

Specification for

Engineers' ratchet braces and drilling pillars

Confirmed
January 2011

Co-operating organizations

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:—

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The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:—

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General Post Office	Society of British Aircraft Constructors
J.E.S.C. Sub-Committee on Hand Tools	Society of Motor Manufacturers and Traders Ltd.
Light Edge Tool and Allied Trades Association	Co-opted manufacturers

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Foreword

This standard makes reference to the following British Standards:—

BS 51, *Wrought iron for general engineering purposes (grades A, B and C)*.

BS 328, *Twist drills and combined drills and countersinks (centre drills)*.

BS 427, *Tables of diamond pyramid hardness numbers*.

BS 970, *Wrought steels*.

This British Standard has been prepared under the authority of the Mechanical Engineering Industry Standards Committee and forms one of a series relating to hand tools.

The various types of brace and the component parts are defined and the clauses specify requirements for the materials, heat treatment and hardness, finish and assembly of the tools. A series of tables gives a range of dimensions for the ratchet braces, the range being extended to include the dimensional requirements of drilling pillars, in view of the need to ensure that the correct brace and pillar are associated in some applications. While the drilling pillar dimensions have thus been associated with the range of ratchet braces, they have also been correlated with the drill lengths given in BS 328¹⁾

The standard is intended to apply only to the most commonly used types of tool and pillar; certain types, particularly of drilling pillar, although popular in certain branches of industry, are considered to be special to those branches and have therefore been omitted.

The conversion of nozzles from Morse taper to square taper is effected by adaptors, the range of which is given in the Appendix.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ BS 328, “*Twist drills and combined drills and countersinks (centre drills)*.”

Section 1. General

1 Scope

This British Standard specifies requirements for engineers' ratchet braces and drilling pillars.

The ratchet braces are of the following types:—

- a) *Long head (box) type*, having an open or totally enclosed ratchet and available with either
 - i) Square taper nozzle, or
 - ii) Morse taper nozzle.
- b) *Short head type*, having an open or totally enclosed ratchet. Suitable for square taper shank drills only.
- c) *Extra short head type (pin brace)*, having an open or totally enclosed ratchet. Suitable for square taper shank drills only.
- d) *Short head type heavy duty (boiler brace)*, having totally enclosed ratchet, available with square taper nozzle.
- e) *Bit stock type*, having an open or totally enclosed ratchet. Suitable for bit stock drills only.

Nomenclature and definitions are given, together with requirements for materials, heat treatment, hardness, finish and accuracy of assembly. Ranges of dimensions of the various types of brace and of the drilling pillars are also included.

2 Nomenclature and definitions

2.1 Types of brace

2.1.1

engineers' ratchet brace

a hand tool designed for rotating drills, reamers or similar small tools having Morse taper or square taper shanks

a reciprocating handle actuates the cutting tool through a pawl and toothed wheel, while an adjustable screwed member having a jack action provides the feed into the work

2.1.2

long head (box) type

the type suitable for general purposes, for use where the working space is not limited. The feed is designed for application by spanner, but can also be applied by hand. (See Figure 1)

2.1.3

short head type

for use where space is limited. The feed is designed for application by tommy bar. (See Figure 2)

2.1.4

extra short head type (pin brace)

for use in more confined spaces than those for which the short head type is intended. (See Figure 3)

2.1.5

short head type heavy duty (boiler brace)

a short head type of much more robust construction than the types defined in 2.1.3 and 2.1.4, and designed for use on boiler plates and pressure vessels or similar heavy material. (See Figure 4)

2.1.6

bit stock type

a light design intended solely for use with bit stock drills. (See Figure 5)

2.2 Component parts

2.2.1

frame

the housing for the nozzle and rack integral with the handle. (See Figure 6, Figure 7 and Figure 9)

2.2.2

nozzle

the member which accommodates the drill; it is designed to support and be turned by the rack, and incorporates the means for applying the feed. (See Figure 6, Figure 7, Figure 8 and Figure 9)

2.2.3

rack

the circular toothed member, actuated by the pawl through which the torque is applied. (See Figure 6, Figure 7, Figure 8 and Figure 9)

2.2.4

pawl

the member controlling the rack. (See Figure 6, Figure 7 and Figure 9)

2.2.5

spring

the member through which the pressure is applied to the pawl. (See Figure 6, Figure 7 and Figure 9)

2.2.6

screw centre

a centering device having an external thread through which the feed is applied on the short head or pin type. (See Figure 6, Figure 7 and Figure 9)

2.2.7

box

the hexagon member carrying the centering device, having an internal thread. Used on the long head type. (See Figure 8)

