Herald 281

Chapter 281 Cement Shortage

"So how much can you mix like that in a day?" Alexander decided to know his cement producing capacity.

"Ahem, using the hundred men under me, only about the amount the kiln makes, my lord. We are already at our limit," The caretaker answered in a slightly bitter tone.

Clearly processing such a large amount of the stuff was testing his resources.

Alexander's little frown deepened upon hearing this.

'Hmmm. perhaps I should halt the formation of the new kilns,' He then seriously reconsidered, understanding that it may not be his production capacity that was his bottleneck, but the ability to process the clinkers to cement.

And the realization that he might not have the men to process the huge amount of cement even if he could make them made Alexander displeased.

For he sorely needed the cement, as Diaogosis had been constantly hankering him for more.

But going by Yemin's numbers, if he were to increase the kiln number to eleven as he had instructed Jazum to do, it would mean he would have to employ fifteen hundred times eleven (1,500 x 11)- sixteen and a half thousand men.

And with the current labor shortage that was clearly impossible.

So Alexander deliberated for some time on whether to temporarily stop making more kilns.

'No! The kilns must be made!' But he decided.

This decision was made based on the fact that his demand for the white powder would only increase in the future, with the most recent one likely when he conquers the surrounding areas around Zanzan.

There was also the fact that he planned to base all his kilns in Zanzan, at least for the time being, to protect their secrecy and so the kilns here would have to support his construction works all over the province.

But making more kilns was a must.

He was not unaware of the soon-to-arrive additional workforce.

There was the imminent arrival of, by his estimate, sixty thousand (60,000) refugees, and shortly later the twenty thousand (20,000) slaves, followed by the almost forty thousand Thesians (40,000).

But he also remembered that a lot of them will be needed in the farmlands.

In fact, by his own calculations, only sixteen thousand (16,000) men would be available in total within the city.

So reality was beginning to make Alexander's plan of operating eleven kilns seem like a pipe dream.

'*Sigh*, using so many men to do such repetitive tasks is so wasteful!' Alexander lampooned at this conundrum, wishing that if only he could build a steam engine.

But as soon as he said so, a light bulb lit up in his head as the image of a stream engine spinning a wheel coincided with the image of another certain medieval construct.

'Repetitive! It's repetitive! Of course! Why didn't I think of that?' Alexander slapped his forehead metaphorically as his heart squealed in joy at the image conjured up in his mind.

If he could build that, and build it quickly enough in sufficient quantities, his cement production could soar to new heights.

'I will need to divert Diaogosis to that immediately,' Alexander promised.

Feeling pleased as punch with himself for solving such a critical issue, Alexander finally returned his attention to what was happening around him and then turned to Yemin to ask him about other miscellaneous things.

"My lord, those sledgehammers are proving to be inadequate," Was one of Yemin's complaints, saying, "They frequently crack or outright shatter after a few days of use. And then we have to waste a lot of time collecting the shattered pieces, remelting, and reforming them. Our blacksmiths can barely keep up with all the work."

Alexander was not too surprised by this as such behavior was natural for bronze.

In fact, being inherently weak, brittle, and lacking structural integrity. bronze was not a good metal, its only redeeming quality being its low melting temperature, which allowed these primitive people who could not attain a high temperature in their furnaces to smelt the alloy.

And this was why in Alexadner's earlier life it got replaced by iron as soon as the latter got available.

And perhaps all these weaknesses could be exemplified by studying the famous Egyptian sword Khopesh, which was a sword designed like a sickle.

And the reason for that was that there was a very specific motive behind the very particular design.

Because a long, straight piece of bronze was too weak to be used in heavy melee, and thus would be at risk of snapping in the middle of combat, they made the sword carved, so that the sword could be made shorter while still concentrating the same amount of force on its outer rims.

But Alexander could not really do the same for the hammers, and so under the exertion of the huge compressive forces, which were simply too much for the copper and tin alloy to handle, they would bend and crack.

"Does the lord know of any way to help?" Yemin, seeing Alexander in deep thought, then hopefully called out.

He was one of Alexander's original followers and having witnessed much of Alexander's knack for inventions, was kind of familiar with that thoughtful look.

'I need to get the blast furnace running,' Was Alexander's straightforward answer to the problem As other than replacing the bronze with iron, there really was no way to make the sledgehammers better.

For compared to that junk bronze, iron was close to a super metal, one which could be manipulated to nearly infinite degrees by alloying it with different elements.

But then why had Alexander not yet started the large-scale production of this super metal?

Because of lack of cement.

Because of lack of blowers.

And because of the lack of coal.

'I need to check up on Harun as soon as possible,' Alexander again reminded himself as he thought back on this problem and then turning to Yemin reassured the caretaker, "Don't worry. I will solve this problem by spring. So until then please bear with it."

There was really no difference between the blast furnace and the cement kiln, and so with the cement production already underway, he was confident about getting the blast furnace up and running by February.

"Thank you, my lord, thank you!" Came a wide relieved grin, the thin man's fists shaking in excitement.

Alexander then spent some more time with the man, had a few drinks in his house, and as dusk fell, decided to end his tour of the warehouse.

"Then I will set out Yemin. Work hard and keep the recipe secret," Alexander bid his goodbyes and returned to his manor. feeling a great sense of achievement at his cement production.

A feeling that instantly disappeared when he went to visit Uzak a few days later.

Uzak was in charge of making the roads, and the first thing that the man informed Alexander was that there was no cement for him to do his job.

In fact, his allocated cement was so low that it was work was not just slow, it had completely halted.

"My lord, look," The stonemason pointed to a few meters of road covered by concrete, "That's all we could do till today. Please, I need more!" He whined.

He then further went on to say that his workers were almost finished digging all the curbs and then filling them up with the appropriate aggregates and only needed the cement to make the concrete and give the road a finishing touch.

"But I can't do that if I don't have the cement my lord," Uzak repeated his difficulty.

Alexander too felt a slight migraine coming as he saw the abysmal speed of the road construction.

'Darn, I forgot about this,' Alexander blamed himself.

Being swarmed with all kinds of responsibility, because he really did not have anyone to help him, he had made a huge oversight by forgetting to calculate the required amount of cement for the road.

And now he was about to fall into a pit.

Reminded by Uzak, Alexander did the calculations on the spot, and the number that popped up inside his head made even the usually mentally resilient Alexander feel faint.

Because the number was not just large, it was astronomically large.

In fact, to Alexander, it appeared almost horrific

'I hate multiplication,' Then Alexander cussed and cursed at the answer, attempting to redo the maths again to double-check the answers.

And this time he decided to do the math for just one kilometer of road.

Going by the dimensions he had set up for Uzak, eight meters wide and five centimeters thick with a sub-base of ten centimeters thick gravel, he calculated that the volume of concrete needed would be four hundred, 400 Cum (1000 x 8 x 0. 05).

And since the concrete was made of cement, sand, and aggregate in the ratio 1:2:4, long answer short, the answer was about one hundred and thirty tons of cement per kilometer.

Yes, tons, not kilograms, with three zeroes at the end.

The confirmation of the answer made Alexander feel faint as he felt almost an overwhelming hatred for the number zero, a feeling similar to what many kids might have felt after getting their test papers.

Given that tens if not hundreds of kilometers of roads would be required to be made per day, there was no way Alexander could make roads at such an expenditure.

Not now, not next year, not even in the next few decades.

Even if Jazum and Krishok were to keep making cement kilns for the rest of their lives, they still would not be able to cope with the demand of just making roads, let alone anything else.

Chapter 282 Changes To The Roads

Other than the huge material demand, Alexander had to also include the cost of cement.

Alexander found that it took around five hundred kilograms of firewood to make just one ton of cement.

With firewood being ten kilograms a ropal, that came to fifty ropals per ton.

Then there was the cost of raw materials.

Those were very cheap.

Sand was everywhere so Alexander just needed to pay for the cost of collecting it.

Limestone and gypsum both came from the same place and being soft rocks they were easy to mine.

And clay was well clay, just dirt that needed to be washed and cleaned.

In total, their cost was about ten ropals a ton.

But the most expensive part of his production was the milling process, which cost him one hundred and fifty (150) ropals per ton in total.

But that would soon be cut by ten times as Alexander planned to introduce some new types of machinery to do all the heavy lifting.

So, in short, one ton of cement would cost Alexander seventy-five (75) ropals.

And that gave the cement cost of one kilometer of road to be almost ten thousand (10,000) ropals.

And remember, this was just the cement.

The road would be made actually of concrete, which was a mixture of cement, sand, and gravel.

And then there was the cost of earlier preparations such as clearing out the vegetation and digging the curbs.

So Alexander estimated conservatively per kilometer would cost him eleven to thirteen thousand (11,000 - 13,000) ropals, or a farmer's six to seven years of pay.

Now, while this might sound like a lot for just one kilometer of road, this was in fact, not a large number.

