Herald 321

Chapter 321 Expanded Armory

The weapons shop was built a bit further away from the other two and was designated as a level-3 workshop.

This seemingly low number might surprise many people, as the weapons produced here were a matter of national security and could be said to be one of Alexander's trump cards.

But the reason for this designation was because Alexander did not consider these weapon production plants to be economically very significant for Zanzan.

Sure, revolutions in armor technology like chainmail were being made here, and wonder weapons like the instant bow and crossbows also had their inception there.

But it was because of their speciality that Alexander could not sell them, or at least in great quantities, limiting their economic potential.

And Alexander was also willing to sell some of the technique because the material that was needed to make them, i.e- good quality iron, was almost exclusively under Alexander's monopolistic hand.

So even if Alexander were to sell them the technique to manufacture these armaments, to actually produce and maintain them, they would need to buy the steel from Alexander.

At least, they would have to do that if they wanted to make them economically.

In this way, Alexander would always have the ability to cut off the supply of this vital metal at any time.

And thus Alexander was not averse to selling these weapon-manufacturing techniques and was willing to, perhaps not the know-how on how to make the top-tier ones, but maybe of those of a bit lower quality.

Alexander also had another reason for placing the weapons workshop not on the higher levels like 4 or 5.

And that was because he was sure that it was only a matter of time before his equipment got copied by his enemies.

After all, battles of this time period were brutal hand-to-hand combats, and so killing a soldier and looting his corpse was much easier than in modern times, where engagements occurred at distances measured in kilometers, and thus a dead soldier would likely have anything valuable on him taken away by his retreating comrades.

'Well since I'm bound to get my weapons pirated, might as well pirate it myself,' Alexander hence reasoned with himself.

"Welcome, my lord," Faziz, the leader of this weapon greeted Alexander at the weapons workshop, and then like before, after a few pleasantries and refreshments, was led on a tour of the site.

"So, how goes my weapon production?" Alexander asked as he toured the crossbow and instant bow-making facilities, to which Faziz very enthusiastically replied, "Fine, fine, my lord. We have never seen so much steel in our life. And of so high quality! It's so much easier to work with!"

A wide grin involuntarily crept up on Faziz as he sang these praises, his mind drifting to the first day Alexander had sent his steel to the workshop.

Faziz would never forget the kind of shock he, and also his colleagues had received that day, as tons and tons of steel, cart after cart full of the stuff was presented to them.

The amount of shock and joy he had experienced on that morning was comparable to the kind of happiness he felt when his son was born and Faziz was sure he would remember that feeling for the rest of his life.

'Easier to work it, huh?' Alexander remarked to himself.

He had heard this also before and understood that without all the slag impurities present. the blacksmiths no longer had to waste so much of their time beating the steel and could fold it more easily without the risk of the metal cracking.

Alexander first toured the bow shop, which had expanded to close to ten times its original size.

A large number of blacksmiths were seen here, sitting by their personal forge and beating the heated steel ingots into iron bows to be fitted into crossbows, while others were busy making the stirrup by curving the steel into a semicircular shape.

Clang, *Clang*, *Clang*

The clamor and din of steel hitting steel was deafening for Alexander., while the heat from the so many forges running at the same time soon made Alexander profusely sweat.

"My lord, let us go there next," Faziz, noticing Alexander's state soon advised him to move to the next shed, where the assembly process was happening, as the bow, stock, and stirrups were being married to form the deadly crossbow, held together by thick ropes and tied using expert knots.

"My lord, before being made into crossbows all these iron bows are annealed just like you instructed," Faziz did not forget to tell Alexander this additional information, though he had trouble pronouncing this English word.

Annealing was a heat treatment process where the steel piece would be made more ductile by putting it in a furnace at about 900- 1000 degrees Celcius, which was above the 'recrystallization temperature' and letting it soak at that temperature for a few hours, and then letting it cool inside the furnace slowly to room temperature over time.

This process would cause some physical changes in the steel, with the ultimate result being that it would make the steel softer and much more ductile, and machineable, which were all desirable qualities when making a crossbow, for it would make the bow more springy, allowing it to be bent more and thus shoot arrows faster and further.

This was also an example of how Alexander could protect his weapon's secrets as even if an opponent were to steal his crossbow design and copy it, they would have no idea about the annealing process, allowing Alexander to constantly outrange his opponents.

"When do you anneal them?" Alexander then asked Faziz out of curiosity.

"We start at around noon and heat them in the furnace until the evening. After that, we douche the furnace and turn it in for the night, keeping the steel inside the furnace overnight, and letting them slowly cool. So they are retrieved the next morning," Faziz succinctly described the whole procedure.

"Mmmmm," Alexander approved with a nod and then moved on to the next shed.

Here the instant bow was being made, though the number of people seen working was much smaller than the crossbow plant.

And the reason for it was simply because it was a much more technical feat.

"Can you make the wooden mechanism out of steel?" Alexander asked curiously, feeling that would speed up production by magnitudes.

"Tha…that…might be…ummm," Here Faziz stammered, as his eyes darted to find a quick answer to Alexander's question.

As a blacksmith, he had a rough idea of how that might be possible, but he was still not sure how to properly tackle this problem.

Because producing such large, slabs of steel with the proper slotting without any machine tools would be quite problematic.

Casting them would not work, because cast steel was structurally weak and would likely crack under the large stresses.

Meaning it would have to be forged, or shaped by repeated hammer blows, which would be no easy feat.

At least no easier than chipping wood.

'Hmmm, I should build a waterwheel to help them forge the iron,' Alexander made a mental note, while he reassured Faziz, "Okay, okay, no need to get so worked up. For now, keep making it out of wood. We can think about making it out of iron slowly."

"Thank you, my lord," Faziz breathed a sigh of relief that his young pasha was not going to make some absurd demand.

And then, seemingly not wanting to disappoint Alexander promised the pasha with steely determination, "Sire, we are still learning how this new steel works. Once we get the hang of it, I promise you we can make the instant bow mechanism out of iron."

Alexander certainly liked such ambitious claims and thus smiled and encouraged, "Then I look forward to it,"

Afterward, Alexander was led to the next site, the arrow-making plant which was huge to small the least, employing close to 300 people, all working in small groups.

There were blacksmiths making the steel arrowheads.

There were carpenters making the shaft and attaching them to the bodkins.

And lastly, there were fletchers cleaning the feathers and tying them to the ends using thin linen stings.

The whole process reminded Alexander of one of those assembly lines in China where rows and rows of women could be seen during the same thing over and over again with blinding speed, and standing there and witnessing it for himself, it seemed somewhat of a hypnotic scene for Alexander.

"I'm amazed every time I come here. To think, so arrows could be made so quickly," It was Faziz who said, the appreciation in his voice palpable.

This setup was directed by Alexander, who had taught Faziz the basics of the division of labor as he had done Jazum's son Jafor.

And compared to the previous way of doing things, where one would do much of the work the numbers said it all.

"How many arrows can we make?" Alexander asked expectantly, remembering that he had asked Faziz to obtain a daily production ability of ten thousand (10,000) arrowheads.

"These workers are new my lord. So about twenty-five thousand (25,000) a day," Faziz answered, and then predicted optimistically, "But in a few months, once they become proficient enough, we should be able to make thirty-five thousand (35,000)."

"Mnnn, that's good," Alexander was pleased by these numbers.

And though making so many arrows per day might sound like a lot, it really was not.

For anyone who has ever fired a gun will know just how easily bullets can be used up.

And arrows were the same.

Once thousands of men started letting these sharp bits of iron fly out, Alexander knew his stocks would rapidly dwindle.

Chapter 322 Sword And Sheild

Alexander for the time being found the arrow-making facilities to be adequate, being able to at least meet his required demand for the coming year.

As such, he was next taken to the armor shop, where according to Faziz, two thousand (2,000) men were employed making chainmail.

This was a huge endeavor and the dimensions of the workshop where these men worked in surely represented as such, with the humongous wooden shed being the literal size of a football field, having multiple doors, numerous huge windows to let in sufficient light, and a large number of thick wooden pillars to hold the giant roof up.

Alexander observed that all the men inside were industriously laboring away, with some drawing out the steel wires, others turning them to rings, a few were engaged cutting these rings, many were busy linking them with each other while a large number were riveting them.

The small clinking and clattering noise that filled the football pitch-sized shed was surely something to be experienced as the men tried to fulfill Alexander's order of so many chainmail.

Alexander had ordered his legionaries to be equipped with chainmail that covered up to the thighs, or traditionally by what was called a hauberk with additional head protection, which was also called a coif.

The general soldier's calves and feet were left relatively unprotected, being only lightly armored by leather greaves made from boiled leather and thick leather shoes lined with thin steel plates.

Their hands were also relatively bare, sheathed with only leather gloves, thus making them vulnerable to enemy attacks.

And the reason behind such decisions had to do with weight, time, and cost concerns, due to all of which Alexander was forced to prioritize the protection of key and vital areas of the body and sacrifice armor over relatively safe ones.

Alexander's first concern was the weight of the armor that would soldiers have to lug around.

Chainmail might appear light, being made of thin metal wires turned into rings.

But it was still heavy.

