KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY (KNUST)

KUMASI, GHANA.

COLLEGE OF ENGINEERING

DEPARTMENT OF MATERIALS ENGINEERING

INDEGINOUS PROCESSING

TOPIC: THE TRADITIONAL EXPLORATION OF GOLD AND SILVER SMITHING .

GROUP 13

STUDENT INDEX NUMBERS:

1. 1965322
2. 1965422
3. 1965522
4. 1965622

LECTURER: PROF EMMANUEL KWESI ARTHUR .

ABSTRACT

Gold and silver smithing is a centuries-old time-honored craft that has been producing exquisite jewelry and metalwork. This report provides an in-depth analysis of the art of gold and silver smithing, evaluating its significance, traditional techniques, contemporary practices, and working tools. The report delves into the creative and artistic aspects of gold and silver smithing, highlighting the craftsmanship involved in designing and crafting unique and personalized jewelry pieces. It also sheds light on the challenges and advantages in the gold and silver smithing industry, including the cost of materials, time-intensive production processes, specialized equipment requirements.

TABLE OF CONTENT

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Gold and silver are two of the most precious and valuable metals in the world. They have been treasured for their beauty and rarity for thousands of years and have been used as a form of currency, jewelry, and decorative items. Gold is known for its lustrous yellow color and is highly malleable and ductile, making it ideal for creating intricate designs. Silver, on the other hand, has a brilliant white color and is also highly malleable, making it a popular choice for jewelry and decorative items.

Both gold and silver have been used in various cultures for their symbolic and monetary value. They are also used in various industrial applications, including electronics, medicine, and photography. In addition to their practical uses, gold and silver hold a special place in many cultures and are often associated with wealth, luxury, and prestige.

Fig 1.1. Gold and silver stones.

Smithing is a production skill through which players create a wide variety of metal items from ore and metal bars. It is the companion skill of Mining, which generates raw materials used in Smithing

Gold or silver smithing is the art and craft of working with precious metals specifically gold and silver to create jewelry, decorative items, and other metalwork. This can involve a variety of techniques including casting, soldering, forging, engraving, and stone setting.

A metalsmith or simply smith is a craftsperson fashioning useful items (for example, tools, kitchenware, tableware, jewelry, armor and weapons) out of various metals. A goldsmith works

on gold metals whereas a silversmith works on silver metals. Gold or silver smiths use their skills to shape, manipulate, and join metals to create intricate and beautiful pieces of art.

CHAPTER TWO

2.1 MATERIALS NEEDED

Gold and silver smithing involve a variety of materials which are used to produce a jewelry . Most popular among these materials include:
1. Gold: The primary material used in goldsmithing, it comes in various purities and can be alloyed with other metals to create variations in color and hardness.

2. Silver: The primary material in silver smithing. It is often used in combination with gold and other metals for mixed-metal jewelry and can be used for settings and accents.

3. Platinum: A dense, durable, and corrosion-resistant metal highly valued in jewelry making, often used for settings due to its strength.

5. Gemstones: Precious and semi-precious stones such as diamonds, rubies, sapphires, and emeralds are set into gold jewelry to add color and value.

Fig 2.1. A pack of gemstones.

6. Enamel: Fused glass that adds vibrant colors and intricate designs to gold jewelry through a high-temperature firing process.

Some tools used in gold and silver smithing include the following:

- Anvil

An anvil is a metalworking tool consisting of a large block of metal, with a flattened top surface, upon which gold and silver metals are struck.

