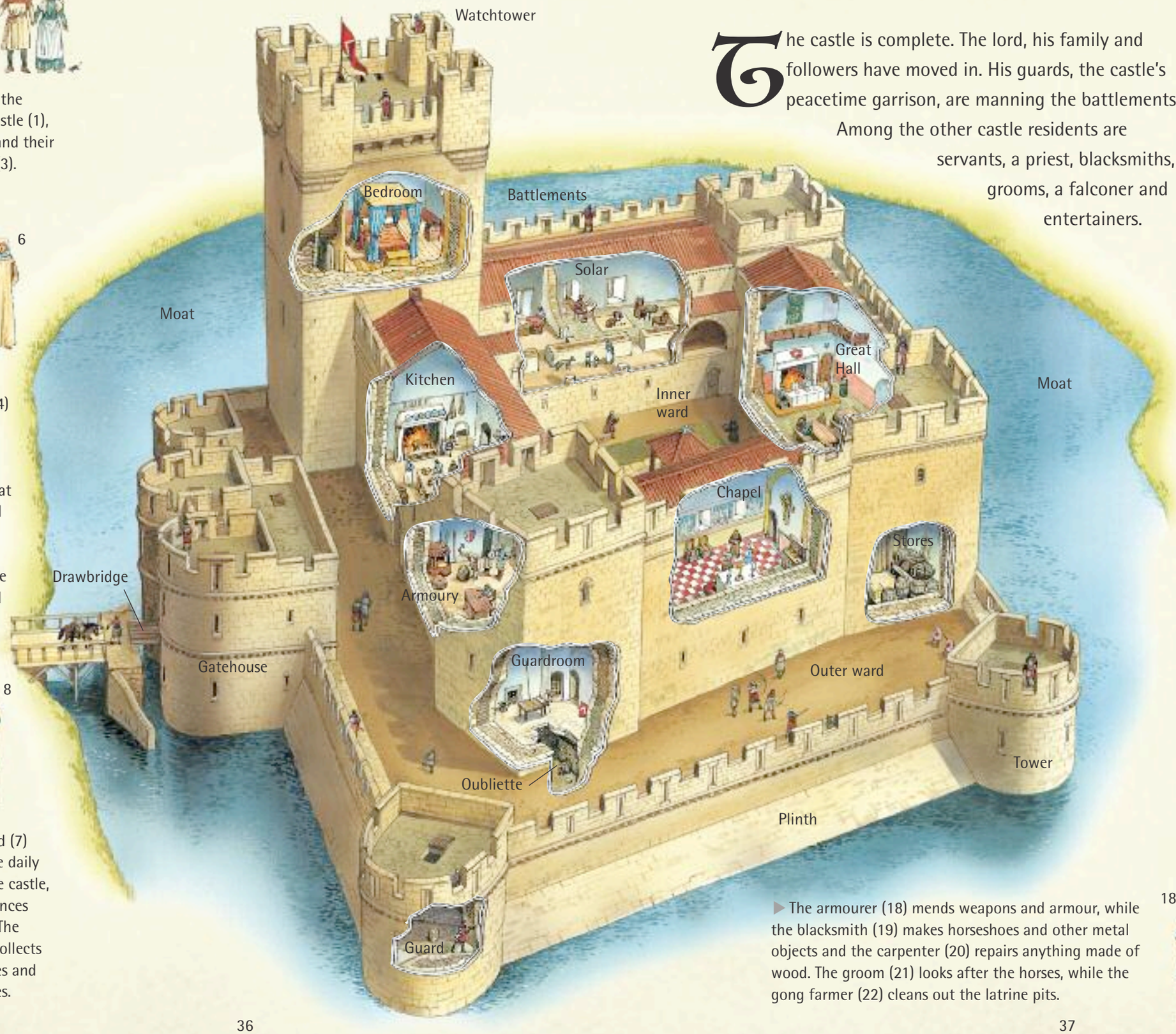
Inside the castle

The castle is complete. The lord, his family and followers have moved in. His guards, the castle's peacetime garrison, are manning the battlements. Among the other castle residents are servants, a priest, blacksmiths, grooms, a falconer and entertainers.