For example, a short-sleeved shirt of chainmail typically weighed around 8kg.

While the hauberk, which was a long-sleeved shirt that reached up to the thighs that Alexander planned to use weighed around 12 kg.

Then there was the headpiece, or as it was more commonly known, coif, which came at around 3 kg.

This was already 15kgs of steel.

And if Alexander wanted to add a pair of mail mittens or gloves to protect the hands and fingers, that would weigh an additional 1.5 kg.

The legs would need to be protected by a pair of chausses which would add another 5 kg of weight, thus bringing up the total ultimate weight to protect the whole body up to about nearly 22 kg.

This was a significant increase from the original 15kg.

Now, granted wearing mail would not feel as heavy as carrying a backpack that weighed the same amount.

Because the weight would be evenly distributed around the body.

And to help with that even more. belts at the hip and straps around the arms and legs could be used to bind the mail to the body so that the weight would rather feel like more of the own body weight and not like dragging a huge burden,

Additionally, chainmail weight could be heavily reduced by making the rings really thin, which could help shave off as much as 50% of the weight, though that would have the drawback of decreasing some of the armor protection.

But all in all, these solutions were possible, thus mitigating the problem with weight.

But in attempting to do so, the second and third problems, i.e- cost and time would start to rear their ugly heads.

Making just the hauberk and coif was already a very time-consuming process, taking somewhere between 180 to 200 hrs to make.

And so, if the mittens and legs were to be included, this would easily reach 300 hours.

The reason for this disproportionate increase was because the rings on these two mail armor would have to be much finer, so as to allow them to slide off the skin and not obstruct the body's movement.

This huge amount of required time naturally translated to huge costs, and reasoning that the legs would be relatively safe shield the legionaries' large shield, and the hands and fingers would be protected by the sword guard, Alexander decided that the cons outweighed the pros here.

But that was the case for only the general soldiers.

As for the armors of his officials and generals, Alexander intended to fully protect them to the best of his abilities, covering them head to toe with chainmail, underneath which would be a layer of thorax linen or gambeson.

The reason for this was because these men would be the brains of the army and would be the ones to lead the common soldiery into battle.

And as Alexander planned to make these men highly trained and educated, hence the cost of protecting them would dwarf the risk of losing such a high-value investment.

This type of equipment would be given to all officers above squad leader (10 men team leader), i.e sergeants (100 men leader) and above, which came to exactly 71 officials per legion.

(60 sergeants, 10 captains, and 1 legion leader).

And though Alexander could not afford 6,000 such chainmail, 71 was certainly feasible.

As these thoughts played inside Alexnader, he then asked Faziz, "How many chainmail can we make?"

About hundred to hundred and twenty (100 - 120) a day my lord," Faziz proudly answered, having never seen large numbers of iron products made every day before in his life.

"Mmmm, that's good," Alexander give him a gentle nod of approval to this, appearing neither pleased nor displeased by the speed, for the number was around his own estimate of 180 to 200 hrs per armor mark.

Finished with this site inspection, Alexander then moved on to the melee weapons part of the district, where he observed the production of spears, pillums, caltrops, and swords were being made.

Alexander particularly paid attention to the sword-making process, as it would be the primary weapon of his soldiers.

He had given Faziz the design of the sword that he copied from the Roman gladius, with the addition of a sword guard.

This was added to protect the fingers, and particularly the thumbs of the wielders, which was a major source of injury for the Romans.

But those were only the outer changes.

As much bigger changes were happening internally.

Firstly, the swords were being made not quite the same way they were made before.

Alexander had attached a waterwheel to his shed, which replaced much of the initial manual hammering, allowing the steel ingots to be more easily turned into sword billets.

Hundreds of blacksmiths would then take these billets into finished swords, and the second difference in the production technique would beings.

Instead of simply beating the steel, Alexander had ordered the blacksmiths to deliberately dent the edge of the blades, creating spiraling patterns on the surface of the sword.

The reason for this was to turn the atoms that run through that ordinarily run straight like the grains in a wood into a swirling pattern very reminiscent of a fingerprint.

In this way, whereas previously any impact energy could travel straight through the steel from edge to edge and break it, now will have to travel all the way along these swirls, thus exhausting more of its energy in the process, before it can break the blade.

Only by doing this, by processing the steel a bit differently, the steel can be manipulated to be such that the cracks will now have to follow a longer path, and this would roughly double the overall breaking strength of a sword.

And not only that, these grooves would allow the swords to withstand hits from multiple angles equally well, rather than only from only one single direction as was the case with ordinary swords, which tended to be very strong when attacked against the grain, but very brittle when attacked along it.

But Alexander was not done yet, for there was still the heat treatment to be done, which in this case was called quenching.

This was very similar to annealing, as the blades would be put into a furnace at around a 1000 degrees Celcius, soaked in the furnace for a few hours, and then, instead of letting the steel cool slowly, they would be taken out of the furnace and immediately bought back to room temperature by placing them into ice-cold water, with the ice, being winter, being sourced from the nearby hills.

This technique would produce a very hard, but also quite brittle steel, making it very good at slicing others but not being able to withstand repeated enemy hits.

And to rectify this, they would again be heated at 300-400 degrees Celcius for a few hours. in a heat treatment process called stress relieving, which would help the steel literally relieve some of its internal

molecular stress and finally turn into Alexander's desired product- strong, tough, and malleable, able to hack, slash, thrust, and parry like no other blades.

A sword made from this would be magnitudes stronger than anything anyone could produce and was designed to be the primary tool for Alexander's conquests.

Chapter 323 Spinning Shop (Part-1)

"My lord, the strength of the sword being produced here is something I truly never thought was possible. It's magical," Faziz had a hypnotic, longing tone to his voice, looking at the sword production workshop like a lover would look at one's partner.

Alexander on the other hand was thinking something completely different.

First, he was thinking these swords, good as they were would unlikely be the wonder weapon that would win him wars.

Sure they would help, perhaps they would even be decisive in particular battles by managing to penetrate the shield or armor of the enemy commander, but overall they were still cold melee weapons used by men.

And then he lampooned over the fact that he was still having to produce chainmail.

Alexander was happy with his revolutionary armor no doubt, he also knew that this product was really not the most optimal option.

He had originally wanted to equip his soldiers with plate armor, at least their top half for the bare minimum, not only because that was simply better, but because they were also easier to manufacture, as instead of going through all the complicated procedures of drawing the wire and riveting it, the metal sheets could simply be beaten into shape.

But when Alexander went on to implement this plan, he soon ran into a huge problem.

And that was that there were not enough blacksmiths to go around who would make these curved, shaped plates.

And even those that were there did not know how to forge iron into such complicated shapes, shapes that would completely cover the body but would not obstruct movement in any way, instead flowing smoothly over the body.

This was a hard ask for these novice blacksmiths who had never worked with such steel before. And then to pile on the misery, Alexander's desire to start an experimental R&D department was also dashed for the time being, as whatever measly good experienced, blacksmiths he had under him, they all were desperately needed to facilitate the current production facilities.

Alexander's hunger for artisans seemed bottomless.

In fact, without the recent influx of refugees, among whom were quite a few good, quality smiths and armorers, expanding the weapons workshops to close to five thousand men (5,000) would not have been possible.

And hence the inception of plate armor would require some time, possibly years.

As such realization hit Alexander, he could only sulk and suck it up, telling himself the hackneyed platitude, 'All in good time.'

After he visited the huge living quarters of the men and their families, instructed Faziz to pay attention to the sanitation facilities and to make sure the men washed their hands with wood ash after doing their business, especially the number two, made sure there were adequate precautions in place at the event of a fire, and then moved on the next workshop, situated at clearance level-4.

This was the tailoring workshop set up just a few weeks ago and overseen by Gelene.

"Master, what took you so long? My poor heart has been aflutter in anticipation since morning," The woman sultrily and with tried eloquence greeted Alexander at the gates, causing Alexander to internally roll his eyes at such flirting in front of all his bodyguards.

Though these men certainly had heard Gelene's melodious moans through Alexander's bedroom door during their nightly guard duties, Alexander was still not comfortable so openly flirting with others, especially when he held ambivalent feelings toward her.

"Sorry, I got held up. The other inspections took longer than expected," He then casually gave an excuse, to which Gelene coquettishly replied, "Ohhh, master, I am sure it could never be your fault. It must have been all these naughty men that deceived you from meeting me."

The teasing look that Gelene sent Alexander's entourage caused all the men to lower their heads, not out of shame or to blush, but because of who that woman was and who she belonged to.

'So you are trying to show off how much I favor you in front of them and thus boost your social standing,' Alexander was not impressed with this trite play, but neither did he go out of his way to expose Gelene.

Instead, he chose to do one better.

He decided to turn to his bodyguards and Takfiz and said, "All of must be tired. Get some refreshments. I trust Gelene fully and believe she will never harm me."

This order caused the smile on Gelene's face to visibly dim, while Alexander birthed a cunning smirk.

What he had done was basically strip her of her audience.

'Don't play such games with me,' Seemed to be Aexander's message.

"Then my lord, we will wait outside the gate. Please call us if you need anything," It was Takfiz, who said so this, misunderstanding Alexander and thinking that he wanted some alone time with his concubine.

