Close
7/1078

Sectt. II-27—60,004—17-11-48

E.&.P.H. (194a.) Department.

M.S. SERIES.

| |
|---|
| ~~C.O.~~ Letter No. 2686. Edn. |
| Dated 25. 8. 48. |

[Despatch Abstract.]

Model lists of equipment for Engg. Laboratories

## Back Papers.

| G.O. | No. | Department. | Date. | G.O. | No. | Department. | Date. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

## Further Papers.

| G.O. | No. | Department. | Date. | G.O. | No. | Department. | Date. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

30802

No.F.6-15/47-Ed. (I.P.)

Government of India.
DEPARTMENT OF EDUCATION.

New Delhi 3, the 11th April, 1947.

Model Lists of Equipment for Engineering Laboratories.

Dear

You may be aware that a number of new Technical Institutions are expected to be set up in the near future in many provinces and States. It seems, therefore, necessary, and you will no doubt agree with us, that the preparation of model lists of equipment for laboratories is a task which has to be taken up without further delay. Such lists cannot be prepared without your co-operation, advice, and suggestions which I am sure you will be agreeable to let us have.

I enclose herewith, in duplicate, provisional lists of equipment which may be considered to be the required minimum standard basic equipment in kind and quantity for the following laboratories of Institutions of University rank :-

| | | |
|---|---|---|
| 1. | Building (including surveying) | 4 pages |
| 2. | Electrical Engineering | 5 " |
| 3. | Hydraulics. | 1 " |
| 4. | Heat Engines. | 2 " |
| 5. | Mechanics and Engineering Models. | 6 " |
| 6. | Metallurgy. | 7 " |
| 7. | Production Engineering. | 3 " |
| 8. | Radio and Radio Tools. | 14 " |
| 9. | Strength of Materials | 2 " |
| 10. | Workshop Practice | 6 " |

The equipment listed do not include research apparatus or expensive single items such as cyclotrons, radium, high-voltage apparatus, etc. The inventories have been drawn up on the basis of teaching practice in British Institutions and may, therefore, require to be altered to suit Indian practice. The inventories have been

compiled .....

DIRECTOR OF PUBLIC INSTRUCTION
12 MAY 1947
MADRAS

compiled from British and American catalogues and the prices indicated are approximately those prevailing in 1938.

I hope you may find the list useful for comparison with those which your Institution possesses and in the light of your long experience advise me as to what changes should be made to suit our own practice.

I also hope that you would not mind returning the second copies of the lists marking on them

(a) the items which you do not possess by .....(N)

(b) the items which you possess but which fall short of the number specified in the list by .....(R)

Above all, I should like to have your considered opinion on the inventories as to their adequacy and also to have your views as to what additions and alterations should be made before we finally print the lists for circulation to all educational authorities concerned.

Similar lists for science subjects are also under preparation.

Your reply latest by the first week of May will be greatly appreciated.

Yours Sincerely,

S. R. Sen Gupta 31/3/47

( S.R.Son Gupta )
Secretary,
All-India Council for Technical Education.

To

A'1 Copy with a set of lists for information to Provincial Governments and Universities concerned. (A)

S R Sen Gupta 31/3/47

( S.R.Son Gupta )
Secretary,
All-India Council for Technical Education.

DDH(A)
This is only a copy sent to this Govt. for information. The papers may be lodged after perused by the D.P.I. no.

Vide A above

DHL 250 CPS.29/3/47"

S (W) D.P.I

1. R.G.P.S.Fairbairn, Esq., B.Sc.(Glas.),
Principal, Delhi Polytechnic,
Delhi.

2. Samiullah Shah, Esq., B.Sc.,
Principal, Engineering College,
Osmania University,
Hyderabad Deccan.

3. T.H.Mathewman, Esq.,
Principal, College of Engineering and Technology,
Aligarh University, Aligarh.

4. Major D.L.Deshpande, B.Sc.(Hons.),
Principal, College of Engineering,
Travancore University, Trivandrum,
Travancore.

5. B.D.Rari, Esq., M.A.(Cantab),
Principal, Thomason College of Engineering,
Roorkee, U.P.

6. M.K.Kewalramani, Esq., M.A.,
Principal, N.E.D. Engineering College,
Karachi.

7. P.N.Joshi, Esq., B.A.(Hons.),
Principal, Victoria Jubilee Technical Instt.,
Matunga, Bombay.

8. B. Prasad, Esq., M.Sc.,
Principal, Bihar Engineering College,
Patna.

9. Dr. S.K. Mitra,
Offg. Head of the Dept. of Applied Physics,
University College of Science and Technology,
Calcutta University, Calcutta.

