

ANNEXE 2



JMS

Health and Safety Executive
TECHNOLOGY DIVISION

Summary sheet of FCG inspector's report

FCG (*block caps*)

NORTH EAST

Name of firm(s) (*block caps*)

SHEFFIELD WEDNESDAY FOOTBALL CLUB

AddressHillsborough
Sheffield**Area of inspection**Dr C E Nicholson, Deputy
Director, RLSD**Area (name)**

South Yorkshire & Humberside

Copies to

MR C J Pertee, PSI, NE FCG

Subject of report

Examination of Turnstiles A-G

FCG file no. NE/FCG/131/89

FCG job no. 14/M/19/89

Date of report 16th May 1989**Key words (*block caps*)**FOOTBALL GROUNDS
(TURNSTILES)**Initiation**

Verbal via RLSD

Date(s) of visit(s)

24-28 April 1989 (Except 27th)

Visited byMr J B Hibbs (NE FCG)
Mr C J Pertee (NE FCG)**Relevant papers**Makers Leaflets - copies
attached.**Persons seen (names and positions)**Club Secretary and Police Officers
at Engineering Control Room**Summary**

Examination of turnstiles A-G confirmed that although old, somewhat worn and in many cases in need of lubrication/routine maintenance etc all were working satisfactorily and would each allow at least 20 persons per minute throughput.

Data on load/pedal release pressure tests, throughput and computer count tests are the subject of a separate RLSD report.

Author's name

J B HIBBS
Specialist Inspector (Mechanical Engineering)

NE/FCG/131/89

14/M/19/89

Technology Division
NE Field Consultant Group
Health & Safety Executive
Woodside House
261 Low Lane
Horsforth
LEEDS
LS18 5TW

/6th May 1989

Dr C E Nicholson
Deputy Director
RLSD
SHEFFIELD

c: Mr C J Pertee, PSI, NE/FCG

SUBJECT: EXAMINATION OF TURNSTILES A-G

USER: SHEFFIELD WEDNESDAY FOOTBALL am, HILISBOROUGH, SHEFFIELD

INTRODUCTION

I visited the Sheffield Wednesday Football Club ground during the week commencing the 24th of April 1989 to continue investigations at your request and in accordance with the wishes of the judicial enquiry team headed by Justice Taylor.

I was present on site between the 24th and 28th of April with the exception of Thursday the 27th of April and on each occasion I was accompanied by Mr C J Pertee, Principal Specialist Inspector, Construction Engineering, North East FCG. During the week I examined turnstiles 17-23 (A-G) and this report contains the results of this examination.

TURNSTILES

The general layout of the 7 turnstiles **A-G** which feed the west terrace at the football ground is shown in Fig. 1 of my earlier report NE/FCG 14/M/18/89 and details are confirmed in Messrs Ralph Braid & Associates drawing no. 1340/04

A general view of the turnstiles from the approach side is shown in Fig. 2 and from the egress side in Fig. 3.

All the turnstiles were of considerable age and were noted to have been manufactured by Messrs W D Ellison & Co Ltd, Irlam, Manchester. Details of the turnstiles and their method of operation are shown in the makers trade literature at Appendix 1.

All the turnstiles were of the low pattern type and turnstiles A, C, D, E, F and G were fitted with convex **arms**. Turnstile B was fitted with straight arms.

I took detailed dimensions in all the turnstile enclosures and assisted with *initial* functional tests of each unit.

All the turnstile ratchets were working satisfactorily and although **worn**, all the foot pedals and footstep motion cams were working correctly. Some of the lower mechanisms were in need of lubrication, however, this did not prevent the mechanisms from operating satisfactorily and allowing at least **20** persons per minute to pass through each turnstile.

I noted the patent numbers on the turnstile ^{*Counters*} which were shown as **658191** and 658226 and were marked on several of the mechanical counter cover plates. The serial numbers were also marked in this area but were only present on turnstile C (serial **no. 14038**), turnstile D (serial no. **13263**) and turnstile G (serial no. **14039**).

I noted that all the doors at the front of the turnstile enclosure were approximately **0.63** m (25 inches) wide and the opening **widths** were **between 465 mm** and **555 mm** (**18.3** inches and **21.8** inches). The heights of the openings were approximately **2 m** (**79** inches).

The passageways through each turnstile were approximately 2 m (6 ft 9 inches) long and 0.5 m (20 inches) wide. The ceiling height in each passageway was approximately 2.25 m (7 ft 5 inches).

The height of the turnstile tables was approximately 1.04 m (3 ft 5 inches). The heights of the turnstile arms and their lower skirt plates etc and the gaps between the ends of the arms and adjacent walls in individual passageways are shown in Table 1.

Vertical blocks of wood were secured to the walls at the **entry** side of the turnstiles in all except passageway C where a box had been constructed on the wall opposite the centre of the turnstile spindle. All blocks of wood in turnstiles except C were approximately 14 cm x 14 cm x 61 cm long (5.5 inches x 5.5 inches x 2 ft long) which were positioned with their lower ends approximately 38 cm (15 inches) above floor level and their central axis approximately 30 cm (one foot) forward of the turnstile axis.

The box mounted on the wall opposite the rotating arms of turnstile C was 46 cm (18 inches) long on its front face and 61 cm (2 ft) long on its rear face. The box was 24 cm (9.5 inches) deep and projected from the wall by approximately 10 cm (4 inches). The top face of this box was approximately level with the top face of the turnstile arm. (See Fig. 6).

Additional wooden blocks were also fitted on the walls opposite the turnstile arms in passageways A and B only. These blocks **were** mounted on the turnstile side of the aforementioned vertical wooden blocks and had **curved** form varying from 7.5 cm (3 inches) thickness at the ingress end to 9.5 cm (3.75 inches) thickness at a point opposite the turnstile axis centre. These blocks were approximately 49 cm (19.25 inches) long and 14 cm (5.5 inches) deep and reduced the gap at the end of

(the turnstile arm to approximately 2.5 cm (one inch).

Photographs of turnstiles A to G taken from the egress side show the aforementioned features together with the respective footstep cams and pedal counterweights etc. (See Figures 4-10),

I removed several of the foot pedals from the turnstiles and two of these from units B **and** C are shown in Figs. 11 and 12 respectively.

Pedal return action was achieved by a counterweight mounted on the respective arm, these weights can be seen in-Figs. 11 **and** 12.

OTHER OBSERVATIONS

During my examination of the turnstiles I noted that an electronic counting system had been installed and that duplicate switching arrangements were present on the majority of the units.

Small roller type limit switches were noted in positions immediately above the central boss carrying the turnstile arm adjacent to the main rotating shaft. These switches were arranged such that they would be actuated at each quarter turn of the turnstile, The central switches at units C, D and E were the only ones connected.

Additional rat-tail switches were seen to have been positioned on the wooden frames at **the** egress side **of** the turnstile block and were actuated at each **indexing** motion by the respective turnstile arm. However these switches were disconnected and had broken tails at turnstiles C, D and E, they appeared to be **connected and**

functioning correctly at the other turnstiles A, B, F and **G**.

Load/pedal resistance testing and throughput rate testing of the turnstiles together with checks on the mechanical and computer counting systems are the subject of a separate **RLSD** report.

It was also noted that photoelectric emitters and sensors had been arranged in pairs across each turnstile passageway at positions above the turnstile arms as well as at table level at the egress side. Examination of these devices indicated that many had been either removed or disconnected and in *some* cases the wiring had been cut. The latter was noted on the over/turnstile sensors at units C and F.

CONCLUSIONS

Examinations of turnstiles A-G confirmed that although old, somewhat worn and in many cases in need of lubrication/routine maintenance etc. all were working satisfactorily and would each allow at least 20 persons per minute throughput.

Data and load/pedal release pressure tests, throughput and computer count tests are the subject of a separate **RLSD** report.

RECOMMENDATIONS

It is recommended that the gaps between turnstile **arms** and adjacent walls should be reduced to **the** minimum practicable safe dimension in order to prevent persons **gaining** access without actuating the turnstile **mechanism**.

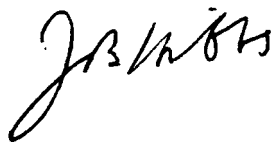
In my opinion the over/turnstile photoelectric devices should be reinstated to detect persons climbing over without actuating the mechanism, alternatively, full height

turnstiles (floor to ceiling) should be installed.

Where necessary, individual turnstiles should be repaired at their broken table supporting pillars in order to improve rigidity and several of the units required re-levelling.

End float in all the turnstile spindles should be checked and adjusted accordingly as many exhibited approximately 4 mm lift.

All ratchets, pedal mechanisms **and** cams should be suitably lubricated at appropriate intervals.

A handwritten signature in black ink, appearing to read 'J B Hibbs', is written in a cursive style.

J B HIBBS
Specialist Inspector (Mechanical Engineering)

TABLE 1
TURNSTILE DATA

TURNSTILE NO.	ARM - WALL	ARM HEIGHTS (CM)		
-	APPROX GAP - (CM)	SKIRT	BOTTOMRAIL*	TOP RAIL*
A	2.5 ^φ	28*	58	91
B	2.5 ^φ	22	58	89
C	11.0	25	60	91
D	9.0	23	59	90
E	8.5	21	57	88
F	6.5	21	57	88
G	10	24	60	91