For context, in the US it takes around eight to ten million (8,000,000 - 10,000,000) per mile, which is also six to seven years of median income pay of seventy thousand (70,000) dollars a year.

A surprisingly similar number.

But it was the demand for the cement that put Alexander off.

Zanzan was about the size of Japan, which was not big, but not tiny either.

But if he were to form an extensive road network that connected not only the large, prominent towns but also every tiny village, fishing hamlet, and hut, as Alexander intended, he would need a daily production capacity in the tens of thousands of tons a day, just to make roads.

And though one might say, 'Well just build more kilns then,' there was the milling bottleneck where the cement could not be processed quickly enough, the raw material bottleneck where the limestone could not be mined fast enough or the firewood cut quickly enough and the labor bottleneck where there would not be enough men to work kilns without everyone starving.

And even if more people were to be hired, well some of that new hires would have to farm to feed these new people.

So if Alexander wanted to actually do such a thing, they would need to be making one thing and one thing only - cement, and nothing else.

This was clearly impossible.

That's why, instead, after giving himself some time to think it over, Alexander decided to look back on how the Romans did it and decided to emulate that.

The Romans too had concrete, though it was not the Portland concrete, but a kind of concrete made from volcanic ash which used a natural volcanic mineral called pozzolana.

And the way they used it to make roads was much different from Alexander's.

Alexander planned to use the concrete to form a flat, smooth, pristine road, much like the highways of his previous world.

Whereas the Romans used their concrete as a kind of mortar or glue to bind the stones together that formed the road.

So, while Alexander's road was a true concrete road, i.e- a road made of concrete, the Roman roads were stone roads that used concrete as only a binding material.

The disadvantage of the latter would be self-evident to anyone who has ever traveled on a stone road before.

Because the wheel travels over little stones instead of a smooth surface, there is a constant shaking and jerking motion that plays havoc on one's hips and spine and Alexander's desire to build a concrete road was because he wanted to mitigate that.

There was also his consideration that there is less wear and tear on the wheels on a concrete road and the attainable speed is much higher.

And at last, for merchants traveling on a stone road carrying fragile commodities like glass and glassware, as Alexander intended to sell, or drinks like wine, it was always perilous.

The constant vibration of the carts made it so that there was a greater chance of breakage or spillage, which made merchants reluctant to trade these goods or necessitate the use of padding, which decreased cargo capacity.

A problem that would have been absent in Alexander's road.

And for anyone claiming that Roman concrete was way superior because it has lasted two thousand years while modern concrete lasts only a few decades, this is a fallacy.

Roman concrete never had to deal with the kind of forces modern concrete has to face, and although roman concrete had been found to get stronger with time due to a complex reaction that happens with water and the volcanic mineral, it is nowhere the magical thing that some make out it to be.

Faced again with another harsh reality as he did with Yemin, Alexander decided to make the road stone roads for the time being, vowing to slowly switch them with concrete ones once cement production caught up.

In this way, he hoped that though not every little road could be made out of concrete, at least the connections between the major city and trading hubs could be.

"Hmmm, okay, we will change tactics here," Alexander at last addressed Uzak, dictating to the man his decision.

He first stated, "According to you, much of the roads are already half completed. There is already a layer of large stones as the foundations of the roads and on top of them is a layer of smaller rocks all mixed up with fine aggregates to fill the gaps. Right?" Alexander asked for confirmation.

"Yes, my lord, that's right," The road maker nodded, adding, "According to you, this is where we are to then add a layer of the concrete to form the finishing surface."

"Mmm, I did say that," Alexander admitted, "But due to material shortages we will do things a bit differently," Alexander claimed.

And then delineated, "Instead of using a concrete layer, the surface with be made of fine clay and gravel, with only a thin layer of just a millimeter of concrete to be used to bind everything together. In this way, our cement consumption will reduce to a fraction of the current need."

"You think that's possible?" Alexander then asked the experienced artisan for his opinion.

Uzak placed his hands on his chin and thought about it for a while.

"....., Mm, yes, I think so," Finally with a jerky nod, Uzak answered affirmatively.

"Good, good, good," Hearing the very 'good' answer, Alexander repeatedly said the word good, feeling like a ten-ton weight had been lifted off his chest.

This was because Alexander believed that if he could not form a robust road network, he was fuck.

And this belief came from studying the Romans.

Alexander believed that the Romans' secret to success in controlling such a huge empire was their extensive road network, which allowed not only for commerce to flourish and thrive, but also enabled their army to rapidly march to any part of the empire, thus giving them the ability to rapidly attack or defend against any threats.

And he wanted to emulate that.

"My lord, there was something else," Alexander was yanked out of his happy, relieved mood by Uzak's chirpy voice, and this made the new pasha very frustrated.

'What now? Don't tell it's another problem,' Alexander snapped inside his head as the dread of seeing more problems had turned to anger.

But he still managed to keep a straight face outwardly and in a bit of an apprehensive voice only asked, "Yes?"

But fortunately for the young boy, this time it was not bad news.

In fact, it was quite good news as Uzak pointed out a feature that Alexander had missed.

"My lord, I suggest adding about two meters by two-meter ditches around twenty feet away from the road on both sides." explaining, "In this way, not only would the drivers have a wide peripheral view of the road, but also wild animals and more importantly high way robbers and illegal merchants won't be able to use the road."

'Well some things you can't learn from reading a book,' Alexander praised in his heart, knowing he could have never thought about this on his own just using his bookish knowledge.

"Is this how the roads are Adhan?" Alexander asked.

"Yes, my lord." Uzak confirmed, saying, "The roads were made such after decades of many such tragic incidents,"

"Mmm, then I will leave it up to you. Good job," Alexander gave an appreciative nod.

After which he asked, "And what about the aqueduct? And the sewage system?"

Though Alexander could vaguely presage the negative answer.

"I'm sorry my lord," Uzak replied bitterly shaking his head, "But we can only start building them once we get enough cement."

'Figured' Alexander placidly commented to himself.

"The road will not need much cement now. So concentrate on the aqueducts from now on," Alexander then commanded the man to switch priorities.

"Yes, my lord," Came the quick affirmative answer.

Chapter 283 The Four Districts (Part-1)

Uzak then excused himself, by very straightforwardly bidding his goodbye, "My lord, then please excuse me as I prepare the necessary equipment and men for the new construction,"

"Umm, work hard." Alexander gave the permission with a curt nod.

And then hung the same bait he had hung for Jazum and Krishok, "And once the three projects are completed, I will make you a shorder (Baron)!"

"As long as I have enough cement I won't need sleep, my lord," The stonemason gave a wide grin as he bowed, his zeal for work tripling.

"Mmm, I will increase production drastically soon. So be ready," Alexander promised the man and thus finished his tour for that day.

Over the next days, Alexander would observe tipper carts, carrying clay and gravel moving along the already half-compacted road layers, and dumping their contents behind them that would be used to form the road's outer layer.

After these materials were felled on the road, the heaps of material were spread out with planks by workers and then a thin layer of the cement would be sprinkled on top.

Soon afterward a second horse cart, carrying water barrels would be used to drizzle the road, wetting the cement and causing it to start reacting with the surrounding sand and gravel and binding them together.

And finally, horse-drawn rollers would be driven over the wet road to evenly spread out the cement and smooth out the surface, thus producing a smooth stone road.

With this production process, one extra care had to be taken which was to make sure that the final geometry of the road had slightly sloping sides, to allow for rainwater to be drained outwards and away from the road.

"My lord, I can confidently say that there exists no road in Adhania as beautiful as this one," Uzak would confidently claim, then going even further to claim that no road in the world was so beautiful.

"And to think that you intend to make all the roads, as beautiful, no even more beautiful than this one! Ohhh!" Uzak cried out in happiness, his artisan spirit singing at being not only able to witness but also contribute to the constitution of such a milestone project.

Alexander only smiled and nodded at the fanboy, instead his mind catching on the word 'all the roads'.

The fact was even Alexander did not know the exact length of the road network he had commissioned.

Only the rough paths along which they were to be made.

But even then it would not be wrong to praise the roads not only for their quality but also their quantity.

For to say the length was anything less than grand would be a gross understatement.

These roads were not just simple straight roads that connected point A to point B.

But more like city block roads, with each straight line containing multiple branches of roads, who themselves had many splits attached to them.

So if seen from above, the roads would not look like the straightforward, single lines one would typically expect in a medieval city, or the narrow, twisty- turny curves of a compact, dingy city, but much more like a modern city's road network- rectangular and grid-like.

And achieving this intended effect was not easy for Alexander.

Previously a house might be situated on a one-man alleyway that the people living there would call a road, whereas Alexander's renovations aimed to make the houses have roads on all four sides, or at least two, much like modern-day apartment blocks.

And this was certainly an ambitious project as space inside an ancient city was really minimal.

For example, ancient Rome housing a million people (1,000,000) was just 40 square km, and people were able to cover the end-to-end of the city in about an hour on foot.

Compare that to a modern city like Dallas with a similar population which has an area of 1000 square km,

And this was the same case for Zanzan.

