Tracing the Scholars of Islam

Series 34

Al-Jazari

The Palace Engineer Who Built the Elephant Clock and Automatic Machines



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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

TRACING THE SCHOLARS OF ISLAM

SERIES 34

AL-JAZARI

The Palace Engineer Who Built the Elephant Clock and Automatic Machines

أَنِ ٱعۡمَلۡ سَٰبِغَٰتٖ وَقَدِّرۡ فِي ٱلسَّرۡدِۖ وَٱعۡمَلُواْ صَٰلِحًاۖ إِنِّي بِمَا تَعۡمَلُونَ بَصِيرٞ

"[Commanding him], "Make full coats of mail and calculate [precisely] the links, and work [all of you] righteousness. Indeed I, of what you do, am Seeing."."

SURAH SABA' 34:11

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ACKNOWLEDGEMENT

All praise is due to Allah, who made iron soft for the Prophet David عَلَيْهِ السَّلَامُ, and taught him to make coats of mail with precisely measured links. Blessings and peace be upon the Messenger of Allah ﷺ, and upon his family and his Companions.

This eBook is specially dedicated to my beloved wife,

ZAHARAH MOHD LATIF;

my dear children,

MUHAMMAD HAFIZ, NOOR HAZWANI, ABDUL HAKIM, NOOR HIDAYAH, NOR AQILA and **NOR ATIQAH**;

and my sons- and daughters-in-law,

FAZILAH, MALEK, HANIN, FAIRIZAL and **FIRWAN**.

This thirty-fourth book of Tracing the Scholars of Islam tells the story of a palace engineer from the Jazira region, who wrote a book on fifty mechanical devices with drawings and instructions for building them. May his story teach us to work with our own hands, to do everything with excellence, and to share knowledge.

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ABOUT THE COVER OF THIS EBOOK

The cover of this eBook is an **AI-generated image** — an ***imaginative depiction, not a real likeness*** of al-Jazari. This label is also printed on the cover. This time the viewpoint is ***over the scholar's shoulder***: we see what he sees, and ***his face is not visible***.

Before him stands the **Elephant Clock** — a painted wooden elephant carrying a domed tower, with brass bowls and balls. In his hand he holds **a brass ball**, as if about to test the mechanism.

On the bench lie **brass gears**, **a water basin**, **compasses** and **a drawing** of the elephant, in a **vaulted stone workshop** lit by a high window.

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Colour guide: green box = verses of the Qur'an; gold box = Hadith; brown box = history note (reports from the books of history and biography); blue table = comparison. Underlined blue narrator names can be clicked to open the narrator's page on sunnah.com.

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AL-JAZARI

The thirty-fourth book of **Tracing the Scholars of Islam** tells the story of ***Badi‘ az-Zaman Abu al-‘Izz Isma‘il ibn ar-Razzaz al-Jazari***, palace engineer of the ***Artuqid*** dynasty in the Jazira region (now south-eastern Turkey).

His work, ***Kitab fi Ma‘rifat al-Hiyal al-Handasiyyah*** — “The Book of Knowledge of Ingenious Mechanical Devices” — describes ***50 devices*** complete with ***drawings and building instructions***. It is among the most important engineering books in history.

This eBook also covers ***iron*** in the Qur’an, ***water clocks and the value of time***, the ***Elephant Clock***, ***water pumps and the crank***, al-Jazari’s ***engineering techniques***, the ***ablution machine***, and the journey of mechanics all the way to today’s ***robots***.

Note: The translation of Qur’anic verses in this eBook is that of Sahih International. The grading of each Hadith is stated in the Hadith box. Information from books of history and modern research is **biographical narration (not Hadith)** *and is placed in the brown “History Note” boxes. A cover image that shows the scholar is an AI-generated image and is marked as such. His year of death is an estimate.*

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CALCULATE THE LINKS PRECISELY

SURAH SABA' 34:11

أَنِ ٱعۡمَلۡ سَٰبِغَٰتٖ وَقَدِّرۡ فِي ٱلسَّرۡدِۖ وَٱعۡمَلُواْ صَٰلِحًاۖ إِنِّي بِمَا تَعۡمَلُونَ بَصِيرٞ ١١

[Commanding him], "Make full coats of mail and calculate [precisely] the links, and work [all of you] righteousness. Indeed I, of what you do, am Seeing."

Translation: Sahih International — quran.com/34:11

Allah taught the Prophet David عَلَيْهِ السَّلَامُ to make coats of mail, and commanded: ***"calculate [precisely] the links"***. ***Precise*** measurement — neither too large nor too small — is the foundation of all engineering. Tafsir Ibn Kathir 34:11.

The verse also commands ***righteous deeds***, for ***Allah is Seeing*** of all that we do. Skill of hand and God-consciousness go together.

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IRON MADE PLIABLE

SURAH SABA' 34:10

وَلَقَدْ ءَاتَيْنَا دَاوُۥدَ مِنَّا فَضْلًا ۖ يَٰجِبَالُ أَوِّبِى مَعَهُۥ وَٱلطَّيْرَ ۖ وَأَلَنَّا لَهُ ٱلْحَدِيدَ ۞

١٠

And We certainly gave David from Us bounty. [We said], "O mountains, repeat [Our] praises with him, and the birds [as well]." And We made pliable for him iron.

Translation: Sahih International — quran.com/34:10

Allah says of the Prophet David عَلَيْهِ السَّلَامُ: ***"And We made pliable for him iron"***. Tafsir Ibn Kathir 34:10.

Hard iron became ***easy to shape*** in the hands of the Prophet David عَلَيْهِ السَّلَامُ. The skill of shaping metal is ***a blessing from Allah***, and al-Jazari too was skilled in casting ***copper*** and shaping metal for his devices.

LESSON OF THE VERSE	IN ENGINEERING WORK
Precise measurement	Every part must fit the other parts.
The right material	Iron for strength, copper for durability.
Righteous deeds	Technology used for good.
Allah is Seeing	Work done with integrity even when no one is watching.

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IRON: STRENGTH AND BENEFIT

SURAH AL-HADID 57:25

لَقَدۡ أَرۡسَلۡنَا رُسُلَنَا بِٱلۡبَيِّنَٰتِ وَأَنزَلۡنَا مَعَهُمُ ٱلۡكِتَٰبَ وَٱلۡمِيزَانَ لِيَقُومَ ٱلنَّاسُ بِٱلۡقِسۡطِۖ وَأَنزَلۡنَا ٱلۡحَدِيدَ فِيهِ بَأۡسٞ شَدِيدٞ وَمَنَٰفِعُ لِلنَّاسِ وَلِيَعۡلَمَ ٱللَّهُ مَن يَنصُرُهُۥ وَرُسُلَهُۥ بِٱلۡغَيۡبِۚ إِنَّ ٱللَّهَ قَوِيٌّ عَزِيزٞ ٢٥

We have already sent Our messengers with clear evidences and sent down with them the Scripture and the balance that the people may maintain [their affairs] in justice. And We sent down iron, wherein is great military might and benefits for the people, and so that Allah may make evident those who support Him and His messengers unseen. Indeed, Allah is Powerful and Exalted in Might.

Translation: Sahih International — quran.com/57:25

Allah says: ***"We sent down iron, wherein is great military might and benefits for the people"***. Tafsir Ibn Kathir 57:25.