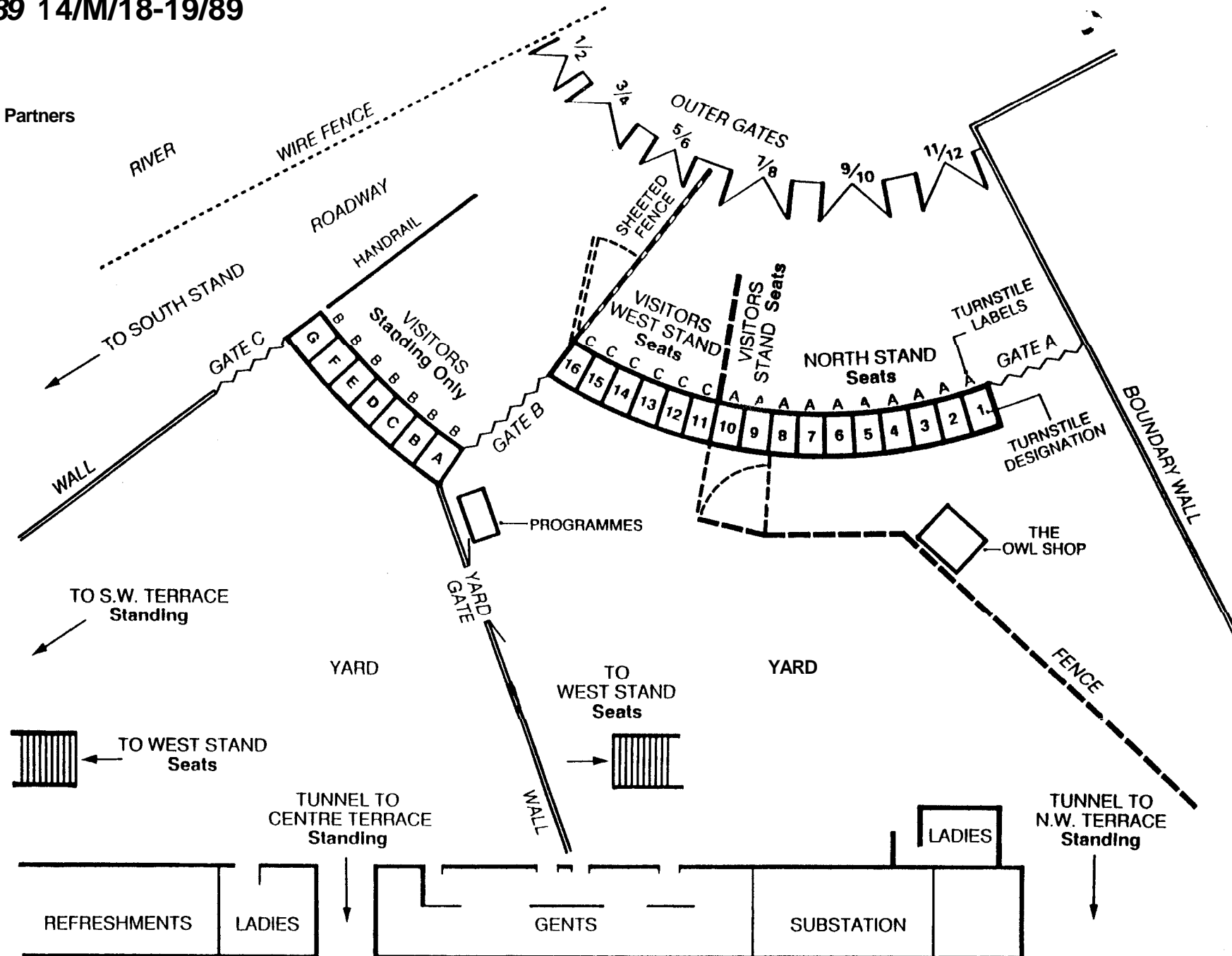
φ To curved wooden block

* To c/l of rail

Fig. 1 - Gates and Turnstiles. Layout West Side
NEFCG 131/89 14/M/18-19/89

Based on Eastwood & Partners
drw. no. 6708/8A

See also Ralph Brade
drw. no. 1340104



NEFCC 131/84 14/M/19/84



General View of turnstiles A-G. from approach side

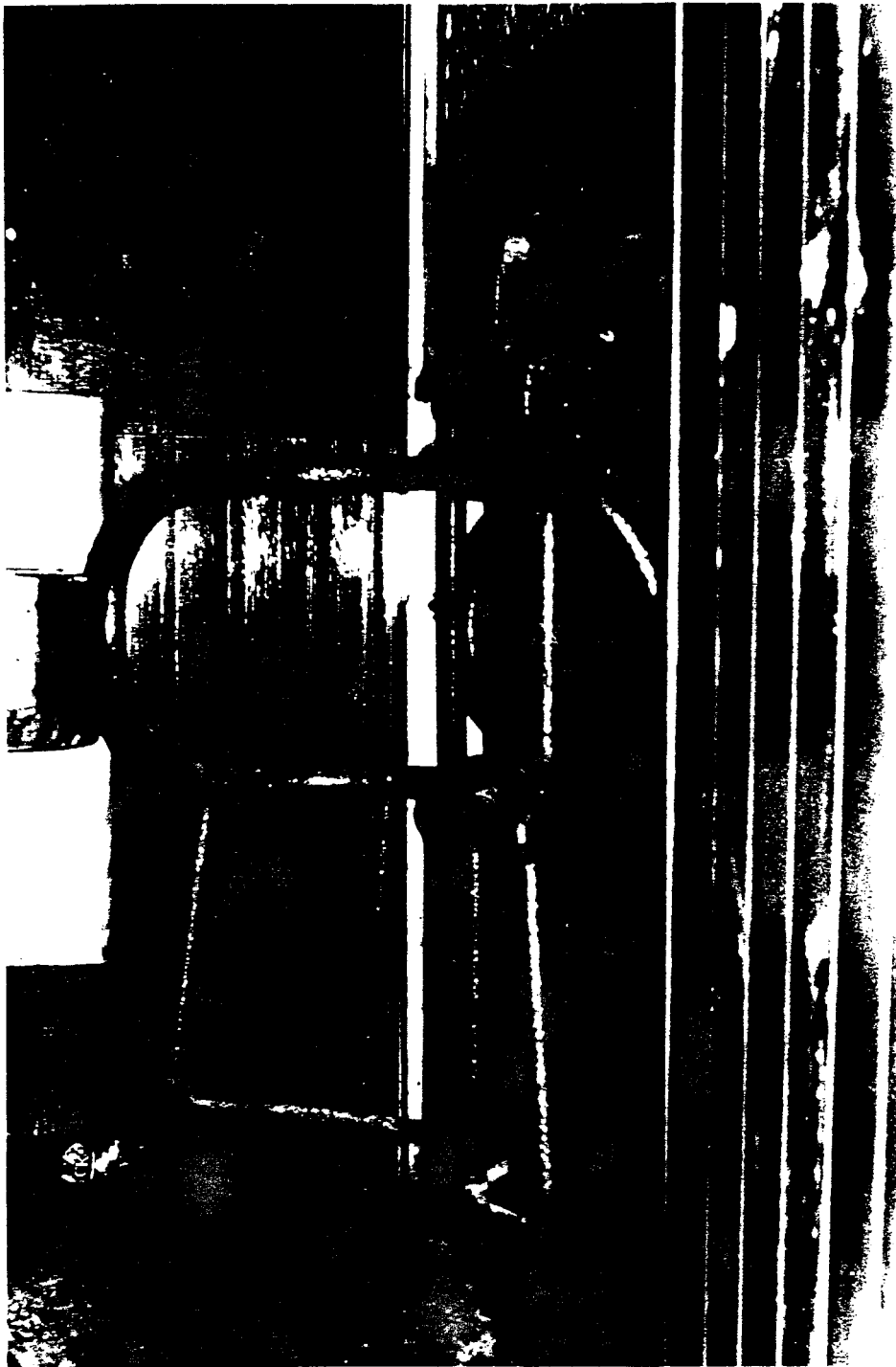
C4



General view of turnstiles A-G. from the egress side

C3.

I
F64.



C9.

Turnstile 'A'.

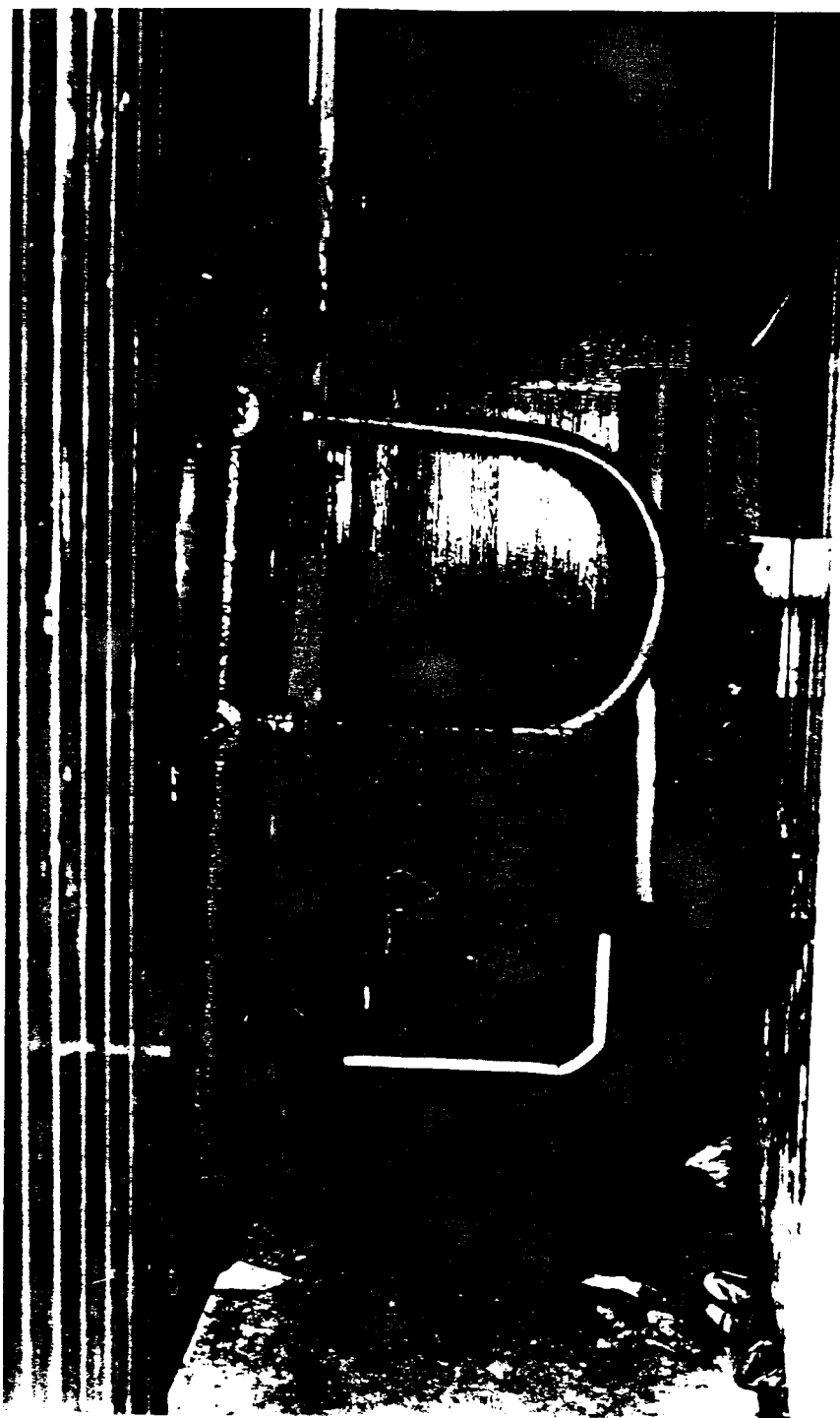
FIG 4A.