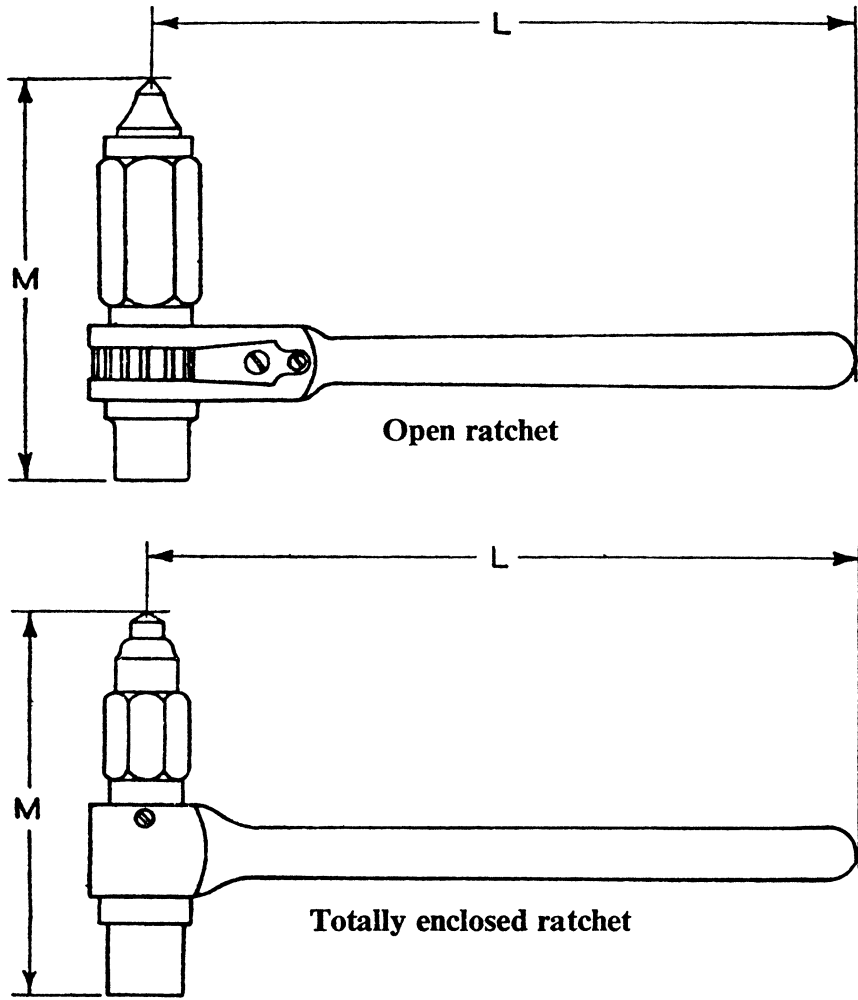
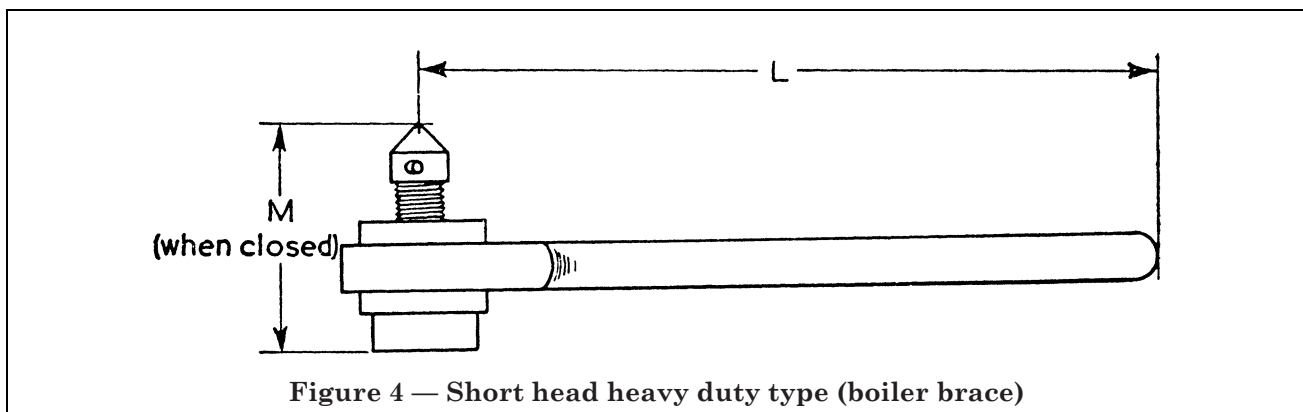
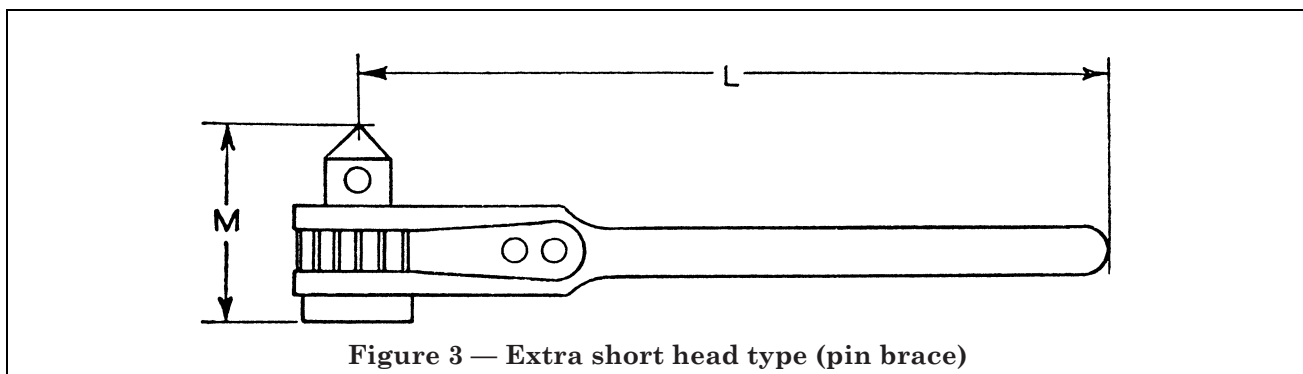
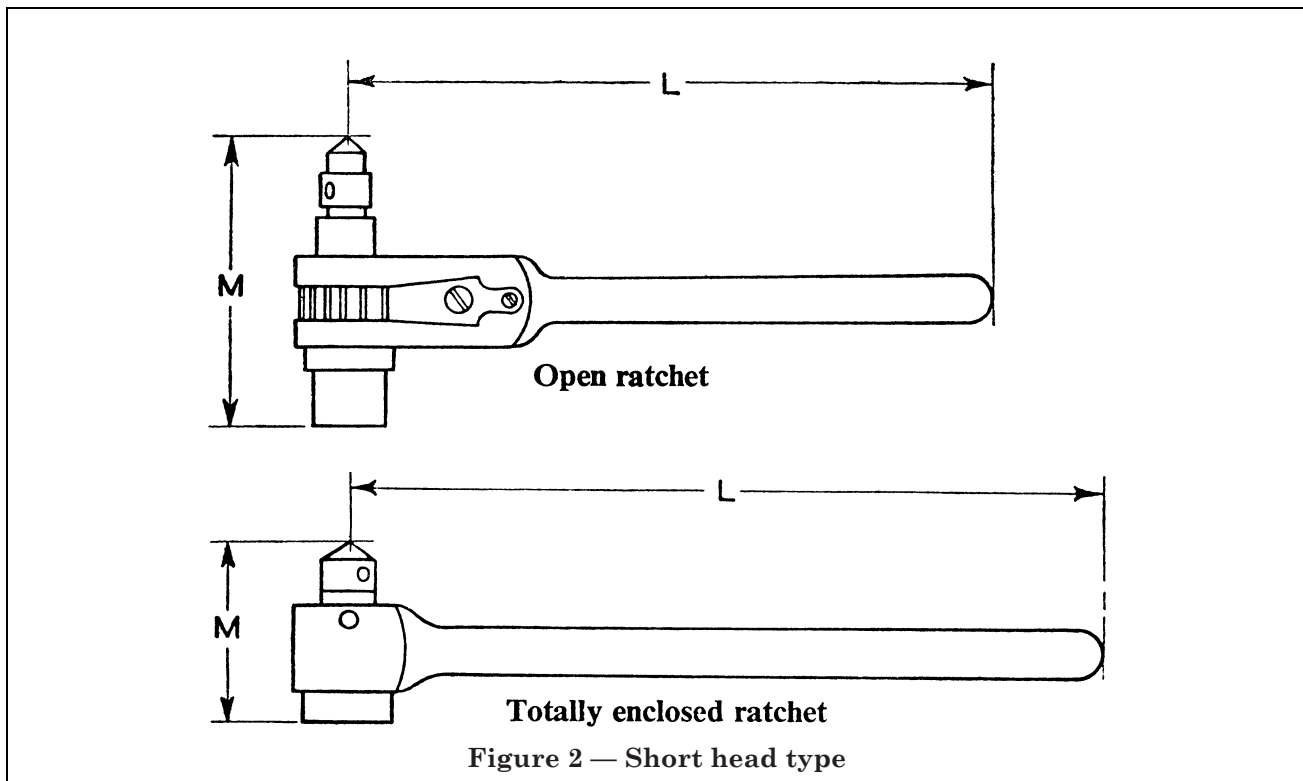
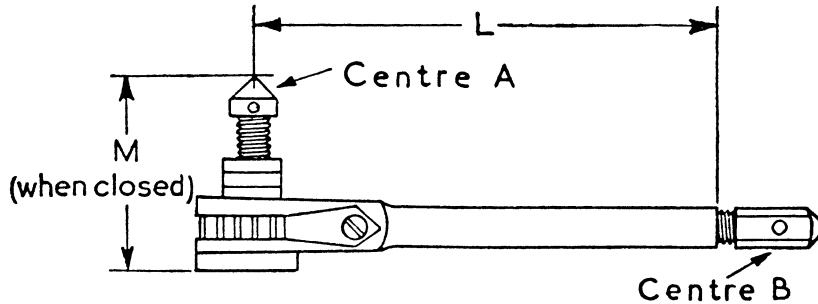


