Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

1957/08

DESIGN AND TECHNOLOGY

Systems and Control Technology

Paper 8 Mechanisms (Higher Tier)

WEDNESDAY 26 MAY 2010: Afternoon
DURATION: 1 hour 15 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the Question Paper

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

None

READ INSTRUCTIONS OVERLEAF

DC (NF/SW) MEP60462 30967

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Answer ALL the questions.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Show all working out for calculations.**
- **Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **The total number of marks for this paper is 50.**
- **Dimensions are in millimetres unless stated otherwise.**
- **Marks will be awarded for the use of correct conventions.**

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1 Fig. 1 shows part of a flood defence system. Aluminium barge boards are lowered from lorries into fixed 'H' section supports at times of danger from rising floodwater.

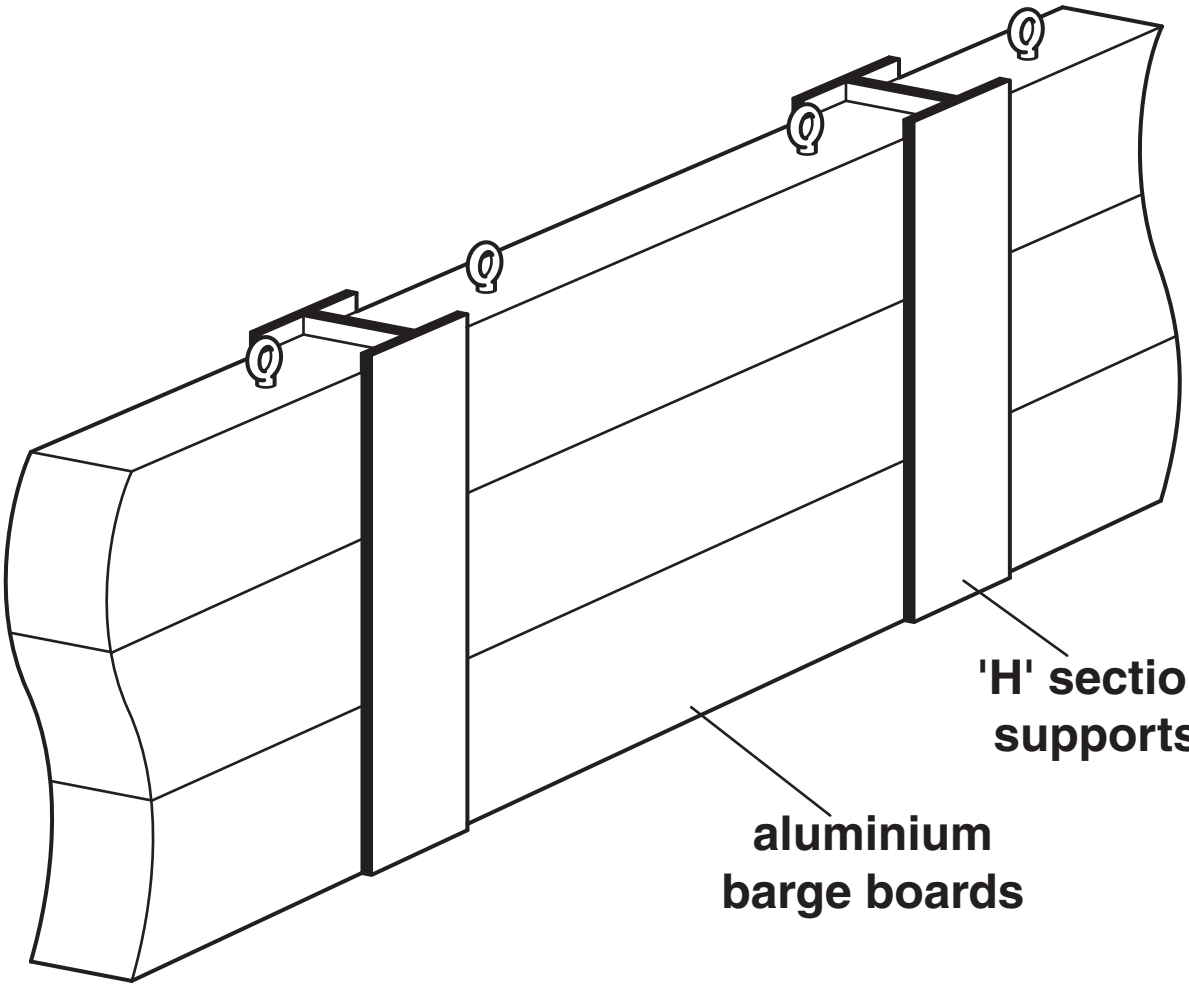

Fig. 1

(a) Give <u>TWO</u> reasons why aluminium is used for the barge boards.

