Herald 351

Chapter 351 Drawbacks Of The Instant Bow

The military commanders seemed to be in unanimous agreement that the new bow was an epoch-defining weapon.

And this sentiment was reflected by the fact that their eyes seemed to glow with happiness every time their eyes landed on the bows held by the soldiers

The only exception was Hemicus, who also had a similar initial reaction before it was extinguished by Alexander.

And hence he did not join in the celebrations.

Alexander gave the men some time to discuss the weapon amongst themselves, and in the meantime, he also gloated over his invention.

And then decided it was regretfully time to bring the party down.

But contrary to Hemicus's expectation, Alexander did not dampen such enthusiasm with the weight of money.

Instead, like the live fire demonstration, he decided to show them the problem of using such a weapon in open combat.

"Ahem," Alexander faked a cough to draw his military commanders' attention, and asked, "I trust you have enjoyed the show?"

"Yes, lord! To think you have made such a weapon! It's … it's…," Menes seemed unable to find the right words.

This was both because he was overwhelmed, but also because Alexander had strictly ordered all to use Azhak and only Azhak in all formal settings, a language that Menes was still not proficient in.

As a side note, Alexander's instruction had produced great resistance in the army, and even now, Alexander knew that outside of communicating with him, Thesian was the primary medium of communication among the officers.

The reason for this was two folds, one because the time had been too short for the army to learn the language, less than two months.

And also because the Thesians were very proud of their heritage, and were determined to vehemently resist their way of life.

But what was funny was though there was an official version of Thesians which was used in formal speaking and writing, there was also an extremely varied range of dialects that people of different regions of the area used.

And sometimes they could be so different that Alexander would wonder why they were not a different language by themselves.

Alexander ignored these actions for now because there was no better way, and also because he knew the switch would be inevitable.

These people living in a foreign land would naturally pick up the native language while mixing with the locals who outnumber them maybe two to one just in Zanzan city, and maybe hundreds of times over Adhania.

Alexander also planned to favor officers who spoke the language of the land, so if the soldiers wanted better pay and greater social status, they would have to learn to apply themselves to the customs of the land.

This was done because Alexander did not want to deal with an army that spoke a hundred different languages.

But such considerations were for later, as Menes's amazed answer was followed by other similar responses.

"Mmm, I'm glad that you enjoyed it," Alexander answered to all the praises with a light smile, and then suddenly proposed, "Now, let us see the same thing while in a battlefield setting."

"....." The others were a bit confused by this and thought, 'Isn't this a battlefield setting?'

But they decided not to question Alexander, but instead wait and see what their lord meant.

And soon what their lord meant became obvious, as new, now wooden targets were set up, but more importantly, they saw supply wagons being pulled up about two to hundred meters behind the men.

Alexander intended to simulate the logistics of delivering the arrows from the back to the front.

And this sight immediately made the veteran commanders have a sinking feeling.

They were battle-hardened enough to understand what Alexander was eluding to even before the start of the demonstration and all their enthusiasm vanished into thin air.

And soon their fears came true and some more with the commencement of the demonstration, which began under Alexander's command, "Start."

At this signal, the soldiers restarted the procedure of letting off their bows and finished their entire quiver in less than a minute.

In the meantime, there were boys, uncreatively named arrow boys running to and fro between the supply wagon and the front, carrying stacks and stacks of arrows with them in an attempt to resupply the archers.

And in this endeavor, they were doing a remarkably good job, somehow managing to run the 300 meters, deliver the arrows, again run back the same distance to the supply wagon, collect an appropriate number of arrows, and then repeat the process.

And with this constant supply, the twenty men were able to keep up the steady stream of fire without great trouble.

But though the archers were having no trouble, the military commanders watching the demonstration were very much in trouble.

For they noticed what was going on.

They noticed that Alexander had assigned one arrow boy to each archer which was a ridiculous arrangement.

For context, the tooth-to-tail ratio, which was the number of supporting men that were needed to keep a soldier fighting was 1:4 for Alexnader's army, which was evident by the fact that 1200 servants served with the 4800 soldiers.

And so it was impossible for Alexander or any army for that matter to assign individual logisticians to each and every archer.

There were many other jobs during a battle after all.

Taking care of the wounded, being messengers and heralds, and guarding the camp against enemies and also against looters from one's own army.

So even if Alexander was Mansa Musa and had the money to throw 45,000 ropals per minute against his enemy, the difficulty of refilling the soldiers' quivers was too high.

It might be possible in an ideal situation such as a test range and with a very small number of men, but the situation would be vastly different in a real battlefield.

For instance, in real life, the archers would not be arranged in a checkerboard formation, but be bunched together to maximize the concentration of firepower.

And so there would not be just two rows of just twenty men, but multiple rows. maybe more than ten, containing hundreds of men.

This meant that would be very difficult to resupply those in the more frontal sections, and especially those in the middle row, even if there were enough arrow boys to get the arrows from the back to the front.

The experiment ended, or more appropriately fizzled out after a few minutes when the arrow boys become too tired to keep running to and fro between the wagon and archers, causing many of the archers to stand still and defenseless with empty quivers, while others had to significantly slow down the rate of fire to match the delivery speed.

After giving a hand signal to end the demonstration, Alexander turned to face a crowd with a much-downcast look.

The mood had changed very much within the short timespan, transforming the once vibrant and cheery atmosphere into a gloomy countenance of disappointment.

All the men present were smart enough to recognize what had happened and understood the hard limitations this new kind of weapon had.

The constraint was logistics and hard physics and there really was no solution to this.

For the instant bow's rate of fire was too much to make it a sustainable weapon on the battlefield.

And if the rate was reduced, then why use it over a regular bow which was significantly cheaper?

"My lord, how many arrows can the men carry?" Menes asked in a low unyielding voice.

He was not resolved and wished to make the men carry as many arrows as possible.

"Each of the men carried twenty, ten on each pouch attached to either side of their legs. They also had five arrows in their…umm….bows, for a total of twenty-five shots. Which lets them fire at full rate for 50 seconds." Alexander gave the numbers.

"My lord, regular archers can carry 60 arrows in their quivers. And I have seen that the arrows fired by these bows are much shorter, similar to crossbow bolts. So they should be able to carry a hundred right?" This observation was made by Hemicus, and the fact that the usually taciturn man had spoken so much so quickly proved his enthusiasm for the bow.

And this proposal was buttressed by Melodias who joyously commented, "That's right. That's right. The pounch might be useful for getting the bolts out quickly, but we can sacrifice that little bit of speed, no problem."

But the party pooper Alexander had to burst their bubble before his military commanders got too ahead of themselves.

Because it would not work.

Even if 100 arrows could be carried, which for the record Alexander did not think the soldiers could carry, but even if they could, the number was too small.

For context, at the battle of Agincourt, it is estimated that the English had 1 million arrows and 4,000 longbowmen.

That gave each archer an average of 250 arrows.

Also, the battle lasted four hours, which gave the longbowmen an average firing rate of roughly 1 arrow every minute.

While Alexander's instant bow would fire around 30 arrows every minute.

Now, it had to be remembered that the English archers did not shoot one arrow every minute for four hours.

They shoot in bursts and the actual firing rate was actually a lot more.

Meaning their logistic chain was capable was supplying a lot more than 4000 arrows per minute.

But still, it would not have been 30 arrows per archer per minute, making the instant bow unviable to be used in open combat.

Chapter 352 Use Of The Instant Bow

Let's come to one very important conclusion, That this new weapon, I call it the 'Instant bow' is not gonna be usable en-mass on the battlefield. Not logistically possible," Alexander gave the answer that made Menes and Hemicus quite downcast.

They already knew that there was no way the men could carry the number of arrowheads required to produce a high sustainable fire rate.

And if they could not, they were just regular bowmen.

But Alexander's confirmation still hit them in the gut and feel like it was such a huge missed opportunity.

So, though Alexander had cowed Menes with his words, another was not.

"Ahem, my lord, how about using horses to carry the arrows?" Melodias, after Menes wanted to champion his idea, and proposed, "We could make the arrow boys ride horses to carry the arrows. Or better yet, give each of the archers an individual mule carrying a thousand arrows! That should work!"

Melodias clenched his fist and widened his eyes as he said this.

He was desperately hoping for Alexander's approval.

"...." But Alexander did not respond to this foolish idea.

The first point was idiotic as using horses to transport arrows instead of using them to form cavalry was moronic.

And besides, archers many times were placed on hills and ramparts, which pack animals could not access.

So that part was not viable.

And the latter part of using mules was also stupid because these mules would be sitting ducks for enemy counterfire.

Not to mention such an arrangement would spread the formation too thin.

And if one wanted to use horses to carry the arrows, why not just become horse-archers?

Why let a perfectly good horse stay empty and idle?

This last point was quickly caught by Grahtos who excitedly said, "My lord, we can use this new bow with cavalry. Much like the crossbowmen!"

He was ecstatic at having found a use.

"Yes, it can." And Alexander seemed to agree, and then asked, "Where else?"