10. N .N.Sen, Esq.,
Principal, Bengal Engineering College,
Howrah, (Sibpur),
PP.O. Botanic Garden.

11. Dr. Ing. T.Sen,
Principal, College of Engg. & Technology,
P.O.Jadavpur, Calcutta.

12. Rai Sahib A.C.Sahgal,
Principal, Kalabhavan Technical Institute,
Baroda.

13. J.A.Turaporavala, Esq.,
Principal, College of Engineering,
Poona.

14. A.Viswanath, Esq., B.E.(Mys.),B.Sc.(Hons.)Lond.,
Principal, College of Engineering,
Mizagapatam, Coconada, Madras.

15. The Principal,
Engineering College,
Anantpur, Madras.

16. Dr. J.J.Rudra, M.B.E.M.A.,B.Sc.,
Principal, College of Engineering,
Guindy, Madras.

DIRECTOR OF PUBLIC INSTRUCTION
1 FEB 1947
MADRAS

3

P.T.O.

17. M.Sen Gupta, Esq., B.Sc.(Cal.) B.Sc.(Engg.),
Principal Engineering College,
Benares Hindu University,
Benares.

18. Dr. Daya Swarup, Ph.D.,
Principal, College of Mining & Metallurgy,
Benares University,
Benares.

19. J.B.S utcliffe, Esq.,
Principal, Birla Engineering College,
Pilani, Jaipur.

20. Sir J.C.Ghosh, Kt. D.Sc., F.N.I.,
Director, Indian Institute of Science, Bangalore.

21. The Principal,
Punjab College of Engineering & Technology,
(Maclagan Engg. College) Mogalpura,
Lahore.

22. E.K.Ramawami, Esq., B.Sc.(Lond.),
Principal, College of Engineering,
Bangalore.

23. Dr. K.C.Chakko, M.I.E.(India),
Head of the Dept. of Engg. & Technology,
Annamalai University,
Annamalainagar, S .India.

—

11 Jul 1947

D.O.F.6-15/47-E.III(A).
Government of India,
Department of Education,
New Delhi 3, the 2nd July, 1947.

SUBJECT: Model Lists of Equipment for Engineering Laboratories.
Our Reference : F.6-15/47-E.III(DP), dated the 11th April, 1947.

5-6683

Dear Sir,

I am desired to refer to the above mentioned letter forwarding the lists of Equipment for Engineering Laboratories, and to request that the despatch of a reply to it may please be expedited.

Yours truly,

(B.Sen),
for Secretary,
All-India Council for Technical Education.

To

All the Principals of the Engineering Colleges in India.

P.T.O.

6

26/7/7

-:(2):-

Copy forwarded to the Provincial Governments, Minor Administrations and all Universities with the request that the comments, if any, may kindly be expedited.

By order,

(B.Sen), 1/7/47
for Secretary,
All-India Council for Technical Education.

E.P.H.(A)

Memo. No. 30802-2/47A Edn dated 18-7-47.

'THAKAR'
80/1.7.47/D.

Sub:- Model lists of equipment for Engg. laboratories.

p2-b above c.no.56683 from the Govt. Dept. of Edn. 76-15/47 E III (A) dated 2.7.47.

The D.P.I. is requested to expedite his reply to U.O.Note.No. 30802-1/47A dd. 10.5.47 on the subject noted above.

To the D.P.I.
(with copy of p1-2 ante)

6/15.7.47

TS/7/47

6/7/47

1

C.F. 304.

OFFICE OF THE S

Date 3/7 194 Hours Minutes 9 A

TELEPHONIC MESSAGE.

From D.P.I | To The Secy Planto

Ref: Govt. Memo 30802-2/47-A Edn of 18.7.47 re: Model list of Equipment for Engineering laboratory

The Model lists have been circulated to the principal of Engg. Colleges & and a reply will be sent to govt on receipt of the principals remarks. E.P.H.(A)

The D.P.I. may be reminded next on 1.9.47

28/7/47

6
29.7.47

28/7/47

Please write on both sides.

2

6 A 6 9

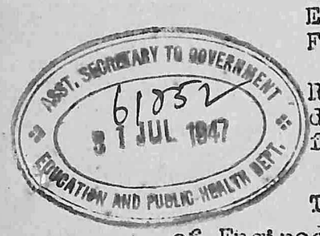
Post Copy of Telephonic Message dated 28th July 1947.

From

The Director of Public Instruction, Madras

To

The Secretary to the Government of Madras,
Education and Public Health Department,
Fort St.George, M a d r a s.




Reference:-Government Memorandum No.30802-2/47-A Edn., dated 18.7.1947 regarding Model Lists of Equipment for Engineering Laboratories.

---

The Model lists have been circulated to the Principals of Engineering Colleges and a reply will be sent to Government on receipt of the Principal's remarks.

R. Narasimhan

FOR DIRECTOR OF PUBLIC INSTRUCTION.

ks.29.7.

