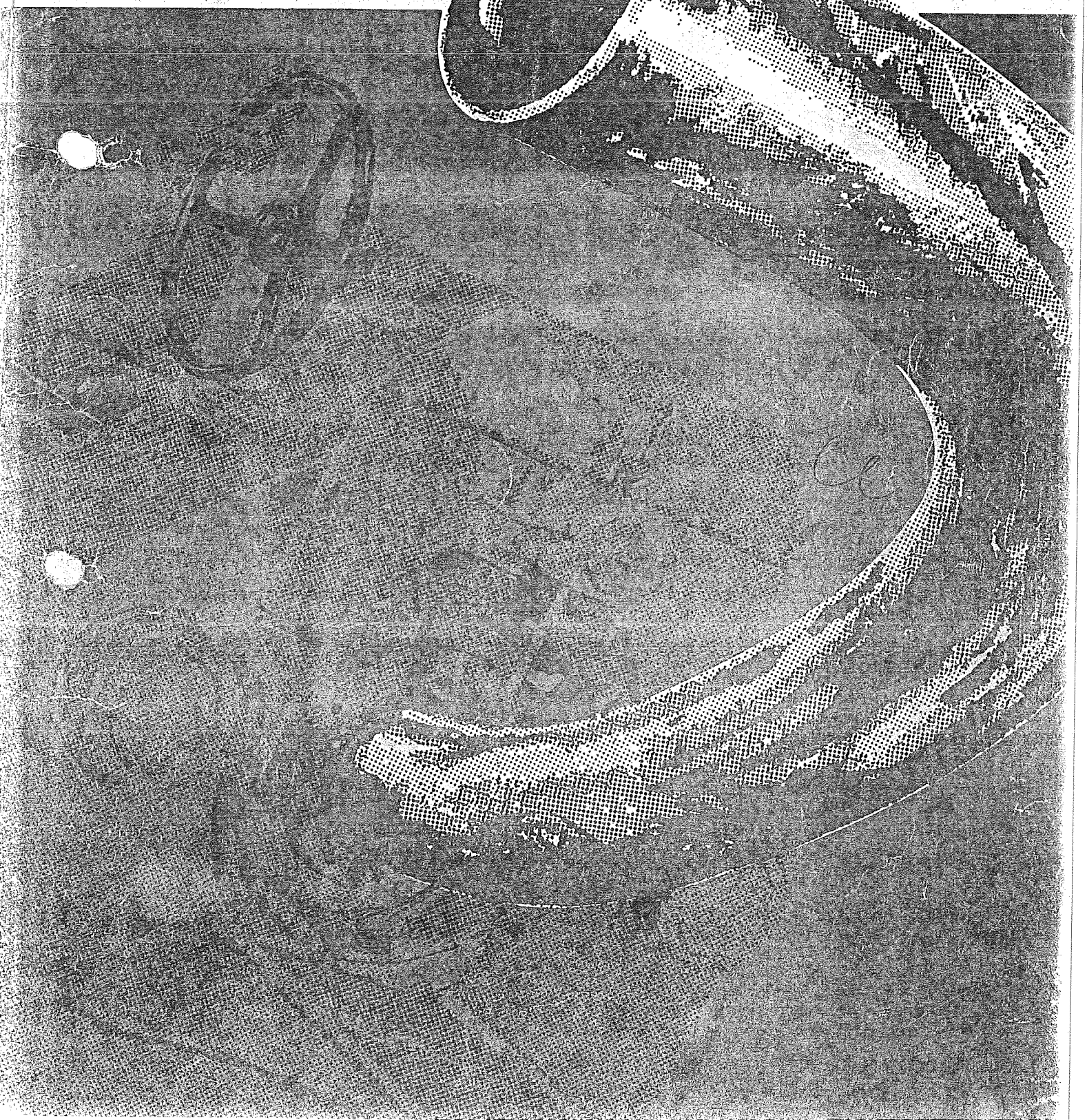
THE COUPÉ HUGOT PIPE BENDING MACHINE

PRODUCES BENDS BY INTERNAL COLD ROLLING IN ANY PLANE OR RADIUS WITH ONE TOOL AND ONE SETTING – IN DRAWN SEAM OR SPIRAL-WELDED FERROUS OR NON-FERROUS PIPES