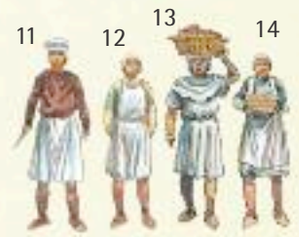
▲ The baron, the Lord of the castle (1), the Lady (2), and their two children (3).

▲ The chamberlain (4) supervises the servants. They include pages (5) who serve at mealtimes and run errands, and ladies-in-waiting (6), the lady's personal assistants.

▲ The steward (7) looks after the daily running of the castle, including finances and supplies. The treasurer (8) collects rents and taxes and pays the wages.



▲ The chaplain (9) takes services in the chapel, and also keeps records of financial accounts and punishments. The falconer (10) trains falcons to catch game.



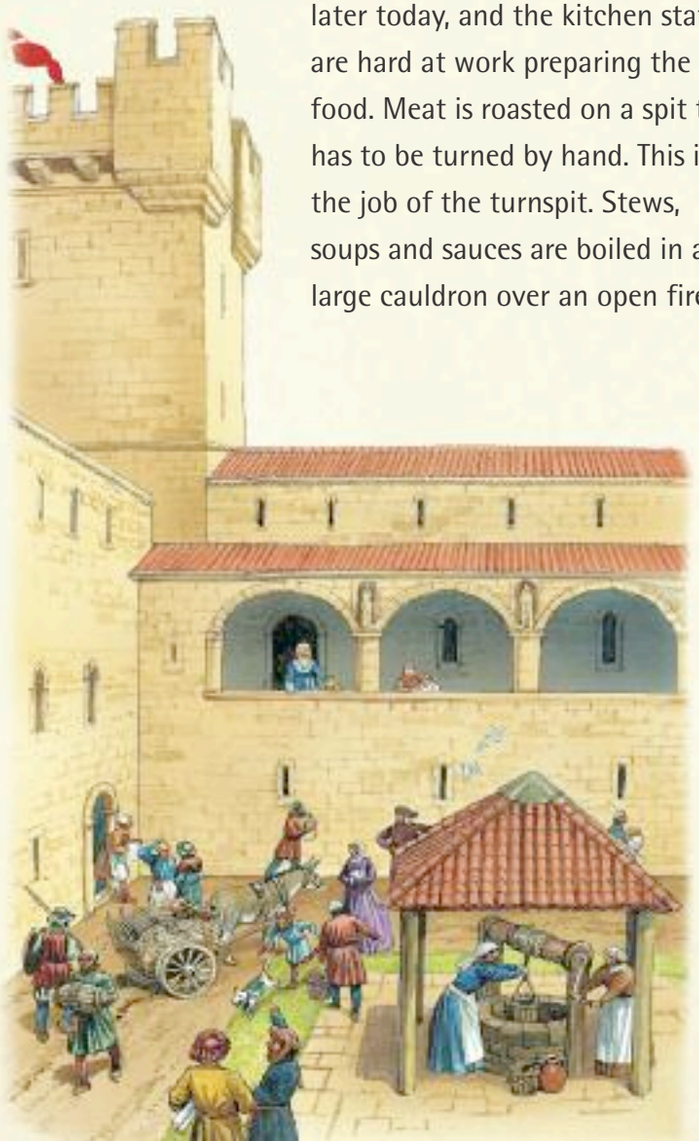
▲ The cook (11) runs the kitchens. He is helped by the scullion (12). The baker (13) makes bread, while the trencherman (14) serves meals.

▲ The pantler (15) is in charge of the food store. Because the water in the castle is often unsafe to drink, people drink beer, made by the brewer (16) instead. The butler, or "bottler" (17), is in charge of the wine cellar.

▶ The armourer (18) mends weapons and armour, while the blacksmith (19) makes horseshoes and other metal objects and the carpenter (20) repairs anything made of wood. The groom (21) looks after the horses, while the gong farmer (22) cleans out the latrine pits.