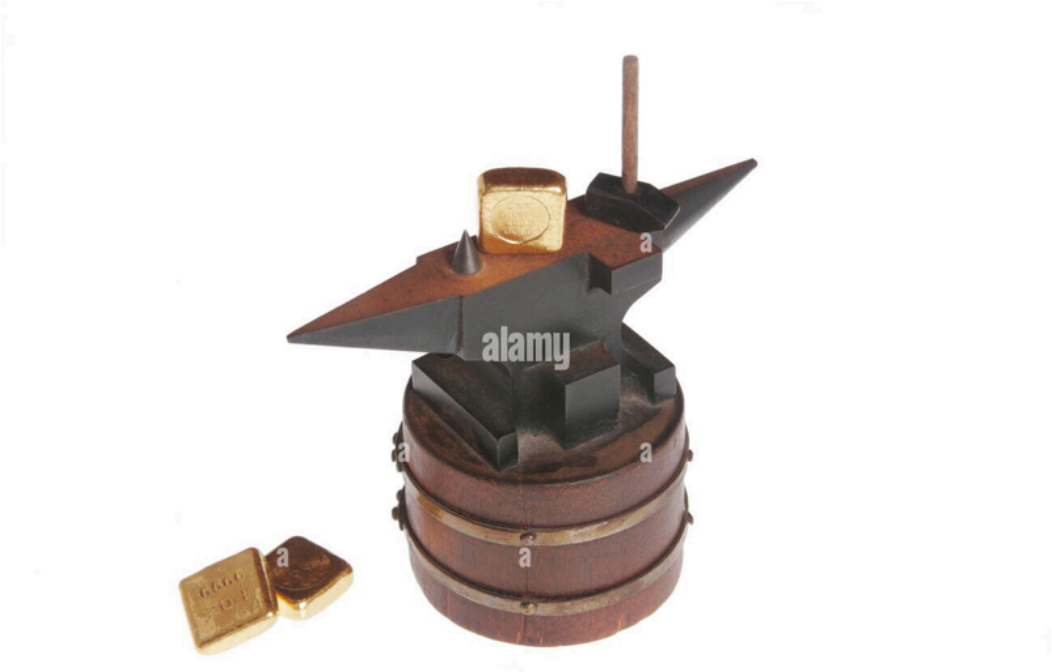

Fig 2.2. An anvil with gold and hammer.

- Goldsmith saw
  A goldsmith's saw is an incredibly viable instrument in jewelry making. The reason for this instrument is to cut material without bowing it neatly.
- Needle file and hand file
  Needle files are small files that are used for filing down excess metal or solder, tidying up pierced work and parts of your jewellery which would be hard to access using a hand file.
- Goldsmith Hammer
- Bench vice
- Sharpening stone
- Vernier and divider calipers

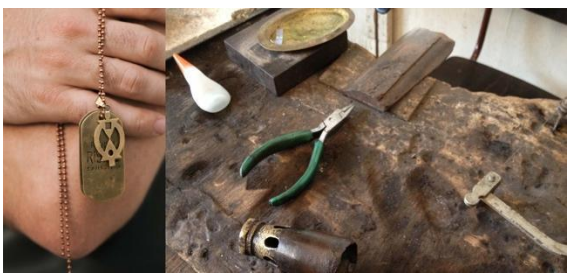

Fig 2.3. A collection of hammer, calipers with a bench vice.

CHAPTER THREE

3.1 PROCESSES INVOLVED IN GOLD SMITHING

The processes involved in smithing is similar among all the metals and they are listed below:

- Casting

In jewellery making, casting is a crucial technique that allows artisans to create intricate and detailed pieces with precision. It involves pouring molten metal specifically gold or silver into a mould to achieve the desired shape and design.

- Soldering

Soldering describes the joining of two or more metals to create a complex structure or artifact. Soldering in gold smithing is creating complex gold artifacts for the purpose of attaching findings and gemstones.

- Forging

Forging describes the shaping of metals into desired shapes. It involves heating gold and silver metals into malleable states and then hammering it with tools like hammers etc.

- Stone setting

Stone setting involves the addition of gemstones or mineral crystals to gold or silver setting.

- Engraving

Engraving is a decorative technique used to add personalized touch and designs to gold and silver settings by etching patterns, texts or designs.

- Polishing

Polishing is done after construction of the workpiece to remove surface imperfections.

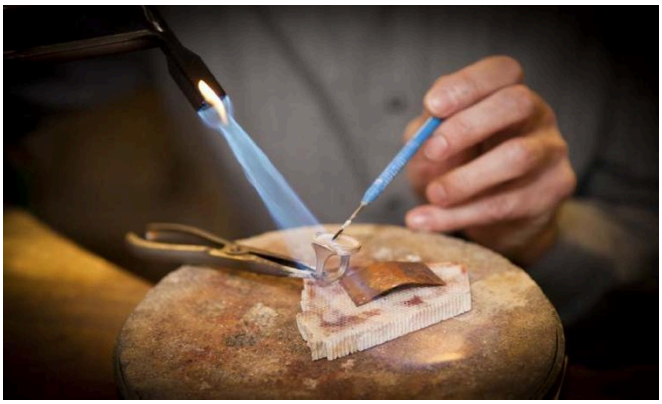

Fig 3.1. A gold jewelry under process

CHAPTER FOUR

4.1 SCIENTIFIC CONCEPTS INVOLVED IN GOLD SMITHING

The whole process of gold and silver smithing is backed by science which includes these basic concepts:

- Oxidation
    - Oxidation is a process whereby oxygen reacts with air on a metal to form corrosion, rusting or change the color of the metal. The knowledge about Oxidation makes it easier for the goldsmith/silversmith to coat the gold/ silver with metals that do not corrode easily.