".Hmmm...." The men took some to think about the bow's other possible uses, and Menes was the first to speak up,

"Since the limit is logistics, they can be used in fortifications! On the walls and ramparts! There won't be any long supply lines then!" Menes said each sentence with a greater amount of force than the preceding one, as if he was discovering each successive sentence.

He seemed excited when answering.

"Yes, they can be used as such. Using to defend forts and stationary positions where the archers will be able to keep a large stockpile of arrowheads close to them. The weapon will let one man do the job of many, making the assault that much difficult." Alexander again nodded in agreement.

And then implicitly turned to Melodia and asked, "Where else?"

"..." This time the silence lasted a bit longer, as the men struggled to find other uses.

And many began to cross eyes with one another as if to say, 'Maybe that's it."

"I can think of another two," But Alexander shattered that thought.

And so the ruminating silence continued for longer, each man eager to show off their pedigree in front of their liege.

They knew being able to answer Alexander's question was the way to earn promotions.

They might be all shordars (barons), but not all of them will become talukdars (Viscounts), or Jamidars (Earls).

And out of them, Melodias was the one most under pressure because his colleague and friend, Menes had already given one answer.

Meaning the score was 1-0 in Menes's favor.

And the score soon became 2-0, when Menes said, "Perhaps Lady Cambyses can use them with the city guards...I mean the police. The rapid firing will be useful to kill rats running through the streets." He crassly added.

This thought occurred to Menes because he subconsciously remembered how Cambyses had poached men from him, and then somehow he imagined a running con man and how good it would be to have a bow that would not need to be reloaded after each fire.

Policemen in Zanzan were allowed to fire at a fleeing target, albeit with the instruction to take care not to hit innocent civilians and so this seemed a perfectly legit tactic.

"Yes, the bow will be quite effective for the police." Alexander nodded.

And then silently looked around for any other answer.

"...." But none came and after a long time of waiting, it appeared that they had given up.

They could not think of any more uses.

And so Alexander gave his two answers.

"Firstly, I think this weapon can be used in siege attacks, like when assaulting walls," He hypothesized raising his index finger, detailing, "So, when the men are rushing up the wall, a quick volley of intense arrow fire could make the defenders move away or duck behind the wall, giving our men long enough to scale the wall and make a small."

Alexander then added, "And in that same vein, it can be used to clear tight spaces, like the corridors of a manor, or similar choke points. Basically, it could be used to kill lightly armored men huddled together."

Then he raised his third finger, and said with a smile, "And secondly, you all forgot about the navy. This weapon is the perfect tool to use in ships."

Alexander enjoyed with a smug satisfaction seeing the realization only dawn on the men only now.

Though they were no naval commanders, they could still imagine that this burst weapon could be a game changer in the right hands, capable of stopping most enemies from boarding ships through a hail of arrow fires.

And this would make the initial boarding similarly risky as modern-day beach landings and it had to be remembered that boarding an enemy vessel and cutting through its defenders was the main way naval warfare was conducted in this time period.

While the other way ramming the other vessels and sinking them.

"Hahaha, as expected of the lord. You can see things we just seem to miss," Grahtos chuckled an almost defeated reply.

He could not believe he missed such an obvious answer.

And his fellow commanders shared the sentiment, drawing rueful shakes of the head all over.

Alexander politely smiled at this frank praise as he began, "So, we agree can that for now, the instant bow will be used during sieges, by the cavalry, and by the navy when we build one, right?"

"Yes, my lord," Was the chorus reply, followed by Grahots's question, "But then will the cavalry use the crossbow then?"

"Yes, we will," Alexander confirmed and then detailed what various weapons the cavalry will use and how.

"The regular cavalry will use the lance, spear, and crossbow in battle as we have discussed, while the instant bow will be used by an elite cavalry unit I intend to create."

"They will be our scouts, and light skirmishers, lightly armored and engaging at the very vanguard of the army to soften targets for the main force."

"This force, I'm thinking for the moment a hundred men, will also sometimes even act inside enemy territory in raiding and assassination missions."

"They could also be used to cause as much chaos and mayhem as possible behind enemy positions, and being able to rapidly fire so many arrows will certainly add to the confusion and give the false impression of a presence of a large force."

"And lastly, this elite unit can be used to covertly infiltrate a city, through secret tunnels or such, and using this bow, they will be able to engage five targets in rapid succession, and likely stopping the enemy from sounding the alarm."

Alexander gave the very basic blueprint of a special forces or commando team.

And then finished by asking"Well, that's all I could think of at the moment. Do you guys have any ideas to share?"

"Hahaha, no, I think those will be enough, for now," Grahtos gave a forced smile at Alexander's huge list of possible ways of using the weapon, feeling both glad at having such a competent master but also a bit defeated for their so outclassed by a teenager.

While Melodias had the urge to ask if such a weapon was used by the goddess and that was how Alexander knew so much about it.

"Good, then I leave it up to you Grahtos to choose the hundred men," Alexander then decided. as he stated his requirements for the recruits.

"These men naturally must be great riders, young, strong, and preferably good trackers or hunters."

"And of course, they should be good shots. It takes skills to use those bows on horseback after all."

"And above all, they should be loyal." Alexander declared.

He had determined that the instant bow was not a weapon of mass use.

If he handed this weapon to a peasant, the poor man would likely have no idea how this strange contraption worked.

'Do I pull the mechanism forward or backward first?'

'What's a trigger?'

All these questions would haunt the poor man.

And if jammed for some reason, which any magazine-loaded weapon was universally prone to doing due to a whole host of things like dirt getting in, or the arrow breaking using operation or the sting getting stuck to a splinter, or some other malfunction, then these inexperienced men would have no idea what to do.

So Alexander planned to let only very trained and very experienced men use this in the front line.

Men who would not for example hit the horse's head with the bow when switching from right to left.

"Yes, my lord. I will personally see to it." Grahtos promised with a thud on the chest.

And with this the instant bow's use was determined.

Chapter 353 End Of The Military Exercises

After the conclusion of the instant bow demonstration ended, the military leaders decided to try out the new weapon for themselves.

And found it to be very fun to use as the ability to quickly fire arrows was something very novel to them.

"Ahh, I just noticed something." Melodias called out while using the bow, "These arrows can only be shot by the instant bow. So we won't have to worry about the enemy shooting us back with our show arrows. Hahaha." The man seemed pleased.

This was a very common practice, where when archers would become empty, they would pick up the arrows fired at them from the ground and use the free ammo.

And in some gruesome cases, they would even use arrows that hit them, yanking them out of the flesh, and then using the bloody head, sometimes with the torn-out flesh still hanging off the metal head, almost as a kind of sanguinary message.

"Oh really? I never noticed!" Menes had missed that part as he took another look at the arrow to find it so, making the general very.

"My lord, can we fire all types of arrowheads with this?" Grahtos on the other hand asked about the compatibility of the slot of the instant bow with different arrow types.

Now, it had to be pointed out that arrows were not just pointy bits of metal attached to a wooden shaft.

Well, they were that, but they were also something a bit more.

Similar to how bullets were not just metal bits shot out really really fast, but a bit more, like having different sizes such as the 9mm, 50cal, etc, having various types such as regular, armor penetrating, incendiary, hollow point, etc, there were also different types of arrows, mainly six.

These types were

Plate Cutter

Needle Bodkin

Barbed type 16

Leaf shape

Swallow Tail

Crescent

Each of these shapes had a particular, specialized use and archers would carry a mix of the top three into the battle, much like a tank crew would carry different kinds of rounds for engaging different kinds of enemies.

Archers would use pate head arrowheads which had a four-faced arrowhead to penetrate metal armor.

The specific design of the arrowhead was important because if one used a round arrow and then the armor would have to be deformed to the full arrowhead size to allow the arrow to pass, requiring a lot of energy.

Far less energy would be needed if four cuts were made on the arrow and then those panels got bent back to make a sort of four triangular flower petal shape, making enough room for the arrow to pass, resulting in greater penetration and a greater chance of death.

The next arrowhead, the needle bodkin was basically a needle-shaped head, made to poke through linen thorax and other leather armor.

The arrowhead got dented by the bronze or other solid metal armor but was really good at getting through fabric armor and also mail.

The type 16 was the typical arrowhead one imagines when asked.

It was a regular arrow not so effective against armor but very good against flesh, the barbed sides sinking into the meat and making getting them out a nightmare.

Those three were the main military arrowheads, while the next three were mainly used for hunting.

The leaf shape arrow was basically a leaf-shaped arrowhead that was good for hunting small and medium game like boar and could also double as a warhead.

The swallowtail was also a hunting arrow, designed like a swallow's tail and very big, designed to hunt deer and elk.

But because of its size and weight, it was also very slow, with a man being able to dodge the arrow from 25 meters, making them not suitable as a warhead.

And lastly, the crescent head, named also because of its shape, looks like a crescent, designed to catch birds.

"The instant bow can accommodate all arrowheads except the swallowtail," Alexander answered to much of Grahtos's glee.

But there was another person not so gleeful and it was Hemicus, though for completely different reasons.

"Master, using this bow on the frontline by the scouts. How are we going to ensure that they don't fall into the enemy's hands?" He reasonably posed, which garnered the attention of all involved.