But Gelene certainly got the message, for even after they were left alone, she changed her tone from a more casual and familiar voice to a more professional one, as she waved her dainty arms and proposed, "Ahem, let master, please allow me to give you a tour of the premises. I'm sure you will find it to your liking."

"Yes, let's," Alexander curtly nodded, and understanding Alexander might not be in the nicest of mood, Gelene silently led him to a large wooden house.

As Alexander approached this large structure, even from the outside, he could hear the low droning of wheels being spun, of the rickety noise wooden tools make when they slide off one another, and knew exactly what this shed was used for.

"Here master," Gelene, standing on the door of the shed invited Alexander in by slightly bowing and gesturing him to enter first, which he did.

And as soon as he entered the shed, the first thing that he laid his eyes upon was the tool being operated by scores of women.

And it was this tool that gave this seemingly ordinary tailor shop its Level-4 security clearance.

And this tool was the spinning wheel, or more accurately the Ashford spinning wheel.

This Ashford spinning wheel was one of the simplest spinning wheels, once which Alexander's grandmother used to use in her early life.

And that was what Alexander had decided to copy and gift Gelene.

This simple wooden tool consisted of four main components, a spinning wheel, a bobbin that was connected to the wheel using a belt, a flyer next to the bobbin, and a pedal to spin the large wheel.

To start spinning yarn, first, a thread, called the leader would be tied in a knot to the bobbin and threaded through the flyer.

After that the spinner would slowly press their feet onto the paddle, which would be connected by a crankshaft to the drive wheel or spindle, making it spin clockwise, causing the bobbing and the leader attached to it to spin along.

Unspun fabric like wool and linen would then be slowly fed into this leader yarn, which would catch onto them, and make them spin with it, thus turning raw fabric into strings, that would be deposited onto the bobbin body.

This relatively simple action worked by manipulating how the spindle and bobbin would be attached to each other.

These two components were built such that each could be rotated using the other, but they could also rotate independently from each other.

And due to how the bobbin and flyer were each connected at a slightly different distances from the spindle, they thus spun slightly differently.

And this small difference in the speed of the bobbin and the speed of the flyer was how the spinning wheel worked.

In fact at its core, spinning was just that, spinning different ends of the fibers at different speeds to create a twist.

And when done correctly this would create the spinning wheel's most useful feature, the draw.

And it would be this draw that pulled the yarn out of the spinners' hands and wind it onto the bobbin while the spinner simultaneously would let the next fibers twist into the yarn, producing a continuous process.

Spinners would be able to control the thickness of the fiber by controlling the amount of draft feed with the leader and in this way, a ball of yarn called a 'single' would be produced.

But this would not be usually ready to be called a finished yarn, as they would be not strong enough to make into clothes.

So, the spinner would then take two or more singles, holds them together, and spin the wheel this time anticlockwise, which once combined, we called "plys."

Plyed yard was much stronger than singles because the two directions of twist make it a lot harder to unravel.

One point to caution to note here would be that when making singles, the wheel must always be spun in the same different.

Because if one were to take singles that were spun in different directions, some to the right, and some to the left, they would be incompatible and would produce a yarn that would be completely unusable.

But if done correctly, this spinning wheel would be capable of producing multiple times the amount of yarns as compared to the traditional handspun method, allowing Alexander to drastically cut costs.

And hence the Level-4 clearance.

Chapter 324 Spinning Shop (Part-2)

Spinning was perhaps among the oldest professions in the world, right alongside mercenaries and prostitution.

There were cave drawings of spinning in Alexander's previous life, there were spindles found in tombs where women would be buried with them, and there even spinning tools even found in Tukanhamen's tomb.

In the very beginning, humans spun by hand, which was called finger spinning.

In this process, one would take the wool, flax, hemp, or cotton, hold it with one hand, and pull and twist it with the other, thus creating weaving yarn

But obviously, this was an excruciatingly slow process.

This was why the drop spindle was invented, and it was also the same tool typically used in Adhnaia and throughout the rest of this known world.

A drop spindle was one of the simplest tools one could envision, just a straight spike usually made from wood, with a circular weight at the bottom.

It was so simple, that some paleontologists even hypothesized that the wheel was invented by studying the motion of the weighted bottom.

A woman would keep a drop spindle in her pocket and at different times throughout the day, whenever she had a bit of time in her hands among her usual duties, she would take it out and spin yarn while she would be gossiping with the neighbors or when she would be waiting for the water to boil, or for the goats to come in to be milked.

In fact, spinning was so common that even prostitutes waiting for clients would pass the time spinning yarn.

And it was from this practice the negative connotation of the word spinster came in, as this job was done during idling and commonly performed by young or unmarried women who didn't have a household to take care of, and so could give their time to something else such as a trade.

Also, as the job brought in a lot of money, some families would be less inclined to let the spinster (usually the oldest sister) marry out of the family as they would lose that income, and thus the word gradually began to represent an old, unmarried woman.

And thought it was a simple tool, this should not distract oneself from its usefulness or even its effectiveness.

By using this simple tool, fabrics having 550 threads in one inch could be achieved, whereas the very best modern machines could do at best 350 threads to an inch.

If anything more is gotten, it's usually two layers stacked atop one another.

But as stated earlier this was very time-consuming.

This was why the spinning wheel that produced a good balance between speed and output was so deemed so highly valuable by Alexander.

And there was the reasoning behind the Level -4 designation, i.e- critical to the future economy, for this tailoring ship, or more specifically the spinning wheel, more of which could be understood if one studied history.

If asked about the basic human necessities, most would put clothes after food and shelter. But unlike food and shelter, clothing is one of the easiest statements of wealth, fashion,

and personal identity,

It's also very easily broken and needs replacing often.

This puts fabric in high demand the world over, forever.

And because of this, historically, making clothes was one of the easiest and fastest ways to get rich.

For example: How did the Ottoman Empire finance its modernization?

By growing cotton in Egypt.

What was the actual cause of the US civil war?

Because of the Confederacy's need for slaves to pick cotton.

Why did they need to pick cotton?

Because the USA's largest export at the time was textiles.

In 1862, 2% of everyone in the entire world worked in the garment industry.

The textile industry was even the driving force of many imperial conquests and subjugation.

For example: Why did the British take over India?

To produce cotton to drive its domestic textile industry.

Throughout history, developing industrial nations made clothing something like a get-rich-quick scheme, almost like a cheat code to get out of poverty.

Because clothes would be always in demand.

All the developed countries once used it, most recently China used it, and Bangladesh, Vietnam, and Myanmar were currently using it.

And the kind of advantages clothes held over the other three needs of all human beings made them a million times more easily tradable.

Food was a perishable commodity, required huge amounts of fertile land and fertilizers, was at the mercy of mother nature, was subjected to strict quality control, and its demand was limited by the number of humans out there.

If a poor person gets rich, he won't eat twice the amount of food, but he might spend ten times on purchasing luxury brand clothes.

As for shelter, it too required land, and most importantly it was difficult to export.

And there was the fact shelter were usually durably built, largely to ensure it does not smash on top of the residents, meaning little repeat business.

And lastly, there was medicine, which was not always an ever-present need, and was a technically demanding substance.

Alexander had always found this fascination with clothes a weird one.

His personal opinion was that people needed three basic necessities, food, shelter, and medicine to live.

What role did clothes play in day to day?

What if one didn't have clothes?

It would not really affect a large portion of the people.

Sure, for those living in extreme conditions, like the artics or deserts, clothing was vital, as it helped protect them against the hostile environment.

But what about the rest of the world, the ones living in the tropical zones, where temperatures were mild?

Other than a scant few barbarian tribes, every city-state, nation, empire, and civilization that there was a record of, clothed itself.

So what was the real reason why people clothed themselves?

If it's a sunny, warm, beautiful day, or somewhere that's air-conditioned like in an office, or it's a sterile environment like in a clinic, would it be acceptable for someone to let his hair down and go all bare?

And people could give only one reason for this being a major violation of all social etiquette, shame.

And what was so shameful about the human body that needed to be hidden?

Nothing.

Every man has what every other man has.

And every woman has what every other woman has.

They might look a bit different, but the basic was all the same.

In fact, if clothes were about hiding differences, then why not hide the face?

The most different part of the human body Alexander would argue was his face.

But even the strictest societies don't ban face revealing for both males and females.

Alexander had no idea about this, and he could never figure out how completely different civilizations could evolve this mostly useless need, other than perhaps using it as armor for battle.

But the desire for clothing seemed innate, and the amount of time, money, and effort that humans seemed to want to spend was beyond Alexander's understanding.

Sometimes, it almost seemed to him that there was a divine entity forcing people to garb themselves.

In fact, in the Muslim holy scripture, it was even written that after Adam and Eve ate the fruit by being deceived by satan, all their heavenly clothes became shredded, and they for the first time felt shame.

"My lord, how do you like it?" Alexander was snapped out of his thoughts by Gelene's inquiry, and he absentmindedly produced a low "Mnnnn," and then quickly refocused his attention to the scene playing before him.