Figure 1 — Long head (box) type





NOTE Centres A and B are interchangeable (see Table 6).

Figure 5 — Bit stock type

Section 2. Ratchet braces — manufacture

3 Materials

The various components of the ratchet braces to which this British Standard relates shall be manufactured from the materials specified below:—

- a) *Frame, nozzle and box.* Mild steel, such as EN 1A specified in BS 970.²⁾
- b) *Screw centre and rack.* Mild steel suitable for case-hardening, such as EN 32A or EN 32M specified in BS 970.
- c) *The apices of the screw centre and the box.* An insert of steel having a carbon content of not less than 0.85 per cent and not more than 0.95 per cent.
- d) *Pawl.* Steel having a carbon content of not less than 0.85 per cent and not more than 0.95 per cent.

NOTE Steels having equivalent physical properties may be used as an alternative to any of those specified in *a*, *b*, *c* or *d* above.

4 Heat treatment and hardness

- a) *Screw centre and rack.* The screw centre and the rack shall be case-hardened to produce a depth of case not less than 0.010 in.

The hardness of the case shall be within the range 400/550 on the diamond pyramid scale.³⁾ During the hardness check the load applied shall not exceed 10 Kg.

- b) *Pawl and the apices of screw centre and box.* The pawls, the apex of the screw centre and the apex of the box shall be hardened to a hardness reading within the range 400/500 on the diamond pyramid scale, with a load of 10 Kg.

5 Finish

The complete ratchet braces and the component parts shall be of smooth and neat finish with all burrs and sharp corners removed. They shall also be free from surface defects and cracks.

6 Assembly

The dimensional accuracy of all component parts and details shall be such that the resultant assembly shall function efficiently and shall, in addition, ensure that any components which can be detached during use shall be interchangeable.

NOTE Where vee threads are specified in the tables of dimensions, free fits have been given, but it has not been possible to specify tolerances for the square threads because of the absence of a British Standard for such threads.

7 Capacity and dimensions

The normal capacity of the ratchet braces and the dimensions necessary to ensure interchangeability shall be those given in Table 1 to Table 6 inclusive.

²⁾ BS 970, "Wrought steels."

³⁾ BS 427, "Tables of diamond pyramid hardness numbers."