Iron is used for ***farm tools, buildings, vehicles and machines***. Almost every modern machine — from cars to ships — depends on iron and steel.

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THE SKILL OF DHUL-QARNAYN

SURAH AL-KAHF 18:96

ءَاتُونِي زُبَرَ ٱلۡحَدِيدِۖ حَتَّىٰٓ إِذَا سَاوَىٰ بَيۡنَ ٱلصَّدَفَيۡنِ قَالَ ٱنفُخُواْۖ حَتَّىٰٓ إِذَا جَعَلَهُۥ نَارٗا قَالَ ءَاتُونِيٓ أُفۡرِغۡ عَلَيۡهِ قِطۡرٗا ٩٦

Bring me sheets of iron" - until, when he had leveled [them] between the two mountain walls, he said, "Blow [with bellows]," until when he had made it [like] fire, he said, "Bring me, that I may pour over it molten copper.

Translation: Sahih International — quran.com/18:96

Dhul-Qarnayn said: ***"Bring me sheets of iron"***, then ordered: ***"Blow [with bellows]"***, and poured ***molten copper***. Tafsir Ibn Kathir 18:96.

This verse mentions three engineering skills: ***gathering materials***, ***heating metal*** and ***pouring molten metal***. Al-Jazari also described how to ***cast metal in moulds*** for his devices.

METAL	USE IN AL-JAZARI'S DEVICES
Copper and brass	Balls, bowls, pipes and small figures.
Iron	Shafts, cranks and load-bearing parts.
Wood	Wheels, boxes and clock cases.

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THE AGE: THE ARTUQID DYNASTY

Al-Jazari lived at the end of the 12th century CE, when the ***Jazira*** region — between the Euphrates and the Tigris — was ruled by the ***Artuqids***, a Turkish dynasty centred on ***Amid*** (now Diyarbakır), ***Mardin*** and ***Hisn Kayfa***.

HISTORY NOTE: A COURT THAT PATRONISED LEARNING

Though small, the Artuqid dynasty patronised ***architecture, bridges and learning***. Stone bridges and mosques built in their time still stand today.

At the same time, ***Salah ad-Din al-Ayyubi*** ruled Egypt and Syria, and the Crusaders were still on the Syrian coast. Engineering flourished even in an age full of challenges.

REFERENCES:

Muslim Heritage, "Al-Jazari: The Mechanical Genius". https://muslimheritage.com/al-jazari-the-mechanical-genius/

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THE JAZIRA REGION

PLACE	DESCRIPTION
Al-Jazira	The “island” between the Euphrates and the Tigris; origin of the name al-Jazari.
Amid (Diyarbakır)	An Artuqid seat of government served by al-Jazari.
Mardin	A hilltop city, one of the Artuqid centres.
Jazirat Ibn ‘Umar (Cizre)	Suggested as al-Jazari’s birthplace.

The region lay on the trade routes between ***Iraq, Syria and Anatolia***. The meeting of many cultures helped engineering to develop.

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WHO WAS AL-JAZARI?

Al-Jazari was ***born in 1136 CE*** in the ***Jazira*** region (Upper Mesopotamia) — hence his name. His exact birthplace is unknown; some suggest ***Jazirat Ibn 'Umar*** (now Cizre, Turkey).

Like his father, he became ***chief palace engineer*** of the ***Artuqid*** dynasty. According to the introduction of his book, he served several Artuqid rulers for about ***25 years***.

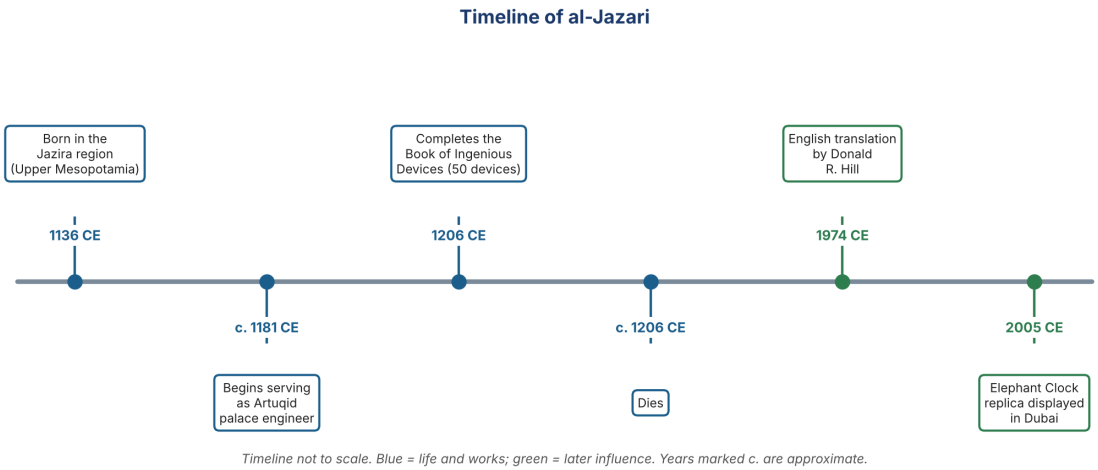


Figure 1: Timeline of al-Jazari.

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THE BOOK OF INGENIOUS DEVICES: 50 MACHINES

In ***1206 CE***, at the request of the Artuqid ruler ***Nasir ad-Din Mahmud***, al-Jazari completed his book. He described only devices he had ***built himself***, with detailed drawings and steps.

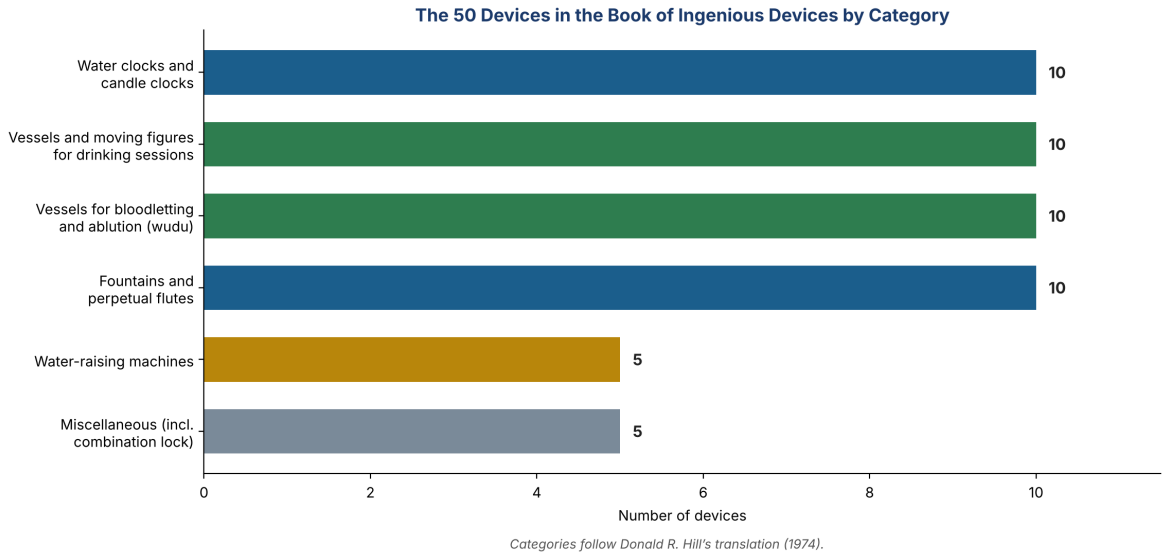


Figure 2: The 50 devices in the Book of Ingenious Devices, in six categories.