Reason 1 _____ **[1]**

Reason 2 _____ **[1]**

(b) Explain <u>TWO</u> ways that CAD could have been an advantage to the designers of the flood defence system.

1 _____

_____ **[2]**

2 _____

_____ **[2]**

Fig. 2 shows a hoist used to lift the barge boards from the lorry into position. The hoist uses a lever system.

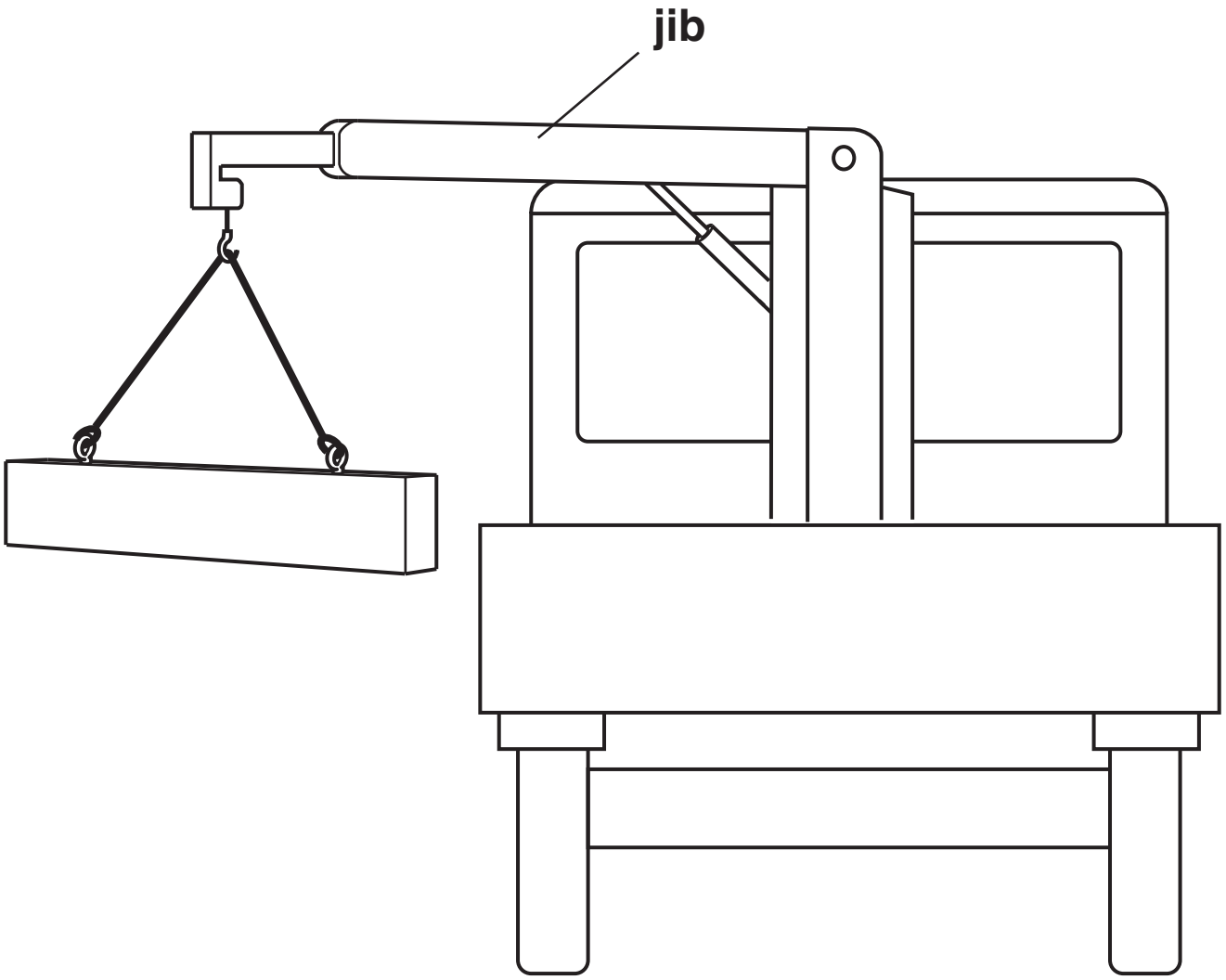

Fig. 2

(c) State the class of leverage in the jib.

_____ **[1]**

(d) Give TWO reasons why this class of lever is used in this situation.

_____

_____ **[1]**

_____

_____ **[1]**

(e) Give ONE disadvantage that this class of lever has compared with the other two classes.

_____

_____ **[1]**

[Total: 10]