Pedal Mechanism at turnstile 'A'

210

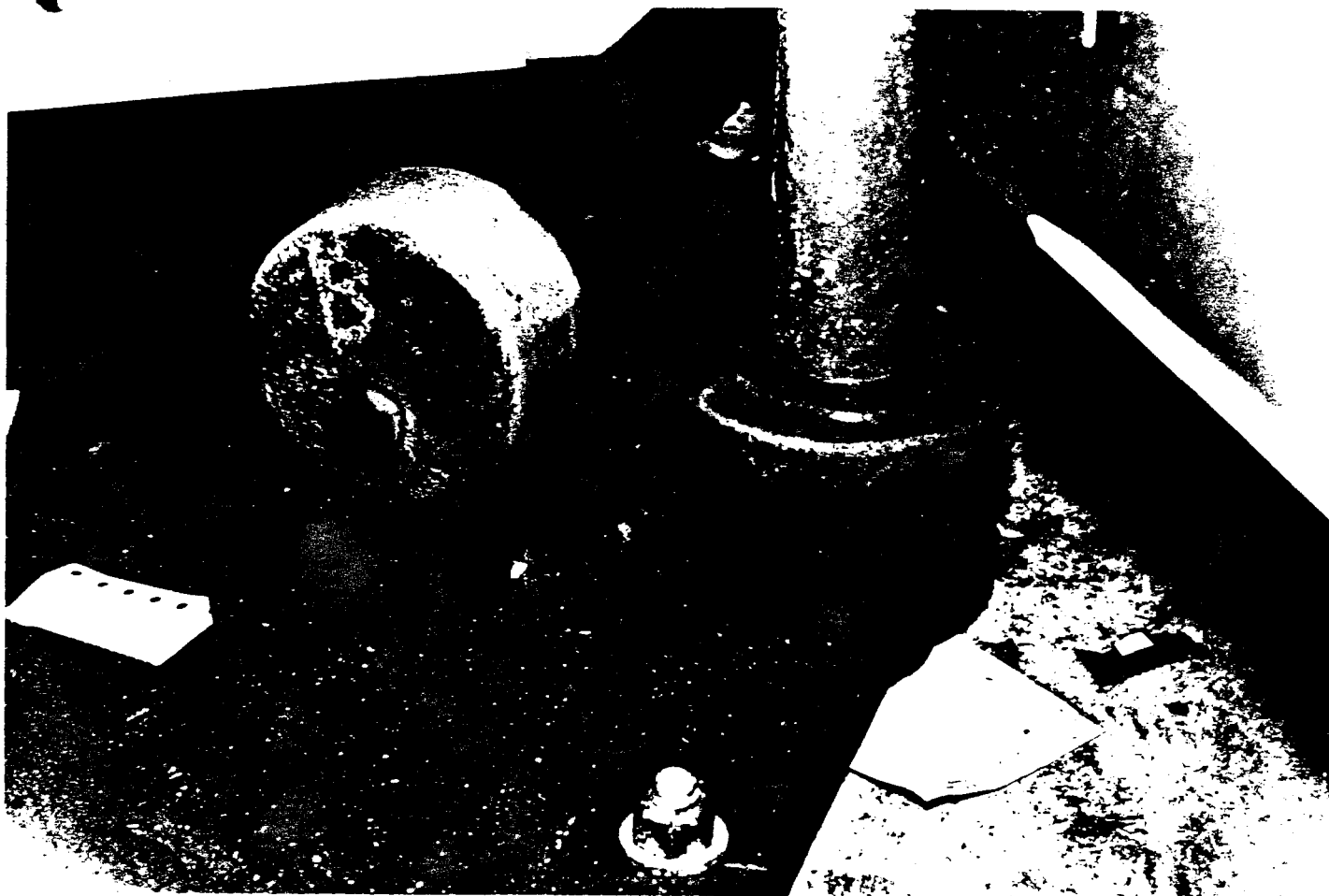
FIG 5.



Turnstile 'B'

C11

F SA



Pedal mechanism at Etnestale 'B'

C12

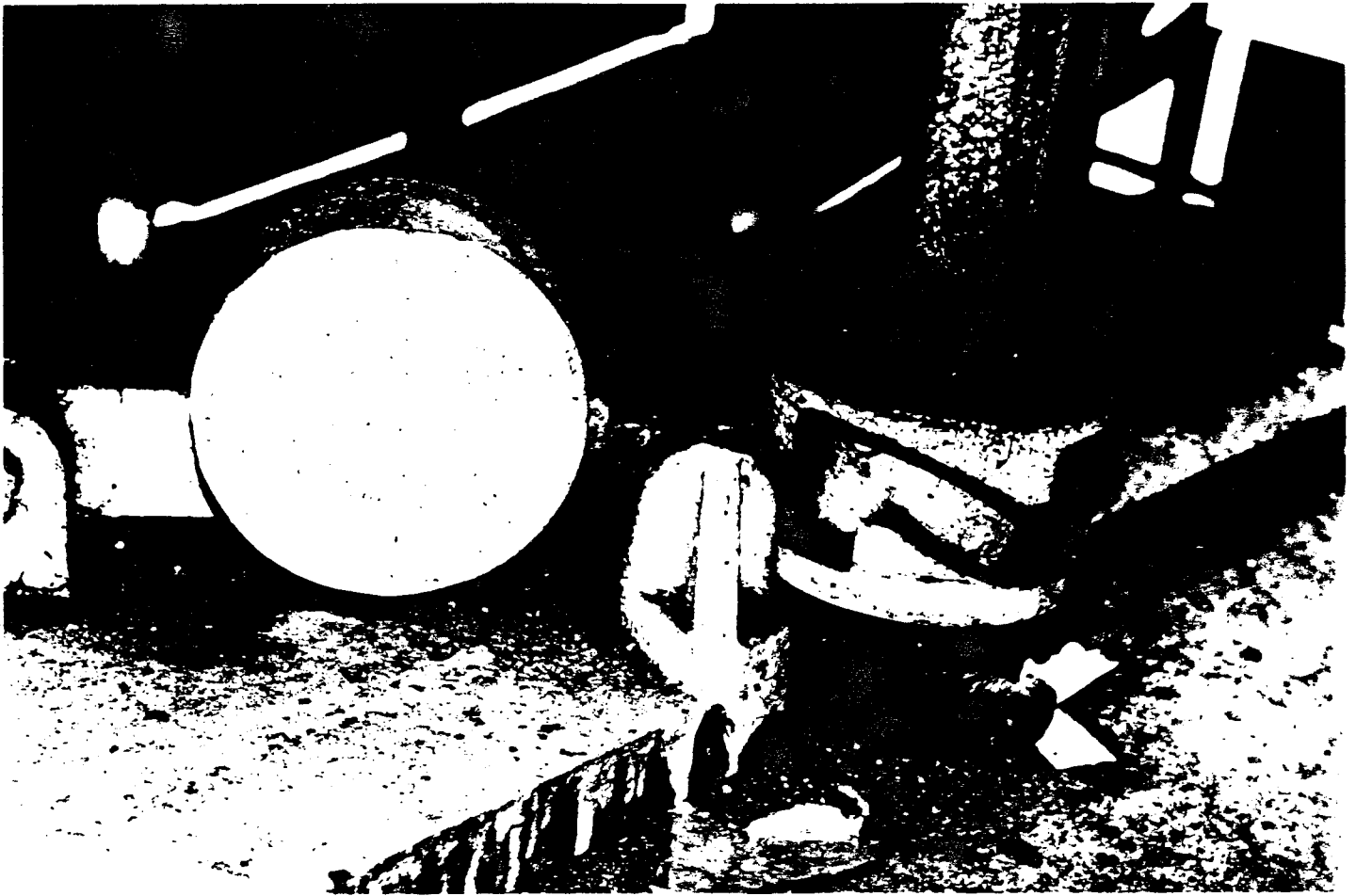
R66



Turnstile 'c'

C13

136A.



pedal mechanism at turnstile 'c'

214

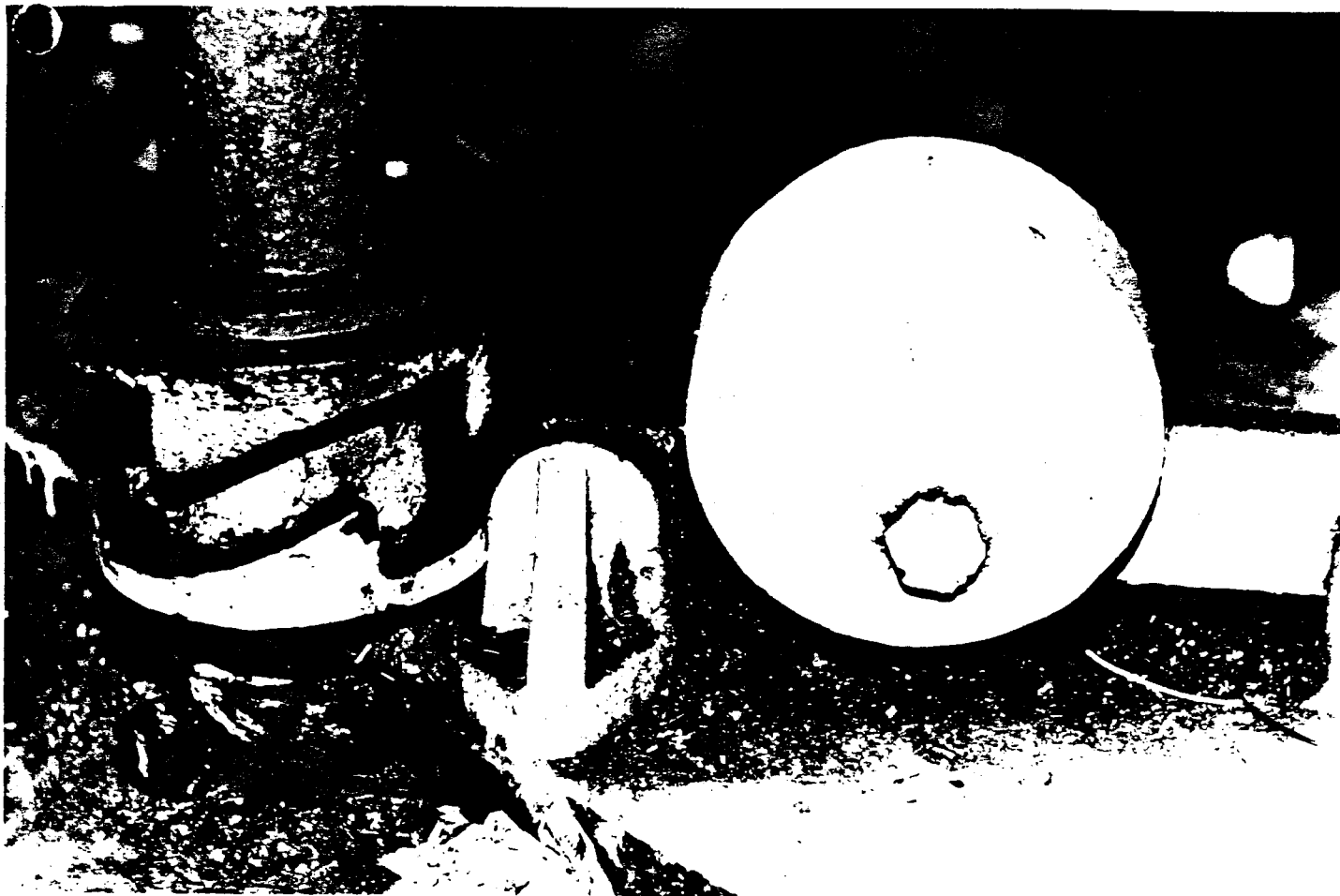
FIG 7



Turnstile 'D'