The protection of this sensitive technology was paramount.

"We don't. At least I can't think of any way to prevent at least losing some," And Alexander gave a very underwhelming answer with a shrug of his shoulders.

Or more accurately a shocking answer as evidenced by the looks of his military commanders.

They had thought that Alexander would have thought of a clever way to prevent this theft, but this frank admittance of his inability caught them off guard.

And they were reminded that Alexander was human as well.

Alexander for his part did try to think of a way to protect this invention.

But in this era of cold weapons, where fighting was hand to hand, how exactly was he to stop an enemy from killing a few of the instant bow users, overrun the positions, and grab the loot?

It was not like in modern wars where the remaining soldiers would have the time to retreat with whatever sensitive equipment there was before the enemy came to their position.

And as the military thought about advising Alexander on possible strategies, they too could find no good way to use the weapon without letting it be copied.

"Forget it. Even if the enemy copies us, we will make ours out of iron, and it will be better. They will not be able to match our quality," It was unknown if Alexander was just saying it, or if he really meant it.

And at least it had the intended effect so making the military commanders cheer up a bit, as Alexander then called, "Okay, let's see some exercise."

He wanted the soldiers to perform a demonstration of how all the new tech would come together in the battlefield.

First was the use of the lance.

Here the cavalrymen were made to ride in a straight line to a target which was called the Quintain.

This was about a 3-inch thick horizontal piece of wood attached to a vertical piece of wood forming the shape of a cross.

The horizontal piece could rotate freely about its axis, and one of its ends was painted white, while the other had a heavy sandbag attached to it.

The target of the horsemen was to accurately hit the painted white part and with such speed that he could gallop away before the swinging sandbag could hit him in the back.

This was not an easy challenge and many of the riders missed the 3-inch target a few times.

They used the technique of approaching the target while grasping their lances with the back point under their right armpit, letting the rest of the spear hang low to the left side next to the horse's neck, and pitching up the spear to point at the target right before impact.

The riders seemed to have found this technique the more initiative, and Alexander did not poke his nose there.

Also, it was here that the stirrups made their showcase, as the riders were able to quickly brace for recoil using the stirrups and quickly regain their posture.

After the lance demonstration, there came the crossbow exercise and then the instant bow.

And they went off without any hitch, with results as expected.

The riders managed to move, shoot and reload from horseback with speed and accuracy as was expected of them, proving that such a procedure was possible.

The crossbows appeared easier to use but the instant bow had raw firepower.

Afterward, a quick mock battle was set up, where two groups of calvary were made to face off against one another, one equipped with the crossbow and lance, and the other with the instant bow.

And the results were particularly interesting for the military leaders.

They showed that when the cavalries were in the open fields, the instant bow users seemed to have the advantage as they were able to snipe the opposing calvary from longer distances and with more

accuracy because they were able to fire a couple of shots very quickly to produce a kind of cloud of arrow fire.

Whereas in static formations, crossbows with their constant fire showcased their worth more, able to hold back the enemy lines for longer.

And lastly, the two cavalries skirmished with each other using spears.

Alexander had wanted to use the lances, but jousting seemed particularly dangerous to Alexander as he feared these good men might break bones from falling off the horse.

And in this contest, the stirrup again displayed its versatility.

The soldiers could be seen leaning to either their side to dodge the incoming spears and then using the stirrups as a level to regain their posture and thrust forwards while staying on the horse.

This meant that there was a lot less chance of soldiers falling off their horses, while at the same time, the could now use their legs almost as a counterweight when striking forward, letting them withstand the recoils much better.

This entire military exercise lasted till close to sundown, and finally concluded with Alexander thanking all the participant soldiers, while the military leaders all praised their lord for providing them with 'weapons from the heavens.'

And he finally returned home after having supper in the military camp, his menu being pork stew, made from the five pigs used as target practice and served to all the soldiers as a celebration for the pasha's visit.

Chapter 354 New Kitchen (Part-1)

As Alexander made in way back from the eastern military district, having spent the whole day there he reminisced about what happened.

He was mostly pleased that the demonstrations went well and good, but he felt a slight acridness at how the stirrups had been somehow overcast by all the other more blingy things.

He had thought that it would get more attention, but forgot it was on the face of it quite a humble invention.

And the reason for Alexnader's error was that he knew the effect the humble stirrup had on history.

This invention allowed knights to stay on their horses while in combat and almost single-handedly gave rise to the concept of a 'cavalry charge'.

It has been attributed to the rise of the knight class in the middle ages and according to some historians even the whole feudal system.

Now, it had to be noted that there is a popular misconception that before the industrial revolution, the whole world practiced some kind of feudal system.

The idea was that the governing structure was that there would be a king and he would give some of the lands to a duke, and that duke gives some of his lands to some marquis, and so on, with each having almost full autonomy to do what they want with their land as long as they could provide the quota of resources, whether it be men or material, set up by his peer above.

And this type of structure definitely existed, especially in the middle ages in Europe, where nobles were basically little kings of their territory, able to make laws, mint coins, judge people as they saw fit, and most importantly of all have personal armies.

But this was rarely the case throughout history.

For example, Rome had a very centralized command, where the emperor and only the emperor could control the army, only the emperor could mint money and no noble or senator could unilaterally make laws.

In the middle ages, the Ottoman Empire was not feudal, and neither was China.

And so for historicals to suggest that one simple invention caused a whole new kind of governmental structure to rise in a part of the world, was a testament to the importance of that invention.

The stirrups allowed a select group of men, who, when sufficiently trained and equipped, could mow down regular folk like wheat, and the latter could do little about it.

And it was this huge martial prowess that forced European kings to recognize the threat and potential of these men, and to obtain and use them against their enemies, they were even willing to give up control of some of their land.

So, few could blame Alexander for being very excited about this invention.

Though it had to be also stated that there are also many arguments against the claim made by some historians.

Because as magnificent and important as the creation of stirrups no doubt was, it was also not like cavalries without stirrups never existed or that they were necessarily inferior.

For example, the Parthians were one of the earliest adopters of the stirrups, but their opponent, the Romans did not seem to have straight away adopted the stirrup.

While Parthia had them before the birth of Christ, Romans started to use them only at the start of the Byzantine rule which was around the 6th-7th century, a few centuries after coming into contact with the neighboring kingdom.

And it was not like Romans did not copy their opponents.

In fact, Rome was probably the biggest intellectual property thief of the ancient world, stealing everything from his opponents, from weapon designs to entire political systems, to even whole religions.

Romans loved copying, improving, and adapting their enemies' stuff into their own.

So, for Rome to not have copied the stirrups was especially intriguing, and no one really knows the reason for sure, but it is hypothesized that perhaps the Romans had saddles that worked similarly to stirrups, or they were really good riders who could control their horses just as well without the extra metal.

So, it was not yet written in gold that Alexander's cavalry with its stirrups would dominate the battlefield.

With these thoughts in mind, Alexander ended his day, while cherishing the fact that tomorrow would be his day off.

And tomorrow soon came, which Alexander celebrated with poached eggs, bacon, and ham, having a hearty breakfast.

And after finishing that, since today he did not have any official duties, decided it was as good a time as any to check out his new kitchen.

He had asked Takfiz to provide the manpower for the construction, and Mean reported to him recently that it had been finished.

And so he made his way to the outside back lawn, where a part of the grounds had been renovated to make a new kitchen.

There were a few new buildings, coated with fresh new paint, and as Alexander approached the new cooking facilities, he was greeted by Mean.

"Alex, come, let me show you around," The petite girl greeted him with a wide smile, and then led him inside.

And as he entered the premises, he was greeted by Julkain, the buff mama that had tackled him.

"Mas....master, welcome. And thank you, thank you," She stammered the greeting.

The latter part was because she felt thankful that Alexander had decided not to punish her for attacking him.

In fact, Alexander had actually written a letter thanking her.

Julkain still vividly remembered the day when she woke up in the servant's quarter that night she tackled Alexander and had spent till dawn entirely shivering in dread, afraid that the soldiers would come anytime to execute her.

She considered running, but the thought of what she did mortified her and so she stayed put, resolving herself to her fate.

And after the sleepless night, her fate seemed to have arrived, as the soldiers did come, led by the scary Jumminus, and Julkain said her last prayers.

But much to her surprise, the soldiers did not grab her by the arm and behead her as she had expected.

Instead, they solemnly declared, "Mistress Mean wants to see you. Come!"

And this command inspired another kind of dread within her, thinking it might be a public execution.

And this thought was even more strongly reinforced when she saw that a large crowd, presumably all the kitchen staff had gathered there.

'I'm about to be made an example of,' Julkain had miserably cried in her heart.

But she was once again disappointed as instead Mean, standing on a chair, called to her with a large grin.

And after Julkain was standing right next to her, Mean spoke out, "I'm sure all of know what happened yesterday- Julkain here stopped the pasha thinking he was an intruder."

Mean politely avoided the exact word which was 'tackled' as she continued,

"And though touching a noble is a capital offense, the lord is magnanimous. He understands that Julkain did this not to attack the pasha, but because she thought she was protecting the pasha from intruders." Mean explained.