Table 1 — Long head (box) brace for square taper shank drills

All dimensions are in inches

1	2	3	4	5	6	7	8
Nominal length, centre line of head to end of handle L (Figure 1)	Dimension across head in closed position M (Figure 1)	Length of screw, including shoulder S (Figure 8)	Diameter of screw, square thread D (Figure 8)	Pitch of screw	Number of teeth in rack	Hexagon across flats dimension of box Maximum	Type of shank for which nozzle is designed
10	6	2 ¹ / ₄	1 ³ / ₁₆	6	15	1.250	No. 2 square taper
12	7 ¹ / ₈	2 ³ / ₄	7 ⁷ / ₈	6	15	1.250	No. 2 square taper
14	8	3 ³ / ₈	1	6	15	1.437	No. 2 square taper
16	8 ⁵ / ₈	3 ³ / ₄	1 ¹ / ₈	6	15	1.437	No. 2 square taper
18	9 ¹ / ₈	4 ¹ / ₄	1 ¹ / ₈	6	15	1.437	No. 2 square taper
20	9 ³ / ₄	4 ¹ / ₄	1 ¹ / ₈	6	15	1.625	No. 2 square taper
22	10 ¹ / ₂	4 ¹ / ₄	1 ¹ / ₈	6	15	1.625	No. 2 square taper
24	11 ¹ / ₂	4 ¹ / ₄	1 ¹ / ₈	6	15	1.625	No. 2 square taper

Table 2 — Long head (box) brace for Morse taper shank drills

All dimensions are in inches

1	2	3	4	5	6	7	8
Nominal length, centre line of head to end of handle L (Figure 1)	Dimension across head in closed position M (Figure 1)	Length of screw including shoulder S (Figure 8)	Diameter of screw, square thread D (Figure 8)	Pitch of screw	Number of teeth in rack	Hexagon across flats dimension of box Maximum	Type of shank for which nozzle is designed
12	6	2¾	7/8	6	15	1.250	No. 1 Morse taper
15	6¼	2¾	1⅛	6	15	1.437	No. 2 Morse taper
18	7½	3½	1⅜	6	15	1.625	No. 3 Morse taper
24	12¼	7¾ = 4½ screw 3¼ plain	1¼ (Plain part 1½)	6	15	1.625	No. 4 Morse taper

Table 3 — Short head brace

All dimensions are in inches

1	2	3	4	5	6	7	8
Nominal length, centre line of head to end of handle L (Figure 2)	Dimension across head in closed position M (Figure 2)	Length of screw	Diameter of screw, square thread	Pitch of screw	Number of teeth in rack	Type of shank for which nozzle is designed	Diameter of clearing hole for tommy bar
10	4	2	5/8	6	15	No. 2 square taper	11/32
12	4½	2	5/8	6	15	No. 2 square taper	11/32
14	5¼	2¼	¾	6	15	No. 2 square taper	11/32
16	5¾	2¾	7/8	6	15	No. 2 square taper	13/32
18	6¼	2¾	7/8	6	15	No. 2 square taper	13/32
20	6¾	2¾	7/8	6	15	No. 2 square taper	13/32
22	7	2¾	7/8	6	15	No. 2 square taper	13/32
24	7½	2¾	7/8	6	15	No. 2 square taper	13/32

Table 4 — Extra short head brace — pin brace

All dimensions are in inches

1	2	3	4	5	6	7	8
Nominal length from centre line of head to end of handle L (Figure 3)	Dimension across head in closed position M (Figure 3)	Length of screw	Diameter of screw, square thread	Pitch of screw	Number of teeth in rack	Type of shank for which nozzle is designed	Diameter of clearing hole for tommy bar
10	2½	1	9/16	t.p.i.	15	No. 2 square taper (No. 1 square taper supplied at customer's option)	9/32
12	3	1½	5/8	6	15	No. 2 square taper (No. 1 square taper supplied at customer's option)	11/32
14	3½	1½	5/8	6	15	No. 2 square taper (No. 1 square taper supplied at customer's option)	11/32

Table 5 — Short head, heavy duty — boiler brace

All dimensions are in inches

1	2	3	4	5	6	7	8
Nominal length from centre line of head to end of handle L (Figure 4)	Dimension across head in closed position M (Figure 4)	Length of screw	Diameter of screw. Whitworth form of thread	Pitch of screw	Number of teeth in rack	Type of shank for which nozzle is designed	Diameter of clearing hole for tommy bar
15	3 ¹ / ₄	1 ¹ / ₂	3 ³ / ₄	t.p.i. 10	12	No. 2 square taper	9 ⁹ / ₃₂

Table 6 — Bit stock brace

All dimensions are in inches

1	2	3	4	5	6	7	8
Nominal length from centre line of head to end of handle L (Figure 5)	Dimension across head in closed position M (Figure 5)	Length of screw	Diameter of screw. Whitworth form of thread	Pitch of screw	Number of teeth in rack	Type of shank for which nozzle is designed	Diameter of clearing hole for tommy bar
8	2 ¹ / ₄	1	1 ¹ / ₂	t.p.i. 12	16	Cropped bit stock shank	7 ⁷ / ₃₂
8	3 ¹ / ₄	1 ¹ / ₈	1 ¹ / ₂	12	16	Cropped bit stock shank	7 ⁷ / ₃₂