C15

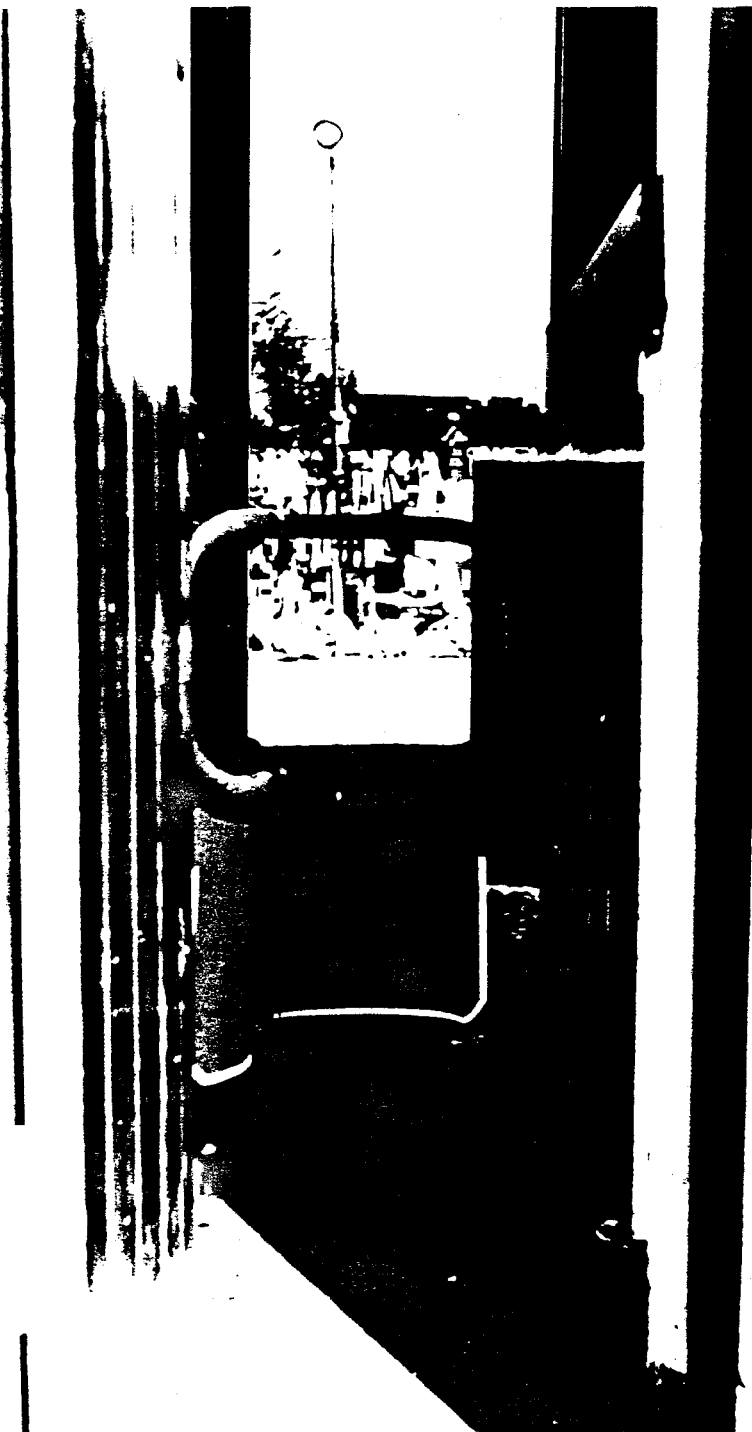
Fig 7A.



Pedal mechanism at turnstyle 'D'

C16

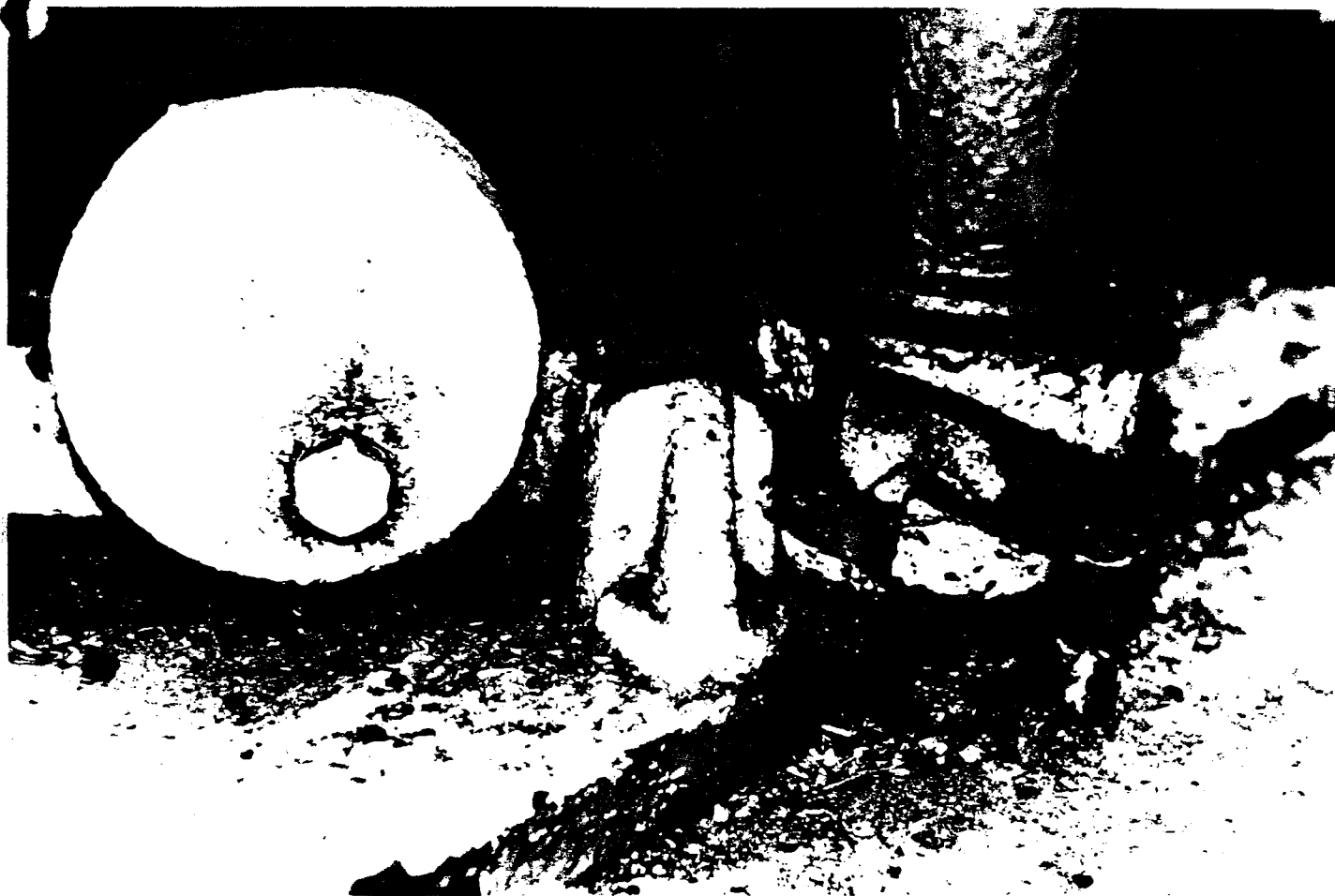
F68



Turnstile E.

C17

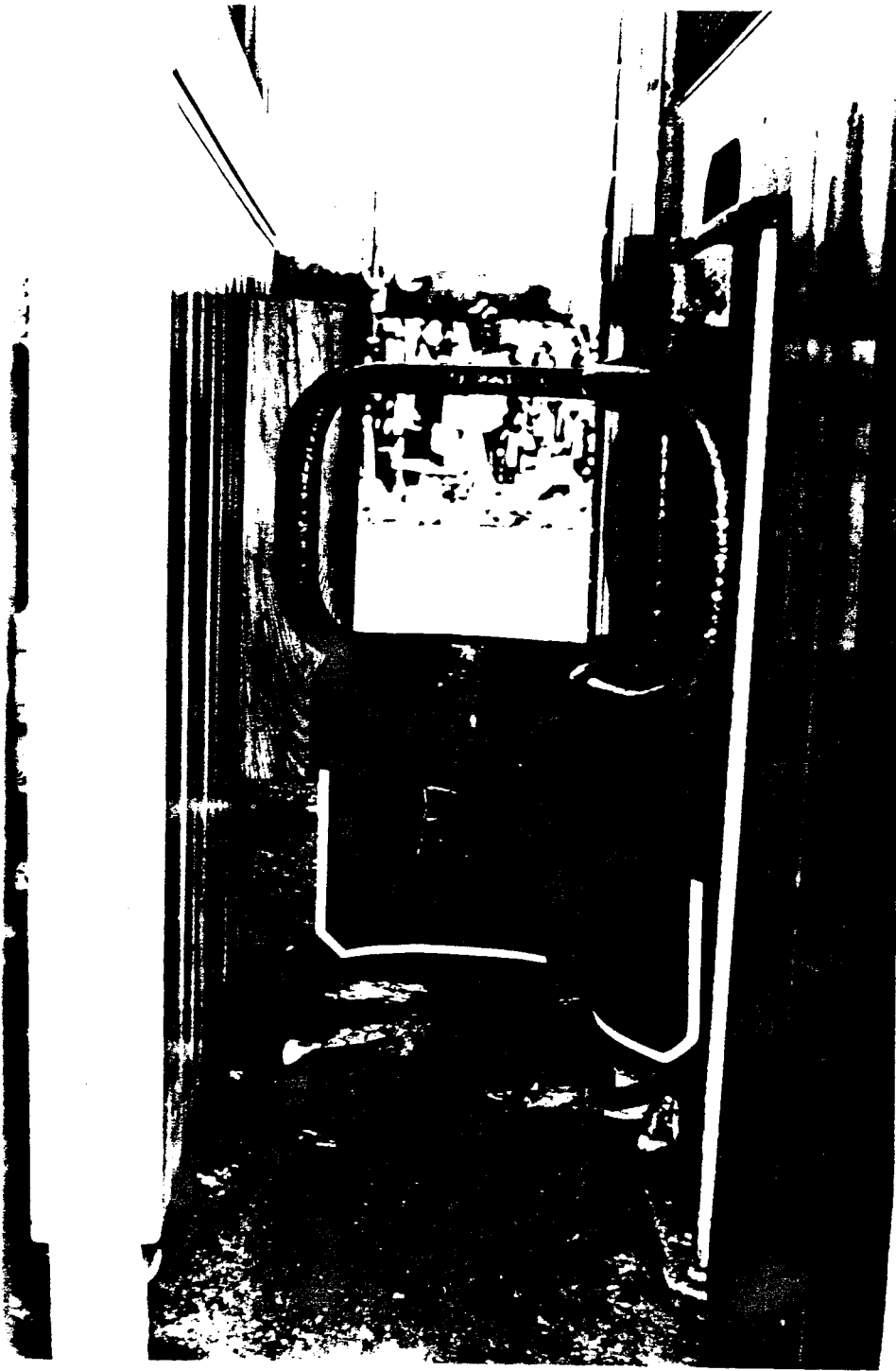
FIG 8A.