2 Fig. 3 shows an alternative flood defence system with a height adjustable barrier.

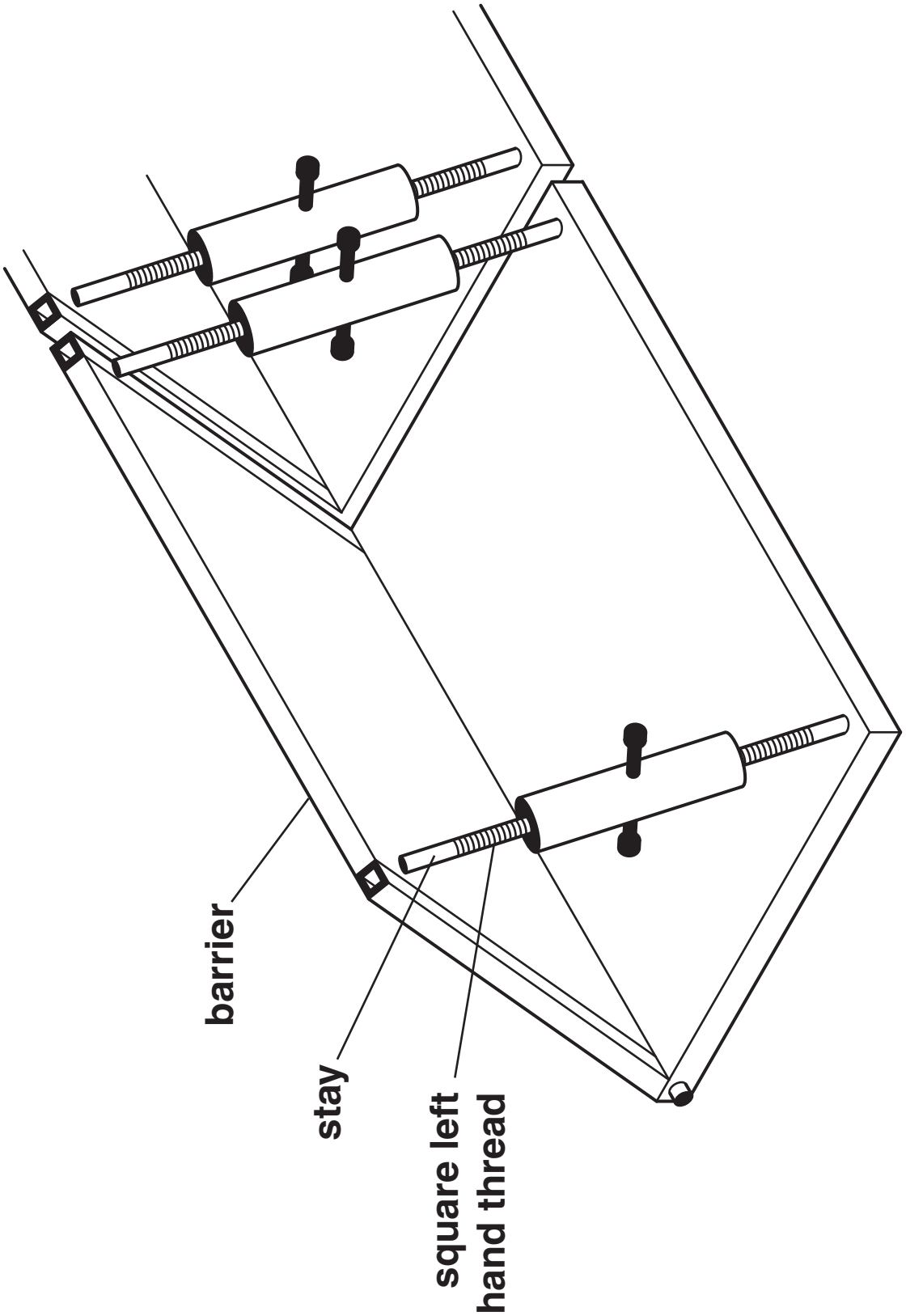

Fig. 3

(a) Give TWO reasons why screw threads are used in adjustable systems.

1 _____

_____ **[1]**

2 _____

_____ **[1]**

(b) Explain why a square thread has been used in the flood barrier system instead of a V-thread.

_____

_____ **[2]**

(c) Give ONE other mechanical system that uses a square thread for adjustment.

_____ **[1]**

(d) Give the conversion of motion that takes place in this type of system.

_____ **[1]**

(e) Fig. 4 (opposite) shows part of the barrier and stay. The adjustable stays need to be securely attached to the top of the barrier.

Design a fitting on Fig. 4 that will:

- **allow the stay to pivot as the screw is adjusted; [1]**
- **prevent the stay from rotating while the screw is adjusted; [1]**
- **securely attach the stay to the barrier. [1]**

Label any additional fittings. [1]