Among the devices described: ***water clocks***, a ***twin-cylinder water pump***, a ***combination lock***, and a ***servant figure*** that pours water for ***ablution (wudu)***. He also used the ***camshaft***, ***segmental gears*** and ***conical valves***.

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SURVIVING MANUSCRIPTS

The earliest known manuscript, dated ***1206 CE***, is kept in the ***Topkapı Palace Library***, Istanbul. Many other copies survive, and the drawings are detailed enough for ***modern engineers to rebuild*** his devices.

FEATURE OF THE BOOK	IMPORTANCE
Coloured drawings	Show the shape and parts of each device.
Precise measurements	Allow the devices to be rebuilt.
Building steps	Like a modern engineering manual.
Only tested devices	He described devices he had built.

This book is more than a collection of marvels — it is an ***engineering handbook*** written so that ***knowledge could be passed on***.

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WATER CLOCKS AND THE VALUE OF TIME

Many of the devices in al-Jazari's book are ***clocks***. A water clock uses a ***steady*** flow of water to measure time.

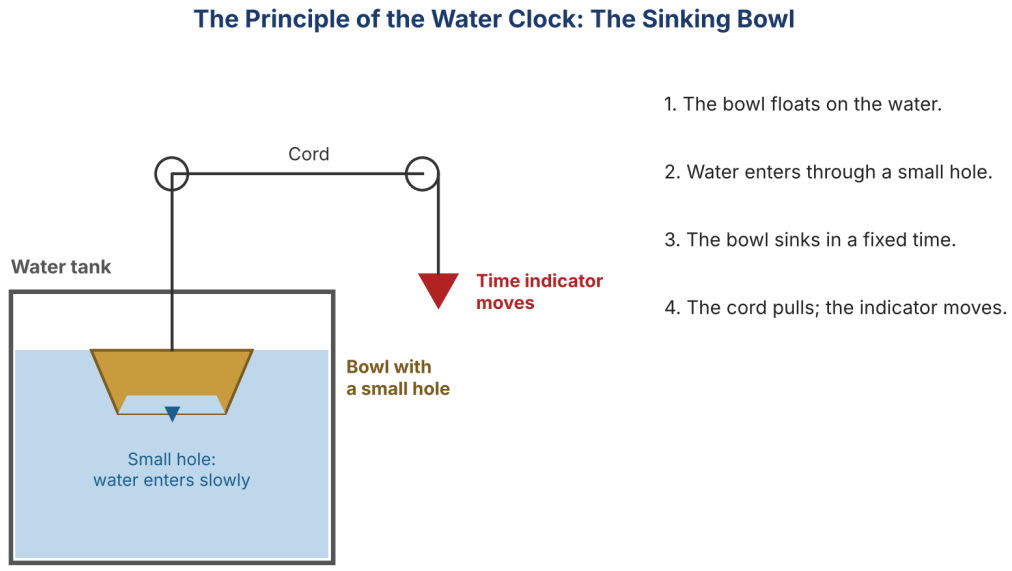


Figure 3: The principle of the water clock — a bowl that sinks in a fixed time.

This sinking-bowl principle is used in the ***Elephant Clock***: the bowl takes a set time to sink, pulling a cord and driving the mechanism above.

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BY TIME

SURAH AL-'ASR 103:1–3

وَٱلۡعَصۡرِ ١

By time.

إِنَّ ٱلۡإِنسَٰنَ لَفِي خُسۡرٍ ٢

Indeed, mankind is in loss.

إِلَّا ٱلَّذِينَ ءَامَنُواْ وَعَمِلُواْ ٱلصَّٰلِحَٰتِ وَتَوَاصَوۡاْ بِٱلۡحَقِّ وَتَوَاصَوۡاْ بِٱلصَّبۡرِ ٣

Except for those who have believed and done righteous deeds and advised each other to truth and advised each other to patience.

Translation: Sahih International — quran.com/103:1-3

Allah swears ***"By time"*** — ***"Indeed, mankind is in loss"***, except those who believe, do righteous deeds, and advise each other to truth and patience. Tafsir Ibn Kathir 103:1.

Prayer too ***"has been decreed upon the believers a decree of specified times"*** (4:103). Tafsir Ibn Kathir 4:103.

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HADITH — SAHIH MUSLIM, NO. 612

حَدَّثَنَا أَبُو غَسَّانَ الْمِسْمَعِيُّ، وَمُحَمَّدُ بْنُ الْمُثَنَّى، قَالاَ حَدَّثَنَا مُعَاذٌ، - وَهُوَ ابْنُ هِشَامٍ - حَدَّثَنِي أَبِي، عَنْ قَتَادَةَ، عَنْ أَبِي أَيُّوبَ، عَنْ عَبْدِ اللَّهِ بْنِ عَمْرٍو، أَنَّ نَبِيَّ اللَّهِ صلى الله عليه وسلم قَالَ «إِذَا صَلَّيْتُمُ الْفَجْرَ فَإِنَّهُ وَقْتٌ إِلَى أَنْ يَطْلُعَ قَرْنُ الشَّمْسِ الأَوَّلُ ثُمَّ إِذَا صَلَّيْتُمُ الظُّهْرَ فَإِنَّهُ وَقْتٌ إِلَى أَنْ يَحْضُرَ الْعَصْرُ فَإِذَا صَلَّيْتُمُ الْعَصْرَ فَإِنَّهُ وَقْتٌ إِلَى أَنْ تَصْفَرَّ الشَّمْسُ فَإِذَا صَلَّيْتُمُ الْمَغْرِبَ فَإِنَّهُ وَقْتٌ إِلَى أَنْ يَسْقُطَ الشَّفَقُ فَإِذَا صَلَّيْتُمُ الْعِشَاءَ فَإِنَّهُ وَقْتٌ إِلَى نِصْفِ اللَّيْلِ».

TRANSLATION:

‘Abdullah ibn ‘Amr رضى الله عنهما reported that the Prophet of Allah ﷺ said: **“When you pray Fajr, its time lasts until the first edge of the sun rises. When you pray Zuhr, its time lasts until ‘Asr comes. When you pray ‘Asr, its time lasts until the sun turns yellow. When you pray Maghrib, its time lasts until the twilight disappears. When you pray ‘Isha’, its time lasts until half the night.”**

CHAIN OF NARRATION: Narrated by Imam Muslim: from Abu Ghassan al-Misma‘i and Muhammad ibn al-Muthanna, from Mu‘adh (ibn Hisham), from his father (Hisham ad-Dastuwa’i), from Qatadah, from Abu Ayyub (al-Maraghi), from ‘Abdullah ibn ‘Amr رضى الله عنهما.

REFERENCE: Narrated by Imam Muslim in Sahih Muslim, Book of Mosques and Places of Prayer, Hadith No. 612.

GRADE: SAHIH — contained in Sahih Muslim, the second most authentic book of Hadith after Sahih al-Bukhari.