Rows upon rows of women were seen busy spinning their wheels, their hands and feet at constant movement as they slowly guided the flax in, while the distinct chitter chatter of women gossiping hummed around the wooden house.

After all, they were only using their hand and feet to work, their mouth was free.

"How many women have you got spinning here?" Alexander then asked Gelene in a whispering voice.

These women, amidst all the noise, had not noticed their boss or their boss's boss enter, and Alexander did not want to disturb them.

"Forty-eight," Was Gelene's exact answer.

"Do you need more?" Alexander then asked, to which Gelene replied,

"Not at the moment. And if I wanted, I can easily employ more."

"Mnnn, okay." Alexander nodded, and made his next inquiry, "Do you make your own linen or buy it?"

"Making linen takes a lot of time and space my lord. So I buy it," Gelene gave her reason.

Linen was made from a plant, which was first harvested, its flowers stripped, and then soaked in water for about a week in a process called retting.

Afterward, it would be dried, threshed to remove the bark, and then finally combed through a hackle, which was basically a huge comb with nails as its teeth, to loosen all the fibers and produce the raw material for the yarn called flax.

Linen merchants would sell this flux in braids or turn it into yarns before making it available in the market.

"Show me the looming," Alexander then asked to see the operations where the spun yarn was actually turned into the underwear and was led to a second workshop some distance away that turned the spun yarn into clothes by arranging the threads vertically and horizontally among each other.

Alexander here witnessed rows and rows of the traditional loop being operated by women doing just them, while in the next shed, the women were busy cutting the clothes and stitching them into underwear, ready to be sold.

Chapter 325 Spinning Shop (Part-3)

After Alexander had finished inspecting the close to two hundred women working under Gelene, who were engaged in spinning yarn, making the fabric, and then finally stitching the underwear, the duo decided to have lunch in Gelene's office situated a bit further away from the hustle and bustle of the workshops.

From the outside, it appeared completely normal, no different from a little wooden hut with a small door and few windows.

"Master, please make yourself comfortable," Gelene politely gestured for Alexander to enter before her, to which Alexander complied with a light smile.

Alexander found the inside to be though small, but not tiny.

Instead, there was a cozy feeling.

In addition, it was quite luxuriously decorated, with thick woolen carpet covering the floor, an expensive mahogany table at the back that was likely Gelene's office table, and two small, but very comfy-looking leather couches in front of it.

"Master, here, you must be thirsty," As Alexander felt his butt sink into the soft leather cushion filled with goose feathers, Gelene quickly fetched Alexander some iced diluted ale, which Alexander accepted with a "Thank you."

And then as Alexander took some time to look around and view the mosaics and paintings, he asked a bit surprised, "You don't have any slaves to help you?"

Alexander noticed that Gelene was all alone here.

He had assumed she would at least have a few extra hands to help her, as was the norm among all businessmen.

Alexander had banned his women from owning male slaves due to obvious bloodline concerns, but he had allowed them to own female females to help them in day-to-day work.

And thus his surprise.

"Hahaha, how could a mere slave like me dare serve master with one's own slaves?" Gelene turned to give the reply with a charming smile.

While internally she revealed the real reason, 'Hmmp, there are already three bugs around you. What if you get ideas for more?'

Gelene already had enough competition in the bedroom.

And that's why, the few girls that were under her, who worked as clerks and handled the various chores around the workshop., were asked by their mistress to make themselves invincible so that Alexander did not have the chance to even glance at that.

Alexander was not aware of this, and, he would not likely lust after slaves anyway.

But he did not have much time to dwell on such issues anyway, as Gelene called out,

"Here master, please have some. I kept it warm for you."

As soon as Alexander had entered, Gelene had quickly taken out a large cooking pot from the cooking cupboard and prepared a cut piece of the pie inside it on a plate for Alexander.

"Thank you. And please join me," Alexander politely asked, as he then took his fork to start his lunch.

"Then excuse me, master," By Alexander's request Gelene too started her meal, as the clink-clank of cutlery sounded from inside the room.

"So how are the seamstresses I gave you?" Alexander asked about the quality of the working women as he cut into the flaky pastry of the pie.

It had a venison filling, accompanied by chopped vegetables, and spiced liberally with salt and pepper and tasted exquisite.

"They are good. Very experienced." Gelene quickly replied to Alexander's inquiry, while making sure to hide her chewing of the same, delicious dish.

But then, taking a large gulp to swallow the food, she produced a slight bitterness and added, "But it's too bad they can only work half the day. Most have families and household chores to take care of."

"Hmmmm," Alexander nodded understandingly.

Alexander had stopped giving free cooked food and instead opted to give out free rations from the start of December.

And the reasons for this were several.

First, he simply did not have enough large pots and pans to cook for hundred and fifty (150,000) people two times a day, morning and evening, every day.

Second, the amount of time to distribute this food took too long.

And if he were to increase the number of food delivery points to rectify this, it would take too many men.

And lastly, the free food was complained to be bland by many.

Alexander had chosen that menu due to its simplicity and ease of preparation, and after eating 60 times the same old gruel with some vegetables chopped in, the populace seemed to have grown tired of it.

So, Alexander decided to change it to just giving the raw grains and vegetables to individuals or families on a weekly basis.

And though it solved all the above problems, it inadvertently created another problem, the problem of requiring the women to stay home and cook the food.

But Alexander did not attempt to change his decision after knowing this.

For this was the norm.

Someone had to stay home and take care of the chores after all.

As it would be ridiculous to expect Alexander to arrange restaurant-type meals for all his citizens till eternity.

"But I remember Azijak employing a lot of women to make paper. And they seemed to be working full-time." Alexander then pointed out something different he had noticed.

And Gelene explained this action while waving her hands, "That's because he has a huge kitchen preparing the meals for the women and their families. And he has employed enough women to make such an arrangement worthwhile."

It seemed that Gelene had done her research.

"Mnnnn," Alexander then remunerated on this problem for a while chewing on the tasty meat, vegetables, and onion mixture.

And after a while, decided to look at his problem from a different angle.

"These women that work for you," Alexander began, "And how much do they earn?" Came his question in a curious tone.

"A lot." Gelene said this with an exasperated tone, elucidating, "The spinners who make the yarn, and the weavers who make the clothes get 50 ropals a month, while the seamstresses get 60 ropals. And that's for only half a day's work!" Gelene sounded surprised even when she said it herself, her tone sounding incredulous.

According to her, making so much money for any woman was almost unheard of.

And she had offered this much because manpower was really short.

'A lot? That's 100 or 120 ropals a month of full day's work. Even a farmer makes 150 ropals.' Alexander only rolled his eyes at Gelene's stated number, seeming to be able to almost smell Gelene's stinginess.

A typical male tailor would get about 200 ropals for the same job, it would seem here was the ever-present gender pay discrimination.

Alexander deliberated if he should advocate for equal pay for equal work.

And though ideologically he was motivated, he ultimately stopped himself.

Because he did not want to spoon-feed every single small solution to others.

Sometimes learning through trial and error was the best.

And if the women did not want to fight for their rights, Alexander did not feel he should just give them away for free.

'If I give such raises out of nowhere, instead of being grateful, they will likely take it for granted. And then they will come asking for more.' Alexander knew how human psychology worked.

'Give them an inch and they will ask for a mile.' was a time-tried and tested truth.

But also did not want to let these poor women suffer either.

And thus he decided to drop some guidance to help Gelene push in that direction.

Alexander began, "This amount is okay for the spinners and weavers. They likely produce enough yarn for us in that half a day anyway."

He then gave Gelene a suggestive look and said, "But the stitching and tailoring need skill. Perhaps you should rethink your pay scale regarding them."

Gelene took a bit of time to think after hearing this.

She had great respect for Alexander's abilities and was smart enough to understand what he was pointing to.

And though she did not necessarily agree with what he was proposing, after a little she prudently asked for his input, "Then what does master advise?"

Alexander answered with a light smile, "As I have seen during my shop inspection, it is the tailors who actually need to do the most technical work, which is sewing the clothes. So, pay them as much as the men. In that way, they will she able to afford a slave to do the household chores for them, while they can concentrate on sewing clothes."

"But master, a slave cost a minimum of five thousand (5,000) ropals!" Gelene had an alarmed and shocked tone to her voice as she barely stopped herself from jumping up.

Slaves at this time were almost like modern-day houses.

An average man would need his entire life savings to even begin dreaming of affording one.

So what Alexander was basically proposing for Gelene was to gift her tailors a free house.

And in this context, her reaction did not seem so extreme.

Alexander certainly understood where Gelene was coming from.

And he was a bit disappointed that she was not quick enough to figure out the math for herself.

'Well, she might be scheming, but not very business savvy,' Alexander evaluated.

Though it was to be expected as Gelene, though by the standards of this world very literate, was still very green with maths and mental arithmetic.

And hence Alexander decided to help her.

Chapter 326 Spinning Shop (Part-4)

"The amount of money these women will get you by working double the hours will easily offset that five thousand (5,000) ropals slave cost." Alexander pointed out the simple fact.

And as Gelene's eyes began to bulge with realization, Alexander further added, "And if you really wanted, then you could make these women pay for the slave in installments.