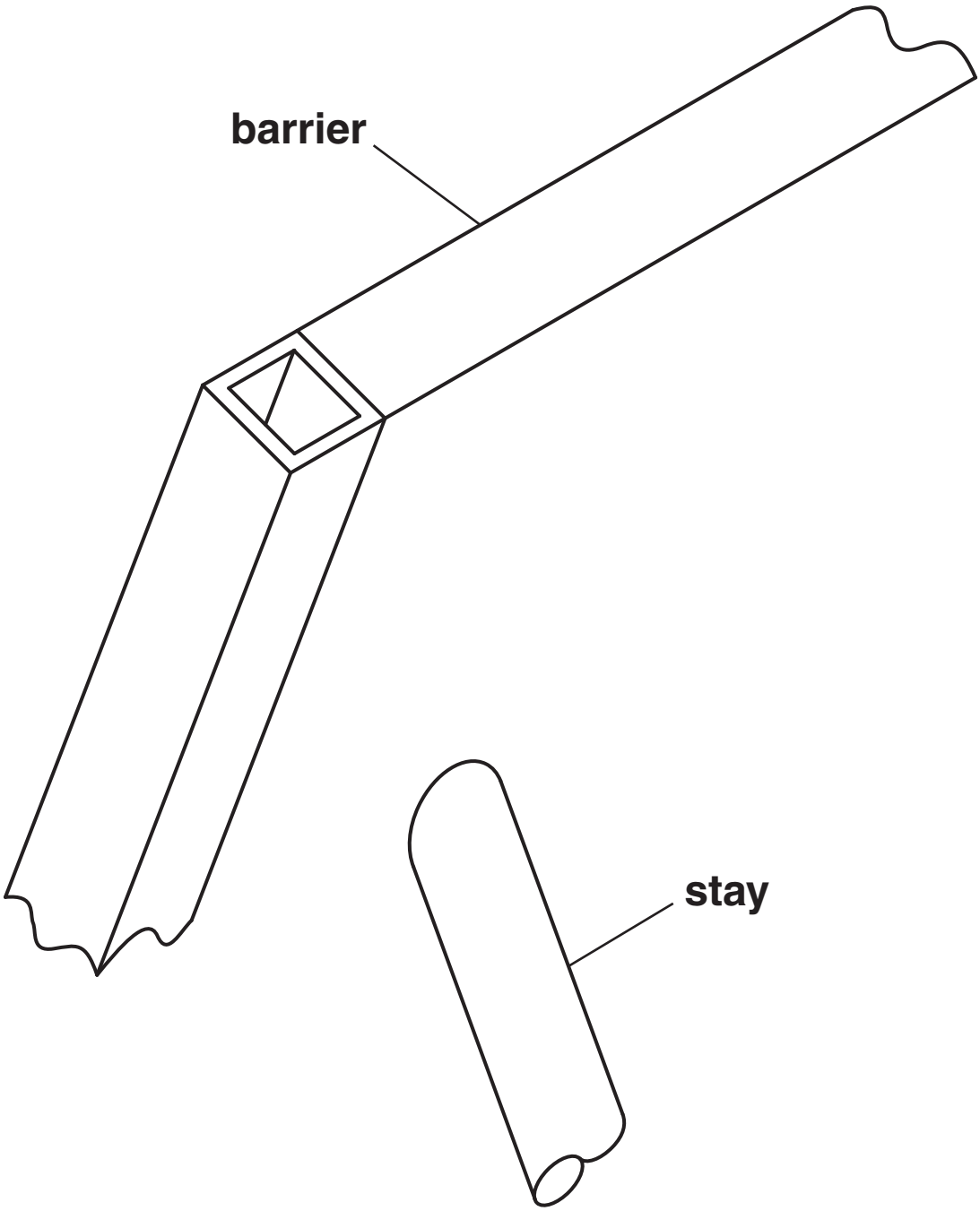

Fig. 4

[Total: 10]

3 Parts of the flood defence system need to be assembled quickly.