PERFORMANCE AND CHARACTERISTICS

A MACHINE 4/10″

Min. dia. of Pipe: OD = 103 mm ID = 99 mm
Max. dia. of Pipe: OD = 276 mm ID = 264 mm
Wall thickness Min. 1.5 mm

Max. $\frac{OD}{20}$ but not exceeding 13 mm

B MACHINE 4/12″

Min. dia. of Pipe: OD = 103 mm ID = 99 mm
Max. dia. of Pipe: OD = 330 mm ID = 314 mm
Wall thickness Min. 1.5 mm

Max. $\frac{OD}{20}$ but not exceeding 15 mm

Data regarding max. wall thickness are theoretical and values calculated for standard MS pipes of good quality.

Minimum Bending Radius

(R = R centre line)

R = 3D (D = external diameter of the pipe) providing that: the wall thickness is less than or equal to 5% of external dia. and not exceeding 13 mm.

R = 5D (D = external diameter of the pipe) providing that: the wall thickness is less or equal to 6.5% of external dia. and not exceeding 15 mm.

Maximum Bending Radius

—no limit.

Maximum Bending Length

6 metre (20′) performed by bending 3 metre (10′) from one end of pipe, turn round pipe and complete bend.

In this case it should be observed that a certain straight will remain at the middle of the pipe.

Standard bending length, 10′ in any length of pipe.
Straight end of pipe which remains after bend will be 200 to 300 mm (8 to 12″ approx.).

Straight portion between two consecutive bends is theoretic ally nill but in practice a length of 25 to 50 mm (1 to 2″) can occur.

Material Specification of Pipes

Standard MS—SS—copper—aluminium—cupro nickel—Aluminium brass — providing they are within the capacity of the machine.

Seam Welded Pipes

Bending of such pipes can be performed provided correct welding rods are used and the seam runs along the small radius portion of the bend.

Spiral Welded Pipes

Bends in spiral welded pipes mainly of SS are continuously performed by users of the Coupe Hugot Pipe Bending Machine.

Consecutive Bends

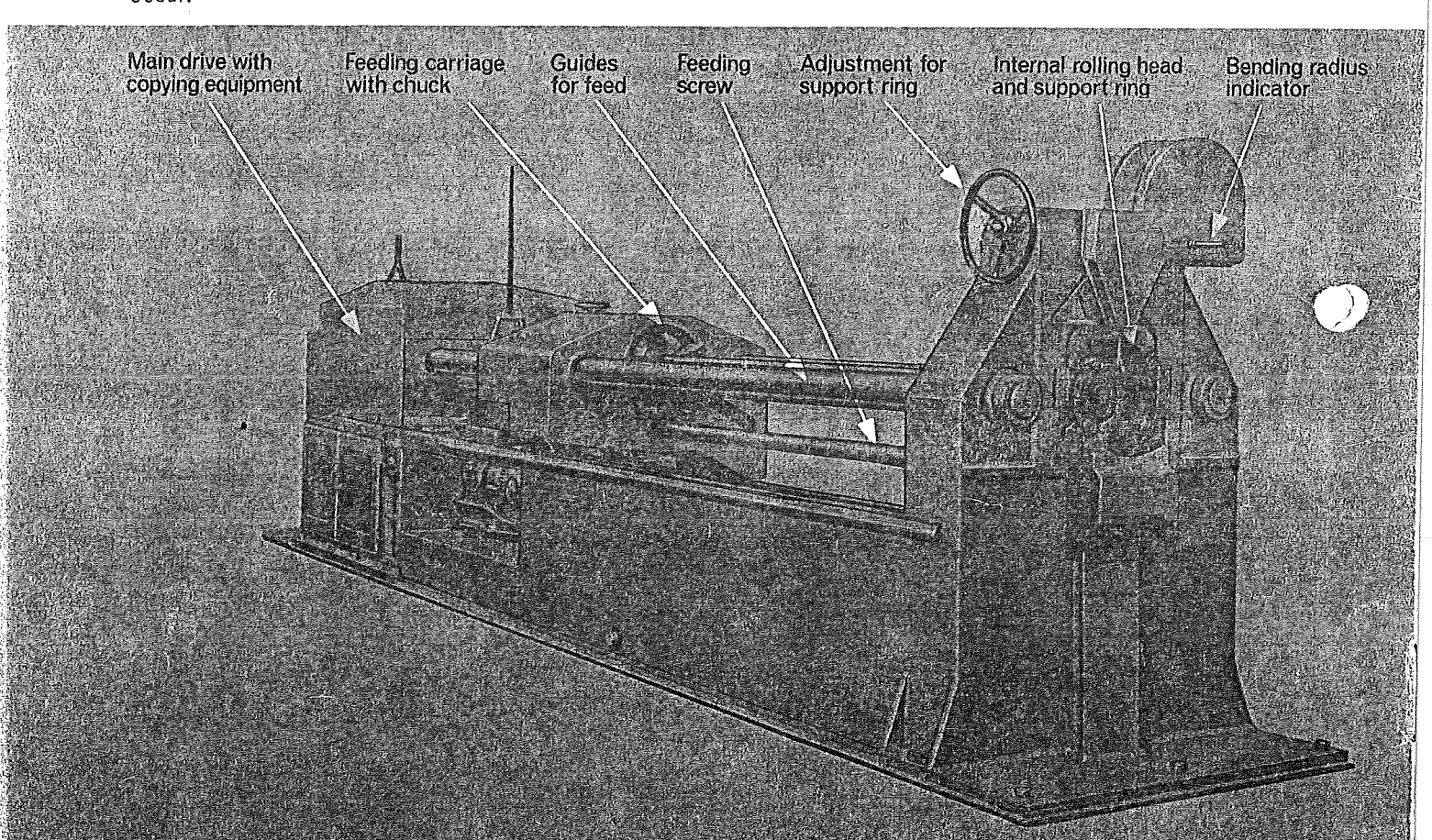
(in different plane and radii) can be performed without re-setting or changing tooling and without time loss within limitation to the permissible length of pipe referred to above.