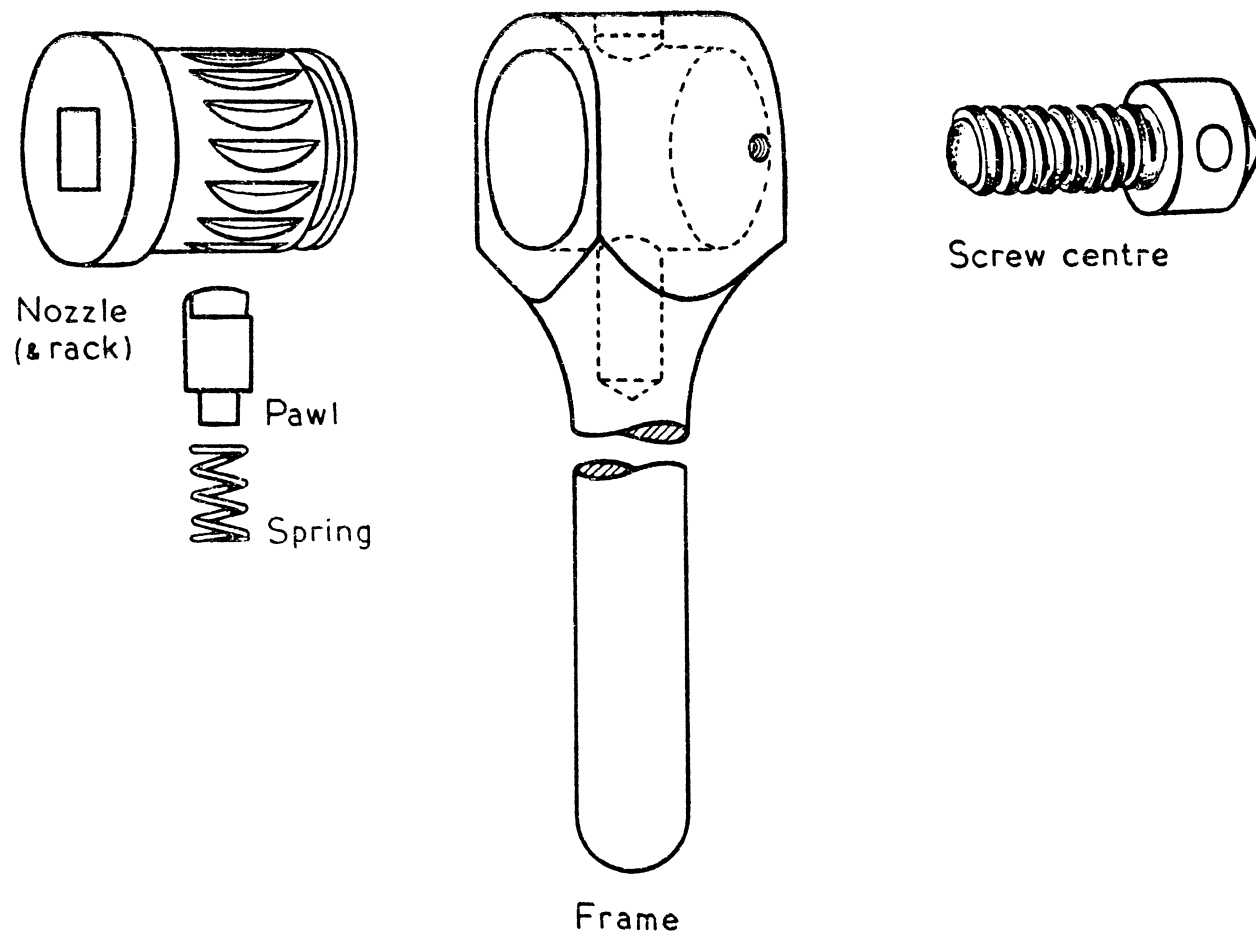


Figure 6 — Exploded view of the component parts of enclosed ratchet type of brace