Pedal mechanism at turnstile 'E'

C18

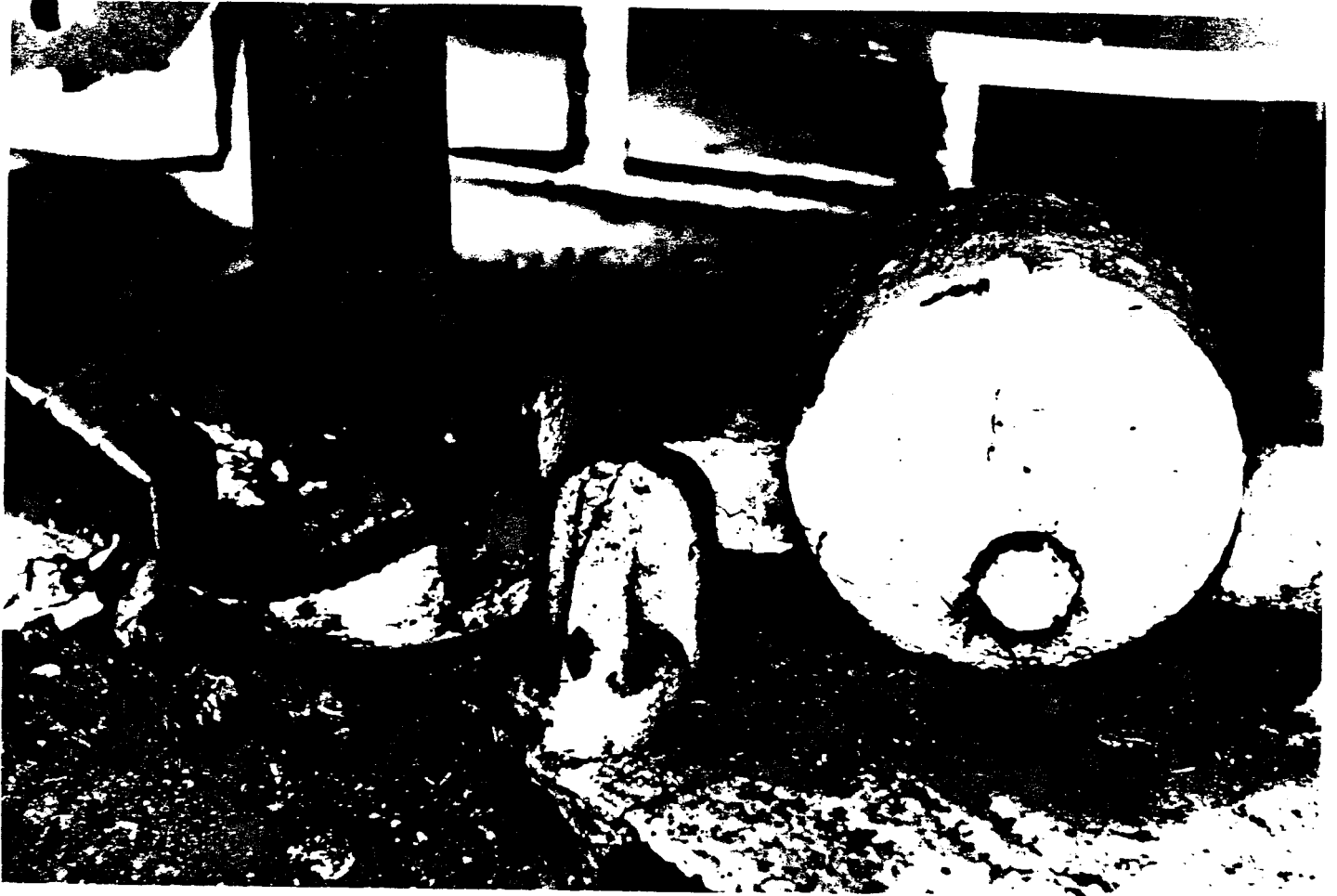
F69.



Turnstile 'F'

C19.

FIG 9A



Pedal mechanism at turnstile. 'F'

220

Ag10



Turnstile 'G'

C21.

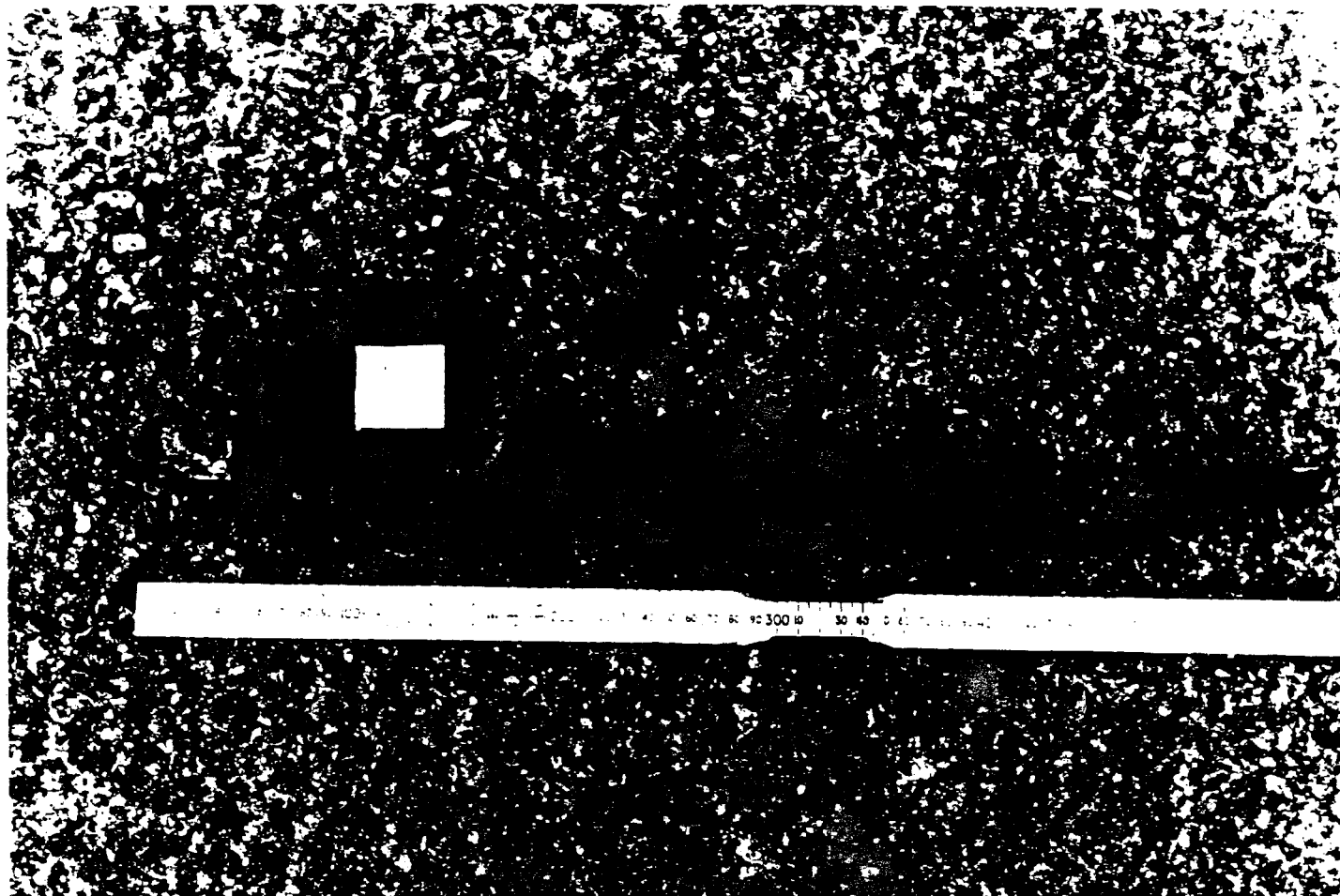
FIG 10A



Pedal mechanism at turnstile 'G'

C22

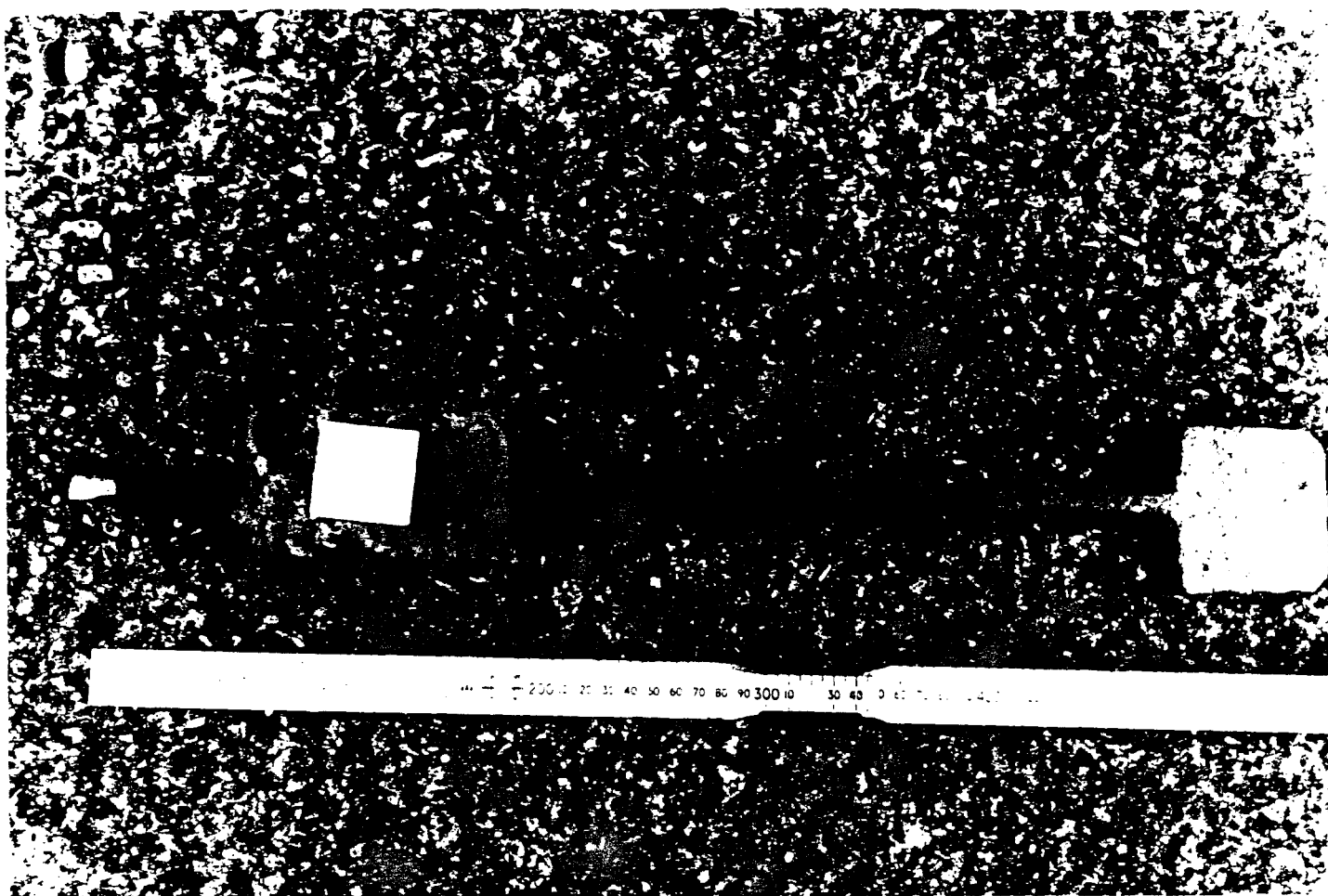
FIG 11



Side View of Pedal 'B.'