Small dingy houses, huts, and shacks littered the side of the streets, occasionally supplemented by shops and workshops of various kinds, all trying to edge closer to the buildings opposite of the street and, choking out the road in between them.

There were open slaughterhouses, fishmongers, and all kinds of unspeakable filth littered the streets, from animal guts to dead animal bits to various house wasters to even human excrement,

And to rectify these problems, Alexander knew he had to remodel the entire city.

There was also the consideration of planning for the future, where, according to optimistic projections by Alexander, the population would balloon soon after, and so, now that Alexander had the opportunity with the population being relatively low and docile, he decided to apply extensively urban reworking to this haphazard, chaotic city.

Thus he laid out his first set of instructions to Uzak, who was in charge of making both the roads and sewage system, and it commanded him to demolish the many slums and dilapidated houses all around the city and start making roads through some of them.

And though some objections were first made, they did not rise up in arms for being made homeless as many would expect.

Instead, these voices very quickly died out.

And there were basically three large reasons for this.

First, it was because Alexander was the one giving out free food, medical, and even jobs to everyone. So the people either obeyed him or starved. And it very much helped that the pasha had a literal army under him to silence any detractors.

Second, it was because a huge number of the houses demolished were ownerless and thus by default owned by Alexander.

This happened because the owner either died, left the city, or was captured as a slave

And the third and last reason was because Alexander had promised all of them new houses. This promise was easily verifiable as they could personally go and see the construction works going on, and many even worked on them, which reassured the populace.

And thus, combining the three factors, the populace was generally peaceful about all the infrastructure developments.

But how extensive were these renovations?

Well, quite a lot actually.

First and foremost came the roads.

According to Alexander's designs, there would be four main roads, with each of them having many lanes, streets, and walkways connected to them, like branches of a tree.

These four huge main ways would be like the arteries of the city, connecting the four major parts of the city all to the city center.

One of the arteries, being connected to the most number of smaller tributaries, came from the west, where the new residential district was being-made.

This western road had many branches, one on each side every twenty meters, which themselves were connected to others, forming the characteristic grid-like city roads.

This made the western part of the city have the most amount of roads and was Uzak's current sector of operation, as directed by Alexander.

Another road went from the port on the southern side of the city to the center.

This would be where all the ships docked and loaded and unloaded their supplies, and Alexander planned to build the road to reduce congestion of all people and horse-drawn carts entering and leaving this part of the city.

This was also where the industrial district of the city was planned to be located, to be littered with workshops, kilns, and furnaces, intentionally chosen for its proximity to the sea for ease of transport of goods and services.

There was already some evidence of that, as both the cement and brick-making kilns were here, and Alexander planned to place the industrial and production heartland of his city here, and make it be littered with workshops, manufacturing plants and kilns, and furnaces.

And to help with that, Alexander had plans to build tens of huge warehouses along the port to store all the raw and manufactured materials.

The next road, according to Alexander's plans came from the east, which ran through the part of the city famously known as the city underbelly.

It was the place where the dregs of society would accumulate and was home to all kinds of immoral establishments, offering pleasures of both the flesh and mind.

Entertainments like gambling dens of all kinds, ranging from playing various kinds of dice games to animal fighting bets, to many drinking parlors that doubled as brothels, so housing the city's famous red light district, this part had it all, making it the immoral party center of the city.

No self-respecting woman would be caught anywhere here, while most male bachelors would be.

But currently, this once 'great' part of the city was close to ruin.

The war and famine had hit this entertainment district particularly hard, and business was almost non-existent.

For example, before Alexander came, there was no food to host the drinking parlors, people would listlessly play dice to pass the time or distract themselves from the crippling hunger pangs, money having lost most of its value and women would only whore for food, not coin, something few would be willing to part with.

And so Alexander had decided to capitalize on this momentary weakness and destroy it.

Yes, not remodel it, but destroy it, with his official reason being the sector suffered from the same problems as the rest of the city, too narrow streets, congested buildings, and squalid conditions.

And while the real reason was much more strategic- to root out the rats that had lived there for generations out of their holes

Chapter 284 The Four Districts (Part-2)

The prosperity and well-being of that part of the city was certainly among Alexander's considerations,

But not the most important consideration.

For when Alexander conceived this plan, his priority for the eastern sector was to eliminate all the actors there and make himself the sole owner.

And Alexander did have some good reasons to want to be such, as he felt apprehensive about these people.

And the justification for this caution could be understood when one studied the history of the place.

Because through these very recent booming businesses, the disagreeable parts of the society had managed to accumulate quite a fortune for themselves, which was evident by the fact that this part of the city was in quite a good condition even after the city and province had been ravaged by disasters for such a long time.

These heavy weights took care of the place they lived and worked in and this could be seen in the surrounding architecture, most of which were of stone instead of the usual wooden buildings, with grand spires, domes, and minarets on top, as per the artistic style of this era.

The hotels, inns, and pleasure houses owned by these people were also of quite high quality, some even better than the ones in Adhan, which was not too surprising given the amount of money being thrown around there, and it was this display of affluence in such a part of the city, nicknamed the underbelly, was what had drawn Alexander's attention to it in the first place.

And this curiosity had turned to first unease and then apprehension as he got to know more about the place.

He had always known gangs, drug lords, and organized crime was associated with many of the shady and objectionable ways of income, whether it be in the twenty-first century or in this time period, but always imagined the places they operated in to be like the image one conjures up when one hears 'the city's underbelly'- a shabby, rough, and dilapidated place, with thugs ready to snatch your money around every corner.

This was certainly wrong as these people wanted repeat customers, something that was hard to get if one tended to rob them every time.

And so, they set up various establishments to fleece one's money not just once, but multiple times.

Hence the articulate architecture.

But Alexander had missed these considerations because of erroneously superposing his previous life experiences on this life.

In his previous life, it would be the poor and less privileged neighborhoods that would usually have gang problems, where many times poverty, destitution, and a lack of opportunity would lead one to gravitate toward that life.

And so, though individuals in that community might be very rich, in general, that neighborhood would have a low level of income on the whole.

But here it was quite the opposite.

In here, many a kid's dream was to join a gang and rise through the ranks.

This was because here many of the gangs and street rats were not scums of society in the eyes of the laws, but part of the ruling class!

For generations, the rulers of this city, Pasha Muazz, and his predecessors would employ these

kingpins and gangsters as guards and law enforcers of the city, making them not rogue actors or enemies of the state but under the payroll of the crown.

So this eastern district was really the home of the former city guards and their associated businesses.

And to supplement their incomes, these busy bees would even sometimes triple as mercenaries, offering fantastic services such as killing, looting, burning, kidnapping, and all other manners of macabre hospitalities.

A service that seemed to have an inexhaustible demand.

They serviced clients from all walks of life, ranging from the lowest dregs of society like a beggar jealous of a corner piece of road that is occupied by a widow and her starving children, to merchants wanting to remove a competitor by burning their shop down to all the way up to the nobles, who fought with each other over everything, from simply being jealous of the other to liking a woman who might have caught both their fancy to having conflict over tangible benefits like a lucrative real estate for shops in the market place.

This gave rise to the culture of many nobles having their own small city gang as hired muscle to protect their property and investments and as a way to attack others, thus resulting in regular clashes between various groups becoming a commonality.

Hence it could be seen that these people that dwelled in the eastern part of the district were armed and dangerous, and though they might appear weak right now due to having their strength eroded and eaten by the drought and war over the last three years, one would be very foolish to underestimate their power, for once given the breathing room they needed, their recovery would be rapid and violent.

But of course, it was also important not to overstate their danger.

Alexander was not afraid that these human-shaped rats and snakes would be able to harm him directly in his own city.

He had eight thousand (8,000) trained men at his beck and call after all.

But what he was afraid of was that these men, spurred on by the nobles from the outside and the temple from the inside, both of whom they had served for generations, and motivated by the fact the new owner of the city had no intention in employing their services and was even actively trying to cut their business of gambling, extortion, and prostitution, would be able to pose as a significant thorn in Alexander's eyes, like a fishbone that's stuck inside oneself, not fatal, but hard to dislodge and extremely uncomfortable to live with.

And their area of expertise certainly allowed them to possess that capability, acting as partisans and saboteurs to undermine Alexander's authority by protesting and rioting, providing refuge to criminals,

obstructing people's work, strong-arming businesses into bankruptcy or preventing their set-up, spreading lies and rumors or even just relaying intel to hostile forces.

All such acts would weaken Alexander's hold over the city and hamper the peace and order of the state.

Alexander could never let that stand and gasping the prime opportunity the current times presented, with almost all the actors absent- being either dead, missing, or running from the plague, Alexander, in the name of renovation, decided to take over that part of the city.

But what did Alexander mean by 'take over'?

Didn't he already control the city?

It meant that he would take these private properties and the land they were on and remodel them to his own wish.

And he intended to do this remodeling by knocking down most of the buildings here.