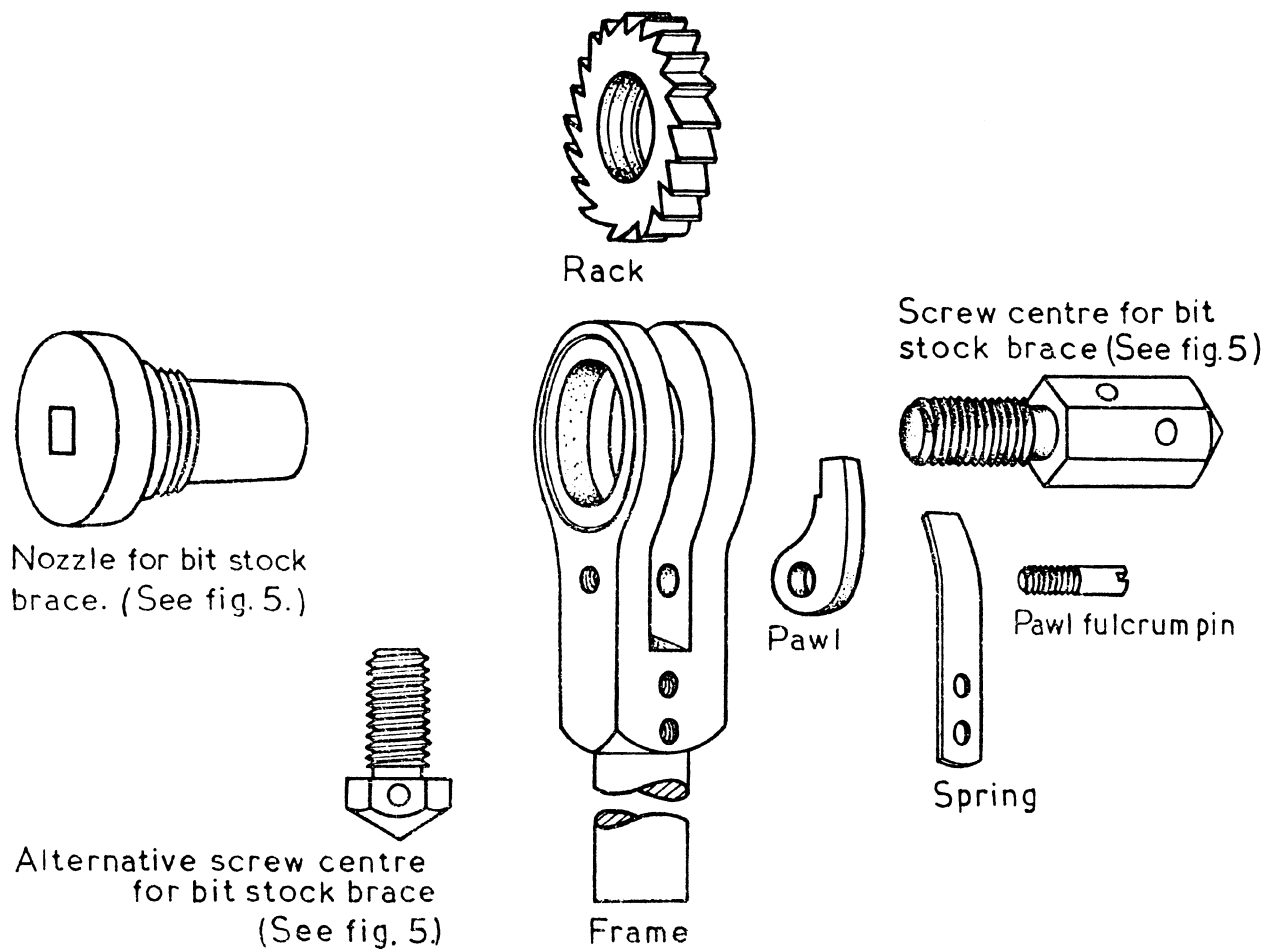
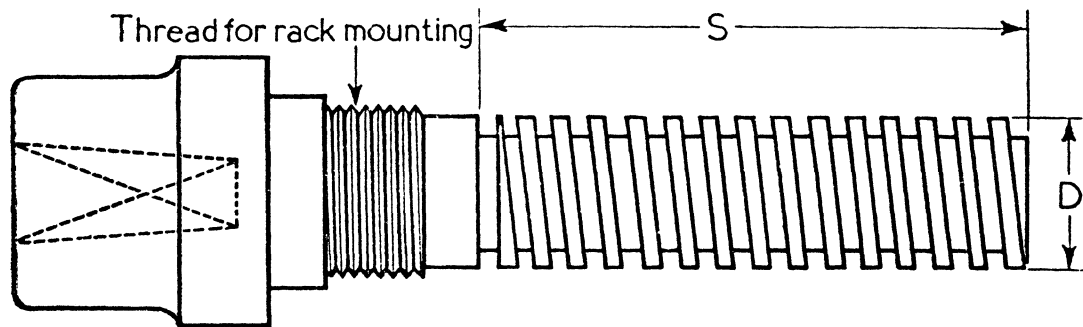
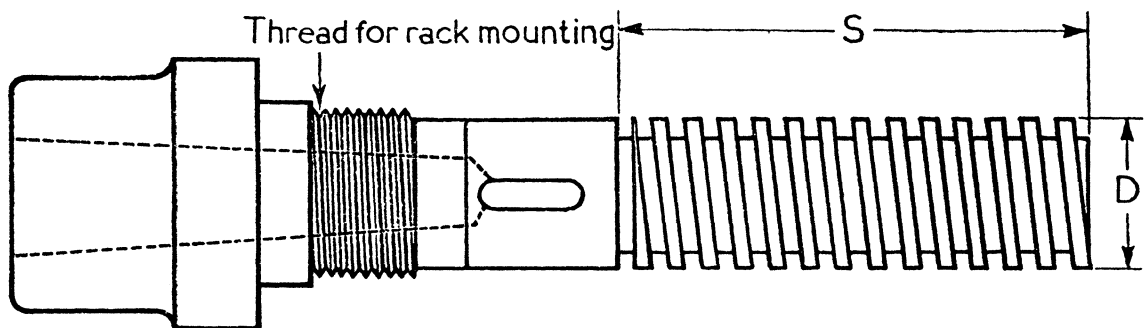


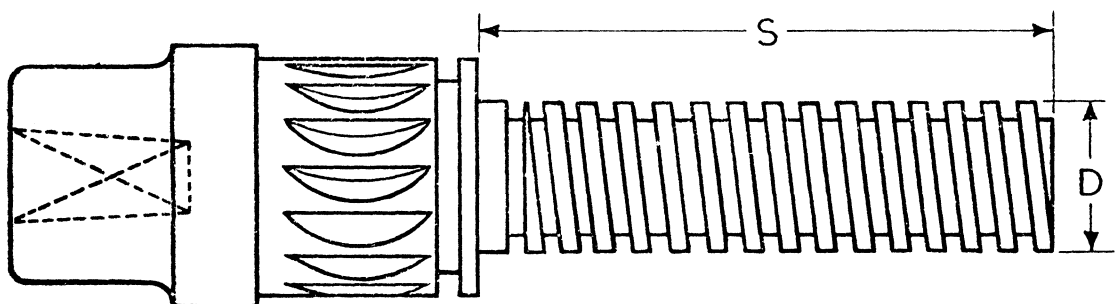
Figure 7 — Exploded view of the component parts of open ratchet type of brace



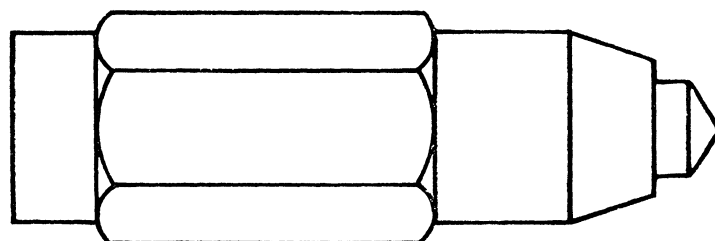
Nozzle with square taper socket for open drive type.



Nozzle with morse taper socket for open drive type.



Nozzle (and rack) for enclosed drive type.