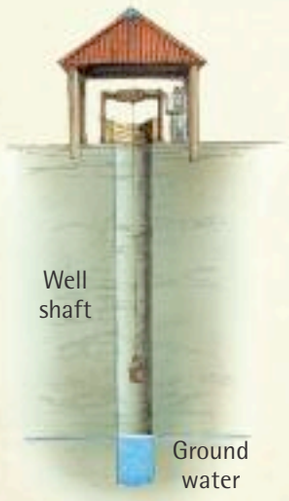
Castle life

The baron is often away, fighting for the king or visiting his other estates. During these times, the castle is quiet. When the lord is in residence, the castle comes to life. The inner ward buzzes with activity as food supplies arrive by cart and the storerooms are filled. There will be a feast in the Great Hall later today, and the kitchen staff are hard at work preparing the food. Meat is roasted on a spit that has to be turned by hand. This is the job of the turnspit. Stews, soups and sauces are boiled in a large cauldron over an open fire.



▶ Even in peacetime, the castle needs to be prepared for sudden attack. The armourer ensures all weapons, chainmail and helmets are in good order. Swords, lances and axes are sharpened on the grindstone, while new swords are made by heating the metal in a forge and hammering it into shape on an anvil.

▼ Having a well inside the castle walls is essential, especially during sieges. One of the first acts a besieging army would do is to poison the castle's water supply. Water is also needed to put out fires started by fiery missiles. Water is drawn from a bucket from a shaft dug several metres deep to the water table, the underground layer below which the rocks or soil is saturated with water.



6. Knights

THE CASTLE WILL be defended by knights, the most important fighting men in the land. So who are these men? How do they become knights? And how do they protect themselves in battle?

Knights are "gentlemen soldiers", a separate class of people below the higher nobility of the feudal system *(see page 10)* but above merchants and craftworkers. Noble lords secure their services by rewarding them with grants of land. Knights are expected to follow a code of chivalry, by which they have a duty to defend the weak and show courtesy, especially towards women. Many, however, fail to live up to these high standards.

1

2

The crusades

From the late 1000s to the 1200s, knights fought in the Crusades, in which Christian forces attempted to win the Holy Land from the Saracens. Among them were knights who were also monks: the Knights Hospitaller (1), who also cared for the sick, and the Knights Templar (2) who protected Christian pilgrims visiting the Holy Land.

Becoming a knight

▲ A page performs a variety of tasks in his master's household, including helping his master dress in the mornings and serving food and drinks at mealtimes.

▲ One of a squire's duties is to look after the knight's horses. He has three: a warhorse, called a destrier, which is trained for battle; a palfrey, used for travelling from place to place; and a packhorse to carry the knight's arms and equipment.

▶ A squire is expected to follow his master into battle. His duties also include polishing his armour, sharpening his weapons and dressing him in readiness for combat.

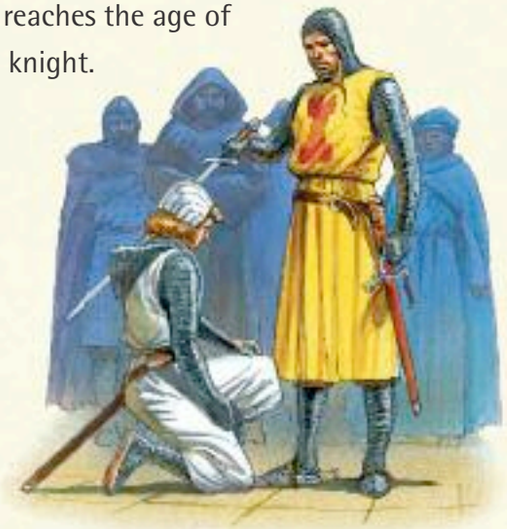
Only the son of a knight can grow up to be a knight. In order to fulfil their destiny, they must go through years of training, to learn the fighting skills and the code of chivalrous behaviour that is expected of a knight.