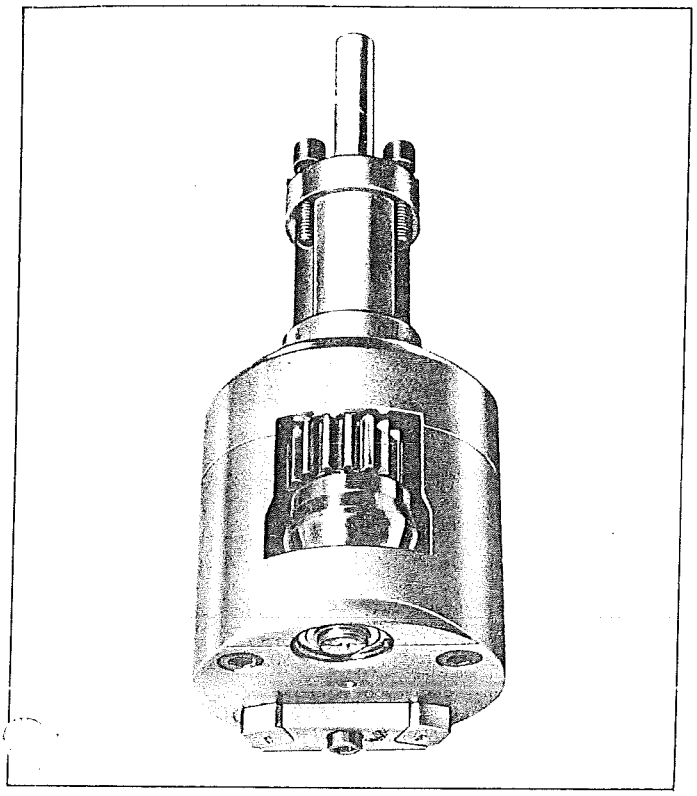
MACHINE DATA

Pipe Feeding

Length of stroke max. 2.950 metre (9′ 10″)

Position of Speed Indicator (variable drive)	Speed per minute	
	mm	inches
1	16	$\frac{3}{8}$″
2	19	$\frac{3}{4}$″
3	22	$\frac{7}{8}$″
4	25	1″
5	28	$1\frac{1}{8}$″
6	33	$1\frac{5}{16}$″
7	38	$1\frac{1}{2}$″
8	44	$1\frac{3}{4}$″
9	50	2″
10	58	$2\frac{1}{4}$″
10.5	62	$2\frac{1}{2}$″





The Rolling Head consists of:

- A main body with radial support rollers, adjustable to a variety of internal pipe diameters to a given nominal external size.
- The actual roller with its shaft eccentrically enhoused to perform uniform oscillation at each revolution of the rolling head by the impulse of a copying mechanism.
- A rotary path pick-up control at the operating end of the machine with its transmission mechanism through the hollow driving shaft through the body of the rolling head to the oscillating roller.