29/7

E.P.4.(A)

The D.P.I. may be reminded next on 1.9.47.

1.8.47

1/8/47

E.P.H. (A)

3rd (3)/49

U.O.Note No. 30802-3/47 H dated 6-9-47.

Sub: Model lists of equipment for Engg. laboratories.

Ref c.no. 61852 from the D.P.I. P.C. 9-7-47 dated 28.7.47.

The D.P.I. is requested to expedite his reply to U.O.Note No. 30802-1/47 A Edn. dated 10.5.47.

To the D.P.I.

4-9-47

5/9/47

SDO.

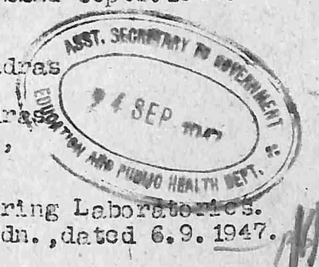
A 8 13.

Post copy of Telephonic Message dated 22nd Septr. 1947.

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From The Director of Public Instruction, Madras

To The Secretary to the Government of Madras,
Education and Public Health Department,
Fort St. George, M a d r a s.




75703

Sub:-Model Lists of Equipment--Engineering Laboratories.
Ref:-Government U/O.No. 30802-3/47-A Edn., dated 6.9.1947.

---

The remarks of the Principal, College of Engineering, Guindy in the matter are awaited. A reply to the Government U.O.Note will be submitted on receipt of his remarks.

K. Narayana

For Director of Public Instruction.

ks. 23.9.

23/9

E.P.H.(A)

This may be seen till 26-10-47.

26.9.47

26/9/47

27-9-47

E.P.H.(A)

U.O. Note No. 30802-4/47 A Edu. dated 16-11-47

Subj: Model lists of equipment for Engg. laboratories.

Ref. to U.O. No. 15703 from the D.P.I. P.C. dt. 22-9-47.

The D.P.I. may now be requested to expedite his reply to U.O. Note No. 30802-1/47 A Edu. d. 10.5.47.

To The D.P.I.

14-11-47

15/11/47

E.P.H.(A)

U.O.Note. No. 30802-5/47 A Edu dated 20-1-48.

Sub: Model lists of equipment for Engg. laboratories

Ref: E.P.H.u.o. 30802-4/47 A Edu. d. (6-11-47).

The D.P.I. may be requested to submit expeditiously with his remarks the G.of I., Communication No. 6-15/47 E dated 11-4-47 sent to the Director with E.P.H.u.o. 30802-1/47 A Edu. d. (10.5.47), as the letter of the G. of I. referred to has remained unreplied for more than nine months.

To the D.P.I.

17-1-48

9/1/48

EDUCATION DEPARTMENT.

From

Sri D.S.Reddi, M.A.,(Dxon).,
DIRECTOR OF PUBLIC INSTRUCTION,
MADRAS.

To

The Secretary to Government,
Education and Public Health Department.

R.O.C.NO.292-A2/47 dated 28..1..1948.

SIR,

SUB: COLLEGES - Engineering - Model Lists of Equipment for Engineering Laboratories.
REF: Government U.O.Note 30802-5/47-A Edn.d/20.1.1948.

@£@

The model lists are still with Dr.Rudra, Principal, College of Engineering, Guindy for scrutiny and remarks. They will be resubmitted to Government as soon as his reply is - received.

for Director of Public Instruction.

Ram.29/1/48.

ASST. SECRETARY TO GOVERNMENT
30 JAN 1948
EDUCATION AND PUBLIC HEALTH DEPT.

E.P.H.(A)

The D.P.I. may be reminded next on 1.3.48

G.O. 22.

Education DEPARTMENT.

In reply, please quote number, date and short title.*

*Received* _____ *Registered* _____

From (Name) Sri D.S.Reddi, M.A., (Oxon).,

(Designation) Director of Public Instruction, Madras.

Post Box _____, (Station) _____,

*Telegraphic Address* _____

To

The Secretary to Government,
Education & P.H.Department, Madras.

ASST. SECRETARY TO GOVERNMENT 7 - FEB 1948 EDUCATION AND PUBLIC HEALTH DEPT. 9138

Roc.No. 292 A2/47, *dated* 5-2-1948. 19

Sir,

Sub: Equipment - Model lists - Engineering Laboratories - Remarks.

Ref: Government Memorandum No.30802 2/47-A Edn., dated 18-7-1947.