Fig. 5 shows a socket and wrench used for this purpose.

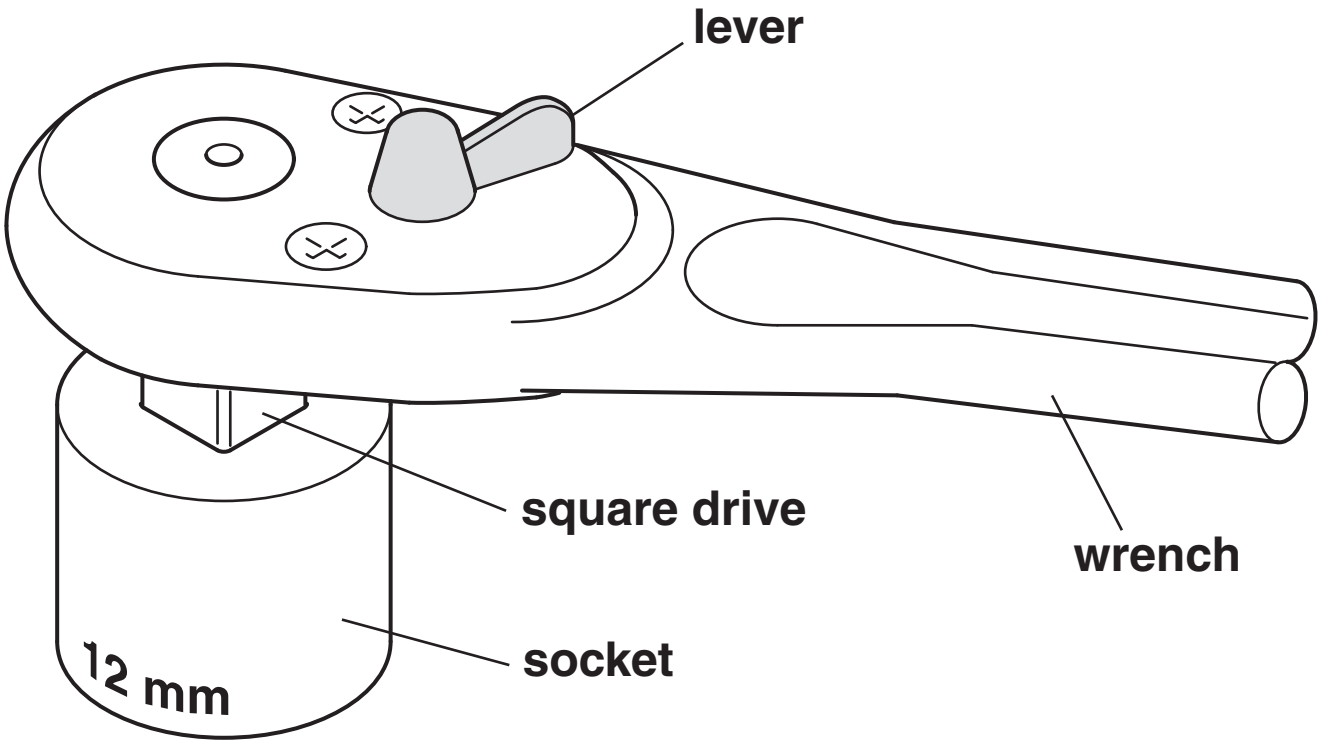

Fig. 5

(a) Explain the purpose of the lever on the wrench.