Thus the more appropriate word would have been demolition.

This was a drastic measure and had expectedly generated some flack from his council members who were understandably reluctant to see such high-value pieces of property be destroyed and reduced to dust.

But Alexander was adamant, citing, of all things, the issue of safety, saying that if a fire were to ever catch in just one of the buildings, due to the close proximity of all the buildings and many of them being made partially or entirely of wood, it could rapidly fan out in all directions, endangering thousands or tens of thousands and even causing a city-wide disaster in the worst case scenarios.

He further reasoned that due to the congested nature of the streets, firefighters would not be able to come to the rescue in time, and so, by saying, quote, 'Thus considering the safety of the city and its residence, I have decided to demolish the eastern district', he overruled his advisors and went ahead with his plan.

And seeing Alexander be so adamant about this, the other council members could only hide their exasperation and accept, powerless to stop their boss in this endeavor.

Alexander did later tell them what he intended to build in place of the destroyed structures, which made many of them pleased, but still, this example went on to heavily illustrate the distribution of the power dynamic between Alexander and his retinue.

For though Alexander on the surface appeared very diplomatic, and would usually heed his advisors' suggestions and advice, and change strategies accordingly, the reality was that he did not really need to listen to anyone.

He had the right and power to unilaterally run the city and there was really no one to challenge him of he did choose to do so.

This was because, firstly, having been granted the title by the king himself, he was basically untouchable, at least by his advisors, who did not have even a morsel of legitimacy to Alexander's seat.

Secondly, because he enjoyed widespread support among the general populace.

Alexander's policies and generosity and even his supposed ability to catch criminals had won the hearts of many, thus making a popular uprising not possible.

These people might not jump up to defend Alexander, but making them turn their torches and pitchforks against him was also unlikely.

And the third reason was that Alexander had the support of the army.

Although a significant bulk of the army was made up of former Menicus and Melodias's loyalists, but Alexander too had his personal forces from his mercenary group and the Cantagenans, led by Grahtos were squarely on his side, thus balancing out the equation, and making any armed take over not possible.

Thus Alexander could have ruled the city as a tyrant if he wanted to.

Chapter 285 The Four Districts (Part-3)

Alexander, though capable of becoming a tyrant, had no intention of becoming one.

He believed the maxim, 'Absolute power corrupts absolutely,' and had already gotten a bit of a taste of it when he killed the boy named Fatrak in haste.

And so he usually refrained from doing things with an authoritarian approach, preferring to get the consent of advisors before acting.

Usually.

But this time he had arbitrarily chosen to demolish the eastern district.

Why?

Why did he take such drastic measures?

Well, there were three main reasons.

One was simply because Alexander was petty and wanted to remove these establishments as a way of making a political statement to all the hostile nobles.

They owned a lot of the property there and it was his way of sending a very simple message- 'I'm coming for you bitch.'

For if Alexander had even the modicum of the intention of making any kind of concessions with these nobles, he would have at least tried to use these properties as a bargaining chip for their loyalty.

Two was because Alexander's advisors were not crying over him taking over the establishments, but that they would not be able to possess some of the expensive buildings they were drooling over.

And this was a way to teach them to keep their greed in check.

And third was because Alexander had plans to build similar establishments elsewhere and wanted no competition from these pre-existing, already-known places.

He feared, even if the management were to change, people might feel more comfortable coming around to the same place than go to his new establishments.

So the thing had to go.

The entirety of it.

Alexander did feel a twinge of regret tearing down most of the structures.

But consoled himself by saying that he would soon build buildings bigger, better, and stronger.

But then the question arose, 'if Alexander planned to demolish the whole neighborhood, what did he plan to replace with?'

And the answer was surprising.

Because what he intended to do with the new district was perhaps quite the opposite of what it had been used for centuries.

Whereas previously this part was famous for its crime, lawlessness, and den for criminals, Alexander's new role for the district would see it clean, safe, and a glowing example of a model society.

For he intended to turn it into the army barracks!

Alexander's proposal naturally generated some talks, both of slight disagreements and of elations, the former from the civilian sides, and the latter from the military.

But Alexander squashed any dissent with the words, "The army will expand in the future. They will need a place to live, eat, and train. So the eastern district will go to them"

Thus, though currently the army was situated in the western district, their lodgings being in the barracks of the various empty noble houses, they were scheduled to be soon relocated to the opposite side of the town.

Alexander had planned to do it slowly and quietly, so as to not rattle the people who lived and worked there too much.

But the temple killing had inadvertently sped up that process exponentially.

This was not the plan at all, but after a large portion of the eastern part had been cleaned up by Cambyses by arresting the thousand men in a blitz operation, and after Alexander proclaimed that the eastern districts decadence and immorality had become a nesting ground for devils, the people were very eager to see it get demolished.

And so a few days after that incident, Alexander sent out his army to reclaim the land, who then started the extensive demolitions, transforming some of the large structures like warehouses into barracks, building new ones over the top of old ones, and tearing down large swaths of the land to make ground available for things like offices, stables, weapons storage, and training grounds.

The army also had its own team of engineers to do this and under Alexander's directive, they even started on the roads, connecting the central district to them.

While the ordinary soldiers took residence in the newly constructed or refurbished barracks, many of the officers made some of the best buildings in the district their homes, making a few former inns, pleasure houses and residences of kingpins now grace many of the high-ranking leaders of Alexander's military.

This was tacitly approved by Alexander himself, as a kind of remuneration for moving from the luxurious noble district to the kind of lower district, and now possessing these nice, spacious dwellings, these men's little acridness towards Alexander had disappeared.

There were reasons why Alexander had chosen to drive out the army from the western district, away from his close proximity, to the opposite side of the city.

The first was due to future considerations of space.

Alexander knew that he would have to expand the civilian residential districts by magnitudes in the future, and he decided to get ahead of the problem by clearing space beforehand, before such a large number of soldiers could entrench themselves with their friends and families here, making future removals close to impossible.

And the army would not have just taken up living space, but training and storage space too.

Then there was his consideration of the fact that he did not want the soldiers to be in so close proximity to the civilians.

He feared that this could cause bullying by the former and information leak by the latter.

It would also cause the people to forget their fear of the military.

What did he mean by that?

Well, this phenomenon could be easily explained by citing the kind of dread and terror one felt hearing the phrase 'the military has been deployed,' as opposed to similar phrases for the police, SWAT, or even the national guard.

And one of the reasons for that was armies were generally, and intentionally, kept distant from the civilian, so that civilians did not get too chummy with them.

That was the police's job, which was also why 'militarizing the police force' usually had a bad connotation.

And Alexander shared that mindset, for he wanted the army feared so that their presence would deter any thoughts of rebellion.

And the last reason was because he did not want the soldiers to get used to luxury.

The nobles' houses were naturally very beautiful and lavish, and Alexander feared once these men got used to the sweet things of life, they would have difficulty adapting to the harsh conditions of a campaign.

This was the detailed in-depth view of the easter district, thorough which ran the eastern road, leaving only one artery of the city- The Northern road.

This great road came from the north of the city, which was the original residential or more aptly the slum area.

It was generally where the regular populace lived, in squalid, unhygienic conditions, the situation deteriorating as one moved closer to the gates, while the wealthier inhabitants such as merchants and artisans tended to live closer to the center.

It was, by and large, the least developed part of this ancient city, and the living conditions here were appalling.

There was a perpetual stink of rotting ammonia around the area and the people here were shabby and filthy, likely never taken a bath in their lifetime.

The houses, built of wood or mud, were close enough to touch each other, making the surroundings dark and damp even in broad daylight and there was virtually no road between them, just a thin spit of alleyway which was usually so tight that even just two people could not use the road side by side.

So if they encountered another person coming from the opposite side, they would have to turn sideways till their shoulders became parallel to the road and shuffled past each other with their chests rubbing against one another like playing some kind of vertical version of the Limbo- How long can you go, or in this case, Limbo- How thin can you go.

And the challenges for crossing these streets were not just 2D, just 3D, as many times the people from the top floors would simply dump their garbage onto the heads of the passersby, resulting in frequent exchange of hot and fiery words between the residents.

All these made living in the northern district not suitable for any human and Alexander's plans were renovations were the most extensive here.

He planned to thoroughly demolish this part of the city, build roads, dig a proper sewage system and connect aqueducts to transform this part of the city into the commercial district, turning the dankest part of the city into its liveliest, it's beating heart.

The entire district was planned replaced with rows and rows of two-three story buildings, which would serve as markets, stalls, bazaars, inns, and various other entertainment establishments.

These regular buildings would have eight-meter-wide roads running through both the back and front of the stores, with a small two-meter gap in between them, enabling them to withstand huge gatherings.

And they would have to be able to as Alexander did not just want to make the usual shops, markets, and malls, but also include the arts and dance into this part of the city, making a part of it into the theatre district with a large permanent stage, an amphitheater and shows to be held every night.