Source: https://sunnah.com/muslim:612a

LESSONS FROM THIS HADITH

Each prayer has ***a beginning and an end time***. The need to know the time precisely drove Muslim scholars to build ***clocks, astrolabes and timetables***. Al-Jazari contributed with his water clocks.

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THE ELEPHANT CLOCK

Al-Jazari's most famous creation is the ***Elephant Clock***. It is a water clock: a perforated bowl ***slowly sinks*** in a water tank inside the elephant, pulling a cord that drives the mechanism above.

HISTORY NOTE: THE ELEPHANT CLOCK AND ITS REPLICAS

Every ***half hour***, a ball drops from the tower on the elephant's back, setting small figures in motion and striking a bowl. Researchers describe it as among the first water clocks to use ***moving figures*** to mark time.

Its elements — the ***elephant***, ***dragons***, ***a bird***, ***a carpet*** and ***a turban*** — are often interpreted as symbols of the many civilisations whose knowledge met in the Muslim world.

A large working replica of the Elephant Clock is now on display in ***Dubai***, and other replicas are found in several science museums.

REFERENCES:

Wikipedia, "Ismail al-Jazari". https://en.wikipedia.org/wiki/Ismail_al-Jazari

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PARTS OF THE ELEPHANT CLOCK

PART	FUNCTION
Water tank in the elephant's belly	Where the bowl sinks.
Perforated bowl	Measures time by sinking slowly.
Cord and pulley	Transfer the motion to the tower.
Copper balls	Drop every half hour to drive the mechanism.
Mahout figure	Moves and sounds to mark the time.

The Elephant Clock shows that al-Jazari was not only an engineer but also an ***artist*** who combined ***function and beauty***.

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RAISING WATER

One section of al-Jazari's book describes ***water-raising machines*** for irrigation and water supply. The most famous is the ***twin-cylinder pump*** driven by a water wheel.

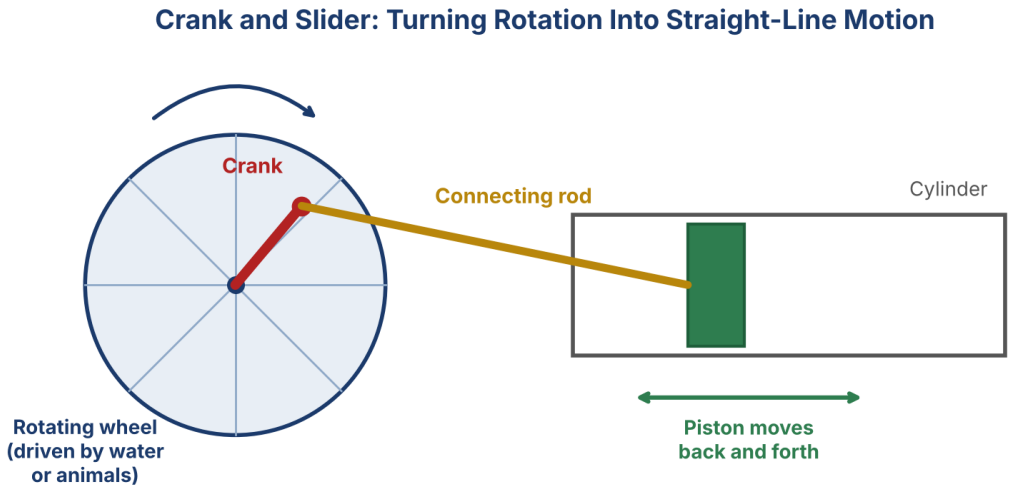


Figure 4: The crank-and-slider principle — rotation turned into straight-line motion.

The turning wheel drives ***two pistons*** in turn: one sucks, the other pushes water upward. Muslim Heritage notes the use of a ***crank shaft*** in al-Jazari's work (Muslim Heritage).

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WATER, THE SOURCE OF LIFE

SURAH AL-ANBIYA' 21:30

أَوَلَمْ يَرَ ٱلَّذِينَ كَفَرُوٓاْ أَنَّ ٱلسَّمَٰوَٰتِ وَٱلْأَرْضَ كَانَتَا رَتْقًا فَفَتَقْنَٰهُمَاۖ وَجَعَلْنَا مِنَ ٱلْمَآءِ كُلَّ شَىْءٍ حَىٍّۖ أَفَلَا يُؤْمِنُونَ ﴿٣٠﴾

Have those who disbelieved not considered that the heavens and the earth were a joined entity, and We separated them and made from water every living thing? Then will they not believe?

Translation: Sahih International — quran.com/21:30

Allah says: ***"made from water every living thing"***. Tafsir Ibn Kathir 21:30.

WATER MACHINE	USE
Water wheel (noria)	Lifts river water into irrigation channels.
Twin-cylinder pump	Pushes water to a higher place.
Saqiya	A geared wheel driven by animals.
Modern pump	Water supply to homes and tall buildings.

These machines helped ***farming and water supply***. Water is the source of life, and managing it well is part of ***our trust***.

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AL-JAZARI'S ENGINEERING TECHNIQUES

Besides his devices, al-Jazari described ***building techniques*** that show an engineer's precision. Muslim Heritage lists several of these techniques (Muslim Heritage):

TECHNIQUE	PURPOSE
Laminating timber	Reduces warping of wood.
Balancing wheels	So that wheels turn smoothly.
Paper models	Test a design before building.
Calibrating water orifices	So the flow is accurate for measuring time.
Casting metal in sand moulds	Make precise copper parts.

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FROM AL-JAZARI TO MODERN ENGINEERS

AL-JAZARI'S TECHNIQUE	PRACTICE TODAY
Paper models	Prototypes and computer models (CAD).
Calibrating orifices	Calibrating measuring instruments.
Balancing wheels	Balancing car tyres.
Detailed drawings	Engineering drawings and manuals.

These techniques show that al-Jazari worked like a ***professional engineer***: planning, testing, measuring and recording.

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LOCKS, FOUNTAINS AND MUSICAL MACHINES

Besides clocks and pumps, al-Jazari's book describes many other devices. Some were for ***everyday use***, and others for ***court entertainment***.

DEVICE	DESCRIPTION
Combination lock	A chest that opens only when letters are set in the right order.
Fountains	Fountains that change the shape of their spray over time.
Automatic musical band	Musician figures on a boat, played by water.
Drink dispensers	Figures that pour drinks for guests.
Blood-letting measure	Shows the amount of blood removed in cupping.

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ENTERTAINMENT DEVICES AND USEFUL DEVICES

Some historians criticise many of al-Jazari's devices as ***mere entertainment***. Yet these devices contain important ***mechanical principles*** — cams, valves and gears — later used in useful machines.

PRINCIPLE IN ENTERTAINMENT DEVICES	USE TODAY
Cams that move figures	The camshaft in a car engine.
Valves that control water flow	Pipe valves and hydraulic systems.
Gears that transfer motion	Gearboxes and factory machines.
Combination lock	Number locks on bags and safes.

Knowledge that begins with ***curiosity*** and play often leads to ***useful discoveries***.

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A MACHINE FOR ABLUTION

Among al-Jazari's most interesting devices is a ***machine for hand-washing and ablution***. A servant figure pours water onto the hands, then offers a ***towel*** and a ***comb***.