B3

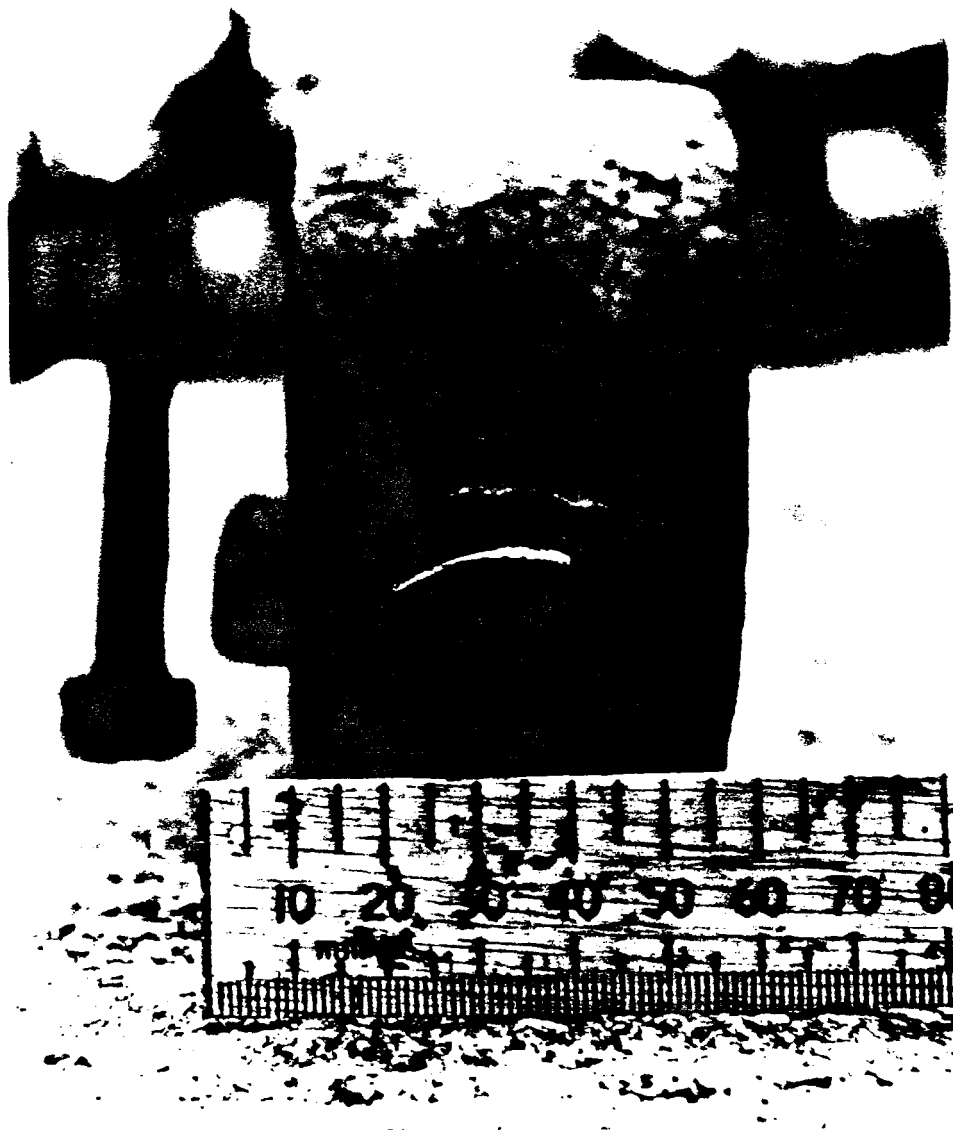
FIG 11A.



Plan View of Pedal 'B'

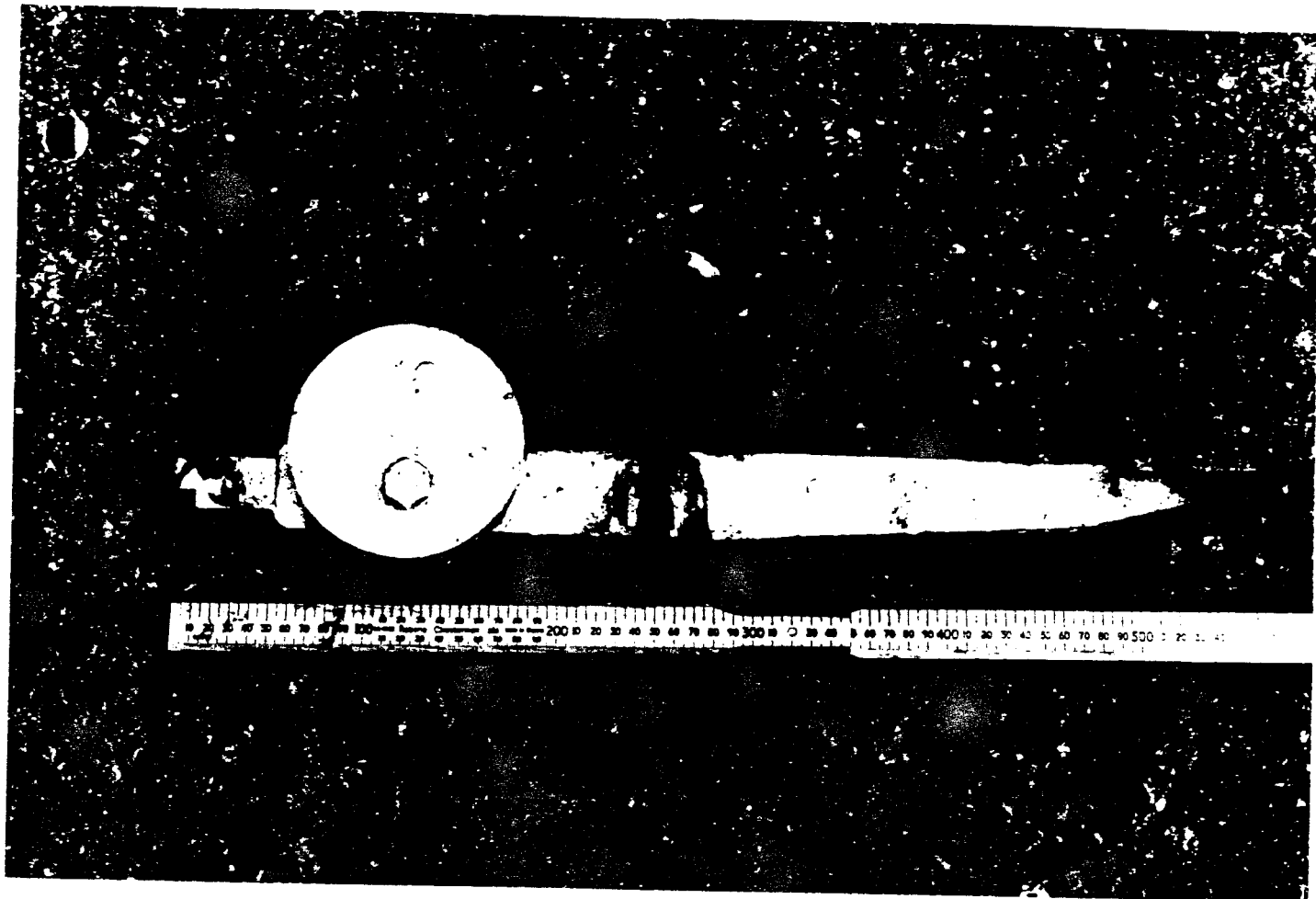
B4.

FIG 11B



End View of Pedal 'B' Showing Near B1

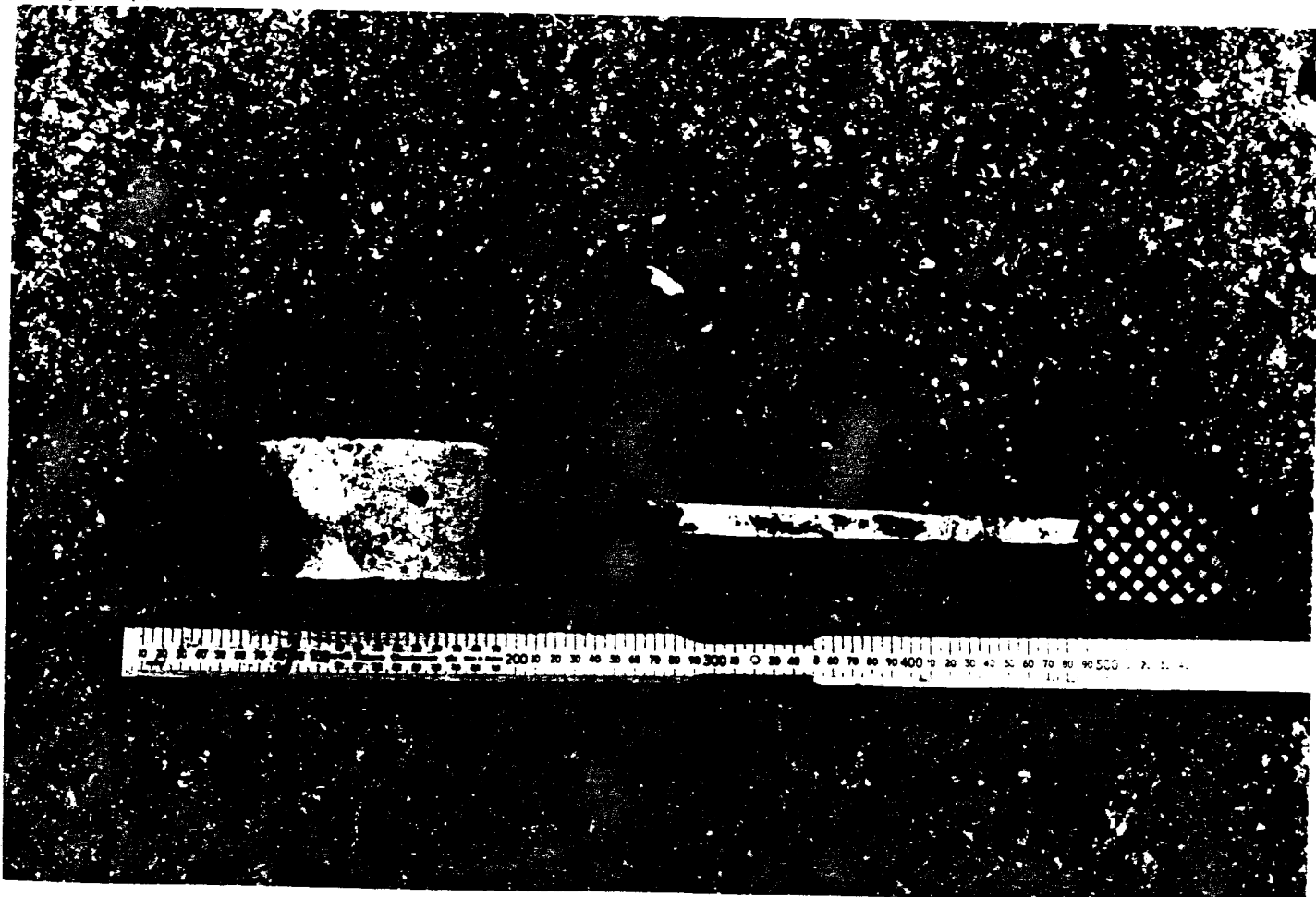
FIG 12



Side View of Pedal 'C'