And last of all, Alexander planned to make a huge stadium, similar to the circus maximum, where various sports like horse and chariot racing and other athletic events like sprinting, pole vaulting, and javelin throwing would take place.

Chapter 286 The Fifth District

The huge four major roads would be connected to the central district of the city, a place that Alexander intended to make his nerve center of the city.

This part was previously the marketplace, intuitively chosen, because it was at the center of the city and so people could easily come and go as they wished from all four parts of the city.

And Alexander had intended to keep it that way at first, instead placing the administrative buildings to the north of the city.

But it was Menes who raised an objection to this, citing it would be dangerous to place such important buildings so close to the gates, as in the case of a siege, these important buildings, with all the important heads of the city, alone with carrying thousands, if not tens of thousands of precious documents, everything would be vulnerable to enemy siege weapons.

And after thinking about it a while, Alexander agreed.

So, he placed all the important buildings in the middle of the city, so that even in the event that the city walls were breached, the leaders and decision-makers were not immediately in the crosshairs.

And to decrease the probability of that ever happening, Alexander placed one of the city gates, the eastern gate under the hands of the army, while the northern gate was to be protected by the city garrison.

The southern portion did not have any large gate, for it faced the ocean, while the western part was made up of steep hills that would make any attack unassailable and any attacker visible for miles.

According to plans drawn up by Alexander, the central district was to house the following buildings for the time being:

There would be the police headquarter, plus the residential quarters of the servicemen, all one thousand members, and possibly more in the future, with all their family members placed here.

In the daytime, these men would be placed all over the city, but at night they would sleep in the central district, the idea behind the decision being that these armed men would have more motivation to protect the district they lived in, thus ensuring the security of this vital part of the city.

There would be the central bank that Alexander planned to soon set up, which would be the country's first but certainly not the last one, as Alexander was sure that others would soon emulate him to set up similar financial institutions, making the central district become a financial hub for the province and possibly the country.

There would be a huge public library that would house tens of thousands, if not hundreds of thousands books and manuscripts.

Work was scheduled to begin as soon as Alexander found the time to invent the printing press.

There would be several state-sponsored public schools and universities here, designed to teach the younger generation the basic knowledge, who would then be expected to use and contribute to the public library.

There would be all kinds of administrative buildings that would handle all the paperwork for the entire city and slowly extend to the entire province.

Some of the buildings that came to Alexander just from the top of his mind were the usual ones anyone could come up- the agricultural building, the mining building, etc.

But some were a bit more special like the marriage registration and immigration building and two were completely new kinds of buildings called the slave management building- responsible for, as the name suggests, registering and looking after the well-being of the slaves and the citizen record building which Alexander planned to use to keep a detailed track of the population, by issuing something similar to the US social security card.

And then there were the judicial buildings, which would settle both criminal and civilian matters for individuals, businesses, and even the state.

They would not only judge and enforce their ruling but also make, study, evaluate, and interpret the law.

But what did it mean by interpreting the law?

Wasn't the law what was written on the parchment?

No, because, even the most versatile and knowledgeable lawmakers could not make a law that will be true for all eternity.

And so it was a lawmaker's job to not only read and memorize the law but also understand the appropriate context of its implementation.

Alongside these administrative and judicial buildings, Alexander also planned to make the central district the spiritual hub of the city.

There already was both the Temple of Ramuh and the Temple of Gaia here, displaying that even the people before knew of the location's convenience of travel, and Alexander planned to make many more temples in the vicinity.

And at last, there was the big one.

The single piece of building that would make all the other buildings appear secondary, casting a shadow on all of them.

The one that would legitimize the central district's title- The nerve center of the city.

A building called- The Senate.

The current senate's address was Alexander's home, more specifically the second-floor hall room.

But that place was only chosen as such because of convenience, and out of necessity.

It could never become the norm.

The setting was too informal for his liking, and Alexander did not look too kindly to so many men coming and going out of his house every day.

And in the future, there would be even more traffic as more and more people would be invited to join the meetings.

So it was soon bound to get crowded.

This was not a problem for the previous pasha as he kept only a few men around him, letting his subordinates oversee all the work.

But that was not how Alexander operated, as evidenced by his invitation of even civilians into his meetings.

He liked to be informed and in the thick of things and so the number of his advisors was bound to keep increasing in the future.

So the parliamentary building was a necessity, which he planned to design exactly like the Roman one, with a central platform to address others and give speeches, and all the lords seated on raised platforms all around like a gallery.

Alexander also contemplated moving the noble's district, which was currently to the west of the city, and one that he was transforming into the civilian residential district to the center of the city.

But he was yet to make his mind up on that one.

And the very last thing that Alexander planned to build was a triumph.

It was basically a Roman invention and it was a huge arched gate that one paraded through to celebrate military success.

And like the Romans, Alexander too planned to hold grand parades to celebrate his military successes.

And that completed Alexander's plans for the city.

Most of these plans were still in their infancy, and it would take a few years to get all the buildings up and running, but Alexander had decided to reserve the plots for those buildings from now.

For now though, Alexander was concentrating his efforts on getting the basic infrastructures going.

And his first priority were the roads.

Though even this simple plan had been met with, not opposition exactly, but some grumblings.

The complaints were as expected, his advisors felt that building such massive wide roads, capable of accommodating two double horse carriages as excessive.

Given the already small size of the city, they felt that the land could have been better used to make more productive structures such as shops, buildings, and offices.

But Alexander knew perfectly well how important the smooth flow of traffic was to a city and he was well aware of how quickly transports in a city could balloon.

And he did not want to deal with the kind of congestion that could create.

After all, traffic jams were after all not just a modern thing, but existed even in ancient times.

And many times it would be even worse.

One only needed to look at the Roman empire to know the kinds of congestion a misplanned city could create.

First, horse-drawn carts from dawn to dusk were banned in Rome, because they caused too much noise and confusion on the streets, and harnessed horses contaminated the city.

And then people were ordered to move around the city only on foot.

And at last, when even this did not totally work, women were not allowed to move with carts.

And similar traces of congestion was already beginning to show themselves in Zanzan even by now, in a city largely empty.

This was because there were only a few important streets wide enough for two carts to cross each other while most of the streets were narrow with a width of 1 to 2 meters.

This meant that horse-drawn carts carrying construction materials such as cement, bricks, and stones would face huge problems maneuvering in such small, tight spaces, especially if there were many crowds in the streets.

To remedy this, usually, the coachman would send a man forward to pave the passage or properly instruct another oncoming driver, for example, by forcing a temporary stop.

This could never be a long-term solution and so Alexander decided to build the roads as wide as possible since he had the chance to do so now.

As a matter of fact, he wanted to build the main roads 10m wide but found it difficult to do within the confines of the compact city.

So, he settled for 8m.

And he handed these plans to Uzak and told his men to get to work, tasking them with creating a road network that measured close to a hundred kilometers.

And all that for a city of just two square kilometers.

Chapter 287 Residential District

Uzak quickly got to work using the army of workers under him to dig not just the roads, but also the underground sewage system for the entire city, the total work spanning more than a hundred kilometers.

While Alexander decided to meet his next, very important advisor- Diagnosis.

The man had been put in charge of the public houses and Alexander was eager to see how much progress he had made.

He also planned to give the man with a fierce scar some critically important additional work related to the cement manufacturing and so the two met up at the construction site in the morning.

"My lord, good morning," The man had greeted Alexander and after the usual polite exchanges, Alexander got to know about the extent of the construction works.

"My lord, I have said it again and again, I need more cement." Diaogosis repeated his request, and then he pointed to a few men some distance away, "Look, many are starting to idle. If my lord had not asked for all those plows, they would have had nothing to do."

This was the um-teemed time the man had asked him for more cement, as with the amount allocated to him, he was barely able to make just four outside perimeter walls (16m x 4m x 0.2m) and one roof (16m x 16m x 0.4m) per day.

In fact, he could not really even do that.

So by this point, he was bound to miss his deadline of making one hundred homes by December, leaving the people to spend the cold winter nights in their rundown shacks.

"I instructed Jazum to make ten more kilns in three months. You will get enough soon," Alexander promised in a tired voice.

He had promised the men that all infrastructure projects would be able to go full steam ahead once the first cement kiln was built, but was finding that even working 24/7, with a production rate of over one ton per hour, it was but a drop among the ocean of demands.

Being not a civil engineer, Alexander had no idea of this freakish rate at which cement could be consumed, a realization he was only waking up to.

When Diaogosis had first informed him that he was running out of cement within the first hour, all fifteen tons of it, Alexander's only thought was that the man was certainly incorrectly using the thing.

And so he had personally gone on a site visit to confirm his fears and the scene there gave Alexander a slight trauma.

He was not appalled by the bricklaying though.

Oh no, on the contrary, that was happening exactly as Alexander had instructed and in fact, he was even very impressed by the smooth, slick, technique by which the workers were laying brick after brick on the walls.