_____

_____ **[2]**

(b) The socket and wrench uses a ratchet and pawl mechanism.
Use sketches and notes to explain how this type of system works.

[4]

When flooding risk has passed the barriers need to be removed easily.

(c) Explain the need for lubrication in the flood defence system mechanism.

_____

_____ **[2]**

(d) State the most appropriate type of lubrication applied to the mechanism in this application and give a reason for your choice.

_____

_____ **[2]**

[Total: 10]

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4 Fig. 6 shows a wrench with a gripping action that can be locked in place.
The locking function is achieved by means of a toggle clamp.

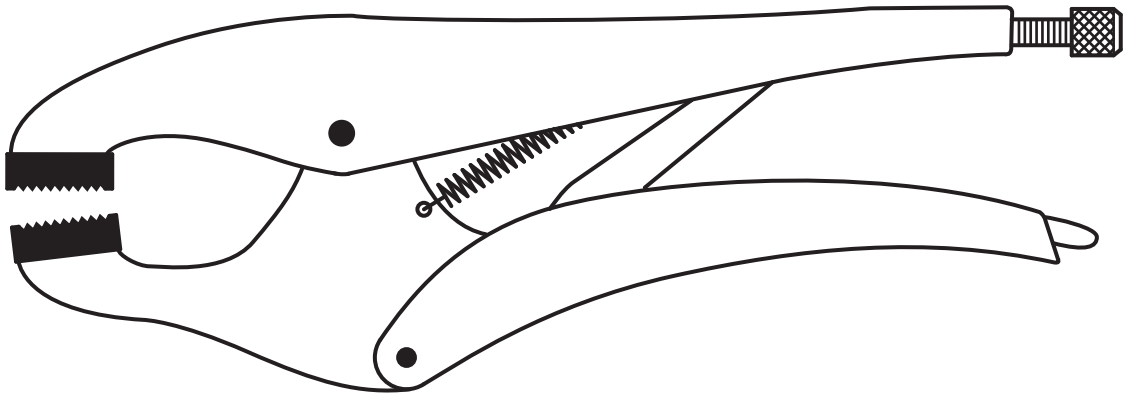


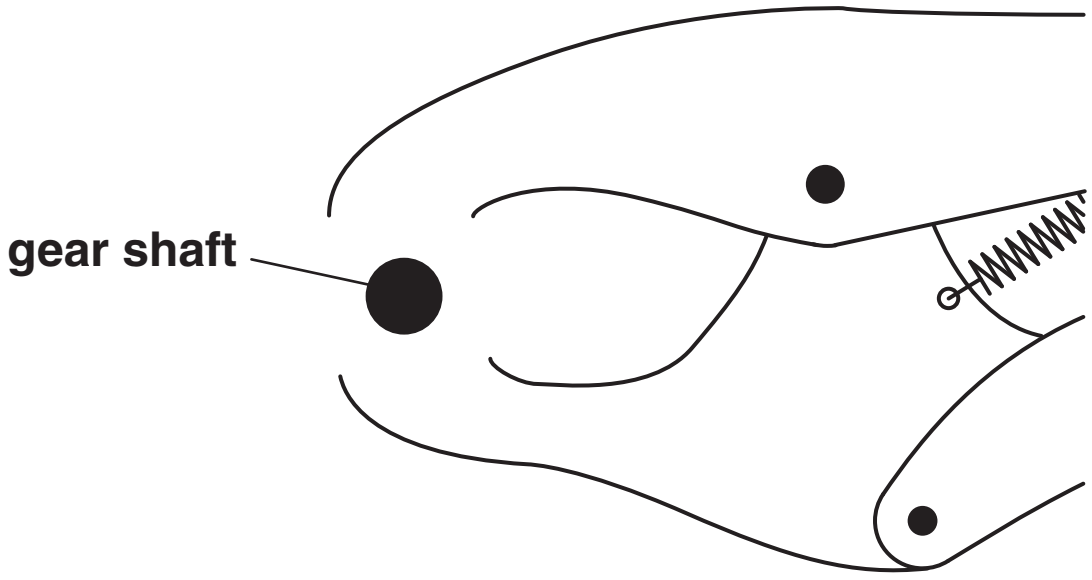
Fig. 6