"For example, you can make them pay 50 ropals of the 200 ropals they earn every month and you will recoup that cost in only about eight years."

And then using some more simple maths, Alexander showed Gelene that even after paying 50 ropals for the slave and another 60 to 70 ropals looking after the slave, the tailors will be able to make at least 80 ropals a month of their 200 ropal salary, which would be 30% more than the current 60 ropals.

As Alexander patiently explained this to Gelene, a large, happy smile bloomed on the slave's face, as she exclaimed, "Ahh, master, that's why you're my lord and owner," and then being unable to stop herself, jumped and hugged Alexander.

Feeling Gelene's soft, mature body crush against him, Alexander only lightly chuckle and patted her back."Hahaha, okay, okay,"

But then, as if cashing on Alexander's good mood, Gelene sent a sweet smile and asked, "But master, giving each of the thirty-three tailors under me a slave is too expensive. I can't afford that…" she trailed off suggestively.

'Is this where you suggest another form of payment and then proceed to suck me off?' Alexander rolled his eyes at this play, as he could not help but connect Gelene's way of talking with the cliche 'plumber x housewife' scene.

Though in all honesty, he would not be averse to such an arrangement.

"Fine, fine, will two hundred thousand (200,000) ropals be enough?" Alexander decided to directly give the money Gelene was so coyly asking for.

"Yay, master is the best!" Gelene cheered animatedly like a little girl, raising both her arms up in the banzai pose, another huge smile on her face.

Though manpower was a bit short now, she was confident she could get around that amount of slaves from the recent refugees.

After this was said, Gelene returned to her seat, and then Alexander further advised, "Gelene, do you think we should also expand the spinning shed? We can sell those spun yarn."

The kind of spinning wheel that Alexander invented could spin a bobbin full of yarn in an hour – which was about 100 grams.

But such yarn would be singles.

To make it usable, they had to be plyed, or spun together with another single yard.

This took about another half an hour.

To put into context, an average tunic, depending on the size and thickness, used approximately 700 grams – 1000 grams of yarn.

And the yarn needed for it required close to 50 hours of traditional hand spinning.

Whereas, with the spinning wheel, it would take just 12-15 hours to spin the yarn for it, reducing the cost by at least 20 - 30 ropals.

"Then I will follow master's instruction." Gelene was quick to recognize this potential.

But then she then added, "Also master, you said spinning can be done by everyone. But I think that is not true. I once tried it for myself, and after a few hours of pedaling, I found it to be tiring."

"Also, other than having to constantly move one's feet, they also have to constantly adjust the strength of pinch holding flax to make sure that the leader draws the correct amount."

"Or else the yarn will have different thicknesses along different points. It's all a demanding job." Gelene finished by saying this.

"Hmmm, do you think men would be better then?" Alexander felt that was the reason Gelene was telling him these.

To allocate more even men for her workshops.

"No…no…umm…I was asking if I should increase their wages too," Gelene instead asked about the money issue that they just discussed.

'Hmmm, she seems to be a quick learner,' Alexander liked this question but decided to let Gelene figure this out on her own.

"Do what you think is profitable for the business." Alexander gave an answer which was not an answer.

And this made Gelene imperceptibly pout before immediately hiding it.

'He is hard to make talk,' Gelene had known Alexander to be mostly immune to her charms but still felt a bit disheartened that she could not get everything she wanted out of him.

She had dolled up herself all morning for Alexander, powdering her nose, applying her lipstick, and wearing her best dress and jewelry.

But Alexander had not offered a second glance or uttered a single word of praise.

Alexander pretended to not notice the little bitterness in the ebony beauty's heart, as he instead said, "Gelene I saw the yarn spun and weaved, but where are the dyeing baths? Are they not here?"

All weaved fabric was white until they were put in huge dye baths and then given color.

This dye was extracted from various plant leaves and then soaked in warm water.

And the color extracted depended on the type and even the season the leaves were extracted in.

Additionally, new colors could be made by mixing two different colors, like green was obtained by mixing red and blue.

"Master, dying takes a lot of space and needs to be built near the river or sea to wash away the wastewater. So we send the spun yarn out into the city to get clothed." Gelene told Alexander, adding, "We usually tell the dye house what dyes we would like the day before. The yarn is then mordanted and put into the dyebath by the workers there."

And she finished by saying, "And depending on the color we want and the type of dye we are using, the process can take from several hours to even several days."

"For example, red is particularly hard to dye because the color does not like to sink into the fabrics."

"But once the dyers are confident that the color won't watch away after a few rinses, the dyed yarns are removed from the dyebath, rinsed, and allowed to dry. And all this, from sending the yarn to getting it back typically takes about a week."

'Huh, you learn something new every day,' Alexander said to himself as he did not know all these.

Ancient dye houses were huge industrial buildings that looked literally like modern bathhouses, with the only difference being that instead of just plain bathwater, the tubs were filled with warm dyed water being heated from below, and instead of people taking baths, clothes were bathed in this colorful liquid.

And this huge need for water was also why they needed to be built near a water source, both for its input, but also as a medium to discharge the dye house's waste.

"Hmm, so much does dying cost?" Alexander then asked about the price.

He knew that it could not be cheap.

And the evidence was that almost everyone, or more accurately about 80% of the public wore white or some shade of that.

This also meant that the colorful clothes that TVs and especially isekai animes liked to show were all inaccurate.

And the reason for choosing only white was because clothes, even minus the dyes, just by themselves were very expensive.

For example, even a simple tunic, after all the costs of spinning and weaving, and stitching were taken it account, would cost a hundred twenty to thirty ropals (120 - 130).

And if it was dyed, that could reach 300 to even 500 ropals.

As such the dress Alexander was wearing under his armor, a simple blue tunic, and brown pants that were bought by Nestoras had cost him 6000 tustas (600 ropals).

And that was Alexander's reward for designing that 'super' tent.

While the price of what Gelene was wearing, a bright orange full-sleeved gown, that was probably at least a few thousand ropals.

So it could be seen that clothing was a very lucrative business, and Alexander would just need to break into it.

And Alexnader's spinning wheel was just the thing that could give him the price advantage.

"For the panties and bras, it costs us two to twenty depending on the color," Gelene answered Alexander's inquiry.

The duo then spent a bit more time discussing a few other things.

Particularly they discussed the wedding dresses Alexander had ordered Gelene to oversee, a suit for Alexander, and a crimson, red gown for Cambyses.

"Master, don't worry, I'm personally seeing to it," Gelene seriously swore.

She knew how important that day was to Alexander, and any mistake on her part could easily make Alexander turn her life very uncomfortable.

Soothed by Gelene's words, Alexander did not pry any further, content to let her handle it, as he said, "Good, I trust you and your expertise."

Gelene smiled at this, and then, as if reminded by Alexander, suddenly asked in a pitched voice, "Ahh, master, about the shop? When should I open it And what will be the name?"

Gelene had the product, but her showroom was yet to be opened.

"I will introduce your business with its name and all during my wedding. And you can open the shop the day after." Alexander planned to use that day as a PR stunt, as he then waved his hands and said, "And I will leave the store design and location up to you."

"Then master can I choose a noble's manor?" Gelene quickly asked as she already had some ideas on where to place her shop.

"Sure." Alexander gave his permission and with that, after a bit more casual talks, this fourth shop visit came to an end.

Chapter 327 Renovating The Glass Workshop

After Alexander finished his lunch with Gelene, he had asked her to choose a name for her shop, to which Gelene replied, "Master, it would be my great honor if you could choose the name for me."

"Okay, I will think of a one," Alexander then promised.

And then leaving her to her work, Alexander called his bodyguards and decided to move on to the last existing workshop, the glassmaking plant.

On the way, Alexander could not help but think back on the Ashford spinning wheel.

But he was not thinking how great it was but in fact the opposite.

He was thinking that instead of the spinning wheel, Alexander could have made the spinning jenny, which was basically a few spinning wheels combined into one.

One could say it was a spinning wheel on steroids, able to make forty times the yarn a person would make using just the spinning wheel.

In fact, it is said it was the spinning jenny that really gave birth to the industrial revolution as it allowed for the first time to have machine-spun fabric.

The spinning Jenny allowed James Watt's steam engine to be used commercially to spin yarn and weave fibers, which could be sold for profit, thus initiating the age of the machines.

And Alexander had seen this device in a museum that had come with a video augmentation and according to that, the mechanism seemed simple enough that Alexander was confident that he would be able to build one if he really put his mind to it.

So why did not he?

Because he felt giving Gelene such a powerful tool would not be wise.

He was still cautious of her and would only gift her such a revolutionary tool once she had proved herself.

Or perhaps Alexander would start his own clothing brand.

He had not decided.

But for now the spinning wheel was adequate and he felt that he would switch of the spinning Jenny once he had sold the secrets of the spinning wheel.

Alexander had such thoughts running inside him as he approached the glass workshop, which he had given a level - 5 clearance, that represented it as being absolutely critical to the economy and something that Alexander would never sell the secrets to.

The reason for this was obvious.

Glass was cheap to make but very technical to make.

Meaning once someone figured out the formulae to it they could make a product only they had access to, thus making them impossibly valuable, and the profits margins astronomical.