Enclosures _____

Spare Copies _____

The model lists sent to me for perusal with Government No.30802 A/47-1 Edn., dated 10-5-1947 are herewith resubmitted. They are drawn up on the basis of teaching practice in British Institutions. Presumably these institutions are what are known as "technical colleges" in England, for example, the Loughborough Technical College, Loughborough, Salford Technical College, London etc. These Colleges are similar to our polytechnics and prepare students for the ordinary National certificate and the higher national certificate examinations. They do not come up to University rank. In England the Colleges which are constituent or affiliated Colleges of Universities and University departments of Engineering are referred to as "University schools of Engineering" to distinguish them from Technical Colleges. The Colleges of Engineering in this Province are of the standard of University schools of Engineering in England and not of that of Technical Colleges. Unless the model lists are based upon the equipment of University schools of Engineering as they should be, the lists cannot be of any use to our Engineering Colleges.

2. In this connection Dr. Rudra, Principal, College of Engineering, Guindy has expressed the view that the equipment in our Engineering Colleges for routine work ought to be much more than in University schools of Engineering in United Kingdom for the reasons that the courses here are of four years' duration as against three years in U.K., that the students in our Engineering Colleges spend far more time, in practical work than those in British Universities, and that our Colleges have more students working in laboratories and workshops than they have in British Universities. Further it is necessary that our Engineering Colleges should have their workshops planned on a comprehensive basis in order that the students may be given adequate practical training, for there is a dearth of manufacturing establishments in this country where the students can receive practical training. To this end the workshop and Production Engineering section of the model lists should include more items of equipment of the latest type.

p.t.o.

22

: 2 :

3. The Principal and the Professors of the College of Engineering, Guindy are of the opinion, that the model lists under reference are far short of the requirements of Engineering Colleges of University rank. It would be possible to draw up a far better model list on the basis of the equipment of Engineering Colleges in India. The Principal and the Professors have so many suggestions to improve the model lists that it would amount to preparing a fresh list. However a sub-committee of Professors of the Engineering Colleges in this Province is drawing up a model list of equipment for the new Engineering Colleges and a copy of this list which will embody the additions and alterations necessary for the lists under reference, may be sent to Government of India when it is got ready.

4. In his letter dated the 11th April 1947, the Secretary of the All India Council for Technical Education has asked for some indication in the lists as to the availability or otherwise of the various items of equipment in the Laboratories at present. As some of the laboratories are still in the formative stage and as the model lists themselves do not embody all the requirements of an Engineering College of University rank, it may not be useful to mark the items which are either not available or in short supply.

for Director of Public Instruction.

k.h.6-2.

R
6-2-48

Copy to the D.P.I. (Ex. Secy) (× copy of Pp. 21-22 Sep.)

Letter No. 30802-b/47 Edn dated 19-2-48.

To the Secretary, All India Council of Techl. Edn., Ministry of Edn., Govt of India, New Delhi. (with endorse)

Sir,

Sub: Model lists of equipment for Engg. laboratories.

Ref: your No. 7.b-15/47 E III D.P. dated 11.4.47 directed

I am to enclose herewith a copy of the letter of the D.P.I. No. 292-A/47 dated 2/2/48 containing his comments on the model lists of equipment for Engg. laboratories, received with your letter read above, and to say that a copy of the model list of equipment for the new Engg. colleges that is being drawn up by a sub-committee of Professors of the Engg. colleges in this Province, referred to in para 3 of the D.P.I.'s letter will be sent to you, when ready.

12.2.48

17/2/48

p1-2 cf.

p21-22 cf.

p22 cf.

4

25

E.P.H.(A)

No 165/2/4

Memo. No. 30802-7/47 A Edn dated 15-4-48.

Subj. colleges - Engg. - Model lists of equipment for Engg college laboratories.

Ref: From the D.P.I. No. 292 A2/47 d. 5.2.48.

The D.P.I. is requested to state whether the model list of equipment for the new Engg. colleges reported to be under preparation by a Subcommittee of Professors of the Engg. college in this Province is ready, and, if so, to send a copy of it to the Govt.

To The D.P.I.

22-4-48

12/4/48

To Pt (A)

Memo. No. 30802-8/47 A Edn dated 11-6-48

Sub: Colleges - Engg. - Model lists of equipment for Engg. College Laboratories.

Ref: Memo. No. 30802-7/47 A Edn. d. 15.4.48.

The D.P.I. is requested to expedite his reply to the memo read above.

12/6

To The D.P.I.

9.6.48

11/6/48

C.F. 36.

EDUCATION **DEPARTMENT.**

*Received* ..... 19 *Registered* ..... 19

ASST. SECRETARY TO GOVERNMENT
17 JUN 1948
EDUCATION AND PUBLIC HEALTH DEPT.

44751

*Subject.*

COLLEGES - Engineering - Model lists of Equipment for Engineering College laboratories.

E.P.H.(A)

The D.P.I. may be reminded on 18.6.48.

16.6.48 OSM 19/6/48

ENCLOSURES.

No. .....

.....

Spare copies .....