Toggle systems are used in many industrial clamping applications.

(a) Use sketches and notes to explain how a toggle system operates.

[4]

(b) The type of wrench shown in Fig. 6 is often used to grip round shafts during maintenance operations of a gearbox.
Show on Fig. 7 a modification to the jaw that will ensure a firm grip on a round shaft but prevent damage to the shaft of a gearbox.



[2]

Fig. 7

(c) Fig. 8 shows part of a gearbox.

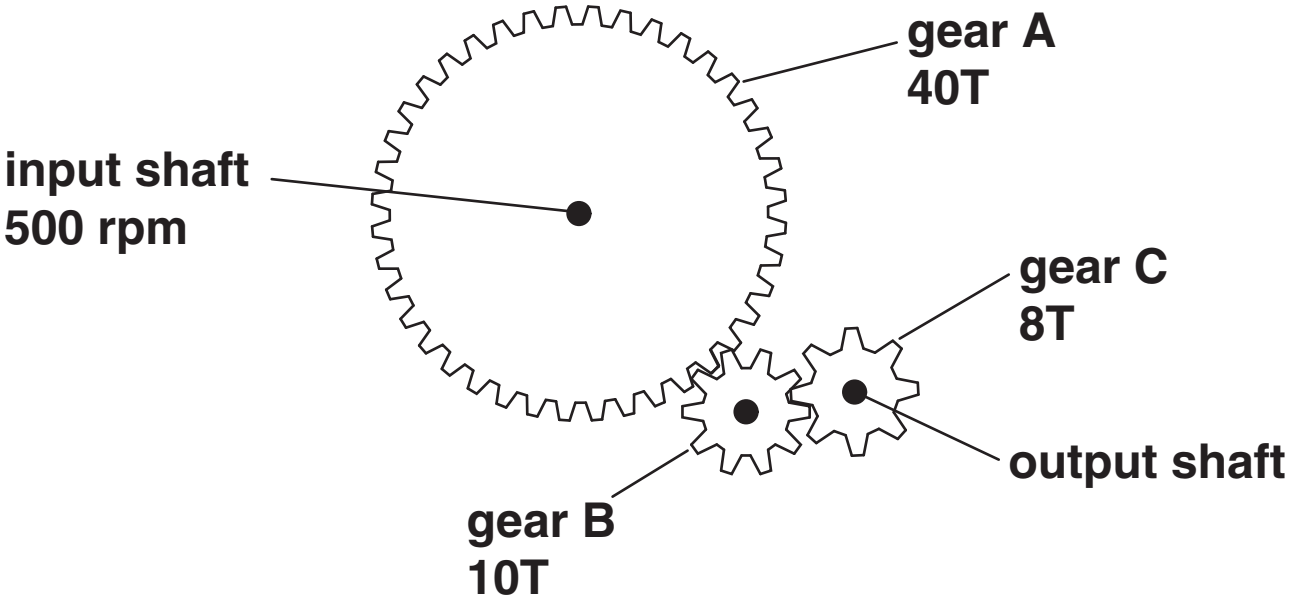


Fig. 8

(i) Explain the purpose of gear B.

_____

_____ **[2]**

(ii) Calculate the output speed of the gearbox.

Use the formula VR = $\frac{\text{driven}}{\text{driver}}$

_____

_____

_____ **[2]**

[Total: 10]

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5 Fig. 9 shows a partly completed wind powered garden ornament.