"And hence he has decided to not only forgive her but in appreciation of her diligence, has even decided to reward her!" As Mean said so, she took out a letter from her pocket and unfolded it in front of the crowd.

Then waving it around, Mean explained, "Here is a letter personally written by the lord thanking Julkain for her work. Here let me read it out for you. It says:

From Alexander, Pasha of Zanzan,

Greeting to you Julkain. This pasha is very impressed by the courage and commitment you have shown in your work.

You are a shining example for all other fellow workers to follow.

So as a reward, you will be given a monthly stipend of 200 ropals from now on.

And I hope you will continue to serve this manor wholeheartedly for all time to come.

Farewell, Pasha Alexander."

There came a huge torrent of applause after Mean finished, while Julkain felt tearing up, as she immediately kneeled in front of Mean and swore, "I wish to dedicate my life to the lord and his family. Let the gods bear witness."

The mama had tears and a bit of snot coming out of her nose as she said this, crying drops of happiness and glee.

The monthly wage did not affect her as much as Alexander addressing someone as lowly as her by name.

It had to be noted that Alexander wrote that letter early dawn after asking Jumminus about the mama's name.

Mean patted the kneeling mama on the shoulder and handed her the letter as a keepsake, and then dismissed the gathering with the saying, "Remember, the lord said that everybody can become like Julkain if they work hard enough."

This was probably the most cliche line in the corporate world, but these gullible, uneducated servants bought it hook, line, and sinker.

They excitedly swore to not disappoint the pasha, as their hearts blazed with the determination to be just like Julkain, an endeavor that would prove to be futile for most of them.

And after that, when Mean was picking her team for the second kitchen, she chose Julkain as the head of guards, tasked with keeping the security inside the kitchen, such as keeping an eye on the cooks to make sure they did not add anything unsavory to the meals.

"Hahaha, Julkain it's nice to see you. Keep up the good work," Alexander greeted the mama enthusiastically and after some more pleasantries and encouraging her to keep up the good work, decided to start inspecting the new cooking facilities.

Chapter 355 New Kitchen And Old Menus

The kitchen that Alexander designed was pretty basic.

The centerpiece of it was a huge fireplace where meat like boars and deer, and even large oxen, could be roasted on spits.

Left of it was a pantry which Mean introduced to Alexander as, "This is where we store the smoked meat." while the guard opened the large door.

Inside Alexander found numerous birds and beasts such as chickens, swans, blackbirds, and ducks hung on hooks, while the room could also house other beasts such as pigeons, rabbits, mutton, venison, and wild boar.

These cuts of meat would be generally stored for winter after smoking and salting them and would last the lord and his staff for many months.

Alexander did not enter inside because he found the smell a bit overpowering as he then moved on to the next pantry.

This was situated underground, lined with straw and other insulating material, for it was the ice room.

Mean had the guards open the door, and as it was being done, she informed, "As you asked, we made the door of wooden planks with a filling of sawdust between the layers for better insulation."

And then led Alexander into the dark room where a guard followed them with a torch.

"This is where we store the fruits, vegetables, fish and naturally the ice," Mean showed Alexander the storeroom filled with various fresh produce, as well the tall stacks of ice blocks."

The ice room was not an invention of Alexander and was known to most of the world as well as how it worked.

There was even a thriving trade where merchants would fully encase a block of ice with sawdust, keeping it solid for literally months, and then transport them to areas where snow did not fall.

For the nobles there would pay astronomical prices for having the access to cold, soothing drinks in the blistering heat.

The air around inside was very cold, so cold that Alexander found it hard to breathe, and so after a little look around, and finding no glaring irregularities, quickly exited the cold hellscape.

And as he ran back, he off-handedly thought, 'I wonder which unlucky soul gets to retrieve all the ingredients every day? And if he has an eternal cold?'

These two pantries were the main storage facilities dedicated for Alexander and his immediate family and guests.

Mean then took him to another side of the open ground, and said pointing, "Here are the barbecue facilities you asked for. Hope it's okay."

Alexander was a great enthusiast of all things smoked and grilled, with his particular favorite being the Texas-style BBQ.

In his previous life, he had the whole barbeque kit and would sometimes spend more than twelve hours slow-cooking a rib to perfection, just to get that feeling of immense satisfaction when seeing the steak just fall apart and disintegrate when tugged by a fork.

And eager to get that same feeling soon, he quickly hopped to check his new toys.

There was the all-important grill- large and cylindrical with a body made of bronze and as he lifted up the lid, he inspected the grill mesh to find that it was made of thin strips of iron, along with some of the utensils needed to do the bbq there, such as skewers, tongs, brushes, and spatulas.

Alexander then out of excitement picked this mesh to peer into the belly of the grill where the coal would go, and was satisfied with the volume of coal it would be able to hold.

He could cook a lot of meat with it.

"It's good. And I will soon teach you how to use them," Alexander informed Mean after being satisfied with the facilities, and then looked around to see there were four such similar cooking points.

Alexander had built this many with the plan to hold an outdoor bbq party sometime in the future.

And as the image of the slow-cooked, Texas-style bbq steak, dressed with simple salt and pepper and marinated with his specialty beef bone butter surfaced inside his mind, Alexander could not help but salivate.

He even thought of putting the dish on his wedding menu.

Though quickly relinquished that thought after understanding that that kind of meat was not designed for formal occasions, but for close, informal parties.

"By the way, have you decided what to serve at why wedding?" Alexander asked Mean offhandedly as the thought of the menu came to his mind.

"Ummm, yes…I have a rough list," Mean nodded affirmatively and then gave her thoughts.

"I asked the cooks about the customs of Adhania and they told me that royal or such weddings have three stages to them."

"There would be the appetizers- made up mainly of fruit and nuts. Some of the popular items according to them are melon drizzled with honey, pear soufflé made with eggs, seafood cooked with leeks in white wine, and white fish cooked with raisins."

Alexander had a weird feeling hearing this mishmash of items.

Some of them were okay for appetizers, such as the melons with honey.

But fish with leeks sounded like a main course and all his life he thought souffles were deserts.

Alexander did not doubt these cooks as unqualified because he had bought some of these cooks from Adhan and they used to work in the palace or in other noble houses.

So, it seemed that it was Adhania's eating habits that were a bit sketchy, and Alexander would have to choose the appetizers that went with his taste.

After Mean finished listing the appetizers, she told about the next course, "The next course- the main is the most varied. Peasants and poor folks have good cuts of pork, goat, chicken, grouse, and rabbit in their weddings."

"Minor nobles would have beef as the center of their dish, and sometimes entire split roasted calves would be presented in a huge bronze tub."

"While some nobles liked to go the opposite route in terms of size and provide their guests with dormice, here considered a supreme delicacy."

Hearing the word dormice, Alexander would help but interject with a pitched squeak, "Dormice? You mean the rats!"

The disgust and revulsion that conjured inside of him at the thought of eating rat meat was very apparent on his face.

Who knew where that rat had been and what it had eaten?

He had never eaten rat, and would never want to either, not at least willingly.

"Dormouse are not rats Alex." Mean corrected Alexnader with hands on her hips, a bit astonished by Alexander's lack of this common knowledge.

And she then introduced this species to him, "Doemouse live in the wild and are primarily herbivorous, mainly snacking on, berries, apples, and nuts."

"And in Adhania, they are caught from the wild in autumn when they were fattest and kept in large pits, who are then slowly eaten throughout the winter by either roasting and dipping them in honey, or stuffing them with a mixture of pork, pine nuts, and other flavorings."

"It's said they taste quite nice, almost like squirrels," Mean finished the introduction.

This description softened Alexander's reception to the new dish, as he thought he could eat squirrels and those alike.

Though he was still a little apprehensive about it.

But what Alexander did not know was that in Adhania, dormouse was one of the staple dishes to entertain guests, and so it was inevitable that he would have to eat the dish at some point, either as the host or the guest.

In fact, the dormice was one of the rare delicacies enjoyed by both the nobility and peasantry, and catching dormouse was a favorite past time of children,

These children would build rudimentary traps such as the hollow-tree trapping method and the flat-stone trapping method to feast on these welcome protein supplements, while there were even experienced seasonal hunters who would use different types of baits such as fruit and bacon soaked in wine to catch between 200 and 400 dormice a day and sell them as a side income.

And it was not like the dormice were not caught only for their meat.

But their fat was also used as an ointment.

Alexander listened to Mean's introduction to this yet unknown to him species, and then asked,

"Okay, what else do the nobles eat besides rats?"

"Dormice!' Mean instinctively corrected, and then continued,

"Real high nobility like the pashas and kings, do not usually serve these items. But they entertain their guests with fowls and most popularly, the expensive peacock."

"And I asked the cooks how much peacocks cost. It's around two thousand (2,000) ropals a kilogram. Fuck!" Mean could not help but let out a low cuss, a crime Alexander was too guilty of committing in his heart.

Alexander never ate peacock but did read about its taste when he learned about the shah of Iran's lavish party which served the bird.