They were so high in fact that Alexander could assume that when any glassware was sold, almost the entirety of it could be counted towards his profit, as the cost were negligible in comparison.

At the gates of the workshop, the smartly dressed Gajopk with his immaculately styled mustache was there to greet Alexander as he cheerfully called out, "Ahh, my lord, welcome, welcome. We were very much expecting you."

And Alexander responded in kind with the usual greetings, after which he was escorted inside.

"We have practiced how to shape glass for the whole of last one and a half months my lord. And I can finally say we are starting to get the hang of it," Gajopk informed Alexander as the latter observed the surrounding changes.

Out of all the workshops, the glass workshop seemed to have changed the least, which was expected given the skill-based nature of the job.

"That's good. I too am eager to see the new glassware," Alexander smiled at Gajopk, and soon they arrived at the workshop.

"Please, my lord," Gajopk gestured for Alexander to enter, and once inside, he found the place virtually unchanged from the last time he had visited it.

The men were all at their stations, each operating their individual furnaces, having their own rolling tables and set of glass-making tools, and were hard at work shaping and molding the hot, glowing dough.

"My lord, these are the glassware we have managed to produce," Gajopk then pointed to a large table at the center of the workshop where all their manufactured products were displayed and it involved a large number of glass cups, goblets, plates, and dishes.

They were all the same shape and with similar intricate designs of curves, waves, and spiraling twists carved into them, with the only difference being their color, which ranged from a green tint to translucence to being completely transparent depending on the type of flux used.

"They are pretty good," Alexander commented as he picked up these glass products and tried to look through them to see how much light they would let pass through them.

He was also impressed by the intricate artwork done on the surfaces, and could not help but trace his fingers along them.

"Thank you, my lord," Gajopk lightly bowed at this praise.

"So how many of these have you made?" Alexander then inquired.

"All the good ones are displayed in front of you, lord pasha," Came Gajopk's reply.

He had others as well but those were all practice pieces and not presentable.

"Hmmmm, then can you finish all the orders on time? My wedding is in two weeks?" Alexander had asked Gajopk to make a large number of completed glassware to display during his wedding as a form of advertisement.

It would include not only dishwares such as glass, plates, and bowls but also decorative pieces to be put on the table such as a swan, heron, elephant, or some other kind of showpiece.

"That….if we push ourselves….then …we are confident we will be able to do," Gajopk forced out the reply.

'Well you do not sound confident,' Alexander raised his eyebrows internally.

But he knew he could not really complain.

Gajopk and his men were trying their hardest and it was already impressive that they had made such good progress in such a short period of time.

Alexander could ask little more from them.

'Hmmmm, what to do?' Alexander thus mused as he thought out loud while looking at Gajopk, and saying, "Demand for glass is bound to skyrocket after my wedding day. And the twenty-odd men you have under you will never be able to meet this demand on their own."

Alexander's words made Gajopk nod in silent agreement.

He too shared this concern.

But according to the glass maker, recruiting more people seemed to be a problem due to security concerns about the glass recipe leaking.

Alexander thought about the problem for a while, and then finally reached upon a solution.

"Okay, we will do it like this," Alexander loudly started, and then delineated,

"The secret to the glass recipe relies on its ingredients and the temperature over which it's made. So, we will make the raw glass, and then transport this molten glass to various blowing sheds where hundreds, if not thousands of blowers can work on them."

Alexander reasoned that glassblowers did not need to know how to make glass.

Only how to shape and form it.

"That…um….hmmmm, that should work, if we can get the glass quickly enough that it stays molten." Gajopk at first had his reservations, but after thinking it through for a while, found the proposal quite possible.

Gajopk's concern about keeping the glass liquid was valid because if the glass were to be solidified, most of it would become basically useless.

What was meant by that?

It meant that only 'pure' glass, i.e- glass made of only quartz sand, and limestone could be melted, solidified, and then resmelted without any changes to the property.

Whereas other types of glass, like crystal glass, or glass to which other substances like powdered metal have been added, they cannot be allowed to solidify or else they would transform back into the regular glass.

This was evident in even Alexander's previous life, where only glass bottles were recycled but glassware, window panes, or glass windshields could not be as they contained other substances that the recycling process could not separate.

So these types of glass had to go through a new kind of complex refining process to be made reusable again.

A process that Alexander could not replicate with the primitive technologies with him.

Hence Alexander came up with a way to prevent such solidification.

"That should not be a problem." Alexander declared while swinging his muscular arms as if blowing away all the concerns as he elucidated his setup.

"We will put the molten glass on large, say twenty- thirty kg concrete crucibles and load them into huge horse carts. These will be special carts which will have heating mechanisms underneath them so they don't freeze." Alexander proposed.

And then he finished by saying, "And we will make the road from here to the blowing workshops entirely of concrete so that the horse can run as quickly as possible."

All these sounded very agreeable to Gajopk and he very enthusiastically nodded his head and said, "Excellent, my lord, excellent. That will work excellently."

And with this, Alexander's promised Gajopk that he will get him his special cart and roads as soon as possible while instructing him to start recruiting potential candidates for glassblowing from among the city folks.

And with this, his glass shop visit came to an end.

But surprisingly was not the end of the day for him.

For he still had two workshops to look at.

Shops that were not yet operational, for the raw materials were still in the fields growing.

They were the sugar workshop and rubber workshop.

Chapter 328 Sugar Plant

Alexander's sugar plant had not been made yet operational as the beetroots were yet to sprout.

And so today was only Alexander visiting to survey the plant's setup and equipment.

"My lord, it is my honor," A sharp, thin voice greeted Alexander immediately as he made it inside the workshop.

It belonged to a slim, bare-boned man, the drought having eaten away at his health, who wore the best tunic he had and greeted Alexander with a bow.

"Sassim! How are the fields, my man?" Alexander responded to the man with a light smile the peasant who was in charge of the fields of beetroots.

"They are great my lord. The fertilizers that you gave us really had their effect. You will see it once they mature in February. They will be giants!" Sassim let everything off at the first opportunity, the excitement of being able to talk to his lord palpable in his voice.

"Haha, that's great," Alexander patted the man's shoulder as he said that.

And then mysteriously asked, "So, how are the trials going?"

Sassim's eyes too glowed a slight cunning glow as he replied, "Hehe, let me show you my lord, this way."

And then Alexander was led to a small shed whose only equipment was a large empty pot atop a stove and a few linen sieves.

But the group's current interest was not in the bare-boned equipment.

Instead, they focused their attention on the small pouch that Sassim was taking out.

"Here, milord, have a look," The peasant then offered as he undid the knots of the bag, letting Alexander witness the treasures within.

They were sugar crystals, small and granular, having various shades of brown and surprisingly even Ã white!

Alexander had bought quite a lot of beetroots with him from Adhan, and though most of it had been used to plant the crop over the forty hectares area, he still had some leftovers that he had asked Sassim to experiment with.

His goal- to find out what method of sugar extraction produces which kind of sugar grains.

And Sassim was now reporting his findings.

"My lord," He introduced, "The first one is the most basic one. Made from just boiling the beetroot juices and then filtering and cooling them."

The grains of sugar he pointed to were large, crude, and dark brown, inching themselves closer to the color of the wood.

This was the way Alexander first made sugar and as he took a few grains of the stuff, he found its taste familiar, bitter and coarse, and not nice to his refined tongue.

Then, Alexander proceeded to taste the next refinement procedure, the process that helped him kill Diamous and Aristotle, which was adding limestone.

That tasted a bit sweeter but was still a bit salty from the neutralization reaction.

And it was still brown.

Alexander was looking for a bit more refinement and so he moved on.

Next was adding woodchips in addition to limestone.

And produced no change that Alexander could discern.

Then Alexander moved on to the pouch he was most excited about.

The grains inside it were crystal white and sparkling, looking very close to the store-bought sugar he was used to.

"Is this the bone char?" Alexander sounded over the moon as he excitedly felt the beautiful crystals on his fingers, and then placed a bit on the tip of his tongue.

Sweet!

It tasted sweet!

A tasted Alexander seemed to have almost forgotten over the past 10 years.

"Yes, my lord, it is the cow bone char that you instructed us to use," Sassim confirmed, then admiringly added, "I almost could not believe that that brown powder could turn to such pearly white powder. It's amazing!"

And Alexander was inclined to agree with Sassim on this one.

The result of beetroots refined with limestone and then further refined with bone char was indeed amazing.

But how did Alexander know how to use this bone char?

Well, when he was in high school and being taught Napoleon and the battle of Waterloo, his teacher had commented that the dead soldiers of the battle were cremated and their charred bones were used to make sugar, or more particularly it was used to decolorize the sugar and remove the brownness.

Alexander never found out the veracity of that claim in his previous life, but after transmigrating, he felt that there was no harm in trying it out.

Of course, he did not use human bones, but animal ones, mostly bovine.

And the effects were astounding, producing the sugar he was looking for so long!

"Mnnn, this bone char is very really good," Alexander answered the jubilant Sassim with a placid facade, so that the peasant would not know the true value of the technique.

And then quickly moved on to the last test sample, where charcoal was used.