The first step is to become a page. At the age of 7 the boy is sent to work in the household of another knight or noble lord. At the age of 15, the page becomes a squire, acting as a personal servant to a knight. By this time, he is spending long hours learning swordsmanship, using wooden swords in mock duels with other squires *(above)*.

A squire dedicates his life to learning from his master: how to ride a horse, how to fight with a sword, mace, lance or axe, and how to out-think an opponent in battle. A useful training for the joust *(see next page)* is to take part in the game of quintain *(above)*. The quintain is a post with a spinning arm at the top. At one end is a shield, at the other a heavy sack of sand. The squire must aim his lance exactly at the middle of the shield. If he strikes off-centre, the sack of sand will swing round and quite possibly knock him off his horse!

▼ The evening before he becomes a knight, the squire is bathed and shaved. Dressed in simple robes, he spends the night in prayer at the castle chapel: an all-night vigil.

By the time a squire reaches the age of 21, he will become a knight. This happens at a dubbing ceremony *(right)*, in which the squire kneels before his master, a noble lord or the king himself. Sometimes, if a squire has been especially brave in battle, he is knighted on the battlefield. But normally dubbing takes place in the Great Hall of a castle, before invited family and friends. The squire kneels before the lord, who lightly taps the young man on the neck with a sword, accompanied by the words: "I dub you a knight". He is then presented with his own sword and spurs, often a gift from his father or master.



Knight batchelor

If a squire could not afford all the expenses of becoming a full knight – maintaining horses, purchasing armour, hiring a squire etc. – he might remain a knight bachelor, or even not be knighted at all. Many new knights had no land or property to begin with, and enjoyed a life of hunting and hawking, competing in tournaments and attending banquets at manor houses or castles.

Tournaments

A knight is granted land from a noble lord in return for 40 days' military service each year. The rest of the year knights may travel from tournament to tournament, fighting mock battles for personal profit. It is also an opportunity to practise fighting skills in readiness for war as well as show off prowess in combat. In keeping with the code of chivalry, knights may take the opportunity to display courtesy towards the watching ladies and generosity to their supporters.

▶ A tournament usually takes place on fields just outside castle walls. The area in which the events are staged is called the lists. Knights set up their tents close by. Each is bedecked with his colours and coat of arms *(see page 44)*. His squire helps him put on his armour and his helmet.