ROC.No.248-A2/48

*Station* MADRAS, *Dated the* 14th June 1948

From (Name) Sri D.S. Reddi, M.A. (Oxon),

(Designation) Director of Public Instruction.

To The Secretary to the Government of Madras,

EDUCATION AND PUBLIC HEALTH Department.

Sir,

Reminder sent

REF: GOVERNMENT MEMORANDUM No.30802-7/47- A Edn., dated 15.4.48.

I have the honour to report that the preparation of the model list of equipment for the new Engineering Colleges by a Sub-Committee of Professors has not yet been completed and that a copy of the list will be submitted to Government, When ready. In this connection I submit herewith a copy of the letter Rc.33/SK/48 dated 9-6-48 from the Principal, College of Engineering, Guindy for the information of Government.

for DIRECTOR OF PUBLIC INSTRUCTION.

3 15/6.

P.T.O.

COPY OF:

R.C.33/SK/48 dated 9th June 1948 from The Principal, College of Engineering, Guindy, to The Director of Public Instruction, Madras.

Sub: Model list of equipments for Engineering College laboratories.

Ref: Your Proceedings Rc.245 A2/48 dated 28.4.48.

During the year 1947 the Expert Sub-Committee met twice and discussed in great detail the various aspects connected with the list of equipment required for the model Engineering laboratories. As a member of the above Sub-Committee, I attended the meetings along with the Consulting Architect to the Government of Madras and all points relating to Class rooms, Lecturer Halls, Drawing Halls, Administrative Block, Laboratories and Workshop, Hostel, Playgrounds equipment and machinery were discussed in great detail. It is however submitted that I am not able to trace any papers regarding the above from the files left by Dr.J.J. Rudra, former Principal of the College. I have therefore circularised to heads of Departments of this college to prepare a list of equipment required for their Department as a Model for the new Engineering Colleges. As the officers are now on vacation I expect the list will be ready after the reopening of the College. I shall submit the same early in July 1948.

Sd/**************
Professor-in-charge.
/TRUE COPY/

for DIRECTOR OF PUBLIC INSTRUCTION.

RAMU.15.6.48.

17 31 E.P.H-(A)

Memo. No. 30802-9/47 A Edn dated 29-9-48.
Sub: colleges. Engg.- Model lists of equipment for Engg. college laboratories.
C.no. 44751 from the D.P.I. No. 248-A2/48 d. 14-6-48.

The D.P.I. is requested to state when the further report promised in his letter read above may be expected.

To the D.P.I.

27.9.48/Ag 27/9/48

28/9/48

C.F. 32.

Education DEPARTMENT.

In reply, please quote number, date and short title.

ASST. SECRETARY TO GOVERNMENT
21 OCT 1948
EDUCATION AND PUBLIC HEALTH DEPT.

Received _____ Registered _____

From (Name)

(Designation) The Director of Public Instruction, T.P.H.(A)

Post Box _____, (Station) Madras. the D.P.I. may be reminded on 29-11-48.

Telegraphic Address _____

7487

To

The Secretary to Government,
Education & Public Health Department,
Madras.

Roc.No. 245-A2/48, dated 18-10-1948.

Sir,

Sub:- Colleges - Engineering - Model lists of Equipment - for Engineering College Laboratories.

Ref:- Govt. Memorandum 30802-9/47-A Edn., dated 29-9-48.

*********

The model lists of Equipment have not yet been received from the Principal, College of Engineering, Guindy. The preparation of these is reported to be engaging the attention of the Special Committee appointed by the Standing Advisory Board for Technical Education. The lists will be submitted

P.T.O.

ENCLOSURES _____

SPARE COPIES _____

34

to Government, on receipt.

Yours faithfully,

For Director of Public Instruction.

19/X.

IDS
19/10

Education Department.

From

The Director of Public Instruction,
Madras.

To

The Secretary to Government,
Education and Public Health Department,
Madras.

Roc.245 A2/48 dated 17-11-1948.

Sir,

Sub: Colleges - Engineering - Model lists of equipment for Engineering laboratories.

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Ref: Government Memo No.30802-9/47-A Edn., dated 29-9-48.

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ASST. SECRETARY TO GOVERNMENT
23 NOV 1948
EDUCATION AND PUBLIC HEALTH DEPTT.

In continuation of my letter to Government Rc.245 A2/48 dated 18-10-1948, I submit herewith for information a copy of the letter Rc.No.33 SK/48 dated 3-11-48 from the Principal College of Engineering, Guindy. The model lists will be submitted to Government on receipt from the Principal.

Yours faithfully,

for Director of Public Instruction.

KHR.19-11.

Copy of the Principal's letter read above.