And according to that article, peacocks tasted to some like a turkey when brined, or like guinea pigs, with most finding it tasting like pheasant or turkey.

"There is no way I'm spending that much on a stupid bird. The guests can curse me all they want," Alexander categorically rejected the peacock off the list.

He was not that much of a wastrel to spend so much on food that did not even taste that good.

And besides he was already hemorrhaging money, and every penny saved was a blessing.

A sentiment that Mean too seemed to share as she answered back with a nod,

"Mmm. Then we will make something out of fowls I guess."

Chapter 356 New Kitchen (Part-2)

These main dishes that Mean described would all have some garden produce accompanying them, such as artichokes, beans, asparagus, beets, onions, etc, either roasted, salted, or prepared in some other way.

"After the main course, is the deserts." Mean listed the third and last course.

And the menu was simple beyond belief, as Mean pronounced, "It's just fruit such as grapes, apples, pears, plums, etc. And it's customary to give various nuts, hazelnuts, almonds, walnuts, and pistachios as a gift to take home."

That was it.

Adhanian food customs did not really have much in the way of desserts, and even their wedding cake was more like a bread mixture.

'Well that will need to change.' Alexander decisively determined about the desserts.

He could not believe that the Adhanian had invented the ice room, but did not have the time to invent some kind of dessert using it.

All they would do was use the ice as a kind of topping to cool their wine.

While in Alexander's timeline, some sources describe ice cream-like foods as originating in Persia as far back as 550 BC, where using ice houses and ice pools, Persians were able to serve and produce faloodeh (a type of fruit custard made from rice or flour) and sorbets (fruit juice/ shake) all year round.

And lastly there were the drinks portions that Mean left implied.

A variety of options would be available such as apple and pear cider, cordials from aromatic plants, fermented honey and water, and of course, wine, which was also the most popular.

Though that one was always drunk diluted to make sure one remained sober and did not make sure the party was rowdy, for that would be a large breach of etiquette.

Listening to Mean's list of courses, Alexander found it not to his taste and almost snobbishly said, "I'm not satisfied with any of the items on the menu. So, in the following week, I will teach the cooks here the dishes I want for the wedding."

Mean kept a placid face to this declaration and nodded understandingly, though commented in her heart, 'There he goes all acting high and mighty!'

A tiny little pet peeve of hers and Cambyses was that Alexander would many times act unimpressed or even express disdain over things the girls would find quite attractive.

Things like good food, housing, bedding, etc.

And they thought Alexander was just hard to please.

While the real reason was that he had much better expectations and also because the things that were new for the girls, were not new for him.

But Mean kept these thoughts to herself, and decided to escort Alexander into the kitchen, teasingly saying, "Well, let's go inside and meet the cooks you will be teaching."

Alexander found all the staff standing in front of the kitchen door ready to greet him, and cheered in a chorus, "Welcome my lord."

These men and women all wore hairnets and white overall with a name tag attached to their chest, as asked by Alexander, looking almost like surgeons.

Alexander nodded lightly to the greeting, as Mean invited him inside and gave him a tour of the interior.

It was a very large complex, with multiple chimneys and large windows, its floor paved with cement and its walls made of wood.

"Here are the hearths and stove," She introduced as Alexander walked past the roaring fireplaces being manned by women and being constantly fed firewood, cooking the liquids inside the many large and small pots.

"And there is the 'pizza oven' you asked for," Mean showed a bit further into the tour.

It was a semicircular stove with fire raging inside, a stove found all over Adhnaia typically used to bake flatbread.

And pizza was that- a flatbread with cheese, meat, and other vegetables as toppings.

Alexander nodded in satisfaction at the construction, as he then checked the area around the stoves for dirt and unclean hygiene practices.

And was reassured to find none.

"As you requested, I have instructed that all the cooks must wash their hands with soap before handling the ingredients. And they must pay particular attention to clean their hands after cutting meat and fish," Mean diligently further reported.

"Good. Unclean hands make us sick," Alexander reminded.

Mean then continued her report, "I have also compiled a list of common infractions and the punishments they carry as you asked. It is hung there."

Mean pointed to a large board placed prominently at the center of the kitchen, which was covered with a large sheet of paper.

Alexander walked over there to read the contents of the paper, and it included the types of mistakes commonly made and the punishment associated with them.

For example, Spilling food mistakenly was marked as getting scolded.

Breaking pots was punished by skipping a meal.

Unclean hands were punished by fines.

And much more, with the list appearing exhaustive.

"How did you make the list?" Alexander asked curiously as he read through the list, and Mean answered, "I asked each of the staff one large mistake they did and how they were punished. That's it,"

"Clever," Alexander nodded approvingly.

Alexander was satisfied with the hygiene of the cooking area, as he then asked, "Could I see where the pots, pans, and utensils are stored? I want to see if they are properly cleaned?"

"Sure, we store them over on the rack there," Mean pointed at a part of the kitchen and soon took Alexander there.

There on wooden racks there were rows and rows of pots and pans of all sizes, made of earth and stored with their mouth flipped down.

Alexander randomly took picked a few and inspected them for any sign of grime and dirt, and noticed none.

But as Alexander was putting them back, he remarked how heavy they were and how convenient it would be to have them made of iron.

'Iron! I should get to starting to pottery shop!' Alexander in his busy schedule had forgotten that he had an excess supply of iron.

In his mind, he thought he would sell the raw, impure ingots as is.

"Mean, what do you think of making all these pots and pans out of iron? And those utensils too!" Alexander asked while pointing to all the wooden spoons and ladles hung on the side of the rack to dry.

'Huh? Is there enough iron in the world, Alex?' Mean looked at Alexander incredulously, thinking he might be overworking himself.

Because in this time period, iron was a somewhat precious material, and so to Mean it sounded the same as Alexander wondering if he could make the potteries out of gold or silver.

Fun fact, even the last thought was not an impossibility if one thought about the Aztecs and Mayans, whose civilization thrived due to the presence of gold as they had not mastered metal-working, though it was that same metal that drew the greed of the Europeans and destroyed them.

"Don't you know about the iron furnace? We can make a lot of iron now!" Alexander also asked a bit surprised, a bit shocked that Mean did not know about this monumental creation.

"I work in the house. And I know what happens inside the house. How would I know what happens outside?" Mean put her hands on her hips and flared up her nose as she chided Alexander.

And this made Alexander comment, "Fair point."

To Mean what the servants whispered was more important than what happened to the city outside.

And this made Alexander again aware that without the printing press, it was very hard for news to spread amongst the populace as evidenced by even someone as privileged as Mean had missed such a huge piece of news.

Whereas if there was a newspaper, which new invention would have been headline news for at least a month.

'Tsk, I really should get to making one,' Alexander again promised himself but found his schedule relatively packed until his wedding about a week and a half from now on.

For within this time period, he had to inspect the wedding venue, oversee its decoration, plan how to showcase the various new products to the people attending them, inspect the coal briquettes plant, visit the cement plant, and the latest thing to be added to his itinerary, teaching the cooks here the new dishes to be served in the wedding.

But for now, Alexander put these scheduled visits out of his mind and instead focused on Mean.

"We have invented a way to make iron cheaply and in very large quantities. So I was thinking of setting up an iron pottery and utensils shop. And I wanted you to oversee it," Alexander offered Mean another job.

He was sure the shop he was about to set up was extremely lucrative.

Because making pottery was like the tech industry of the ancient world- it was where all the money was.

This might sound a bit strange as potters and vase makers were not the wealthiest artisans, but

people needed pottery for all kinds of things- from cooking pots to drinking, to storage jars, to decorating one's household.

And although each individual piece only earned a tiny profit, it was the sheer volume that counted.

So, with Alexander being able to offer pottery made of iron at competitive prices of earthen wear, Alexander was confident about undercutting the earthen pottery industry.

After all, who would want to buy an earthen pot which was heavier than its iron counterpart due to it being thicker, and could break easily, when a perfectly better alternative existed?

Chapter 357 Use Of Gears

When Alexander presented his lucrative plan to Mean, instead of taking and running with it, the girl instantly turned it down while waving her hands dismissively, "Alex, I know how to use pots and pans and knives. Doesn't mean I know how to make them. And besides, I'm already too busy as is. Give it to somebody else."

Mean very clearly was not interested.

But Alexander was unwilling to see this.

Because the shop he was about to set up was not only extremely lucrative but also very secretive.

And his heart would be at ease putting someone he really, really trusts.

But what was so lucrative about making pottery out of iron?

One word- Casting.

Casting to the untrained eye might not seem like much, just a technique of metal fabrication where liquid metal was simply poured into a mold, it took that shape and then solidified, thus making the product.

But it was much, much more complex than that.

There were large, complicated formulas regarding casting, and it was a very technical, and specialized job.

Without these mathematical formulas, making beautiful casting required immense talent and it was almost equivalent to an art.

It was also because of that those artisans who were proficient in the art were revered.

Because they had the sixth sense and intuition to know how the liquid metal would flow into the mold, how quickly it would spread to the corners, and how quickly it would solidify, and then could make designs and molds accordingly.