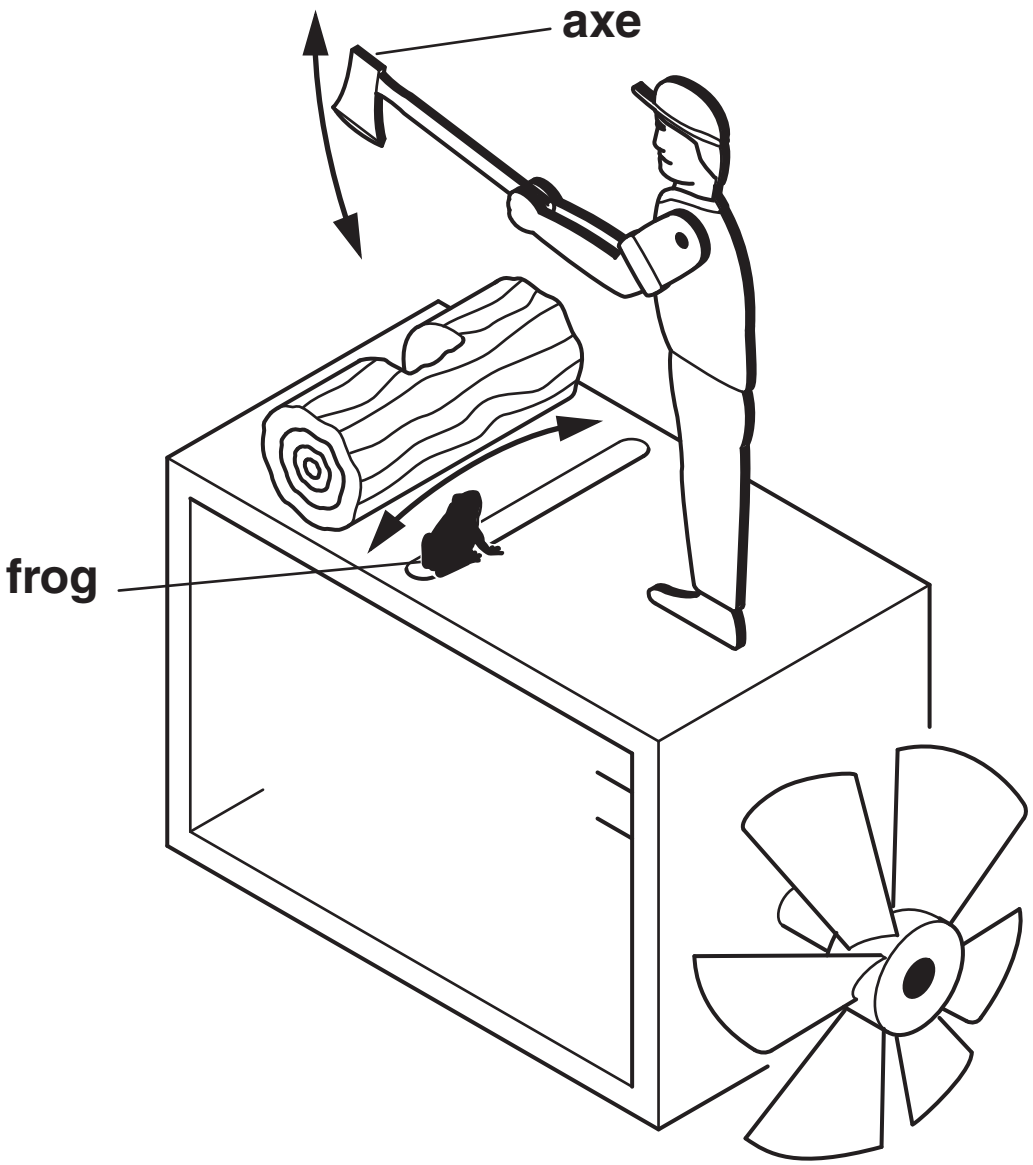

Fig. 9

(a) Explain the benefit of using wind power instead of mains power for this ornament.

_____

_____

_____ **[2]**

(b) Use sketches and notes to complete the design of the garden ornament. Clearly show the mechanical system that will meet the specification below.

The system must:

- **lift the axe slowly;**
- **cause the axe to fall suddenly;**
- **oscillate the frog as shown by the arrow.**

Show all additional components.

[8]

[Total: 10]

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