HADITH — SAHIH MUSLIM, NO. 223

حَدَّثَنَا إِسْحَاقُ بْنُ مَنْصُورٍ، حَدَّثَنَا حَبَّانُ بْنُ هِلاَلٍ، حَدَّثَنَا أَبَانُ، حَدَّثَنَا يَحْيَى، أَنَّ زَيْدًا، حَدَّثَهُ أَنَّ أَبَا سَلاَّمٍ حَدَّثَهُ عَنْ أَبِي مَالِكٍ الأَشْعَرِيِّ، قَالَ قَالَ رَسُولُ اللَّهِ صلى الله عليه وسلم «الطُّهُورُ شَطْرُ الإِيمَانِ وَالْحَمْدُ لِلَّهِ تَمْلأُ الْمِيزَانَ. وَسُبْحَانَ اللَّهِ وَالْحَمْدُ لِلَّهِ تَمْلآنِ - أَوْ تَمْلأُ - مَا بَيْنَ السَّمَوَاتِ وَالأَرْضِ وَالصَّلاَةُ نُورٌ وَالصَّدَقَةُ بُرْهَانٌ وَالصَّبْرُ ضِيَاءٌ وَالْقُرْآنُ حُجَّةٌ لَكَ أَوْ عَلَيْكَ كُلُّ النَّاسِ يَغْدُو فَبَائِعٌ نَفْسَهُ فَمُعْتِقُهَا أَوْ مُوبِقُهَا».

TRANSLATION:

Abu Malik al-Ash'ari رضى الله عنه said: The Messenger of Allah ﷺ said: "Purification is half of faith. Alhamdulillah fills the scale. Subhanallah and Alhamdulillah fill what is between the heavens and the earth. **Prayer is light (nur), charity is proof, and patience is radiance (diya').** The Qur'an is an argument for you or against you. Every person goes out in the morning and sells himself — either freeing himself or destroying himself."

CHAIN OF NARRATION: Narrated by Imam Muslim: from Ishaq ibn Mansur, from Habban ibn Hilal, from Aban ibn Yazid al-'Attar, from Yahya ibn Abi Kathir, from Zayd ibn Sallam, from Abu Sallam Mamtur, from Abu Malik al-Ash'ari رضى الله عنه.

REFERENCE: Narrated by Imam Muslim in Sahih Muslim, Book of Purification (Kitab at-Taharah), Hadith No. 223.

GRADE: SAHIH — contained in Sahih Muslim, the second most authentic book of Hadith after Sahih al-Bukhari.

Source: https://sunnah.com/muslim:223

LESSONS FROM THIS HADITH

Purification is half of faith. Al-Jazari used his expertise for a device connected with ***cleanliness and worship***. Good technology helps people ***draw closer to Allah***.

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THE WORK OF ONE'S OWN HANDS

Al-Jazari did not merely write theory — he ***built*** every device himself. Islam honours the work of the hands, as the Messenger of Allah ﷺ said:

HADITH — SAHIH AL-BUKHARI, NO. 2072

حَدَّثَنَا إِبْرَاهِيمُ بْنُ مُوسَى، أَخْبَرَنَا عِيسَى، عَنْ ثَوْرٍ، عَنْ خَالِدِ بْنِ مَعْدَانَ، عَنِ الْمِقْدَامِ ـ رضى الله عنه ـ عَنْ رَسُولِ اللَّهِ صلى الله عليه وسلم قَالَ « مَا أَكَلَ أَحَدٌ طَعَامًا قَطُّ خَيْرًا مِنْ أَنْ يَأْكُلَ مِنْ عَمَلِ يَدِهِ، وَإِنَّ نَبِيَّ اللَّهِ دَاوُدَ ـ عَلَيْهِ السَّلاَمُ ـ كَانَ يَأْكُلُ مِنْ عَمَلِ يَدِهِ ».

TRANSLATION:

Al-Miqdam رضى الله عنه narrated that the Messenger of Allah ﷺ said: **"No one has ever eaten food better than what he eats from the work of his own hands. And the Prophet of Allah David عَلَيْهِ السَّلَامُ used to eat from the work of his own hands."**

CHAIN OF NARRATION: Narrated by Imam al-Bukhari: from Ibrahim ibn Musa, from 'Isa ibn Yunus, from Thawr ibn Yazid, from Khalid ibn Ma'dan, from al-Miqdam ibn Ma'dikarib رضى الله عنه.

REFERENCE: Narrated by Imam al-Bukhari in Sahih al-Bukhari, Book of Sales (Kitab al-Buyu'), chapter on a man's earning and the work of his hands, Hadith No. 2072.

GRADE: SAHIH — contained in Sahih al-Bukhari, the most authentic book of Hadith after the Qur'an by consensus of the Hadith scholars.

Source: https://sunnah.com/bukhari:2072

LESSONS FROM THIS HADITH

The Prophet David عَلَيْهِ السَّلَامُ, a king and a prophet, still ***ate from the work of his own hands***. The skill of making things is an ***honour***, not a disgrace.

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SURAH AL-ANBIYA' 21:80

وَعَلَّمۡنَٰهُ صَنۡعَةَ لَبُوسٖ لَّكُمۡ لِتُحۡصِنَكُم مِّنۢ بَأۡسِكُمۡۖ فَهَلۡ أَنتُمۡ شَٰكِرُونَ

٨٠

And We taught him the fashioning of coats of armor to protect you from your [enemy in] battle. So will you then be grateful?

Translation: Sahih International — quran.com/21:80

Technology is a ***blessing*** taught by Allah. So the question that closes this verse deserves reflection: ***"So will you then be grateful?"*** Tafsir Ibn Kathir 21:80.

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EXCELLENCE IN EVERYTHING

Al-Jazari's book is famous for its ***precision*** — every measurement, material and step is explained so that others can build it again. This is ***ihsan*** (excellence) in work:

HADITH — SAHIH MUSLIM, NO. 1955

حَدَّثَنَا أَبُو بَكْرِ بْنُ أَبِي شَيْبَةَ، حَدَّثَنَا إِسْمَاعِيلُ ابْنُ عُلَيَّةَ، عَنْ خَالِدٍ الْحَذَّاءِ، عَنْ أَبِي قِلاَبَةَ، عَنْ أَبِي الأَشْعَثِ، عَنْ شَدَّادِ بْنِ أَوْسٍ، قَالَ ثِنْتَانِ حَفِظْتُهُمَا عَنْ رَسُولِ اللَّهِ صلى الله عليه وسلم قَالَ «إِنَّ اللَّهَ كَتَبَ الإِحْسَانَ عَلَى كُلِّ شَىْءٍ فَإِذَا قَتَلْتُمْ فَأَحْسِنُوا الْقِتْلَةَ وَإِذَا ذَبَحْتُمْ فَأَحْسِنُوا الذِّبْحَ وَلْيُحِدَّ أَحَدُكُمْ شَفْرَتَهُ فَلْيُرِحْ ذَبِيحَتَهُ».

TRANSLATION:

Shaddad ibn Aws رضى الله عنه said: Two things I memorised from the Messenger of Allah ﷺ; he said: **"Indeed Allah has prescribed excellence (ihsan) in everything.** So when you kill (where it is permitted), kill well; and when you slaughter, slaughter well. Let each of you sharpen his blade and spare his animal suffering."