And it too produced a similarly white, crystalline grain, and tasted almost identical.

"Once the beetroots are ready, use charcoal and limestone to refine the juice and make the white powder," Alexander instructed, choosing charcoal over the bone char as it was much more readily available.

And then added, "And I will get you more men to help with the plantation of the beetroots and extraction of the sweet powder from them."

The people did know the name sugar as it was a completely new product and hence just called it sweet juice or sweet powder.

And thus Alexander also addressed it as such.

But Alexander intended to introduce the word sugar by calling it such when exporting it and even naming the shop selling it 'Sugar'.

Speaking of selling, Alexander was sure that he would be able to charge this elusive white powder 1 ropal a gram at the minimum, and possibly much more than that, and people would still come running over, for Alexander knew that the nobles would find sugar addictive.

And this was at a price that was 5% of gold, which went for 20 ropals a gram.

And gold was a non-perishable good.

And it was because of this discovery of white sugar, something Alexander could call white gold that Alexander designated sugar as a Level -5 product.

But Alexander was also sure he would not be able to protect everything regarding it.

First would be because people would be able to just guess what it was made from.

After all, it would be quite hard to hide thousands and thousands of hectares of beetroot farms.

And even if he could somehow do that, it would not be wise to try and monopolize everything.

For the sugar business was too lucrative.

An example would be Alexander's very own production, which was right now quite limited.

But even this mere 40 hectares of beetroots promised astronomical returns.

It was known that the yield of beetroots on good, heavy soil like those around Alexander's estate would get one twenty to twenty-five (20 - 25 tons) tons of the vegetable per hectare.

And Alexander would later find that he was able to turn ten to twelve percent (10% - 12%) of the vegetable in weight into sugar crystals, with the rest of the flesh and fiber later turned into animal feed.

This meant a total promised yield of 80 to 120 tons of sugar, or 80 to 120 million ropals, and possibly even more.

This amount of money was already astronomical and moreover, it could be gotten from a relatively tiny farmland of only 40 hectares, which was being done only as a test project for now.

Now imagine what could be done if it was done commercially.

If it was done not over hectares but over square kilometers, which was a hundred times bigger than hectares.

And it was these kinds of benefits that would remind students of history of the number of wars that Europe had launched in search of sugar, its production, and the procurement of its raw materials.

The European powers had launched countless battles against themselves to obtain fertile lands like those in the Caribbeans to turn into sugar plantations, to acquire slaves to grow, harvest and process these sugarcanes into fine sugar, and to protect the shipping routes of these sugar products.

In fact, the Europeans had such a sweet tooth that there are even records of European lords going to war with their neighbor over not sugar plantations but over a few beehives.

And that was over honey which was just a poor substitute for sugar.

So Alexander knew if he were to too zealously the secrets of sugar, he would have a hard time avoiding war launched against him.

Thus to mitigate, if not prevent such an occurrence, Alexander planned to sell the name of the ingredient and the addition of limestone which would enable them to produce brown sugar, while he would keep the further refinement with the addition of charcoal to himself.

And this would also have another benefit that Alexander foresaw.

And that was that Alexander planned to buy these brown sugars at a discounted rate and transform them into white sugar before reselling them at a premium.

In this way, Alexander would not have to bother with the labor and land-intensive process of actually growing the sugar himself, and could only focus on only refining the product.

In this way he could save himself all the headaches that come with cultivating any crops, such as ensuring proper irrigation, recruiting capable farmers, worrying about the weather like proper rainfall and avoiding droughts, and many more.

With all these considerations made, Alexander asked Sassim to properly look after the fields, and then bid him goodbye, moving on to the last workshop on his list, the rubber shop.

Chapter 329 Rubber Workshop

Alexander's acquisition of rubber might seem strange to many as the former had no access to rubber trees.

But Alexander did know of an alternative source.

And he was here to inspect the growth of that product.

"My lord, we are honored," The head of the workshop, another peasant named Piash, was at the gates ready to welcome Alexander, who after the pleasantries led Alexander inside.

"So how are the flowers?" Alexander asked as he moved along the path, turning his head to look at the vast swathes of dandelions planted on both sides of the track.

Yes, Alexander indented to make rubber from dandelions.

Or more specifically, the roots of dandelions.

"My lord, these weed flowers can grow anywhere, anytime. So, you don't have to worry about them growing properly," Piash promised Alexander.

Dandelions were considered to be weeds and in Alexander's previous life, millions of dollars were spent on weed killers every year to remove this menace.

And thus, as Piash assured, it took little to no effort to grow these wildflowers.

"That's good," Alexander nodded pleased, and then asked, "Show me the trial products."

Like the sugar plant, Alexander had asked Piash to use some of the leftover dandelions he bought from Adhan as test pieces to see how much latex could be extracted from them and then try out the new refining process to make them into rubber.

"This way then my lord," Piash urged Alexander and was led to a large warehouse which Alexander entered to see that it was filled with sheets of white rubber that were hung on thick wooden sticks like drying clothes.

"We have hung them to dry," Piash commented and then strode over to get Alexander a sample.

"Here, please look," Piash then handed over a sheet of rubber he had pulled down to Alexander to inspect, and as Alexander took it using both his hands, he found it to be soft, elastic, and wobbly.

Alexander then spent a bit more time twisting, bending, and pinching the product, and it was just like rubber.

To get this product, Alexander had asked Piash to collect the dandelion roots, clean and dry them over the fire and then shred them into tiny chunks, followed by dissolving them in water and then gently heating the whole product for a couple of hours until the rubber floats to the top as a sort of sticky gum.

This suspension would be skimmed off the surface and then again heated over the fire to further evaporate the remaining water vapor, finally obtaining latex.

This end product was the one Piash had handed Alexander, which looked like giant sheets of thick paper.

'Mmmm, not bad,' Alexander said to himself.

He had read about this alternative source of natural rubber in an article, which touted it as the next big thing in tire manufacturing, and so decided to try it now for himself.

And though he was a bit skeptical at first about getting rubber from the milk of the dandelion flowers, the product in his hand managed to erase much of his doubt.

"You have done well. Good job," Alexander praised Piash, who let out a large smile and silently bowed, though internally he asked himself, 'But what is this thing? I have known dandelions all my life and I have never seen anything like that.'

But he did not have the guts to question Alexander and simply vowed to follow whatever his lord instructed him to.

And further instructions were soon given to him, as Alexander said, "Next, you will take these rubber and mix it with 2% sulfur and heat them for a few hours. And then, you will roll them into thin sheets like this again."

"Yes, my lord," Piash immediately nodded and agreed.

And though he was curious, Piash did not ask why.

Because that was not his job.

But the person issuing the instruction did know, for this process was called vulcanization and it was something Alexander was taught in his A-level Chemistry.

Vulcanization helped rearrange the polymer molecules of rubber in such a way that it made them stronger and more elastic, in addition to making them more abrasion resistant, meaning they will last longer.

And the extent of his process could be controlled by varying the percentage of sulfur added,

For example, 2% to 3% of sulfur made soft elastic rubber, perfect more making rubber bands, erasers, and the thing Alexander was most interested in, elastic bands to be used in men's and women's underwear.

And for now, that was what he had commanded Piash to make.

But if one were to move up a bit, up to 4% to 6% of sulfur, that produced mid-rubber, which was stronger and harder than the previous iteration but also less elastic.

This type of rubber was primarily used in making corks, gaskets, sports balls, shoes, and various types of rubber padding.

For now, Alexander planned to use them to make gaskets for storing gas in cylinders, make badminton feather corks, and make balls such as footballs, tennis balls, and basketballs.

And lastly up to 10% of sulfur produced hard rubber, the most wildly produced of the three types, almost entirely used in making tires.

Alexander was still ambivalent about using this type of rubber, as he was still not sure if he wanted to introduce tires to his carriages.

'I can decide on that after knowing my output,' Alexander decided, remembering that particular article itself had also said that the new discovery of natural rubber would not move the needle of global rubber demand.

Because if the entire world were to switch to dandelion rubber, it would have to be grown over a land the size of Australia to meet all the demand.

Hence, though not skeptical of the product, Alexander was still skeptical of the volume of the product.

And he decided to ask Piash exactly that, "So, how much rubber is there? And how much dandelion did you need to make it?"

"My lord, we had around a ton of dried dandelion roots. And from that, we got 150 kg of rubber," Piash gave an exact number.

'A 15% of dried weight,' Alexander remarked, as he found the yield reasonable.

Later he would find that a hectare of dandelion would net him 200 kgs of rubber, which meant that he could get a ton of the stuff from the five hectares he had planted.

This was quite adequate for the time being as there was very limited use of the stuff for the time being, for the primary use of rubber was in making tires, or more accurately about 70% of all rubber was used in that endeavor.

And as Alexander did not intend to coat his wooden wheels with this, thus his demand for rubber would be only limited to elastic bands to be used for clothes, and some other niche uses like sealants and rubber balls.

'Hmmm, I should also remember to tell Gelene to use it on her panties,' While Alexander was thinking of the rubber uses, he added that thought as a side note.

He also reminded himself to order the manufacturing of football, as he intended to introduce the game soon to the populace.