Box

Figure 8 — Nozzle and box for long head (box) type

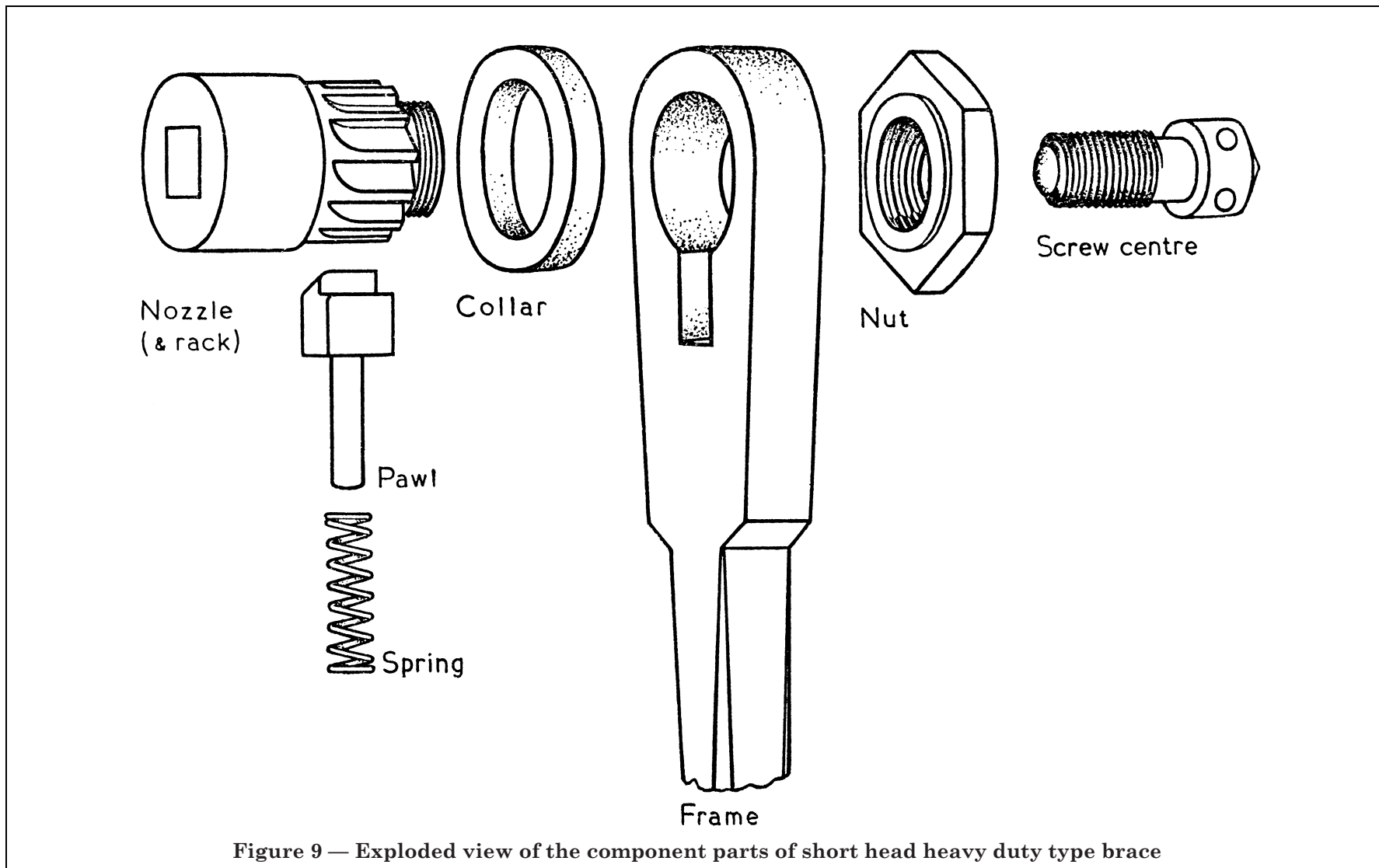


Figure 9 — Exploded view of the component parts of short head heavy duty type brace

Section 3. Drilling pillars — manufacture

8 Materials

a) *Arm and pillar.* The arm and pillar shall be manufactured from mild steel complying with the provisions of specification EN 1A in BS 970⁴⁾ or from steel having equivalent physical properties.

b) *Base.* The base shall be manufactured from mild steel complying with the provisions of specification EN 1A in BS 970 or from steel having equivalent physical properties. Alternatively, it shall be manufactured from wrought iron complying with the provisions of BS 51.⁵⁾

9 Locking eyebolt and key

The drilling pillars to which this British Standard relates shall be fitted with an eyebolt for locking the arm. The diameter of the hole in the head of the eyebolt shall be not less than $\frac{5}{8}$ in. The screw shall make direct contact either with the post or through a key located in the boss of the arm at the option of the purchaser. (See Figure 10).

10 Base

The under-face of the base shall be produced in such a manner that the possibility of tipping or movement during drilling is reduced to a minimum. (See Figure 10).

11 Dimensions

The nominal size and the dimensions of the drilling pillars covered by the provisions of this British Standard shall be those given in Table 7.

⁴⁾ BS 970, "Wrought steels."