CHAIN OF NARRATION: Narrated by Imam Muslim: from Abu Bakr ibn Abi Shaybah, from Isma'il ibn 'Ulayyah, from Khalid al-Hadhdha', from Abu Qilabah, from Abu al-Ash'ath as-San'ani, from Shaddad ibn Aws رضى الله عنه.

REFERENCE: Narrated by Imam Muslim in Sahih Muslim, Book of Hunting and Slaughter, Hadith No. 1955.

GRADE: SAHIH — contained in Sahih Muslim, the second most authentic book of Hadith after Sahih al-Bukhari.

Source: https://sunnah.com/muslim:1955a

LESSONS FROM THIS HADITH

Allah has prescribed ***excellence in everything*** — including engineering. Making things ***carefully***, ***writing them down clearly*** and ***sharing knowledge*** so that others benefit are all part of ihsan.

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YOU KNOW BEST THE AFFAIRS OF YOUR WORLD

Islam gives wide room for ***worldly knowledge*** such as engineering, farming and technology:

HADITH — SAHIH MUSLIM, NO. 2363

حَدَّثَنَا أَبُو بَكْرِ بْنُ أَبِي شَيْبَةَ، وَعَمْرٌو النَّاقِدُ، كِلاَهُمَا عَنِ الأَسْوَدِ بْنِ عَامِرٍ، - قَالَ أَبُو بَكْرٍ حَدَّثَنَا أَسْوَدُ بْنُ عَامِرٍ، - حَدَّثَنَا حَمَّادُ بْنُ سَلَمَةَ، عَنْ هِشَامِ بْنِ عُرْوَةَ، عَنْ أَبِيهِ، عَنْ عَائِشَةَ، وَعَنْ ثَابِتٍ، عَنْ أَنَسٍ، أَنَّ النَّبِيَّ صلى الله عليه وسلم مَرَّ بِقَوْمٍ يُلَقِّحُونَ فَقَالَ «لَوْ لَمْ تَفْعَلُوا لَصَلُحَ». قَالَ فَخَرَجَ شِيصًا فَمَرَّ بِهِمْ فَقَالَ «مَا لِنَخْلِكُمْ». قَالُوا قُلْتَ كَذَا وَكَذَا قَالَ «أَنْتُمْ أَعْلَمُ بِأَمْرِ دُنْيَاكُمْ».

TRANSLATION:

‘A’ishah رضى الله عنها and Anas رضى الله عنه reported that the Prophet ﷺ passed by some people who were pollinating date palms. He said: “If you did not do it, it would still be fine.” The fruit then came out poor. He passed by them again and asked: “What is wrong with your palms?” They said: “You said such and such.” He said: **“You know best the affairs of your worldly life.”**

CHAIN OF NARRATION: Narrated by Imam Muslim: from Abu Bakr ibn Abi Shaybah and ‘Amr an-Naqid, from al-Aswad ibn ‘Amir, from Hammad ibn Salamah, from Hisham ibn ‘Urwah, from his father ‘Urwah ibn az-Zubayr, from ‘A’ishah, Mother of the Believers رضى الله عنها; and from Hammad, from Thabit al-Bunani, from Anas ibn Malik رضى الله عنه.

REFERENCE: Narrated by Imam Muslim in Sahih Muslim, Book of Virtues (Kitab al-Fada’il), Hadith No. 2363.

GRADE: SAHIH — contained in Sahih Muslim, the second most authentic book of Hadith after Sahih al-Bukhari.

Source: https://sunnah.com/muslim:2363

LESSONS FROM THIS HADITH

In technical worldly matters, people must ***study, experiment and learn from experience***. This is what al-Jazari did — he tested his devices until they worked, then recorded them.

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RELIGION AND THE WORLD

MATTERS OF RELIGION	WORLDLY (TECHNICAL) MATTERS
Based on revelation	Based on research and experience.
Fixed and unchanging	Develop over time.
Example: how to pray	Example: how to build a clock.

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THE STRONG BELIEVER

Building complex devices requires ***dedication and patience***. Many attempts may fail before one succeeds.

HADITH — SAHIH MUSLIM, NO. 2664

حَدَّثَنَا أَبُو بَكْرِ بْنُ أَبِي شَيْبَةَ، وَابْنُ، نُمَيْرٍ قَالاَ حَدَّثَنَا عَبْدُ اللَّهِ بْنُ إِدْرِيسَ، عَنْ رَبِيعَةَ بْنِ عُثْمَانَ، عَنْ مُحَمَّدِ بْنِ يَحْيَى بْنِ حَبَّانَ، عَنِ الأَعْرَجِ، عَنْ أَبِي هُرَيْرَةَ، قَالَ قَالَ رَسُولُ اللَّهِ صلى الله عليه وسلم « الْمُؤْمِنُ الْقَوِيُّ خَيْرٌ وَأَحَبُّ إِلَى اللَّهِ مِنَ الْمُؤْمِنِ الضَّعِيفِ وَفِي كُلٍّ خَيْرٌ احْرِصْ عَلَى مَا يَنْفَعُكَ وَاسْتَعِنْ بِاللَّهِ وَلاَ تَعْجِزْ وَإِنْ أَصَابَكَ شَىْءٌ فَلاَ تَقُلْ لَوْ أَنِّي فَعَلْتُ كَانَ كَذَا وَكَذَا. وَلَكِنْ قُلْ قَدَرُ اللَّهِ وَمَا شَاءَ فَعَلَ فَإِنَّ لَوْ تَفْتَحُ عَمَلَ الشَّيْطَانِ ».

TRANSLATION:

Abu Hurayrah رضى الله عنه said: The Messenger of Allah ﷺ said: **"The strong believer is better and more beloved to Allah than the weak believer, and in both there is good. Strive for what benefits you, seek the help of Allah, and do not be weak. If something befalls you, do not say: If only I had done such-and-such, it would have been such-and-such. Rather say: Allah has decreed, and what He wills He does. For "if only" opens the door to the work of Satan."**

CHAIN OF NARRATION: Narrated by Imam Muslim: from Abu Bakr ibn Abi Shaybah and Muhammad ibn 'Abdillah ibn Numayr, from 'Abdullah ibn Idris, from Rabi'ah ibn 'Uthman, from Muhammad ibn Yahya ibn Habban, from 'Abd al-Rahman al-A'raj, from Abu Hurayrah رضى الله عنه.

REFERENCE: Narrated by Imam Muslim in Sahih Muslim, Book of Divine Decree (Kitab al-Qadar), chapter on the command to be strong and to abandon weakness, Hadith No. 2664.

GRADE: SAHIH — contained in Sahih Muslim, the second most authentic book of Hadith after Sahih al-Bukhari.

Source: https://sunnah.com/muslim:2664

LESSONS FROM THIS HADITH

Strive for what benefits you, seek Allah's help and do not give up. A Muslim engineer combines ***effort*** and ***trust in Allah***.

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WRITING SO OTHERS CAN BUILD

Many inventors of old ***kept secret*** how they built their devices. Al-Jazari, however, wrote in detail so that others ***could rebuild them***.