Alexander watched with muted appreciation as the workers would scoop up the bit of the cement with their small wooden spade, expertly flick the tool to deposit the gray, spongy solid onto the bricks or stones, and then spread it over the bricks in one swift, practiced motion, laying four hundred to five hundred bricks per day individually.

This speed very much impressed Alexander.

But what impressed Alexander less, or more specifically what made him fearful, was the amount of cement they were using, even when they were applying just the appropriate amount.

He was astounded to find out that 25% of a brick wall was mortal, which it self was one-seventh (1/7) cement.

And when he did the math using what he saw, he found that around a ton of cement was needed to lay about four thousand (4,000) bricks.

In fact, one ton was usually not enough, as spillages and wastes were bound to occur, bringing the number closer to eleven hundred kilograms of cement.

So using Diaogosis's allocated daily amount of fifteen tons of cement, the limit of the number of bricks he could lay was around fifty-five thousand (55,000).

This might sound like a lot because that was around a hundred and ten tons of materials a day.

But such an amount could be laid by just a bit over hundred men, much less the five thousand under Diaogosis.

His demand was not fifteen tons per day, but more like fifteen tons per hour, and possibly double that.

This realization had made Alexander's stomach unnaturally squirm as he let out his usual curse, 'I hate multiplication'.

He knew beforehand that even small numbers would swell to huge figures when multiplied, but it was only after he became the pasha that he was beginning to get a real example of it.

And he hated it.

But along with this frustrated feeling, Alexander also began to appreciate the industrial revolution of his last life and the huge production capacity that people in his previous life had managed to achieve.

And then thought back on a certain county, realizing just how terrifying its production ability was that earned it the nickname- 'The world's factory'.

The numbers that must have been needed to meet the ever-hungry, insatiable demand of the eight billion people of his previous life must have been gargantuan, a number that surely would have hurt Alexander's head just seeing it.

And compared to that, here Alexander was, struggling with just making enough cement.

In fact, the lack of cement was also not Alexander's only headache.

"My lord, we only get two hundred bricks a day. That's as good as not getting any, "Diaogosis again complained, "And that's why we are using stones instead."

Afterward, he warned, "And though the huge stockpiles from before and the production from the quarries is enough to ride us through right now, if cement production becomes more than ten times as you promised....I'm afraid we will face shortages within days."

"..." Alexander only gave a flat, placid look, feeling like he had bitten off more than he could chew.

After just becoming pasha, and being given the full rein to do whatever he wanted to do, he launched every infrastructure project in his mind simultaneously, wanting to transform Zanzan in one fell swoop.

But reality had now come knocking on his door, reminding him that he had forgotten to take into account the issue of raw materials and manpower.

So Alexander felt that all these construction projects were stretching his efforts too thin, resulting in none of them being completed on time.

And so he decided to scale back his ambitions by some scale.

"I will go see the issue of brick making and find out why the speed is so less." Alexander weakly addressed the man's first complaint.

Then he informed the man of his decision, "Taking into account the acute manpower and raw materials shortage, it is clear we are not able to proceed with all the projects simultaneously at the speed I had hoped."

"As such, understanding the realities of the situation, I have decided to decrease the extent of some of the works."

As soon as Alexander said this, Diaogosis could understand where he was going and he quickly interjected, "My lord! But why? These the people's homes we are talking about!" He cried and even pointed to the many dug-up plots of land that had hollowed wooden pillars sticking out, ready to be filled with concrete, and said, "Look, sire. We have already done so much of the work. All we need is the cement and we can start building the houses immediately!"

And at last, he pleaded in a shaky voice, "Think of the people my lord. It's the middle of the winter. They need these houses!"

It appeared that Diaogosis's heart was bleeding for the population.

But his true intentions were certainly not so altruistic.

The real reason why he was whining so much was because without these projects he feared he will not be able to distinguish himself, without building all those residential buildings he was worried he would not be able to make contributions to Zanzan, and without control of the thousands of workers under him, he knew he would see his power and influence in Zanzan dwindle.

And all these combined would mean that there will be nothing to show for his work and without any accomplishments, there can be no peerage of him. something he knew Alexander had already promised Jazum, Krishhok, and Uzak.

Seeing his colleagues move up in life and become bona fide nobles while he trudged in the obscurity of the common mass was a mortifying thought for the man and something he would never be willing to accept.

And thus the hysterical outburst he was currently displaying, even before Alexander could really say anything.

Alexander knew very well why Diaogosis was being so defensive about his project.

But he was also a bit angry that he was interrupted even before he could really say everything he wanted to say.

The man was worrying about nothing because Alexander intended to give the man alternative tasks which he could do to earn credit and acclaim.

And Alexander was very much in the mind to give him the same peerage he had given the other three.

Was.

Alexander was going to give him.

But the outburst right now displeased Alexander and he decided to hold off on it for a while.

So, instead of directly giving the man his new job, and then promising the peerage, he decided to delay his noble title.

Chapter 288 Convincing Diaogosis

Alexander's decision to drastically reduce his plans for the residential buildings was based on pure maths.

Something that Diaogosis seemed unable or unwilling to consider.

So he decided to show the man that wanting to continue with this project regardless was an exercise in futility.

"Diaogosis," He gently called out, and in a fake understanding tone said, "I understand your passion for your work, But it is simply not possible to complete the constructions at the pace I imagined." He said so shaking his head.

"Let us see why." Alexander then raised his index finger dictatorially.

"According to what I have observed from being here with you, a worker can use up to 500 bricks or a ton of stone's equivalent and close to a hundred fifty kilograms of cement a day."

"So, with the men people under you, only you will need two and a half million bricks and seven hundred and fifty tons of cement per day."

"And that's only for you. Even that will take years to reach that capacity," Alexander had a slightly fearful tone to his voice as he said these numbers.

He was not only fearful of the numbers but what these numbers meant in the grand scheme of things, nothing much really.

For example, just four (16m x 4m x 0.2m) walls and one (16m x 16m x 0.4) roof which made up the outside perimeter of the apartment blocks used up more than fifty thousand (50,000) bricks and fifteen tons (15 tons) of cement and it represented just a hundred workers' output for one day.

Thus Alexander dreaded to think the kind of numbers that would have been needed to keep up the infrastructure projects in his previous life that employed tens of thousands of workers.

Alexander's analysis dampened Diaogosis's resistance to the cuts, but he was still unresolved to lose much of his power, knowing, though Alexander had not explicitly mentioned the cutbacks, they were bound to be drastic.

And so, suddenly remembering a bit of something else, he quickly piped up, "My lord, didn't you say we would be having more than a hundred thousand men (100,000) soon? What about them? They can work!"

Diaogosis had a huge grin as if saying he had found the magic formula.

"Men, women, and children. That's what I said," Alexander gently chided, feeling a bit frustrated he was having to waste so much time on the man.

So in a bit of a display of anger, Alexander stated brushing his arms, "As we discussed a majority of them will be employed in farming. And even much of the rest will be needed in other projects. They cannot be given sorely to you."

And besides, Alexander's main issue was not the manpower shortage but the raw material deficit.

"I understand what you are saying, my lord," Diaogosis at last bowed to reality, though the unwillingness in his voice could not be missed.

And then as a side note let Alexander know, "But please know that if we wait too long, the wood and ropes that's been used to mark the plots and make the outlines of the pillars will rot and we will have to start over again."

"Mnnn, I understand," Alexander could only helplessly see those things get wasted.

"Your Grace, then what about all the homes? Where will all the people live?" Diaogosis did not forget to remind Alexander about his promise to the people, a promise it seemed Alexander would be unlikely to keep.

And then further said, "And sire, without the northern district cleared, we will also not be able to make the commercial district too. What about that?"

"..." Alexander had little answer to this problem as he put on a thoughtful or more aptly, confused face.

He was thinking about how he was gonna sell it to the people.

'Fuck.' Alexander cursed himself for getting over-eager and over-promising to the public.

This decision not only would damage the fragile reputation he had managed to build up within the short time, it would also hamper one of his critical strategies:

A god who promises something and then is unable to deliver on it was no god.

But he soon forced himself out of such a self-deprecating state.

Mistakes were made but what had to be done, had to be done.

And as the leader, he knew he should always appear confident and confident in front of his subordinates.

So regaining his hawk his azure eyes, Alexander spoke, "As far as I recall, you have ten thousand (10,000) men under you, right?"

Diaogosis knew this question was the preclude to Alexander relocating his men elsewhere.

And though he thought about hiding some of it for a split second, he quickly understood that that would be a very bad idea and in the end answered truthfully.

"Yes, my lord, Half in the quarries and half in the constructions. Though most are now making the plows you wanted for farming,"

Sigh, if these 10,000 men could work at full capacity, even assuming each floor with all the individual flats, rooms, and stairs used a total of six times the materials, which came to around three thousand thousand bricks and close to a hundred tons (100 tons) of cement, they could have built four four-storied buildings each day.' Alexander could not help but let out copious amounts of sighs as he ruminated over what could have been.

But Alexander quickly returned his attention to address the man currently in front of him.