But this feeling of how a metal worked was a natural ability, and so it would take people literal decades to understand how the liquid metal worked.

Whereas Alexander could replace all that work with maths.

He was taught formulas in a 4-credit course that could accurately describe how to design a mold to get the best casting for various shapes, and because of this precise calculation, Alexander would be able to make his products almost identical in dimension, something not even the best artisans in the world would be able to do consistently.

So it could be seen how he would want to let Mean have these formulas.

This was because Alexander would not have the time to be 24/7 in Zanzan, and so, if there was a new design or a similar one with different dimensions, he could let Mean design the mold.

But since Mean was currently uninterested, he decided not to pressure her right away.

Alexander was of the mind that since setting up all the production facilities and hiring enough labor would take a lot of time, he would have plenty of time to convince Mean in the meantime.

And he replied as such, saying, "Okay. If that's what you feel like, then so be it."

Alexander then stayed on the kitchen premises till afternoon, visiting and talking to the various staff, finding out little tidbits like the uniform for the staff in the manor would take a bit longer, and decided to have his lunch there, consisting of a flatbread topped with chess and vegetables, as a kind of poor version of a pizza, some buns filled with fish and vegetables, and heavily diluted wine.

"Well, I will come to show you some new recipes tomorrow. Then see you at supper." Alexander gave a very informal goodbye and then decided his next destination would be the cement plant.

And why was it the cement plant?

Because he had asked Jazum to have something additional joined to the ball milling machine.

And Alexander wanted to inspect it today.

Alexander approached a part of the Cisrian hills where the cement plant had been relocated and found a few huge, waterwheels rising into the horizon.

These gigantic spinning structures were made of wood and iron, and as they rotated by the rapid descent of mountain springs, they produced a very distinct creaking noise muffled by the crashing of water down below.

All around the site there were busy, busy workers, all purposefully walking, shouting, and working, endeavoring to produce and transport the all-important white powder.

This grinding part of the cement plant worked all day, all night, everyday all throughout the year, with workers given a weekday off on rotation.

So unlike Thursday being a weekend for everybody, some would have their off days on Sunday, some Monday, and so on.

Alexander then looked up to see that three huge hills had been taken over to build the milling plant, and many man-made structures were placed on them.

There were the obvious waterwheels, huge sheds where the grinding occurred, log houses for the soldiers, warehouses, latrines, and many miscellaneous structures, all connected by large, wide, stone-paved roads.

The layout was almost identical to the steel-making plant.

Alexander spent a bit of time looking around to observe the workers' day-to-day operation, finding the place to be functioning properly.

He had arrived unannounced, and because he and his bodyguards were plain clothed, wearing a simple tunic over their armor, they did not draw any attention from the common workers and could observe the mill incognito.

After a while of this, satisfied, Alexander decided to go on to the next site, though he had no plans to meet Jazum today because he just wanted to see inside the mills.

So noticing a large of workers who were transporting the finished clinkers from the kiln to the mill, Alexander picked an opportune moment and silently joined them.

And then simply followed them up through the slopping paved road until he found himself in front of one of the many grinding mills.

'Well that was easy,' Alexander said to himself, commenting about the security here.

But as he looked around and observed the bustling workplace filled with who knows how many workers, he quickly understood policing such a large number of people would be very difficult.

If he were to issue them ID cards like in his manor, then the number of people he would need to employ to enforce this document would be a significant part of the employed labor force.

This would make the entire point moot because people would spend more time stopping cement recipe from being stolen than actually making cement.

And the only reason it worked in Alexander's manor was because of its relatively small size and workforce, and because the workers were all slaves or forced to live on his land.

But the cement grinding plant's inability to enforce strict quarantine did not truly hamper its security.

Because one could learn little from just watching what was happening.

The actual recipe was known to only a handful of them, and except Alexander, none knew the complete one.

Even the workers there only knew what they were supposed to do, but not why.

Alexander marveled seeing the waterwheel up close and then peeked inside to see observe the operations of the grinding mill.

And they were almost identical to how the coke crushing worked.

With only one caveat.

Attached to this ball-grinding machine were two huge, gear-like structures.

Made of thick solid wood, these gears almost looked like miniature waterwheels themselves.

One of the gears, larger and with more teeth, the body made from dried oak was attached to the spinning wheel of the waterwheel, while the other smaller, but with fewer teeth were attached to the ball milling wheel.

In this way, when the large gear rotated once, the smaller gear had to rotate multiple times.

Alexander had to design this mechanism because the grinding mill worked by rapidly spinning, which would cause the solid balls to fall and smash into the clinkers many times per minute, thus breaking them into powder.

But the problem was that the waterwheel did not spin very fast, at best obtaining 3 rotations per minute (rpm).

Whereas the milling machine required around 20 to 25 rpm.

And this number was not something Alexander made up.

He calculated this figure using mathematical formulae, taking into account the average diameter of the ball, the size of the machine, and the density of the material to be crushed.

So, to get his desired rpm, Alexander could do two things.

One- make the waterwheel smaller, because things with small diameters rotate faster.

But this would reduce the energy a waterwheel could convert from gravitational potential energy (GPE) to kinetic energy (KE) and so reduce Alexander's production capacity.

So it would be the same as having a 3 rpm billing machine.

Or two, Alexander could build a gear mechanism, which could make the milling machine spin much faster than the waterwheel.

Gears worked on the principle of conservation of energy, which very simply meant that when a large spinning object was attached to a smaller object, that smaller object would also spin at a much faster speed so that the angular momentum and energy of both objects were conserved.

By this same principle, because the waterwheel wheel was of a much small diameter than the waterwheel, then with the appropriate number of gears were used, the milling machine would spin much faster to expend all the energy of the much larger waterwheel.

While without the gears, this energy would remain untapped and be wasted.

And this was the additional 'something' Alexander had said that the waterwheel needed to Jazum all the way back when he had asked the stonemason to first create a prototype of the waterwheel.

Satisfied with the proper installation of the gear system, and after observing how it was being lubricated with oil and water, Alexander then moved to oversee the other facilities, all of whose operations were up to the mark.

And so Alexander retired for the day while thinking of what recipes to teach the cooks tomorrow.

Chapter 358 Uses Of Coal Brisquttes

Alexander spent almost the entirety of the next week teaching the cooks the things he wanted to be served on the wedding dinner table, the most important one being the wedding cake.

Baking a cake without an oven was possible, but a pain in the ass.

And whilst this training, one day he took a day off because Takfiz had informed him that all the necessary facilities had been set up.

The coal briquettes plant was complete.

So, naturally, Alexander had to go see that for himself.

As he made his way there, Alexander had two options on how to use the coal briquettes.

One was selling it in the open market as cheap fuel, both for civilian and industrial use.

One might think that daily output of 2,000 tons of coal might be too much production for civilian consumption and most of it would go to industrial use.

But one would be surprised by how much firewood, which was roughly equivalent in energy density (Joules per kg) to the briquettes, a regular peasant would consume.

In winter, for heating alone, a family of 4-8 would use an average of about 50 kg dried firewood per day.

With an additional 15-20kg of wood per day was used for cooking.

Though interestingly, despite the high amounts of wood being burned, the room temperatures of these houses would be generally only around 4 degrees Celsius higher than outside temperatures, This was mainly because of the poor insulation of the house, and also because burning firewood was an inefficient way to transform chemical energy into heat, its conversion being only around 30%.

So to mitigate this, the peasants would build their huts with really low ceilings and small doors and windows, so that there would be less space needed to be heated up and fewer ways for the heat to escape.

And since the peasants spent almost their entire day outside, and only spent the night, all wrapped up and sitting or sleeping near the fireplace, there really was no need for large, lavish houses for the poor folk.

Though the size of the short doors would give later historians the misconception that peasants of this time were short, lanky, and malnourished.

Whereas the truth was the quite opposite.

Peasants of this time, due to all the physical activity they were required to do were quite muscular.

Not buff, but strong and muscular.

And they were certainly physically fitter than the twenty-first-century average city dweller.

A peasant would spend about 5 tons of firewood for heating in a year as winters in Zanzan were relatively short, about three months.

While cooking would need an additional 7 tonnes, making the average demand for firewood in Zanzan about 2 tons per capita per annum.

And with a current population of 150,000, that produced a total demand for firewood of more than 800 tons per day.

Or about half of Alexander's daily production.

And Alexander could easily sell the other half to all the industries like steel, cement, and brick who used firewood for kindling.

But Alexander was reluctant to follow this path.

One because in the civilian sector, most of the firewood was self-sourced.

And the very simple reason was because no peasant could afford to buy that much firewood from the market.

So, when there was a lull in the work and in seasons with less load, peasants would often go to the woods and cut firewood, then store them in barns for use in winter.

Or they would simply chop off the dead trees in winter, as they would have little work at that time.

This was also the case in Alexander's previous life, until the medieval times when forests in Europe started to get scarce as people had been hacking away at all the forest areas for generations and over millennia.

It was only then when the price of firewood had begun to rise that people started to seek alternative sources and found coal.