- Thermal expansion and contraction.
    - Thermal expansion and contraction: When heat is applied to the gold/silver, it expands. This makes it easier for the goldsmith/silversmith to beat it into any shape of choice. This concept shows how temperature affects the process in gold smithing and silver smithing.

- Deformation.
    - Deformation in goldsmithing refers to the changes in shape, structure, or texture that occur in the metal during the crafting process. This can happen due to various factors such as hammering, bending, or stretching the gold to create jewelry or other items. Deformation can also occur during the heating and cooling processes involved in goldsmithing, which can alter the metal's properties. Skilled goldsmiths are able to manipulate and control these deformations to create intricate and beautiful designs.
-

CHAPTER FIVE

ADVANTAGES AND LIMITATIONS IN GOLD AND SILVER SMITHING

5.1. ADVANTAGES

- Goldsmithing is a traditional craft that requires skill, precision, and attention to detail, allowing artisans to showcase their craftsmanship and expertise in working with precious metals.
- Goldsmithing allows artisans to express their creativity and artistry by designing and crafting unique and personalized jewelry pieces and metalwork.
- Precious Material: Working with gold and other precious metals allows for the creation of high-value, luxurious items that are highly sought after in the jewelry market.

5.2. LIMITATIONS

- Health risks
  Exposure to metals and chemicals like mercury can pose serious health risks. Goldsmiths who work with these materials without proper protective measures may face conditions like metal poisoning. Also the processes of crushing, grinding, polishing and shaping gold/silver can generate dust particles which when inhaled can lead to respiratory issues. Exposure to high heat sources gold/silver smithing can result in burns.

- Environmental impact
  Gold extraction operation s are responsible for the depletion of massive amount of surface vegetation, resulting in destruction of natural habitat and biodiversity of the natural setting.
  Also in the process of gold extraction through the biological oxidation process, certain poisonous gases like sulphide, carbon and cyanide are emitted into the atmosphere. These gases are hazardous to workers around and even nearby communities. Toxic waste produced by these processes are dumped into the surrounding water bodies rendering it unsafe.
  Smelting also requires significant amount of energy inputs, which contributes to carbon emission.

- Time-Intensive
  Handcrafting jewelry through goldsmithing techniques can be time-consuming, particularly for intricate designs or custom pieces, which may result in longer production times.

CHAPTER SIX

IMPROVEMENT METHODS

Gold and silver smithing can be improved in several ways, including:

1. Skill development: Goldsmiths can improve their craft by continuously honing their skills through practice and learning new techniques. This can involve attending workshops, classes, or seeking mentorship from experienced goldsmiths.

2. Use of technology: Incorporating modern tools and technology into the goldsmithing process can improve efficiency and precision. For example, using computer-aided design (CAD) software for designing jewelry or laser welding for precise metal joining.

3. Quality of materials: Using high-quality raw materials such as gold alloys with specific properties can improve the overall quality and durability of the finished products.

4. Design innovation: Goldsmiths can improve their craft by staying updated with current trends and developing innovative designs that appeal to contemporary tastes.

5. Sustainability: Implementing sustainable practices in goldsmithing, such as using recycled metals and ethically sourced gemstones, can improve the environmental impact of the industry.

6. Customer feedback: Listening to customer feedback and incorporating their suggestions can help goldsmiths improve their products and services to better meet the needs of their clientele.

CHAPTER SEVEN

CONCLUSION

In conclusion, gold and silver smithing are ancient crafts that continue to thrive in the modern world. The art of working with these precious metals requires skill, creativity, and a deep understanding of materials and techniques. As with any craft, there are always opportunities for improvement and innovation. By focusing on skill development, incorporating modern technology, using high-quality materials, embracing design innovation, promoting sustainability, and listening to customer feedback, gold and silver smiths can continue to elevate their craft and meet the evolving demands of the market. With dedication to these principles, the art of gold and silver smithing will continue to flourish for generations to come.

REFERENCES

1. https://www.alexmakina.com/ultimate-list-of-goldsmithing-tools-jewelry-making-tools
2. https://en.m.wikipedia.org/wiki/Goldsmith
3. https://lavanijewels.com/en/blogs/lavaniblog/what-is-goldsmithing?mdApp_countryCodeDomain=GH
4. https://youtu.be/xDE4vZkF_sw?si=YC5UNuWV_9cvmMho
5. https://studiooneeightynine.com/pages/craftsmanship-gold-smithing