HADITH — SAHIH MUSLIM, NO. 2674

حَدَّثَنَا يَحْيَى بْنُ أَيُّوبَ، وَقُتَيْبَةُ بْنُ سَعِيدٍ، وَابْنُ حُجْرٍ، قَالُوا حَدَّثَنَا إِسْمَاعِيلُ، - يَعْنُونَ ابْنَ جَعْفَرٍ - عَنِ الْعَلاَءِ، عَنْ أَبِيهِ، عَنْ أَبِي هُرَيْرَةَ، أَنَّ رَسُولَ اللَّهِ صلى الله عليه وسلم قَالَ «مَنْ دَعَا إِلَى هُدًى كَانَ لَهُ مِنَ الأَجْرِ مِثْلُ أُجُورِ مَنْ تَبِعَهُ لاَ يَنْقُصُ ذَلِكَ مِنْ أُجُورِهِمْ شَيْئًا وَمَنْ دَعَا إِلَى ضَلاَلَةٍ كَانَ عَلَيْهِ مِنَ الإِثْمِ مِثْلُ آثَامِ مَنْ تَبِعَهُ لاَ يَنْقُصُ ذَلِكَ مِنْ آثَامِهِمْ شَيْئًا».

TRANSLATION:

Abu Hurayrah رضى الله عنه reported that the Messenger of Allah ﷺ said: **"Whoever calls to guidance will have a reward like the rewards of those who follow him, without that diminishing their rewards in the least.** And whoever calls to misguidance will bear a sin like the sins of those who follow him, without that diminishing their sins in the least."

CHAIN OF NARRATION: Narrated by Imam Muslim: from Yahya ibn Ayyub, Qutaybah ibn Sa'id and 'Ali ibn Hujr, from Isma'il ibn Ja'far, from al-'Ala' ibn 'Abd ar-Rahman, from his father 'Abd ar-Rahman ibn Ya'qub, from Abu Hurairah رضى الله عنه.

REFERENCE: Narrated by Imam Muslim in Sahih Muslim, Book of Knowledge, Hadith No. 2674.

GRADE: SAHIH — contained in Sahih Muslim, the second most authentic book of Hadith after Sahih al-Bukhari.

Source: https://sunnah.com/muslim:2674

LESSONS FROM THIS HADITH

Whoever calls to guidance will have a reward like those who follow him. Shared knowledge keeps bringing benefit — and reward — after its author is gone.

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SHARING KNOWLEDGE TODAY

WAY OF SHARING	EXAMPLE
Writing books and manuals	Al-Jazari's book; school textbooks.
Teaching	Teachers in schools and mosques.
Open source	Designs and software shared freely.
Free eBooks	Like this eBook.

Al-Jazari shows that ***sharing knowledge*** is part of ***ongoing charity (sadaqah jariyah)***.

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FROM MOVING FIGURES TO ROBOTS

Al-Jazari's moving figures — servants, musicians and the mahout — were driven by ***water, cords and cams***. Today, ***robots*** are driven by electric motors and computers.

According to the ***International Federation of Robotics (IFR)***, about ***4.28 million*** industrial robots were operating in factories worldwide in 2023 (IFR).

SURAH AN-NAHL 16:8

وَٱلۡخَيۡلَ وَٱلۡبِغَالَ وَٱلۡحَمِيرَ لِتَرۡكَبُوهَا وَزِينَةٗۚ وَيَخۡلُقُ مَا لَا تَعۡلَمُونَ ٨

And [He created] the horses, mules and donkeys for you to ride and [as] adornment. And He creates that which you do not know.

Translation: Sahih International — quran.com/16:8

Allah says: ***"And He creates that which you do not know"***. Tafsir Ibn Kathir 16:8.

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TECHNOLOGY FOR GOOD

USE OF ROBOTS	EXAMPLE
Factories	Assembling cars and electronics.
Medicine	Assisting doctors in surgery.
Farming	Picking fruit and watering crops.
Disasters	Searching for victims in dangerous places.

Like al-Jazari's devices, robots are only ***tools***. Their value depends on ***intention and use***: for good or for harm.

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THE LEGACY OF AL-JAZARI

In ***1974***, al-Jazari's book was translated into English by ***Donald R. Hill***. The historian of science ***George Sarton*** regarded this book as ***the climax*** of mechanical achievement in Islamic civilisation (Muslim Heritage).

LEGACY	DESCRIPTION
The Book of Ingenious Devices	Its manuscripts survive in Istanbul and other libraries.
English translation	By Donald R. Hill, 1974.
Elephant Clock replicas	On display in Dubai and science museums.
Inspiration	Al-Jazari's name is used for universities, awards and robotics competitions.

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THE TRUE LEGACY

Al-Jazari's true legacy is ***his way of working***: planning carefully, building with his own hands, testing, and then ***writing for others***.

VALUE	EXAMPLE FOR TODAY'S GENERATION
Precision	Measure twice before cutting.
Handwork	Learn to repair and build things yourself.
Testing	Test before claiming something works.
Sharing	Write and teach what you have learnt.

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ESTABLISHED REPORTS AND POPULAR STORIES

The table below separates what is established from what needs checking about al-Jazari.

STORIES AND THEIR STATUS

POPULAR CLAIM	STATUS
Al-Jazari completed a book on 50 mechanical devices in 1206 CE.	Established. A manuscript dated 1206 CE still survives in Istanbul.
He invented the Elephant Clock.	Established in his book; working modern replicas have been built.
He was “the father of robotics”.	Exaggerated. A modern title; moving figures were also built by earlier engineers such as the Banu Musa.
He invented the first crank.	Disputed. The crank existed earlier; he was among the first to describe a crank-slider mechanism in a pump.
His pump was “an ancestor of the steam engine”.	The view of some historians (Donald Hill, Joseph Needham); the link is indirect.
All his devices had practical uses.	Not accurate. Many were for court entertainment, though his clocks and water pumps were useful.

REFLECTION — HONOURING WITHOUT EXAGGERATING

Al-Jazari needs no exaggerated titles. ***His careful book*** and ***devices that can still be rebuilt*** are proof enough of his greatness.

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LESSONS AND CONCLUSION

LESSONS FROM THIS EBOOK

First: Precise measurement is the foundation of good work — calculate the links precisely (34:10–11).

Second: Iron and metals are a blessing of strength and benefit (57:25; 18:96).

Third: Time is precious — by time (103:1–3; 4:103; Sahih Muslim 612).

Fourth: Water is the source of life; manage it as a trust (21:30).

Fifth: Plan, test and measure — an engineer's techniques.

Sixth: Purification is half of faith (Sahih Muslim 223).

Seventh: Work with the hands is honourable (Sahih al-Bukhari 2072; 21:80).

Eighth: Do everything with excellence (Sahih Muslim 1955).

Ninth: Study worldly matters with knowledge and experience (Sahih Muslim 2363).

Tenth: Strive and do not give up (Sahih Muslim 2664).

Eleventh: Share knowledge so its reward continues (Sahih Muslim 2674).

Twelfth: Separate established history from popular stories.

CONCLUSION

Al-Jazari is believed to have ***died around 1206 CE***, not long after completing his book. In 1974, his book was translated into English by ***Donald R. Hill***. The next book of **Tracing the Scholars of Islam**, in sha Allah, will tell the story of ***Ibn Battutah***, the traveller who journeyed across the Muslim world for nearly three decades. Wallahu a'lam.