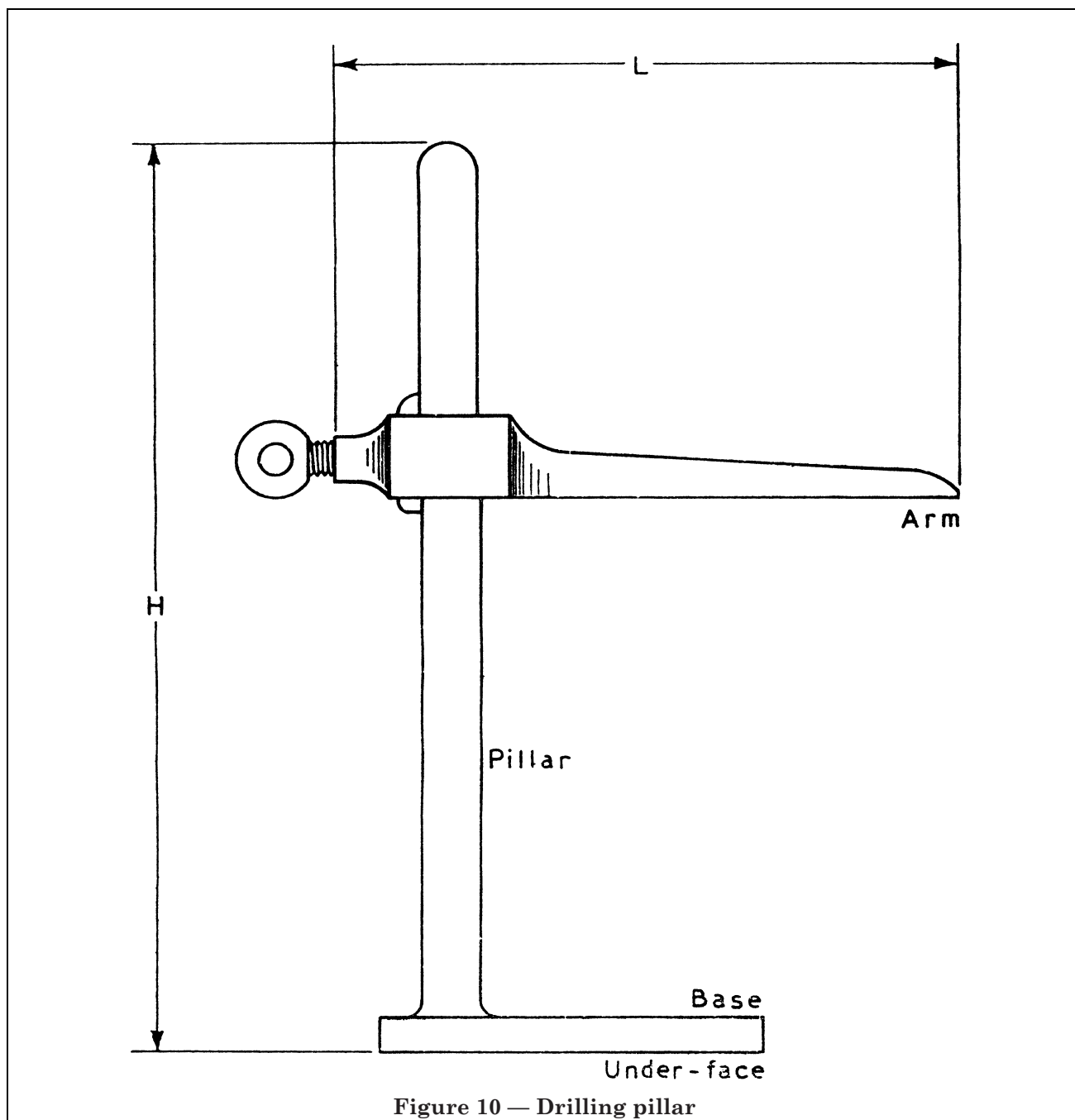
⁵⁾ BS 51, "Wrought iron for general engineering purposes (grades A, B and C)."

Table 7 — Drilling pillars

All dimensions are in inches

1	2	3	4	5	6	7	8	9
Nominal size (overall height) H (Figure 10)	Height of pillar above base	Diameter of pillar	Base section length × width × t thickness	Base slot length × width	Arm			Diameter of eyebolt with Whitworth form of thread
					Overall length L (Figure 10)	Width	Thickness, tapered front to back	
16	15 ¹ / ₈	1 ¹ / ₄	7 ¹ / ₂ × 2 × 7 ⁷ / ₈	3 ¹ / ₂ × 7 ⁷ / ₈	11 ⁵ / ₈	1 ³ / ₈	1 ³ / ₁₆ to 1 ¹ / ₂	1 ¹ / ₂
18	17	1 ¹ / ₂	8 ¹ / ₂ × 2 ¹ / ₂ × 1	4 × 1	13 ³ / ₈	1 ¹ / ₂	1 to 1 ⁵ / ₈	5 ⁵ / ₈
21	20	1 ¹ / ₂	8 ¹ / ₂ × 2 ¹ / ₂ × 1	4 × 1	13 ³ / ₈	1 ¹ / ₂	1 to 1 ⁵ / ₈	5 ⁵ / ₈
24	22 ⁷ / ₈	1 ³ / ₄	9 ¹ / ₂ × 3 × 1 ¹ / ₈	4 ¹ / ₂ × 1	15 ³ / ₄	1 ³ / ₄	1 ⁵ / ₁₆ to 1 ³ / ₄	3 ³ / ₄
32	30 ³ / ₄	2	12 × 3 ¹ / ₂ × 1 ¹ / ₄	6 × 1 ¹ / ₈	18 ¹ / ₂	1 ⁷ / ₈	1 ¹ / ₄ to 2 ³ / ₈	3 ³ / ₄

NOTE The diameter of the hole in the head of the eyebolt shall be not less than ⁵/₈ in. (see Clause 9).



Appendix Adaptors

To provide for the conversion of a ratchet brace from Morse taper to square taper, a range of adaptors is available. (See Figure 11).

The conversion figures are given in Table 8.

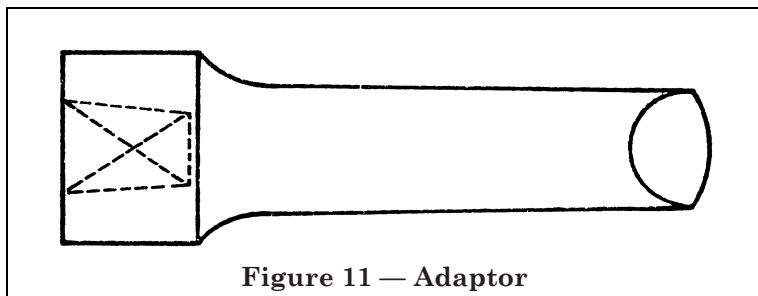


Figure 11 — Adaptor

Table 8 — Adaptors for converting ratchet braces from Morse taper to square taper

FROM Morse taper shank Number	TO Square taper shank Number
1	2
2	2
3	2
4	2 or 3

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