And with that thought, Alexander also remembered about another product, 'Ohh, I will need to invent an air pump to fill up the ball too.'

As Alexander noted these thoughts down, he then turned his attention to the security clearance of this workshop.

And he had decided to give it the highest grade possible, Level -5.

The reason for this was not because rubber was precious, or because it was rare, but because no one knew about it.

In fact, even in his previous life, this esoteric knowledge was not known until the late twentieth century.

Before that people believed that rubber trees were the only source of natural rubber and because of that, people once upon a time believed that Great Britain had almost a 100% monopoly on the stuff due to all its overseas colonies, and this had allowed the island nation to dictate the policies of many European nations.

So it could be seen that it was unlikely for others to figure this out on their own.

And as for deriving it from looking at Alexander, well the raw material, dandelion was a flower and a weed growing everywhere.

Alexander could easily hide its acquisition by claiming he liked the look and smell of it.

And even if someone was clever enough to make the connection, how would he know for what purpose this flower was being used?

Or which part of the flower was useful?

After all, Alexander produced so many products in his workshops.

And last of all, there was the addition of sulfur in the correct quantity, and the heating temperature and time.

All of these were critical to getting rubber with the desired qualities.

Figuring all these out by mere guesswork would be pretty much impossible for a single person, and even a group of people would require thousands of iterations to get it right.

And this difficulty in obtaining this knowledge was what made rubber so valuable and hence Alexander's decision to give it the level 5 clearance, despite its impact on the economy being not as much as the other two current level - 5 products, glass, and sugar.

And with these thoughts, Alexander bid Piash goodbye, finally ending his workshop tour.

Chapter 330 End Of Workshop Tour

After finishing touring all the current workshops, Alexander looked up to see the sky had transitioned from blue to orange, indicating that the day was almost over.

'Darm! And here I had promised Ophenia I would visit her place,' Alexander ruefully muttered while gazing at the setting sun.

Inspecting so many workshops and chatting with the individuals in charge had really drained all the time on his hand.

'Hmmm, should I tell her that I will visit her tomorrow?' Alexander ruminated, but then decided, 'No, tomorrow I will have to tour the new military barracks in the eastern part of the city and will not have any time then. So, it will have to be today.'

With this thought, he turned to Takfiz and asked, "Get me some ink and paper. And someone to deliver it."

Alexander was worried that Ophenia might wait for him in her new establishment even after sunset, believing that he would come to her as promised.

Which Alexander did intend to do but after supper.

And he was afraid that this might cause Ophenia to miss her supper,

"Yes, lord," Hearing Alexnder's request, Takfiz quickly trotted to get this equipment and soon presented the stationeries which was being carried by a thin, spindly boy with droopy eyes.

The boy was also carrying a stool to help Alexander write the letter on, which the latter greatly appreciated Takfiz's foresight for considering.

And so after a light thank you, Alexander took the paper, bent down on the hard wooden surfaces, and wrote the following short message,

Dear Tayin,

I'm sorry I missed our appointment today.

I seemed to have gotten caught up with some of my previously scheduled arrangements.

Please return to the manor now, and I will go inspect the 'new priestess quarters' with you after supper.

Signed,

Your master - Alexander.

Of course, the 'new priestess quarters' was euphemism for the brothel, used as such to hide the building's true purpose from any prying eyes.

Alexander folded this letter and handed it to the boy, with the instructions, "Take this to the Gaia temple and hand it to the archpriest, Theocles there. Say that it is from the pasha himself and he is to deliver the letter to the Sacred Priestess as soon as possible."

Alexander did not know the exact house address of the new establishment and he also did not want the boy to know where Ophenia was, and that's why he sent the letter to Theocles.

"Understood, my lord," The boy readily accepted the order, and then after a bow, strode out to get a horse and rode off.

And while Alexander waited for the letter to be delivered, instead of returning to his manor, he had one last thing to do, which was to solve Harun's coal storage problem.

And to do this, he gave Takfiz the following orders, "Takfiz, in three days I want you to gather six thousand thousand men."

As soon as he said so, Takfiz jumped up in fright at the impossible task, and then attempted to loudly voice out his difficulties, "My lord..th..,"

But before he could go too far, Alexander cut him off, and reassured, "I know what you are about to say. And I'm aware of the labor shortage. So let me finish," Alexander held up his palm as he said so.

And then finished by saying, "You can take these men from the woodcutters. The new job will substitute that job."

Alexander intended to use these men to mainly make coal briquettes which could be used as firewood substitutes for cooking.

"....." Takfiz went a bit silent at this huge claim, but after remembering what Alexander had accomplished, he did not ask any further questions and simply bowed and complied, "As you wish my lord."

"Mnnn," Alexander hummed, and then using the leftover papers, he got down to giving Takfiz some more detailed instructions with the words, "Now look at this."

Alexander then spent the next hour with the caretaker detailing the location, design, and equipment requirements of the coal briquette plant and another workshop that would use most of the coal briquettes, after which he informed the old man that he would visit the site in one week's time.

"I will try to strive to get everything ready by then," Takfiz promised with a thump on his chest, and finally done with all these, Alexander decided to head back for supper.

Along the way, he thought about his remaining work of the day.

And with these thoughts flashed the faces of Ophenia and those three silver-haired beauties.

And as the face of the most problematic girl surfaced in his mind, Alexander was reminded of another task.

'Oh yeah, I planned to have her design some custom wedding cards for me,' Alexander groaned at the thought of asking that willful girl Mikaya.

But since Alexander was determined to get the best designs on the limited number of cards he wished to print, it had to be her, for her skill with the brush was something Alexander would freely admit and admire.

Mikaya was a genius with the brush no two ways about it.

And with this uncomfortable discussion looming imminently in front of him, Alexander sluggishly rode to his manor, just in time to see the outside lamps being lit.

'I wonder if Tayin got my message,' Alexander's question was answered almost as soon as he asked it to himself, as he met the person in question right on the front steps of the main door.

"Ahh, master, how terrible of you to leave me all alone the entire day!" Ophenia cutely pouted as she whined at Alexander for not making time for her.

'*Sigh*, this girl is becoming more spoilt by the day,' Alexander let out a wry internal chuckle, as he patted the dyed black hair of the girl and soothed her, "Sorry, sorry. I will visit it after dinner."

This made Ophenia shake her head excitedly and then after exchanging a few general pleasantries like asking about each other's day, the duo went to their respective baths to shower and prepare themselves for dinner.

Ophenia had become particularly attached to the two times-a-day shower routine, both because Alexander liked it when she took baths, and because of the various hair and body soaps her master had created.

Having a smell fetish meant that the latter point was especially attractive to her, as after each bath, her body would smell like a different kind of flower like roses or dandelions, which she loved.

It was not only Ophenia's habits that had changed.

In the close to three short months she had been with Alexander, she had changed mentally too, changes which Alexander did not dislike.

Whereas previously she was much more taciturn and wooden-faced, hiding all her emotions, she was now much more expressive and vivacious, at least around Alexander.

Much of her previous facade seemed to have melted away and she appeared much more frank and lively, as she molted out of her fake, polite, charade of a shell to reveal her true self.

This was facilitated by both Alexander's generous treatment of her's and by the strengthening of her belief in Alexander, which gave her a newfound purpose in life, which was helping promote and propagate Alexander's faith.

And with the power and influence that was given to her in the form of the title 'Sacred Priestess,' it helped her further move away from her previous identity of the weak, defenseless girl trapped in the Shiva temple, and see herself as strong and powerful.

This strong and powerful girl was currently sitting by the dinner table along with the other guests, and trying a new dish her master had created- steamed pork dumplings.

In addition, and in keeping up with his sometimes bizarre eccentricities, her master had also made two wooden sticks which he called 'chopsticks' that he was currently using to expertly pick up the hot buns, dip them in a chilly sauce, and gobble them down.

As for her, because she was not yet accustomed to the use of the twin sticks, she was performing the same action with a spoon and fork.

"Lady Mikaya, I have got some of that paper you wanted. Will you have the time after supper so that I might deliver them to you?" Alexander asked Mikaya for an appointment.

To which the reply came with a giggle, "Hehe, oh Alex, you are too good to me. First this new 'dumpling' dish and then this new papyrus paper. If you continue to court me like this, I might not be able to reject, hehehe."

Her heavy laughter caused her abundant peaks to jiggle seductively, though her humorous answer did not seem to impress her audience, and her use of the word 'Alex' irked Cambyses, as Alexander only placidly spoke, "Then let us meet in your room after supper. I also would like to commission some artwork to Your Grace."

This statement raised some curious gazes, which Alexander did not bother addressing, and the truly inquisitive like the Queen mother did not bother asking, for she could ask Mikaya directly, while the person in question. Mikaya replied with a grin, "Haha, I would be very happy to create anything you want me to My lord. But please remember that my commission is not cheap."

Her lips were curled up in a devilish arch and her eyes glowed with a crafty light, which Alexander very much understood the message of.

And that was that she was tired of waiting and could not wait till Alexander fulfilled his promise.

'Well, it's good that I will take her on a visit tonight,' Alexander said to himself, as he replied to Mikaya with the promise to pay her 'just' dues.