The pipe is fed at a constant speed into an external hardened and ground ring which is situated at the exact area of the internal rolling operation. By the uniform oscillation of the internal roller, as described above, a certain part of the external circumference, 180° approx., will be re-rolled against the internal ring resulting in an increased surface area and consequently a natural bending of the pipe in the opposite direction of the rolling process. The bending radius is controlled by the amplitude of the oscillation.

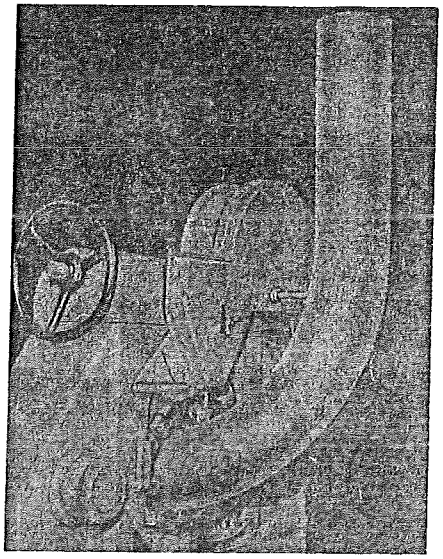
ANTAGES

- Bends from 3D to unlimited radius can be performed with a small number of relatively low-cost tools.
- Consecutive bends can be performed with variation of radii without changing or re-setting tools or machine.
- Bends can be performed in any plane without changing or re-setting tools.
- Bends are performed without deformation of the pipe or change of material structure.
- Bends can be performed in cold or hot drawn, seam or spiral-welded pipes.
- Bends can be performed regardless of material specification in any ferrous or non-ferrous material suitable to be bent within the capacity of the machine.
- Bends are produced with an absolutely-clean internal surface of mirror finish appearance.
- The machine is equipped with dimensional instrumentation to allow work to be easily performed from drawings.
- The light weight and relatively small size of tooling eliminates necessity for heavy craneage and allows storage near to the machine with easy accessibility for the operator.

Multi-bends of different plane and radii in 8 in. nominal bore M.S. pipe with one tool setting and without straights between consecutive bends.

Setting (re-setting) of the machine:

Insert rolling head according to nominal bore, fix stay bearing and rolling ring.



90° bend with 4D radius

Turn pipe 90°

Second bend of 90° with 3D radius

Further bends can follow in any plane regardless of bending radii.

Standard Split Rings and Manufacturers Limits

In general, pipe manufacturers limits are +1% of OD which is compensated for by the split rolling rings. However, to prevent deformation (ovality) through bending process such compensation is restricted to not more than 2 mm. In case of thin walled pipes, considerably less.

For this reason the number of standard rings supplied to a required OD are:

2 off for pipes of OD not exceeding 200 mm.
3 off for pipes of OD over 200 mm.

Examples of standard rings according to nominal bore of pipe:

4″	1 off ø	114.5	8″	1 off ø	218.4
	1 off ø	115.4		1 off ø	219.8
5″	1 off ø	139.7		1 off ø	221.3
	1 off ø	141.1	10″	1 off ø	272.3
6″	1 off ø	168		1 off ø	274
	1 off ø	170		1 off ø	275.8
			12″	1 off ø	322.8
				1 off ø	325.1
				1 off ø	327.2

RESULTS OF MEASUREMENTS ON TEST-PIECES

After examinations carried out by the Laboratoire National D'Essais, Paris, the following results were obtained from test pieces taken from the tubes:

A. Measurement of thicknesses by wire gauge, in 3 points. In the table below, the two extreme figures are given.

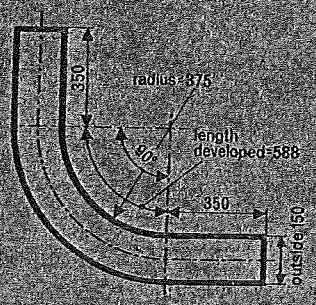
B. Hardness by means of Rockwell machine (Rockwell B under 100 kg. load), the impressions being made on the surface previously polished, corresponding to the inside wall of the tubes. In the table below, the two extreme figures are given.