C23

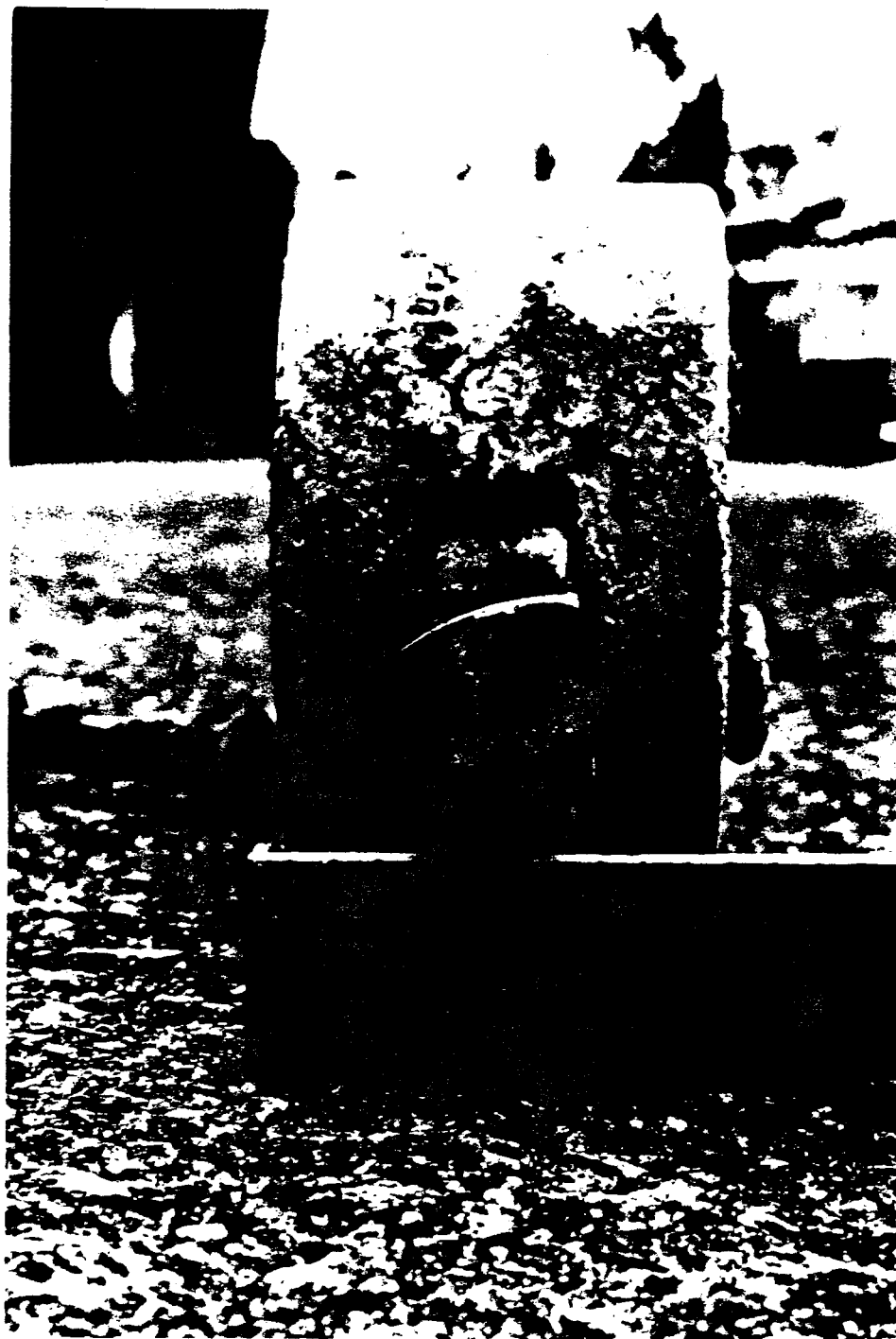
FIG 12A



Plan View of Pedal 'C'

C24

FIG 12B.



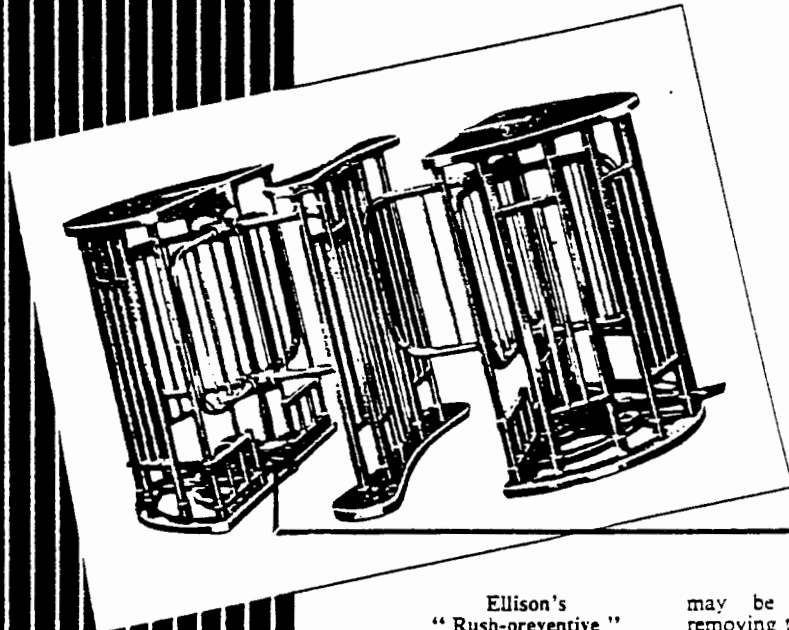
End View of Pedal 'C'

C24A

14/M/10/54 APPENDIX 1.
 Received from Major Turnstiles
 on 8th May 1954.

ELLISON'S

HEAVY DEEP STRAIGHT ARM TURNSTILES



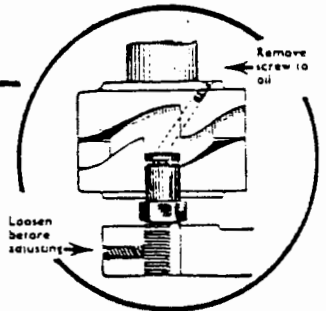
The illustration shows two registering Turnstiles and one Barrier.

This type of Turnstile is of a very pleasing design and is generally used at Zoological Gardens, Museums, Art Galleries, etc., where there is a steady flow of people and not sudden rushes as at football matches.

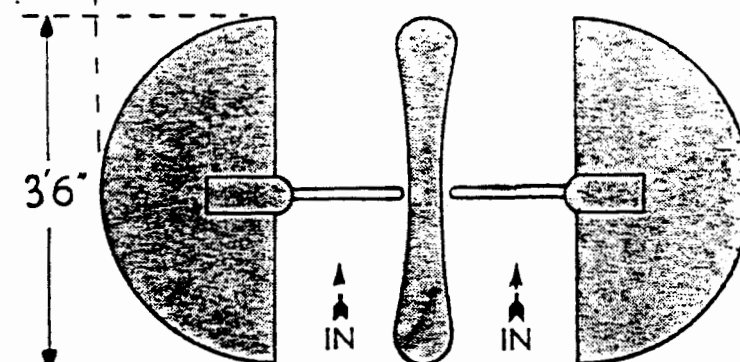
It can be supplied either registering, controlled by foot-lever, or non-registering for exit only.

**Ellison's
"Rush-preventive"
Footstep Motion.**
 This footstep is fitted to all our turnstiles and ensures free rotation of the spindle on ball bearings which

may be lubricated by removing the oiling screw. The spindle may be raised or lowered to compensate for wear by adjusting the hexagon nut as shown.



6' 10"



Height overall 3' 5".

Approximate Weights:
 Turnstiles 4 cwt. each.
 Barriers 2 cwt. each.

Prices on
 application.

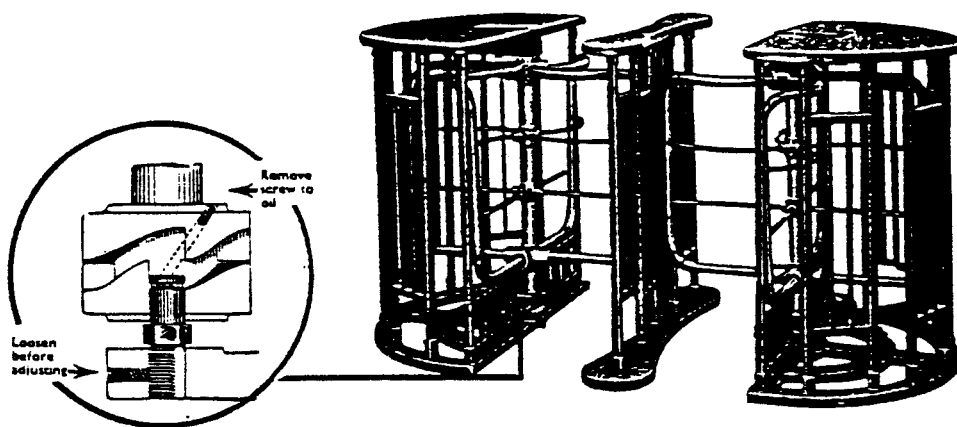
W. T. ELLISON & COMPANY LIMITED

Turnstile Specialists

323 BOLTON ROAD · PENDLETON · SALFORD 6 · LANC'S
 Telephone: Pen 2030 Telegrams: Turnstiles, Manchester

Series No. 7.

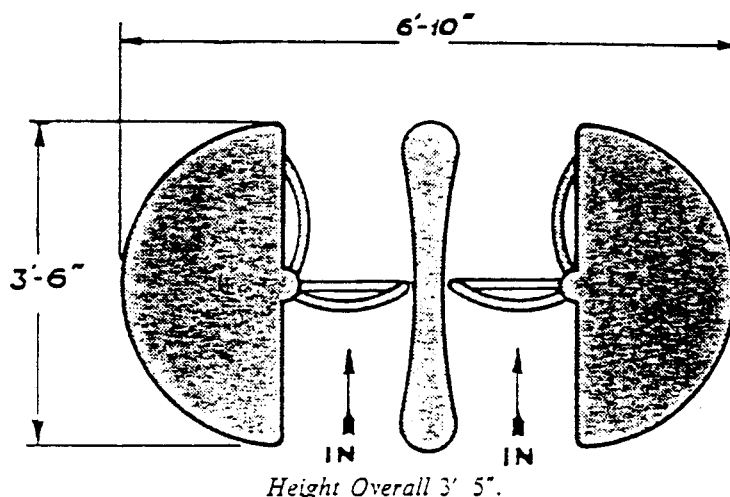
ELLISON'S



Ellison's "Rush-preventive" Footstep Motion.

This footstep is fitted to all our turnstiles and ensures free rotation of the spindle on ball bearings which may be lubricated by removing the oiling screw.

The spindle may be raised or lowered to compensate for wear by adjusting the hexagon nut as shown.



The illustration shows two registering Turnstiles and one Barrier. This type of Turnstile has been specially designed with extra deep convex arms to prevent creeping underneath and also more than one person passing through for each payment. They are most effective in separating the crowd into units and are highly recommended where great rushes are anticipated.

Can be supplied registering only, controlled by footlever, or non-registering for exit only.

Approximate Weights:—

Turnstiles 4 cwt. each.

Barriers 2 cwt. each.

Prices on application.

Series No. 6.