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GLOSSARY AND REFLECTION QUESTIONS

GLOSSARY

TERM	MEANING
Crank	An arm that turns rotation into back-and-forth motion.
Piston	A part that moves inside a cylinder to push water or air.
Camshaft	A shaft with lobes that move other parts in turn.
Valve	A device that opens and closes a flow of water.
Water clock	A clock that measures time by flowing water.
Automaton	A figure or machine that moves by itself.
Calibration	Adjusting an instrument so its measurements are accurate.

REFLECTION QUESTIONS

1. What does “calculate the links precisely” (34:11) teach an engineer?

2. How does a water clock measure time?

3. Why did al-Jazari write his book in such detail?

4. What is the difference between religious matters and worldly matters (Sahih Muslim 2363)?

5. How can technology be used for good?

SUGGESTED ACTIVITIES

Activity 1: Make a simple water clock: pierce a small hole in a plastic cup, float it on water, and record how long it takes to sink.

Activity 2: Draw a diagram of a simple device at home (for example a water tap) and explain how it works.

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SURAH AL-BAQARAH 2:261

مَّثَلُ ٱلَّذِينَ يُنفِقُونَ أَمۡوَٰلَهُمۡ فِي سَبِيلِ ٱللَّهِ كَمَثَلِ حَبَّةٍ أَنۢبَتَتۡ سَبۡعَ سَنَابِلَ فِي كُلِّ سُنۢبُلَةٖ مِّاْئَةُ حَبَّةٖۗ وَٱللَّهُ يُضَٰعِفُ لِمَن يَشَآءُۚ وَٱللَّهُ وَٰسِعٌ عَلِيمٌ ٢٦١

The example of those who spend their wealth in the way of Allah is like a seed [of grain] which grows seven spikes; in each spike is a hundred grains. And Allah multiplies [His reward] for whom He wills. And Allah is all-Encompassing and Knowing.

Translation: Sahih International — quran.com/2:261

SURAH SABA' 34:39

قُلۡ إِنَّ رَبِّي يَبۡسُطُ ٱلرِّزۡقَ لِمَن يَشَآءُ مِنۡ عِبَادِهِۦ وَيَقۡدِرُ لَهُۥۚ وَمَآ أَنفَقۡتُم مِّن شَيۡءٖ فَهُوَ يُخۡلِفُهُۥۖ وَهُوَ خَيۡرُ ٱلرَّٰزِقِينَ ٣٩

Say, "Indeed, my Lord extends provision for whom He wills of His servants and restricts [it] for him. But whatever thing you spend [in His cause] - He will compensate it; and He is the best of providers."

Translation: Sahih International — quran.com/34:39

HADITH — SAHIH MUSLIM, NO. 2588

حَدَّثَنَا يَحْيَى بْنُ أَيُّوبَ، وَقُتَيْبَةُ، وَابْنُ، حُجْرٍ قَالُوا حَدَّثَنَا إِسْمَاعِيلُ، - وَهُوَ ابْنُ جَعْفَرٍ - عَنِ الْعَلاَءِ، عَنْ أَبِيهِ، عَنْ أَبِي هُرَيْرَةَ، عَنْ رَسُولِ اللَّهِ صلى الله عليه وسلم قَالَ « مَا نَقَصَتْ صَدَقَةٌ مِنْ مَالٍ وَمَا زَادَ اللَّهُ عَبْدًا بِعَفْوٍ إِلاَّ عِزًّا وَمَا تَوَاضَعَ أَحَدٌ لِلَّهِ إِلاَّ رَفَعَهُ اللَّهُ ».

TRANSLATION:

Abu Hurayrah رضى الله عنه narrated that the Messenger of Allah ﷺ said: "Charity does not decrease wealth.

Allah does not increase a servant who forgives except in honour. And no one humbles himself for the sake of Allah except that Allah raises him in rank."

CHAIN OF NARRATION: Narrated by Imam Muslim: from Yahya bin Ayyub, Qutaibah bin Sa'id and 'Ali bin Hujr, from Isma'il bin Ja'far, from al-'Ala' bin 'Abd al-Rahman, from his father 'Abd al-Rahman bin Ya'qub, from Abu Hurayrah رضى الله عنه .

REFERENCE: Narrated by Imam Muslim in Sahih Muslim, Book of Virtue, Good Manners and Joining the Ties of Kinship (Kitab al-Birr wa al-Silah wa al-Adab), chapter on the encouragement of forgiveness and humility, Hadith No. 2588.

GRADE: SAHIH — contained in Sahih Muslim.

Source: https://sunnah.com/muslim:2588

HADITH — SAHIH MUSLIM, NO. 1631

حَدَّثَنَا يَحْيَى بْنُ أَيُّوبَ، وَقُتَيْبَةُ - يَعْنِي ابْنَ سَعِيدٍ - وَابْنُ حُجْرٍ قَالُوا حَدَّثَنَا إِسْمَاعِيلُ، - هُوَ ابْنُ جَعْفَرٍ - عَنِ الْعَلاَءِ، عَنْ أَبِيهِ، عَنْ أَبِي هُرَيْرَةَ، أَنَّ رَسُولَ اللَّهِ صلى الله عليه وسلم قَالَ « إِذَا مَاتَ الإِنْسَانُ انْقَطَعَ عَنْهُ عَمَلُهُ إِلاَّ مِنْ ثَلاَثَةٍ إِلاَّ مِنْ صَدَقَةٍ جَارِيَةٍ أَوْ عِلْمٍ يُنْتَفَعُ بِهِ أَوْ وَلَدٍ صَالِحٍ يَدْعُو لَهُ ».

TRANSLATION:

Abu Hurayrah رضى الله عنه narrated that the Messenger of Allah ﷺ said: "When a person dies, his deeds come to an end except for three: an ongoing charity, knowledge that is benefited from, or a righteous child who prays for him."

CHAIN OF NARRATION: Narrated by Imam Muslim: from Yahya bin Ayyub, Qutaibah bin Sa'id and 'Ali bin Hujr, from Isma'il bin Ja'far, from al-'Ala' bin 'Abd al-Rahman, from his father 'Abd al-Rahman bin Ya'qub, from Abu Hurayrah رضى الله عنه .

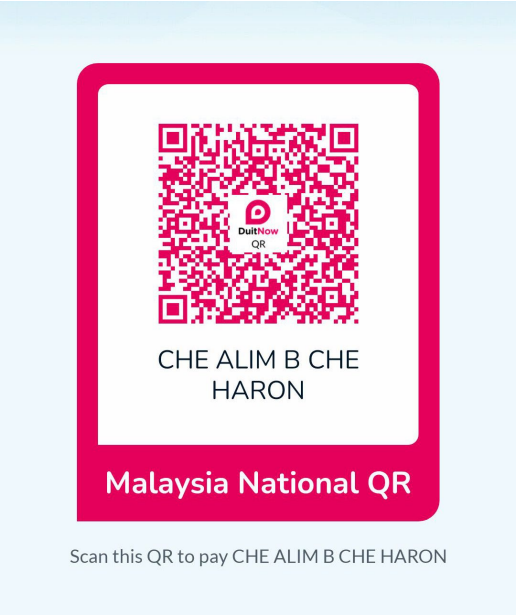
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GRADE: SAHIH — contained in Sahih Muslim.

Source: https://sunnah.com/muslim:1631

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