But coal really gained its popularity with the advent of the industrial revolution, when the black soft rock becomes the fuel of the future.

But Adhania had not reached that point, and so currently the civilian market was out of the picture for Alexander, leaving him with only the second option- selling the coal briquettes to the various industries.

And he did plan to do, for he had asked Takfiz to transfer some of the woodcutters who used to provide firewood to these industries to his briquettes-making plant.

But that would not be enough to sell 2,000 tons of coal, which turned to briskets would become 2,500 tons.

Maybe Alexander would be able to sell half that amount.

And so Alexander decided that he needed a second way to use these fuel sources.

And then determined he would use them to make salt.

Salt was a precious commodity of the ancient world, greatly desired by the mass, for to be used as a seasoning, needed to preserve meat and fish, and even prescribed by doctors as medicine.

But contrary to popular belief, salt was not expensive, or more specifically the quantity of salt a person might buy wasn't particularly costly and valuable.

For example- a kilogram of salt in Zanzan cost about the same price as wheat, at 2 ropals.

So a peasant, who earned around 1,800 ropals a year could afford almost a ton of the stuff.

But he would at best need two to three kilograms for his diet, while the majority of his demand would come from him requiring the white powder as a preservative for storing meat, fish, and vegetables.

But though salt was relatively cheap, that was not to say that the salt 'trade' was cheap.

In fact, the salt trade was immensely lucrative as everyone needed salt to smoke their produce and not starve in winter.

Hence it was a volume business.

In this time period salt could only be produced from seawater, but could not be mined from salt deposits as done in modern times.

This was because there was no way to drain the underground water without heavy machinery.

Thus coastal cities could capitalize on this and sell immense quantities of the stuff inland.

Also it was not like all coastal cities could produce salt, causing many of those even living by the sea not necessarily be able to meet their own demand.

The reason for this was because to make significant quantities of salt, one needed to construct salt pans that could take on a great deal of seawater were broad enough to provide a lot of surface area for evaporation and were adequately sheltered from waves and rain so that they don't get wet again, starting the evaporation cycle over again.

Zanzan did not meet the last criteria, for it rained frequently in there, thus depriving it of a salt industry.

Pre-drought salt would be bought from merchants, while currently, it was through the graciousness of Alexander who had bought a large stockpile of salt from Adhan that the people here did not die of malnutrition.

But those places that did meet the criteria did become wealthy through the salt trade.

Very wealthy.

Wealthy like Adhan.

In fact, it was because of the salt trade, that Adhan was able to become the richest province in the country.

They would not even need to set up a salt pit to extract the salt in Adhan.

The life sea would by itself graciousness leave huge deposits of salt on its shore every year and all someone would have to do was scoop it up and collect it.

And since the royal family controlled the life sea, it was they who profited the most from this trade, enabling them to become the wealthiest and strongest family in Adhania and thus its rulers.

They would say 'We are blessed by the gods, that's why we were given the Life Sea.'

Whereas the true saying should have been, 'We control the Life Sea. That's why the gods favor us.'

And Adhan was not in any way unique to this circumstance.

In Alexander's previous life, Venice's first major domestic industry in the Middle Ages was salt. The shallow marshes of the lagoon were already halfway to being functional salt pans and so all that the Venetians had to do was adequately wall it off and clear out the vegetation, and let nature do its work.

The lagoon was typically sheltered from the worst of the action of the waves and so Venice could make a lot of money off of salt.

Not because salt was intrinsically a very valuable substance, but because the city was in an advantageous position to produce and export large quantities of it.

As did Adhan, and as was Alexander planning to.

Alexander's plan was simple, use the coal briquettes to boil off the seawater manually and produce salt like that.

And by his calculations, if could make the plant large enough, by boiling the seawater off instead of slowly evaporating it, he would be able to sell it in such large volumes as he would be able to produce much faster.

This would enable him to take advantage of the economies of scale and underprice the traditional salt.

Because salt trade was a volume trade.

And additionally, Alexander had already transferred the cost of digging up the coal with the steel production because he found all the small considerations tedious, and so he would now only have to consider the cost of making the briquettes.

And that was what he was going to find out today, as Alexander approached the seashore where Takfiz was waiting to greet him.

Chapter 359 Briquette Plant

The briquette-making plant was situated close to the shoreline, on a cliff overlooking the sea.

This particular location was chosen because it was relatively close to the open-air coal pit, and so transportation of the staff, soft rock was pretty easy.

"Welcome, my lord. I greet you well," Takfiz bowed as Alexander approached him on horseback.

And after the initial general talk, Alexander got to know about the plant.

"We have started making the briquettes since yesterday my lord," Takfiz gave him the most important part of the news first as he led the lord inside.

There the very first thing that Alexnder saw were coals being laid down on large, flat terraces which were being run over by heavy rollers pulled by horses and crushing the soft rock.

Because the milling machines were expensive and location-dependent, Alexander had decided to use this simple method of grinding the coal, a method possible because of the relative softness of the material as compared to iron ores and clinkers.

"Once the coal is crushed, we take them there," Takfiz then took Alexander to another part of the facility.

Here the powdered coals were being mixed with clay that had been sieved and cleaned by other another group of women in a 3:1 ratio, and then liberally drizzled with water, producing a wet, clay-like consistency.

This by itself was basically the briquette, without the appropriate shape.

To do that, this 'coal clay' would be put in wheelbarrows and transported to the real production center of the plant.

Takfiz led Alexander here, where over the huge, expansive space, he spotted over a thousand mostly women workers, laboring away to make his coal briquettes.

These women were seen working in teams of two, each with their designated task.

One would take some 'coal clay' from the large heap deposited to her from the wheelbarrow and place them into an iron cast mold Alexander had ordered made.

The mold was just a hollow cylinder with both of its sides open and the women were seen filling up the mold with the appropriate amount of coal powder, placing a solid metal plate over the tip as a lid, and then using repeated hammer blows to compact the powder into a solid shape, letting the lid sink as much it could to get the most solid product.

This lid would then be taken off, and a second cast iron lid, this one with 12 spikes, each 1cm thick protruding out of it would be placed over the hollow mold, before again hammering the lid in as much as it would go.

The hammering actions would be done by the second woman of the pair, and once she felt the coal was compact enough, the hollow mold would simply slip off the briquette, producing a 20cm diameter and 30 cm high cylindrical fuel source, weighing around 5kgs with twelve holes in them.

These briquettes would then be stacked in a pyramid and left to sun dry for about a week to remove the excess moisture after which they would be ready to be fired, being able to burn for three to four hours.

This relatively long time period was due to the holes in them, which were quite important to the functioning and particularly the efficiency of the briquettes.

This was because these holes increased the surface areas of the briquettes and allowed oxygen to come into contact with more of the fuel, letting it burn higher and faster.

So if there were no holes, if the briquette was just one solid block, then they would only burn on the outer surface, while many of the volatile materials in the inner surfaces would not be able to combust due to insufficient oxygen and decompose into inert waste products- like ash and soot, reducing efficiency and thermal output.

And that was why the holes were added, and that was why these types of briquettes were called beehive briquettes.

Because the holes made the briquettes look kinda like a beehive.

Alexander observed this almost robotic process being repeated all over the huge facility, as he reminisced how he got to learn this knowledge.

He had learned of this product and how it was produced when was working in a steel mill.

There huge amount of coal would be used to turn iron ore into pig iron.

And in the process of using so much coal, naturally, some coal would be leftover and even be wasted as the soft coal on the lower part of the heap got crushed into powder by the weight of the upper portion.

These excess coals would be collected by the day laborers working there, who would mix them with various other fillers such as sawdust, mill scale, mud, flour, etc. and then bind them using water to produce a briquette.

Which then they would burn in a special stove called the beehive stove to prepare their food.

The reason the workers needed to use coal briquettes or if that was not available firewood to cook their food was because the steel mill was way out of the urban city and had no gas supply lines.

So, for these people, who lived close to the minimum wage, being able to save on their firewood prices was a significant boon.

'A penny saved is a penny earned,' was a saying these poor men learned the hard every day all year long.

And it was observing these workers making the coal briquettes in their free time that Alexander learned the technique.

After finishing his reminiscence, Alexander finally bought himself back as he refocused in eyes on the work being done in front of him and mentally counted that it took around 30-40 seconds to create one briquette.

So, with a working day of 10 hours, and generously assuming that 2 hours were wasted in miscellaneous activities like eating, relieving oneself, a little resting, etc, still just one pair could produce close to a 1,000 briquettes a day, or use around 3.5 tons of coal and 1.5 tons of dirt.

Alexander planned to transform all the coal exacted into briquettes before using them in his industry or making salt.

So, to convert 2,000 tons of coal, he would need around 600 pairs or 1200 workers.

And add another 800 responsible for all the other stuff, like transporting all the coal from the mines to here, crushing the coal, sieving the dirt, creating the mixture, etc, it gave Alexander a total workforce of around 2,000 people.

A number confirmed by Takfiz when Alexander asked, "How many people have we got?"

And then asked about the wages, "So, how much are we paying them?"