19/X

---

The Sub-Committee consisting of the Principals of all Engineering Colleges in the Presidency appointed by the Special Committee of the Standing Advisory Board for Technical Education were requested to draw up a model list of equipment required for an Engineering College. The Principal of every college was allotted two or three departments and was requested to furnish a list of equipment necessary for these departments to be adopted as a model list. This Sub Committee met several times immediately after the meeting of the Special Committee mentioned above and discussed the model list prepared by each of the Principals. The Principals were then requested to finalise the lists and have them ready so that they can be consolidated. I have sent urgent reminders to the various Principals asking them to send their respective lists. The lists allotted to the Engineering College, Guindy are ready. As soon as the lists from other Engineering Colleges are received, a consolidated list will be sent immediately.

---

(True Copy)

for Director of Public Instruction.

19/11

36

T.P.H.(A)

Memo No. 30802-10/47 A Edn dated 29-12-48.

Sub: Colleges - Engg. - Model lists of equipment.

Fr on the D.P.I. No. 24 S-A2/48 d-17-11-48.

The D.P.I. is requested to expedite the further reply promised in his letter read above

To The D.P.I.

38

Rc. 245 A2/48

A/21

39

Office of the
Director of Public Instruction,
Madras, dated 18.1.1949.

From

The Director of Public Instruction,
Madras.

To

The Secretary to Government,
Education and Public Health Department,
Madras.

ASST. SECRETARY TO GOVT.
EDUCATION AND PUBLIC HEALTH
20 JAN 1949

Sir,

Sub:--Colleges- Engineering Colleges- Model list of equipment.

Read:--Govt. Memo No. 30802-10/47 A Edn. dated 29.12.48.

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5463

The model list of equipment has not yet been received from the Principal, College of Engineering, Guindy. It will be submitted to Government as soon as it is received from the Principal who is being reminded in the matter.

Yours faithfully,

For Director of Public Instruction.

Sou. 21/1.
Copy to the Principal, College of Engineering, Guindy.

G.P.H.(A)
The D.P.I. may be reminded again on 27.2.49.

26.1.49 26/1/49. 27/1/49

22

41 E.&.H.(A)

Memo.No.30802-11/47A Edn dated 4-3-49.

Sub: colleges- Engg.- Model list of equipment

p.39 c/f c.no.5463 from the D.P.I. No. 245 $A_2$/48 dt. 18-1-49.

The D.P.I. is requested to expedite the further reply promised in his letter read above.

To The D.P.I.

3-3-49

4/3/49

C.F. 32 (a).

A/23

43

Education Department

From (Name)

Designation The Director of Public Instruction,

Station Madras.

22429
21 MAR 1949

Received Registered

To

The Secretary to Government,
Education & Public Health Dept.
Madras.

Enclosures:

Rc. No. 245 A/48-1 dated 16-3- 1949.

Sir,

Sub:- Colleges - Engineering Colleges - Model List of Equipment.

Ref:- Govt. Memo No.30802-11/47-A. Edn., dated 4--3--49.

**********

The Model list of Equipment has not yet been received from the Principal, College of Engineering, Guindy. It will be submitted to Government as soon as it is received from the Principal who is being reminded again in the matter.

Yours faithfully,

For Director of Public Instruction.

MDS
18/3

Copy to the Principal, College of Engineering, Guindy.

16/3

The D.P.I. may be reminded on
28.4.49.

S.P.H.(A)

21.3.49

E.P.H.(A)

Memo. No. 30802-12/47 H Edn dated 4-5-49.

Sub: Colleges - Engg. — Model list of equipment

From the D.P.I. No. 245 $A_2$/48 d. 16.3.49.

The D.P.I. is requested to expedite the further report promised in his letter read above.

To

The D.P.I.

6/5/49

4/5/49

C.F. 32 (a).

Education Department

A 25 47

From (Name)

Designation The Director of Public Instruction,

Station Madras.

To

The Secretary to Government,
Education & Public Health Dept.
Madras.

ASST. SECRETARY TO GOVERNMENT
EDUCATION AND PUBLIC HEALTH DEPT.

Enclosures :

Rc. No. 245 -A2/48 dated 30--5-- 1949.

Sir,

Sub:- Model List of Equipment required for Engineering Colleges.

Ref:- Govt. Memo No.30802-12/47-A Edn., dated 4--5--49.

pesante

42559

E.P.H.(A)

*********

The Principal, Engineering College, Guindy, reports that the preparation of the Model lists of Equipment required for Engineering Colleges, is nearing completion. They will be submitted to Government as soon as they are received from the Principal.

Re D.P.9. may be reminded on 9.7.49, if necessary.

3/6/49

Yours faithfully,

For Director of Public Instruction.

MDS 1/6

11/6/49

46

3. H.M. (Hr.) is requested to ensure the receipt of expected local leave 22-12-48. Copies of Examination papers for the Branches of Mechanical Engineering & Electrical Engineering should be received in the Secretariat, Public Health (A) Department by the 9th January 1949 positively.