"The issue about the houses can wait," Alexander began, stating, "We will continue with the demolitions of the northern districts as planned and move the people to the western district."

"The military has been ordered to clear the eastern district and move there, so many of the barracks and noble houses will be made available soon."

"My lord, that will still take some time. And won't the military setting up all those buildings also use up bricks and cement?" Diaogosis was very quick to point out that Alexander was basically suggesting that the army get more construction materials than him.

"No," But Alexander rebutted, "The army will get cement much later. For the time being, they will live in the various inns and houses in the eastern district. And once the winter is over, they will demolish the district and live in tents."

"And it is unlikely the men will get any significant amount of concrete next year. Only the year after," Alexander added.

Then he soothed Diaogosis's further grievances, "And though it is certainly unfortunate that we will not be able to finish the houses in time, we will compensate the people by building huge bonfires as heating spots so no one suffers from the cold."

"And that's what the people really want don't they - To not suffer from the cold? It's not like they really want the house!" Alexander reasoned.

"I suppose the lord is right," Diaogosis finally accepted his fate.

But what did Alexander mean by people didn't want houses?

Well, the people of this time lived in their houses very differently as compared to people in the 21st century.

Modern humans tended to see their apartments as permanent residences to live in, places where one cooked, dined, slept, and relaxed.

It was their abode, their sanctuary, and as Winston Churchill put it, "Their castle."

But for the people of this time, houses were not like that at all.

For them, especially those who lived in cities, they basically lived outside.

They had a lodging of some kind, like a small shack, hut, or a loft atop the family's workshop or shop, which was small and very minimal, with almost no furniture.

There might be a chest or two there which was used to place valuables and stored clothes, several pegs where to hang clothes in use, winter capes, and other things, probably a couple of stools, maybe a bed (those who can't fit on the bed can sleep on a mat or mattress on the floor), and a brazier that would be used to heat the room in winter and to warm up or even cook food.

Even the rich lived similar lives.

They had their differences of course.

For example, they lived in multi-room homes which were reserved exclusively for the rich.

This was also why Alexander's plans, which promised even the peasants such houses had garnered such attention.

But other than the size, the layout was very similar.

People, both poor and rich tended not to cook inside their houses, but would rather use a large community stove that usually belonged to a baker or an affluent member of the society.

This was because owning and running an earthen stove was expensive.

And since cooking for a great number of people and running a hot stove for a long time was economically cheaper, in addition to the fact that a baker's oven would sit idle after he had finished baking all the needed bread by morning, the people naturally gravitated to that option.

In this way, the people cooked outside, worked outside and because there was no artificial lighting and candles were expensive, tended to socialize outside, meeting up, in small inns, shops, or other public places, like gardens or even on the terrace, drinking, chatting and even playing small games like dice and other board games.

So, the people of this time lived in their city just like modern people did in their homes, eating, playing, and partying, while only returning to their houses at night to sleep, essentially treating them as their bedrooms.

Thus Alexander was confident that as soon as their night's were comfortable, the people would not too much bemoan the delay of the houses.

Chapter 289 Waterwheel (Part-1)

Having decided to hold off on the residential buildings until he could bring his capacity up to scratch, Alexander issued the task he came here for.

"Diaogosis, let's get to the real reason I called you," Alexander said, drawing a surprised look from the stonemason, who thought about a few alternative situations about why Alexander would make such a statement.

But he did not get too far into his thoughts as Alexander handed him a piece of paper with some drawings.

"Here, read this. And see if you can understand them," He instructed.

"Oh! Is this the famed 'paper' that the lord has invented?" Diaogosis quickly accepted the white sheet, rubbing it between his fingers and exclaiming, "So soft! And so sturdy! Nothing like the papyrus."

He seemed more interested in the novelty of the paper than what was actually written on it.

"...," Alexander simply waited and gave the man a bit of time to check out the new invention.

Diaogosis savored the smooth texture and gazed at the pristine white sheet, and even sniffed the new paper smell for a while, after finally which the feeling of novelty ran out and he decided to focus his attention on what was written on the paper itself.

He knew wherever his lord would hand over things like this, it almost always be about new inventions and gadgets, and he felt giddy thinking about what new contraption and contrivance the pasha had cooked up this time.

And as he eagerly turned his eyes to the paper, he found it was just as he had predicted- it was a new invention.

More specifically it was the blueprints of what seemed to be a huge wheel over which water seemed to be flowing causing this huge spooked circle to spin.

And below it was the label- Waterwheel.

"The flowing water will cause the wheel called the millwheel to spin." Alexander began his explanation, "Which can be attached to something like a wheat milling wheel so it will spin with it, and thus milling the wheat automatically."

Alexander's short description was enough to make the artisan understand the invention's significance and he exclaimed, "Oh my lord, this is fantastic! With this installed near rivers and springs, we will be able to mill wheat like we were breathing."

Diaogosis was able to instantly grasp where the waterwheel was supposed to be placed showing the man's skill and expertise.

And then laughed out, "Haha, using this we can half the price of wheat. The people are certain to rejoice,"

He was happy that he had found the excuse by which the people will forget Alexander's little delay with the houses.

And while he certainly exaggerated about the price fall, the waterwheel would certainly be used like that.

But Alexander's intention to use the thing was far more industrial.

"Mnnn, the waterwheel can certainly be used and will be used to grind wheat...later" Alexander said the last word with a bit of a pause, adding with this his characteristic 'but'. "But for now, these ones will be used to crush the clinkers."

"Crush cement?" Being the largest consumer of cement he certainly knew the products from the kiln needed to be crushed.

That was not what surprised him, but this, "My lord, I don't think simply substituting the stone clinkers for wheat grains in the mill will work."

And then he reasoned, "Those tiny stones are much harder than the grain and will either not break, get stuck between the wheels, or the powder will not be fine enough."

There was certainly logic behind Diaogosis's skepticism.

And to understand that one needed to understand how a millstone worked.

The way this simple but vital machine worked was that there was a stationary stone wheel called the static bedstone sitting at the base, with a moving stone wheel called the runnerstone was placed on top of it.

And almost counter-intuitively, these two millstones did not touch when in operation, and a small gap was kept in between them that was adjustable and was determined on a day to day to basis depending on the size of the grain.

The runnerstone had a small hole in the center of it called the eyes through which grains could be inserted, and as the stone was spun, an intricate system of groves known as furrows distributed the grain across the millstone's bottom surface, and also served to ventilate and cool the millstones.

These grains would then be crushed using an intricate pattern on the millstone's surface that was between the furrows and once ground the flour passed along narrow groves called cracking, and was expelled from the edge of the millstones.

Hence, Diaogosis rightly feared that, though the weight of the moving stone and the friction between the two surfaces was enough to crush the relatively soft grains, the solid, stone-like clinkers would get stuck between these narrow channels or even outright ruin the thin grooves due to the clinkers inherent hardness, thus posing themselves as too hard to milled by traditional means.

"Mnnn, you are right," Alexander too agreed with these fears.

But then added, "That's why we will not do it like that."

The confident tone in Alexander's voice gave the clue that he already had the idea about how to overcome this challenge and so Diaogosis kind of jumped the gun and eagerly asked with anticipation, "Oh, then how will the clinkers be crushed?"

His eyes seemed to be sparkling as he asked this.

"Hahaha, first let me tell you how to build the waterwheel," Alexander decided to finish the waterwheel topic first before moving on to the new topic, thus keeping the shroud of secrecy around the new crushing technique around for a little longer.

"Ah! Yes, yes, my lord," Diaogosis quickly replied, letting out an embarrassed chuckle, "Haha, I seemed to have gotten too ahead of myself."

"Mmm, then regarding building the waterwheel," Alexander thus began, "This type of waterwheel, where the water flows from the top is called the overshot waterwheel. And if the water flows horizontally like from a river, it is called an undershot waterwheel."

"We will build both. But first, let's look at how to build the overshot waterwheel." Alexander pointed at the paper.

"To build this type of waterwheel, first you will need to build these things," Diaogosis saw Alexander's fingers direct his eyes to small lines that he presumed to be flat wooden planks between the rims.

"These might look like wooden paddles, but really they are buckets," Alexander clarified, explaining, "The water will flow from the spring or dam, fill up the empty buckets which will cause them to become heavier and fall down, pushing the empty, lighter buckets at the opposite of side up top"

"Once the filled buckets reach the bottom, the inertia of the wheel and the force of the water will tip the buckets over, causing them to deposit their water out and make the buckets lighter, which can be again pushed up by the succeeding heavier buckets, thus repeating the cycle." Alexander gave a simple, generalized overview of how a waterwheel worked.

"To think Your Grace would have thought so deeply. I at best could have made the buckets like solid panels, similar to oars in a boat," Diaogosis let out a genuine exclamation of praise, wholeheartedly conceding that Alexander was a superior artisan to him.

He had observed even before that Alexander could not only think of new inventions but also make small adjustments within those inventions that might seem insignificant additions to a layman's eyes but improved the performance of the contraption by significant margins.