"It varies depending on the jobs. The cart drivers are all male and get 5 ropals a day. So does the roller workers who crush the coal." Takfiz readily answered,

"The women sieving the dirt get 2. The one's mixing and delivering the coal slurry 3, and the two workings the mold 4 ropal, my lord." Then he finished.

"..." Alexander silently noted that the women were paid a ropal a day less regardless of their type of the job.

Which was the norm of this time, and a practice that arguably even persisted in his own modern time.

So, he did not childe Takfiz for this.

He figured that the old man might even harbor the impression that just a 1 ropal wage difference per day was being very generous.

And Alexander was right in thinking this because usually women were paid 2-3 ropals less a day, sometimes even more if the owner was particularly cutthroat.

And that was considering if they were allowed to work at all.

In many cities and provinces, women were not even allowed to have jobs.

Sure they could buy and sell stuff, like by pushing vegetable or fish carts, but usually those produce would belong to, or had been caught by her husband or sons, or other some next of kin.

For a regular woman, there was really only one way to earn money all by herself.

And that was working the oldest profession in the world.

"Hmmm, increase all the women's pay by 1 ropal. Let them know I'm aware of the plight the womenfolk especially have suffered during the drought and that I'm a generous lord," Alexander instructed Takfiz.

This was done both for a PR stunt and also because Alexander believed that the same work should deserve the same pay, regardless of one's gender.

He did not strictly believe in the motto 'Women should get as much as men.'

But believed that 'All workers should get as much as they deserve.'

And seeing the women do the bulk of the work, a 1 ropal price increase was the least they deserved.

There was also the third consideration that letting these women get off their feet will help them improve their living standards and they will be able to contribute more to the economy.

After all, living off just 2 ropals a day was very hard.

One might be barely able to just subsist on just bread and some boiled and salted vegetables with that amount of money.

"Yes, my lord. I'm sure the women will be forever grateful for your generosity," Takfiz readily complied.

Since it was an order from his lord he had no reason who ask for anything more.

And besides, it was not like it was his money.

And lastly the clever old man noted to himself to price the women's and men's wages equally, as expressed by Alexander's preference.

Chapter 360 Salt Plant

Tafkiz did not attempt to argue with Alexander's decision, though his heart did have a slight acridness.

For he felt that this young lord was a little too generous.

Takfiz was a well-to-do merchant before becoming a slave and he even had certain distant relations with a minor noble.

Hence, being a man of age, Takfiz had seen a lot and firmly believed in the saying, 'Give them an inch and they will ask for a mile.'

And if Alexander could read Takfiz's mind, he would have most likely agreed with the old man to some extent.

Giving the people something without them asking for it was a dangerous way of developing greed among the populace.

But Alexander decided to do it this particular time anyway because, one- he felt bad for the women who had almost no say about their wages but mainly because he wanted to portray himself as a generous lord, an image that was crucial for him to maintain as he was a foreigner.

And besides, spending an extra thousand ropals a day was peanuts to him.

"By the way, why are there so many women employed? What about the men?" Alexander then asked curiously, noticing the skewed distribution.

It was not like he disapproved, but just that he found it unusual for someone like Takfiz to follow such an unconventional recruitment process.

"My lord, after your instruction, Lord Menicus suddenly came to me asking me if I could spare some men. He said he needed them to prepare some new fields for the spring."

"And when I told him about your plan, he simply took the woodcutters and instructed me to use women instead."

"His exact words were, 'Since it's not too hard labor, use those good for nothing who do nothing but shamelessly strut around the street tempting men.'" Takfiz even did the old man's gravelly voice.

Alexander only lightly smiled upon hearing this tale, feeling that was in line with Menicus's character.

"You did well," Alexander nodded approvingly.

And then he set his mind to calculating the cost of one briquette.

For convenience's sake, he simply took the average wage to be 5 ropals and then multiplied that with all the employed workers to get 10,000 ropals a day of labor cost.

There were some other running costs such as feeding the horses and regular wear and tear of the carts and wheelbarrows, which Alexander simply rounded off to 1,000.

And then assumed the set-up cost to be zero because it was relatively negligible.

So, given that around 550,000 briquettes could be produced per day, one would be able to buy 50 briquettes for 1 ropal.

This was equivalent to 250 kg of firewood and that would cost someone 25 ropals.

The massive price difference was because surface coal just needed to be dug up, as opposed to firewood that needed to be chopped, cut, and then dried for weeks before being usable.

The maths really pleased Alexander, as this meant that fuel for boiling the salt would be really cheap.

And so, finished with inspecting this plant, Alexander got to instructing Takfiz about creating another new plant- one which would make salt.

And once that was finished, Alexander went on a tour to visit the important site, the salt producing plant.

The history of salt was as old as time.

In the Iron Age, the British evaporated salt by boiling seawater or brine from salt spri-ngs in small clay pots over open fires.

Roman salt-making entailed boiling the seawater in large lead-lined pans.

In that empire, it was even used as currency, and the roots of the words "soldier" and "salary" can be traced to Latin words related to giving or receiving salt.

And this traditional way of collecting salt persisted till the middle ages, where the salt would be collected from the evaporation of saltwater, either from the sea or from natural salty springs.

And because of this process of driving out the water to leave the salt behind, it would also leave some other bad residues with the salt.

Because it was not like there was only salt dissolved in the seawater.

Dirt, small bits of organic matter like leaves or dead tissue, organic wastes, and tiny fishes, were just some of the many miscellaneous stuff that would remain with the salt after this type of extraction.

So this salt would be frequently purified by merchants before sale, or by households before use, by redissolving, filtering, and evaporating it again, though such meticulous care was only given to salt being directly eaten with food, and not when it was being used as a preservative.

The inherent impurity present in this type of salt extraction presented an opportunity for unethical salt merchants who could and did add bulk to their product by deliberately mixing in sand.

And unfortunately for people who lived inland, they would need to buy or barter for salt in any way they could and hope that they got more salt than sand in the trade.

In this way, because salt was so precious, in many instances, it's presence and abundance not only to have determined the site of human settlements and their prosperity but also influenced the social climate.

In places where salt was plentiful, such as along the shores of the Mediterranean and the North Sea, societies tended to be free, independent, and democratic.

But where it was scarce, "he who controlled the salt controlled the people."

For example, in the ancient river valley civilizations of the Nile, in Babylon, Mexico, Peru, and some parts of China, the rulers and priests monopolized salt and used it to manipulate their unfortunate salt-addicted populations.

And a similar case could be applied to Adhania too, with the royal family's huge monopoly on salt being a major reason why they could control Adhania.

And it was not only because of the astronomical amount of money they earned.

But more so because Adhan as an inland city had access to its own salt, and could transport these further inland at less a price than other cities and provinces that produced salt from the sea and hence needed to be coastal.

This way, the royal family from Adhan could project much of its authority way inland than other cities and pashas could, thus letting them exert their will on a much greater area.

In fact, one reason why Pasha Muazz was so loyal to Amenheraft was because the king was his main salt supplier, and hence crossing him would mean death and starvation for the fat noble.

A role that Ptolomy had taken over from his brother over Alexander.

And a monopoly that Alexander was eager to break.

The precious nature of salt and it being taken over by the powerful and the rulers, caused traditions and customs to slowly grow up around salt, giving the white powder an almost mythical quality.

It was used as medicine.

It was thought to increase libido.

It was used in many of Adhania's religious ceremonies and similar to the Japanese it was assumed to be able to ward off ghosts and evil spirits.

And it was also Adhanian custom to place salt as the first item placed on the table and the last item removed from it.

Lastly, salt was historically a source of conflict and war.

Since it was universally consumed government found it a great way to tie their taxes to the stuff and when taxes rose, i.e- the price of salt rose, revolutions had a tendency to follow.

For example, anger over the salt tax was one of the causes of the French Revolution.

And in colonial India, only the British government could produce and profit from the salt production conducted by Indians living on the coast, which led to a revolt by Gandhi and had significant consequences for India gaining its independence.

Because of all the significance salt had, Alexander's decision to produce salt was a no-brainer, even if it would piss off Ptolomy a bit.

And the way Alexander had asked Takfiz to build the salt plant was very different from how the old man knew salt was made.

The traditional way of making salt was to first choose a plot of land on the beach and loosen the sand using one's feet.

Then using buckets, the seawater would be sprinkled on to the sand, wetting it.

Each worker would usually sprinkle 70 kg of seawater per round, for a total of 20 rounds per day.

This large amount of water would be carried by a pair of huge buckets, which would be connected to a wooden rod.

The workers would place the rod over their shoulders and thus carry the 70 kg on their shoulders.

Or in some places, thick bamboo would be filled with seawater and then be sprinkled onto the sand through holes drilled in the front.

This procedure would be usually repeated for six days, while each day, workers would use a large rack to shift the sand to help it absorb more water until it became saturated.

After six days, a large wooden box with a pipe sticking out of it near the end would be constructed near the beach.

The saturated sand would be filled with it using shovels and then even more seawater would be added to the sand, after a few rounds of which seawater, or brine as called would come pouring out.

And up to this point Alexander's and the traditional way matched.

But diverged radically in the next step.