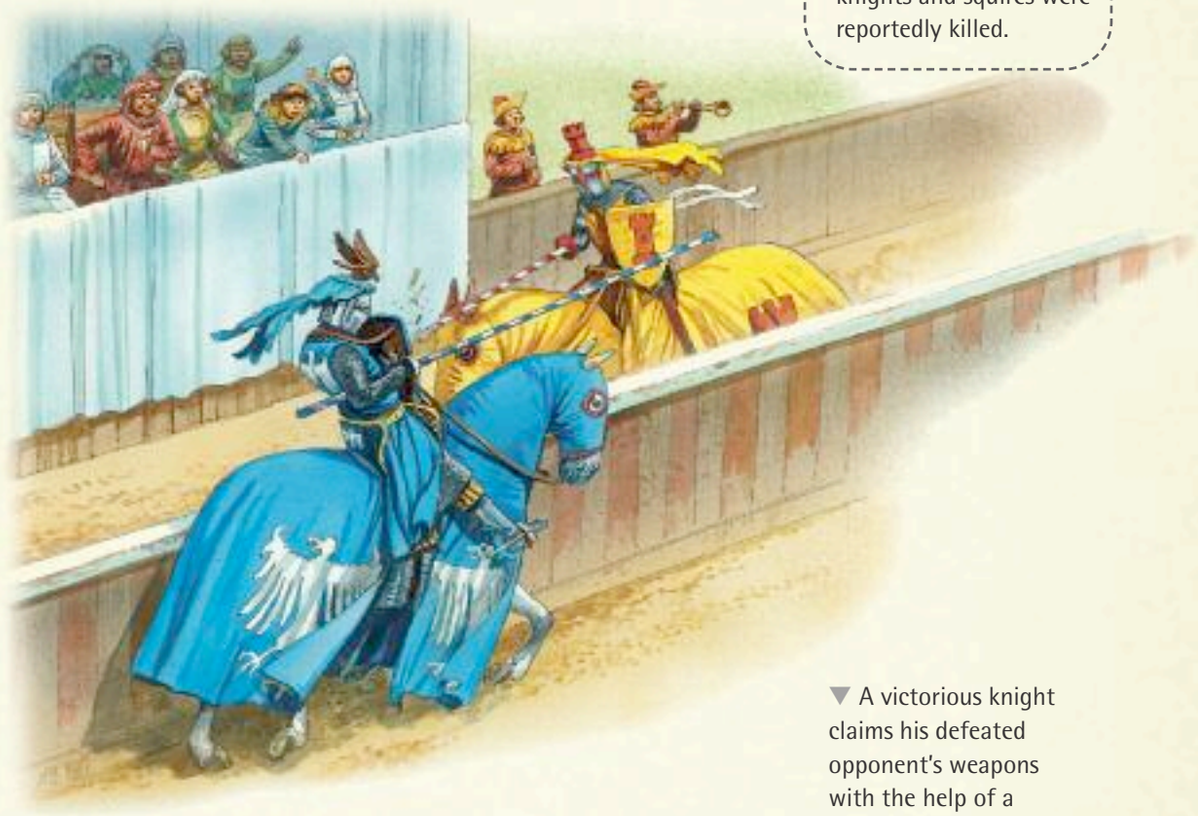
▲ Ladies play an important role at tournaments. They may act as hosts, judge the performances of the knights, or hand out the prizes. Some encourage their individual favourites by handing them tokens, such as silk scarves.

The first event will be the *mêlée*. The knights are divided into two sides and charge at one another *(below)*. Each participant fights as an individual. The object is to capture as many of the opposing knights as possible in order to ransom them, which is to exchange their freedom for money.

The knights use real weapons and death or injury is a frequent occurrence. The joust, another tournament event, is no less dangerous. Proceedings begin with the heralds announcing the names, and listing the knightly deeds of the contestants. Then two knights charge at each other on horseback either side of a barrier called a tilt *(below)*.

Dangers

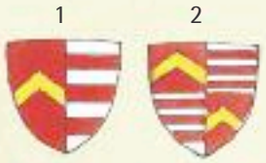
The dangers of death or injury at tournaments were so great that the Church tried to ban them. At one tournament, held in 1241 in the German town of Neuss, 80 knights and squires were reportedly killed.



The object is to knock the opponent off his horse using a lance, a blunted wooden spear. Points are also scored for striking an opponent on his body, with double points awarded for breaking the lance on his shield or helmet. If the points are even after each of the knights' three lances have been shattered, the contest continues on foot with swords or daggers, until either surrenders, or at an agreed time before nightfall. The victorious knight can choose either to claim his opponent's horse and armour, or hold his opponent to ransom.

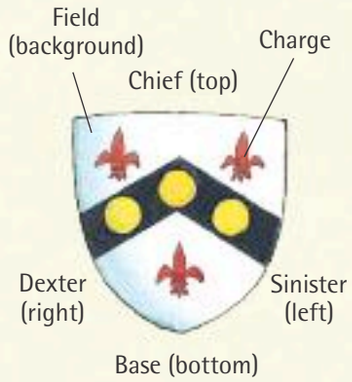
▼ A victorious knight claims his defeated opponent's weapons with the help of a kipper, a peasant boy, hired specially to carry out this task.

Heraldry



▲ When noble families became linked by marriage, the heraldic shield, or escutcheon, was divided between the two coats of arms (1). When their children married, the shield was divided again, or quartered (2).

Knights looked the same when clad in full armour, so they wore a distinctive coat of arms in order to be recognized. The system used for designing and recording these coats of arms was called heraldry.