2. The Principal should state the approximate number of candidates appearing for Part II Examination in 1949 so that the Examination papers may be sent in time.

3. H.M. (Hr.) are being sent separately to the Principal.

9-12-48

R.c. 245 A2/48

OFFICE OF THE DIRECTOR OF PUBLIC INSTRUCTION
Madras dated 14--6--1949

From

The Director of Public Instruction,
M A D R A S.

To

The Secretary to Government,
Education and Public Health Department,
Fort. St. George Madras.

Sir,




Sub :- Model list of equipment required for Engineering Colleges.

Ref :- Government Memo No. 30802 -12/47 A Edn. dated 4--5--1949.

****

I submit herewith the model lists of equipment required for the Engineering Colleges. The Principals of the Engineering Colleges at Coimbatore, Kakinada and Anantapur and the head of the Department of Engineering of the Annamalai University prepared independently separate model lists of equipment and after their receipt they were incorporated and compiled with the corresponding lists prepared by the Professors and heads of Departments of the Engineering College, Guindy, after due consultation and discussion as ordered in Government Memo No. 30802-7 -47 A Edn. dated 15--4--48. These lists now submitted are the final lists made out .

Yours faithfully

for DIRECTOR OF PUBLIC INSTRUCTION

K.M.R. 16--6--

50

GOVERNMENT OF MADRAS

E P H (A) 5

T.M. by Post. No. 30802-13/47 A Endt. date 22-8-49.

To The D. P. I.

Sub: Engg. colleges - Model lists of equipment

Ref: Your No. 245 A2/48 d. 14.6.49.

Please say urgently whether the model lists of equipment required for the Engg. colleges sent with your letter read above may be sent to the G. of I. and whether spare copies of the lists are available ~~with the Principal, Engg.~~ with you for future reference.

30.7.49.

2/8/49

wide p 23 of

p 49 of

53

C.F. 32 (a). EDUCATIONAL Department

A 28 53 A

From (Name) THE DIRECTOR OF PUBLIC INSTRUCTION, Madras.
Designation
Station

Received Registered

To
The
Secretary to Government
Education and Public Health
Department, Madras.

A/ABII

Enclosures :

No. Rc 245 A2/48 dated 12-8-1949 194 .

Sir,

ASST. SECRETARY TO GOVERNMENT :: EDUCATION AND PUBLIC HEALTH DEPT. :: 18 AUG 1949 62996A

Sub:- Engineering Colleges - Model lists of equipment -

Ref:- Government T.M. by post No. 30802/-B/47 A Edn. dated 2-8-49

--

Only one copy of the "Model lists" is available with me. The "Model Lists" may sent with my letter Rc No.245A2/48 dated 14-6-49 may be sent to the Government of India if necessary.

Yours faithfully,

For Director of Public Instruction

MSR 13/8

18/8/48

54

93 1

Copy to the D.P.I. 24/8
× copy of p 49 c/f and
(9) model WE 30/8.
p 1-2 c/f 2018

p 23 c/f.

p 49 c/f.

(9)

29 55 E.P.H-(A)

Letter No. No. 2686 Edn. dated 25-8-47.

To The Secretary, All India Council of Techl. Edn.,
Ministry of Edn., G.O.I., New Delhi. (with enclos

Sir,

Sub: Model lists of equipment for Engg. laboratories

Ref: Your No. 7-6-15/47 E III D.P. dated 11-4-47

In continuation of my letter No. 30802-6/47 A Edn. d. 19-2-48, I am to enclose herewith a copy of the letter of the D.P.I. No. 245 $A_2$/48 d. 14-6-49 together with the model lists of equipment received with it in original.

Yours faithfully,

23.8.49.

DPH
24/8/49

5b

# B U I L D I N G.
(Including Surveying).

16 Students. £ 1,757.

(THEORY OF STRUCTURES, STRENGTH OF MATERIALS, SURVEYING).