W. T. ELLISON & COMPANY LIMITED

Turnstile Specialists

323 BOLTON ROAD
Telephone: Pen 2030

PENDLETON

SALFORD 6

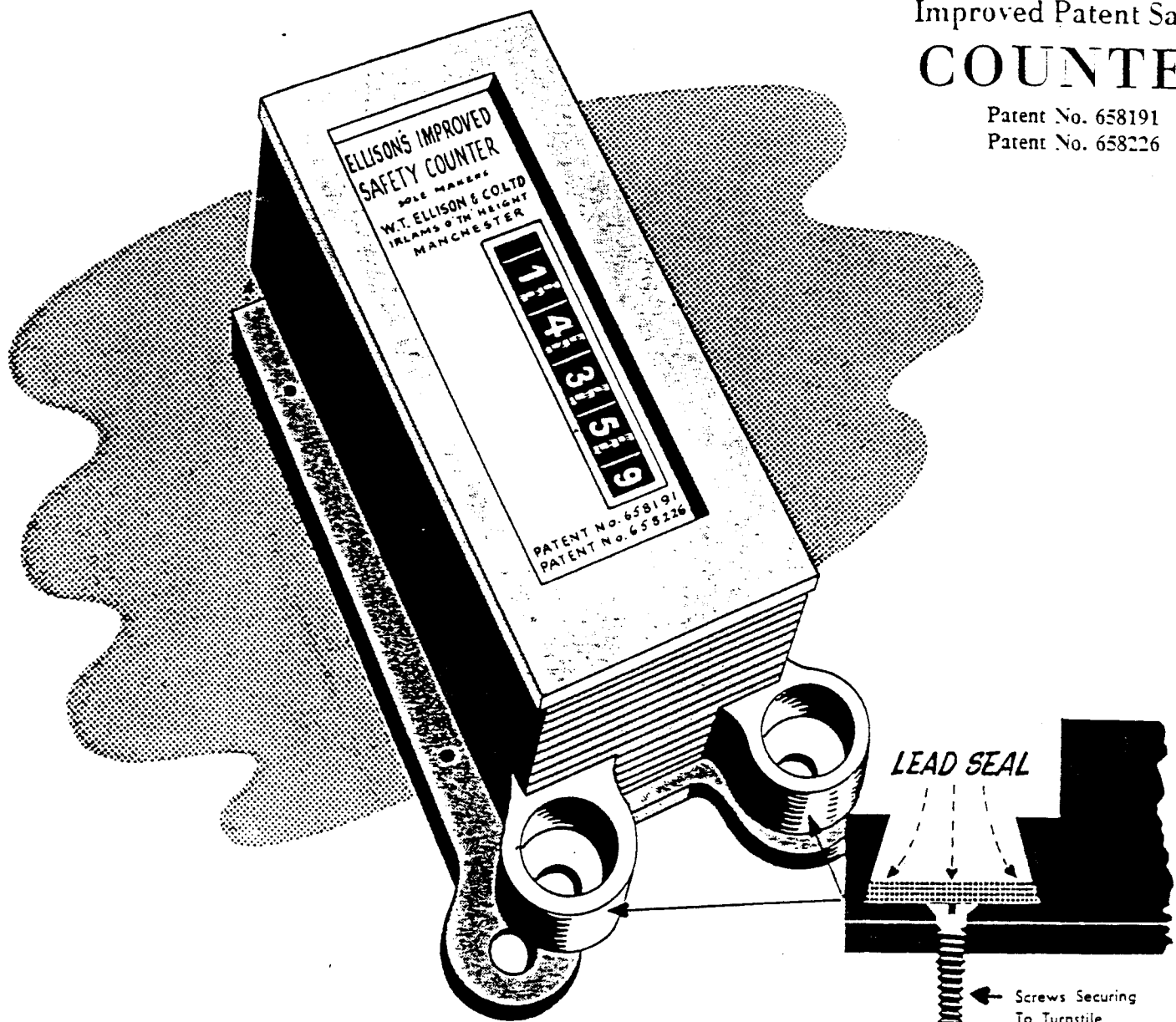
LANCS

Telegrams: Turnstiles, Manchester

ELLISON'S

Improved Patent Safety COUNTER

Patent No. 658191
Patent No. 658226



Made in our own Works—strongly constructed, reliable and easily read.

The cover and base are provided with two apertured lugs through which a screw is passed—thus securing the counter in position on the turnstile. Provision is made for scaling in accordance with the requirements of the Inland Revenue Authorities, so that any tampering with the counter cannot be concealed.

Prices on application.

W. T. ELLISON & COMPANY LIMITED

Turnstile Specialists

323 BOLTON ROAD
Telephone: Pen 2030

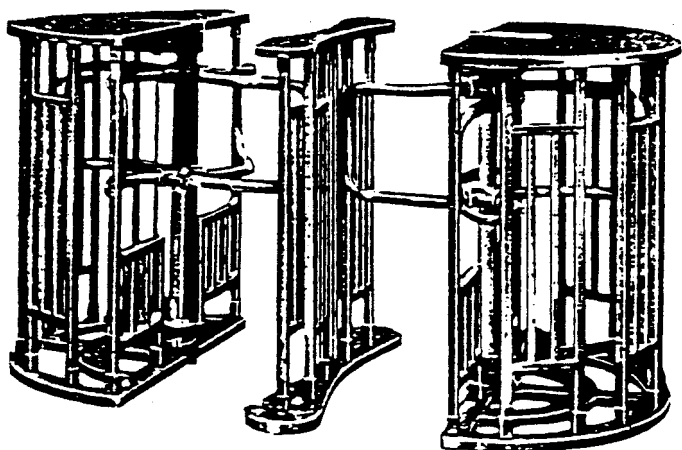
PENDLETON

SALFORD 6

LANCS

Telegrams: Turnstiles, Manchester

ELLISON'S



Heavy Convex Arm Turnstiles

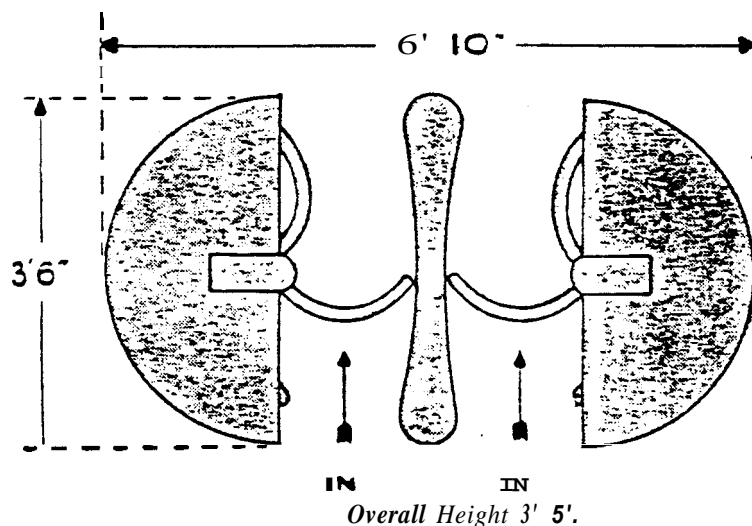
The illustration shows two registering Turnstiles and one Barrier. This Turnstile has been specially designed to prevent more than one person passing through for each payment. It proves its efficiency where great rushes have to be coped with, as it is most effective in separating the crowd into units.

Approximate Weight:—

Turnstiles, 4 cwt. each; Barriers, 2 cwt. each.

Prices on application.

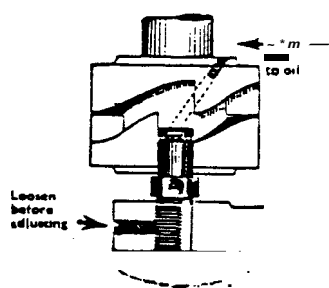
Can be supplied either registering, controlled by footlever, or non-registered for exit only.



ELLISON'S "RUSH-PREVENTIVE" FOOTSTEP MOTION.

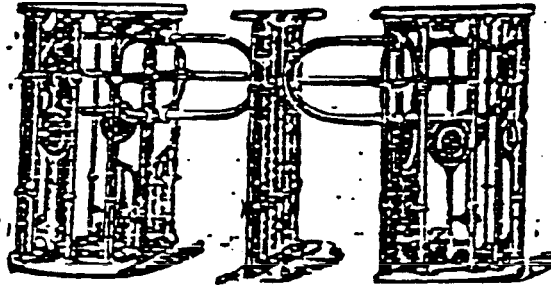
This footstep is fitted to all our Turnstiles and ensures free rotation of the spindle on ball bearings which may be lubricated by removing the oiling screw.

The spindle may be raised or lowered to compensate for wear by adjusting the hexagon nut as shown.



RUSH PREVENTIVE ELLISON'S PATENT- **TURNSTILES** With All Latest Improvements

THE
ONLY
RELIABLE
MACHINE.



BUY
NO,
OTHERS.

Nomatter how cheap a Turnstile may be, it is NO USE unless ACCURATE
ABSOLUTELY UNTAMPERABLE

Are unequalled for DURABILITY, ACCURACY, and FINISH.

The following List of Club and Racecourses, among others, that have
been supplied by us will show that we are the Leading Makers of
Turnstiles, and have a world-wide reputation.

Racecourses.	Association Football Clubs.		
Manchester	Barnsley	Aberdeen	
Haydock Park	Hull City	Scottish	
Birmingham	West Bromwich A	Football Union	
Chester	Southampton	Hamilton	
Keele Park	Preston North E.	Academicals	
Aintree	Wolverhampton W.	Heart of	
Ludlow	Leeds City	Midlothian, &c.	
Stockton	Birmingham	Irish	
Redcar	Brierley Hill A.	Football Clubs.	
Leicester	Middlesbrough	Glentoran	
Hooton Park, &c.	Crewe Alexandra	Distillery	
Cricket Clubs.	Newcastle United, &c.	Cliftonville	
Lancashire County		Shelbourne	
Burnley	Scottish	Belfast Celtic	
Somerset	Football Clubs.	Bohemian, &c.	
Worcester	Celtic	Rugby	
Leicester	Kilmarnock	Football Clubs.	
Leeds, &c.	Queen's Park	Salford	
Athletic	St. Mirren	Leicester	
Grounds.	Glasgow Rangers	Broughton Rngs	
Eanley Park	Falkirk	Oldham	
Burnley Land &	Morton	Warrington	
Athletic Co. Ltd.	Port Glasgow	Runcorn	
Leeds Ath. Grnds.	Dundee	Hull Kingston R.	
Lambeg (Ireland), &c.	Airdrieonians	Swinton	
	Clyde	Portsmouth, &c.	
	ALSO		
Glasgow Underground	Victoria Pier, Blackpool	Manchester Cor. Baths	
Clyde Navigation (Tun'l)	New Brighton Tower	Blackpool Tower Co	
Glasgow New Sub. Ry Co	Liverpool Overhead Ry.	Chester Horticult. Soc.	
Victoria Pier, Colwyn Bay	North Pier, Blackpool	Central Pier, Blackpool	
Southport Pier	Swinton Baths	Wallasey Ferry	
Bridlington Parade	Blackburn Baths	Stretford Baths	
St. Annes Pier	Altrincham Baths	Elland Baths, &c.	

Festival of Empire, Crystal Palace, 1911. 108 Machines.

Prices on application,

Send for Testimonials.

W. T. ELLISON & CO., Ltd., ENGINEERS,

IRLAMS-O'-TH'-HEIGHT, MANCHESTER

Telegram and Cable: "ELLISON L.T.D., IRLAMS-O'-TH'-HEIGHT".
(Three words). National Telephone: No. 20, IRLAMS-O'-TH'-HEIGHT.