Colours used in heraldry were either metals – *or* (gold) and *argent* (silver or white) – or tinctures: *azure* (blue), *gules* (red), *purpure* (purple), *sable* (black) and *vert* (green). The simplest designs were called ordinaries. These could be divided, subdivided, or varied by having their edges patterned. Complex patterns, such as furs and semés, were also used. Pictorial symbols, called charges, were frequently added. They often had meanings associated with the person who bore the arms. A rule of heraldry was that a metal charge could only be placed on a tincture field, or a tincture charge on a metal field. A few examples of charges are shown in the chart opposite.

▶ Heralds were originally messengers sent by kings or noblemen to convey proclamations, such as announcing an attack on a baron's castle. They also ran and scored tournaments, and so became experts at recognizing different coats of arms. They started to keep records of these, and soon acquired the responsibility for designing new ones.

Many of the terms for blazoning, or describing arms, came from French. A person entitled to use a coat of arms was called an armiger. At first, only kings, nobles or knights were armigers. Later, towns, guilds and important citizens could be granted coats of arms.

Armour

1100s

Knights in the 1100s and 1200s wore a hauberk, a tunic made of mail — small iron rings linked together — over a padded jacket. The combination of the two gave some protection from sword blows, but a direct hit from an arrow or a lance could still be fatal. For a helmet, knights of this period wore a pointed metal cap with a noseguard.

In the 1300s, mail coats were shorter. Steel plates were added to protect the arms and knees. They were jointed so a knights could still bend his legs and swing his sword or mace. The helmet changed, too. A square helmet covering the whole head, called a helm, was used. The eyeslits gave a very narrow field of vision so the bascinet, a helmet with a "pig-faced" lift-up visor, was introduced.

1300s

1400s

Plate armour offered much more protection than mail, and so by the 1400s complete suits of armour were worn. They were no heavier than mail suits and were quite flexible to wear. A shield was no longer needed to fend off the blows of a sword or mace, but a crossbow bolt could still penetrate the armour.

▼ Armourers made mail by snipping separate rings from a length of coiled wire. Each one was linked with four other rings before the ends were pinched together and fixed by a tiny rivet. A full hauberk might be made of 30,000 rings, each joined by hand in this fashion. A full suit, including mail leggings and mittens, might weigh up to 30 kilograms.

Glossary

Arrow loop An opening in a castle wall through which arrows were shot.

Battlements The top of a wall with a series of gaps and raised portions, called crenellations.

Blacksmith A person who makes or shapes iron objects.

Chivalry The rules of behaviour that knights were meant to follow.

Coat of arms The emblem of a noble family.

Crossbow A mechanical bow using short bolts instead of arrows.

Drawbridge A wooden bridge across a moat that could be raised or lowered.

Dungeon A prison cell.

Feudalism The system by which land was granted in return for service or loyalty.

Garrison The soldiers based at a castle.

Gatehouse A fortified castle entrance.

Herald The designer of a coat of arms. He also officiated at tournaments.

Hoardings A wooden gallery built on top of the walls with holes through which guards could attack the enemy.

Joust A contest in which one knight tried to unhorse his opponent with a lance.

Keep The main tower inside the castle walls.

Knight A mounted soldier who served a lord and followed a code of chivalry.

Machicolations A stone overhang at the top of a wall with square holes through which guards could drop missiles.

Moat A water-filled ditch surrounding a castle.

Motte and bailey An early castle with a wooden tower built on a mound.

Murder hole A hole in the floor above the castle entrance, through which defenders could drop missiles on the enemy below

Oubliette A small cell inside the dungeons.

Portcullis A heavy wooden grille that could be slid down to close the castle entrance.

Siege The surrounding of a castle by the enemy army, to prevent any supplies from getting in and any people getting out.

Squire A young trainee who worked as a personal assistant to a knight.

Steward An official in charge of running the castle's supplies, servants and finances.

Tournament An event in which knights showed off their skills in mock battles.

Ward An open area enclosed by castle walls. Also known as the bailey.

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