Radius of Curve	Method of Bending	Eventual re-annealing	At Inner Radius (ref. A) Wall thickness in mm.	At Inner Radius (ref. A) H R "B"	At Pitch Radius (ref. B) Wall thickness in mm.	At Pitch Radius (ref. B) H R "B"	Out Radius (ref. C) Wall thickness in mm.	Out Radius (ref. C) H R "B"
Straight tube			6.26–6.44	76–77	6.20–6.28		6.22–6.28	
4D	Hot	R	6.40–6.46	65–66	6.34–6.44		6.34–6.40	
			7.06–7.18	74–75	6.70–6.92	73–74	5.98–6.12	66–68
		R	6.98–7.38	62–63	6.76–6.86	58–59	5.70–5.92	60–62
	On CHSL machine		6.62–6.70	84–85	5.58–5.78	89–91	5.00–5.10	92–93
	WILMAN licence	R	6.86–7.08	60–62	6.10–6.18	61–62	5.36–5.48	65–65
3D	on CHSL machine		6.42–6.50	89–89	5.28–5.44	90–91	4.60–4.80	93–93
	WILMAN licence	R	6.44–6.66	64–65	5.36–5.64	62–63	4.80–5.12	64–65

DEVELOPMENT OF BENDS

EXAMPLE 1

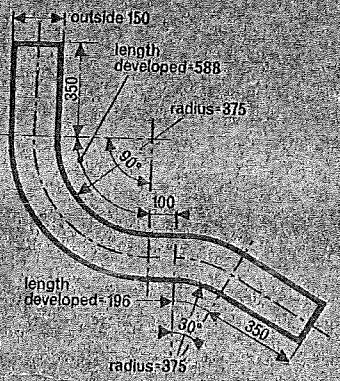
Calculation for single bends
Theoretical straight length required:



350 + 588 + 350 = 1288

EXAMPLE 2

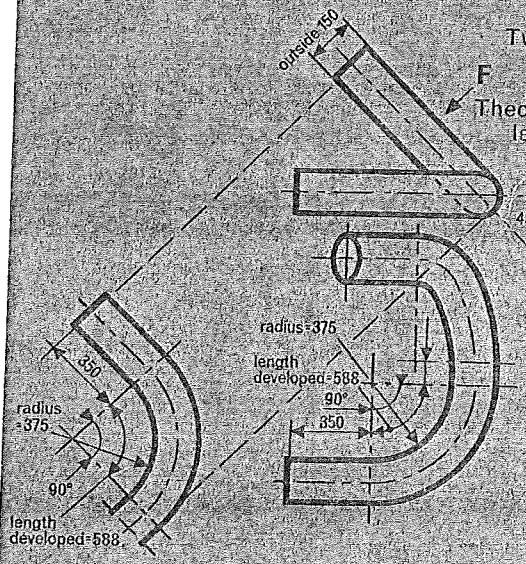
Two consecutive bends in one plane:
Theoretical straight length required:



350 + 588 + 100 + 196 + 350 = 1584

EXAMPLE 3

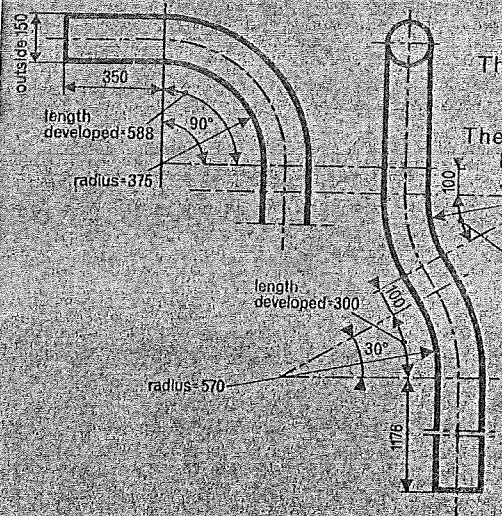
Two consecutive bends in two planes:
Theoretical straight length required:



350 + 588 + 100 + 588 + 350 = 1976

EXAMPLE 4

Three consecutive bends in two planes:
Theoretical straight length required:



350 + 588 + 100 + 210 + 100 + 300 + 1176 = 2824