But it would be too wrong for Diaogosis to disparage himself too much as he was no slouch either, for few possessed the ability to tell at a glance or just from hearing the description, why using buckets instead of straight blades or paddles were better.

Diaogosis, though did not fully comprehend the existence of gravity, could intuitively understand this type of structure will not only use the speed of the water striking the wheel to spin but also use the additional weight of water going down, making the wheel spin faster.

Alexander had learned the details about the waterwheel, both the overshot and undershot from a science project in his high school, a topic got handed to him by a class lottery, one which asked him to explore some real-life examples of the usage of gravitational potential energy.

And the project had been quite extensive, making him learn much about watermills, how they worked, what kind of equations were used to calculate their output, their factors of efficiency, and hundreds of other peripherally.

"So where does my lord what to build this? And how big? Diaogosis was very enthusiastic about the whole thing, understanding this was Alexander's way of giving him an alternative path to making contributions.

"I have not finished," Alexander gently chided, feeling a bit peeved at being interrupted.

"..." Diaogosis only produced a little flush and quickly stooped down his head to hide this as he deeply concentrate on the paper he was holding.

" Now, these buckets" Alexander once again started, "They will be stuck to each other at a 45-degree angle," Alexander showed this by tilting his palms, forming his fingers that resembled a military salute.

The concept of angles was something these people understood very well, and so Diaogosis nodded understandingly, though this time did not open his mouth for fear of going off-topic, only looking down at the diagram to confirm what Alexander was saying matched the instructions that were already written on the paper.

Chapter 290 Waterwheel (Part-2)

Alexander's choice of angle 45 was easy- Because it was the most optimal one.

This is because any less and the water would fall out before reaching the maximum bottom of the wheel, thus losing out on some of the gravitational potential energy.

And any more and some of the water will be leftover even when the bucket reaches the lowest point, making the apparatus waste energy by again bringing the water up.

"That's all there is to the milling wheel- just take some wood, make them carved on the inside to make them like buckets, attach each of them at 45 degrees with one other, and then hold the entire thing together with thick wooden panels," Alexander finished explaining the most important structure of a waterwheel.

"*Nod*," Diaogosis signaled the understanding with a gentle nod.

"Then there is the transmission system, which is the thing that will transfer the rotation of the wheel into work," Alexander then moved on to the second topic as he indicated with his fingers to flip the page.

"The transmission will be pretty simple, just a log which goes through the center of the milling wheel, which will be attached to the structure using large, thick wooden spokes."

Alexander then twirled his fingers as a visual aid and continued, "So as the wheel spins, the cylindrical structure spins with it. And anything could be attached to the other end to make that spin with it too."

Diaogosis very attentively listened to these, taking mental notes as Alexander said, who then finished his first point by suggesting, "These spokes will go through both ends of the log, and attach itself to two points on opposing sides of the wheel. They will be the ones making the log spin with the wheel and so needs to be made of very good lumber.

"We will also need to use thick lumber then," Diaogosis subconsciously added, as he thought not only about the spokes but also about the challenges of drilling such large and deep holes through wood without cracking it.

"Use thick ropes to tightly bind the log together," Alexander suggested, understanding the artisan was worried that drilling such large holes might compromise the structural integrity of the wood.

"And once iron becomes more available, we will have the transmission fully out of steel," Alexander promised.

If anyone would have said this Diaogosis would have either politely smiled and nodded, while calling the man a lunatic in his mind, or had just outright said so.

But after what Alexander had displayed he was capable in such one short month, Diaogosis knew if Alexander claimed so. it was certainly possible and so eagerly waited to see how Alexander would do it.

So he smiled lightly, and said, "Then I look forward to it, my lord."

"Mmm, hopefully, I will be able to show it soon," Alexander replied with the same smile.

"Now, about the undershot waterwheel," Alexander then moved to the next diagram, as he bought out another piece of paper, "It will be like this and placed on rivers, and other horizontally moving bodies of water."

Alexander then handed it over to Diaogosis so that the man could better read it and said, "Here is how to build that."

As the stonemason laid his eyes on a waterwheel placed on the banks of a river, the classic picture one imagines when thinking of a waterwheel, he found the blueprints to be much more complicated.

There was much more text and even some very complex math.

Well complicated for him, as evidenced by the scrunched-up eyebrows and the confused gaze.

Alexander knew the maths of this time was not advanced enough for most people to be able to read this and so decided to help out.

"First, you will need to measure something called the 'head'. This is basically the distance the water would have fallen if it was a spring and not a river," He began.

"To find that, the primary thing that you will need to know is the speed of the flowing water that will be hitting the wheel."

"This can be calculated by setting two strings of known length near the banks of the water. Let's say it's 100m. Then corks or chips of wood can be thrown on the water and then measure the time taken to travel between the strings. Afterward, simply dividing the distance by the time should give you the speed of the current." Alexander spelled out the experimental procedure.

And then quickly added, "Oh, you will need to do this several times at several points along the stream. and take the average velocity. And remember to do it meters. Not in feet or centimeters." He emphasized.

Diaogosis only silently listened and nodded, understanding most of it, though not why he would need to repeat the procedure several times, and take the average.

This was normal as things like compensating for experimental errors were concepts literally thousands of years of his time.

But for now, he kept his mouth shut and just listened.

Alexander was still speaking, "Once that is done, you will need to take that number and multiply it with itself. And then divide that number by 19.62. That will convert your velocity into the so-called 'head'."

Alexander did not explain where these seemingly arbitrary numbers and procedures came from.

And Diaogosis did not bother to ask.

And even if he did, Alexander would have just instructed him to follow the procedure.

Because the derivation of the formulae used here- v2/2g (velocity squared divided by twice of gravity) would take even a college student some ten-twenty minutes to understand, much less a man with the math skills of a middle schooler.

Another point of consideration was taking g = 9.81m/s2.

Alexander had not measured the gravity of this planet, but he felt that gravity here seemed identical to earth and decided to plug in that value.

After giving Diaogosis some time to digest the 'heavy' maths, Alexander started again, and then spent almost the full next hour explaining in detail the rest of the mathematical procedures in its entirety.

"So, the optimum diameter of the milling wheel will be between three to six (3-6) times the head." Alexander drew attention to that fact, saying, "Any smaller and we will not be using all the energy of water. And any bigger, we will not be getting any additional benefit."

'Just multiply the head with six,' Diaogosis simplified the procedure to himself, as he loudly said, "Understood my lord."

Whatever Alexander said, Diaogosis took as gospel, as, for all he cared, the goddess Gaia might have whispered them to the pasha.

"Okay, next is the spacing between the paddles," Alexander then moved to the next topic, giving the answer, "That will have to be equal to the head."

In the overshot watermill, the buckets were joined together, with no gap, but here they needed to be spaced.

Alexander then reminded, "Oh, remember, here we will have to use paddles and not buckets."

Diaogosis needed no explanation why as the reason for this was obvious, the procedure of making the bottom heavier would be the very antithesis of how a water wheel worked.

It would only make the waterwheel heavier and obstruct movement.

"And lastly the waterwheel needs to be submerged into the river equal to the head length."

With all these instructions, Alexander finally finished the topic that was a waterwheel, making Diaogosis feel his head heavy with all the math.

"I...I will strive," The stonemason felt this simple structure will not be as easy as it looked to build.

"Mmm, that will be the basics. And I will leave the rest to you," Alexander decided to let Diaogosis figure out the rest of the details on his own.

Done with the waterwheel, Alexander then moved on to the thing that would actually do the work- the structure that would be used to crush the clinkers.

To show this, he brought out a third blueprint, and said, "This will answer your question of how to crush the clinkers."

Diaogosis looked down at the new paper and found the new drawing to be much simpler than what he had expected.

It was simply the picture of a huge drum whose diameter read 3m, about one story, with a length of 10m.

And the only thing that was slightly different was that the walls of the drum seemed to have small internal horizontal protrusions.

Below the label read 'Ball Milling machine'.

"The grinding procedure is simple," Alexander reassured, "We will put the clinkers inside and then add many small iron balls with it."

"So, when the drum rotates, these iron balls will rise up riding on those small platforms and then fall from above once it reaches a certain height, smashing against the clinkers and breaking them apart."

Alexander explained.

"Oh! That's ingenious," Diaogosis praised with repeated nods.

"....." Alexander only lightly smiled and gave one last bit of advice, "Make sure to tilt the drum at a slight angle. It will help in the milling."

"I will be sure to remember it, my lord," Diaogosis nodded.

"Okay, that's all there is to the construction for now," Alexander said, though the ominous 'for now' did not escape Diaogosis.

'There's more? What could there be even more? The stonemason dreaded and hoped he was reading too into this.

But Alexander pretended to not see the look of slight horror on the man and simply instructed, "You are to first build a small 5m diameter waterwheel as a prototype. And then I will give you something additional to build." Alexander mysteriously added.