| Article and Type. | Size | Quantity: 16 Students. | Price per Unit. (1939). £ s. d. |
|---|---|---|---|
| **I. THEORY OF STRUCTURES.** | | | |
| 1. Bending moment apparatus, comprising pitchpine beam, hinged, with dynamometer and compensating screw fixed across hinge, supports and weights. | - | 1 | 3. 12. 6. |
| 2. Building Science Apparatus :- For experiments on loaded frameworks : comprising - 4 stands, supporting legs, rods, multiple hinges, loading hangers, spring balances and weights, sufficient to erect the following frames. | - | 1 set. | 71. 10. 0. |
| Simple roof truss<br>Roof truss<br>Simple cantilever<br>Cantilever with four members.<br>Four-in-one stand<br>King post roof truss. | Roof truss.<br>Mansard roof truss.<br>Roof truss with wind loads.<br>Island roof truss.<br>Warren girder.<br>N-type girder.<br>Framed arch. | | |
| 3. Carne, simple, with jib consisting of tubular compression balance, reading 20 lb. x 4 oz., pivoted to base, and tie-rope of adjustable angle with spring balance roading 16 lb. x 4 oz., mounted on wooden base. | - | 1 | 2. 10. 0. |
| 4. Deflection of rods apparatus, consisting of 2 end knife-edge supports for beam, hanger with knife-edge and pointer, scale pan for load, mirror glass scale on separate stand, with 1 pine rod and 1 steel rod. | - | 2 | 1. 12. 6. |
| 5. Inclined plane, for study of friction, consisting of slotted wood plane 45 cms. long, of adjustable angle, adjustable pulley 5 cm. diameter, bold linear and angular scales, on heavy metal base. | - | 2 | 2. 4. 6. |
| 5A. Jack : (a) hydraulic ... | 2000 kg. | 1 | 10. 0. 0. |
| (b) screw ... | - | 2 | 4. 10. 0. |
| 6. Level, spirit. ... | 8 cm. | 6 | - 2. 6. |
| 7. Levers :- | | | |
| (a) Simple, wooden lath 1 m. long with holes at 2 cm. intervals, movable fulcrum, 2 hook hangers. | - | 12 | - 5. 9. |

| Article and Type. | Size. | Quantity: 16 Students. | Price per Unit. (1939). £. s. d. |
|---|---|---|---|
| (b) Bell crank, consisting of wooden lever with horizontal arm 75 cm. long pivoted to wooden baseboard, tension spring balance with adjustable wing nut attached to short vertical arm. | - | 3 | 1. 8. 9. |
| 8. Moment's disc, circular, with series of drilled holes for fixing scale pans, glass scale and plumb bob on stand. | - | 3 | 1. 7. 9. |
| 9. Pulleys :- | | | |
| (a) Single, for study of forces at a point, aluminium, steel bearings. | 5 cm. diam. | 24 | - 3. 0. |
| (b) Single, aluminium, mounted in iron S- frame for clamping to blackboard. | 5 cm. diam. | 24 | - 5. 0. |
| 10. Pulley blocks :- | | | |
| (a) Single, working load. | 100 kg. | 4 | - 6. 9. |
| (b) Triple, working load. | 500 kg. | 2 | - 12. 6. |
| (c) Differential, working load. | 250 kg. | 1 | 1. 12. 6. |
| 11. Rule :- | | | |
| (a) Boxwood | 1 m. | 20 | - 3. 0. |
| (b) Steel. | 30 cm. | 20 | - 2. 0. |
| 12. Scale pans, brass. | - | 24 | - - 10. |
| 13. Shear force apparatus : hinged pitch pine beam, 6 ft. long, with dynamometer and adjusting screw for restoring line of beam under load, complete with supports and weights. | - | 1 | 3. 15. 0. |
| 14. Shear legs, with tabular compression balances and tension balance. | - | 1 | 4. 15. 0. |
| 15. Strain, linear, apparatus for study of : consisting of pitch pine beam, roller, pointer and scale for magnifying strain, end supports, and four weight hangers. | - | 1 | 1. 7. 6. |
| 16. Weights, brass, flat. | 100 gm. x 10 gm. | 12 sets. | - 4. 10. |
| 17. Weights, iron, slotted, with hanger (a) | 0.5 kg x 0.1 kg. | 6 sets. | - 9. 2. |
| (b) | 2 kg x 0.1 kg. | 6 sets. | -15. 11. |
| 18. Winch, hoisting crab. | - | 1 | 9. 10. 0. |
| 19. Worm and wheel. | - | 1 | 9. 0. 0. |
| 20. Young's modulus apparatus (Searle's pattern): comprising sensitive level mounted between two brass frames suspended on identical wires, and micrometer for measuring extension of one wire relative to the other, complete with ceiling bracket. | - | 1 | 4. 10. 0. |



| Article and Type. | Size. | Quantity: 16 Students. | Price per Unit (1939). £. s. d. |
|---|---|---|---|
| **II. STRENGTH OF MATERIALS.** | | | |
| 1. Balance. | 10 kg x 0.2 gm. | 2 | 14-0 -0 |
| 2. Calipers and dividers, combination. | - | 2 pairs. | 1-2 -6 |
| 3. Caliper gauge. | - | 1 pair | 7-16-0 |
| 4. Cement Testing Accessories :- (a) Damp box, mahogany, for briquettes, with canvas lid. | 21"x 19"x 3½" | 3 | 2-7 -0 |
| (b) Knife, pallet. | - | 3 | 0-8 -0 |
| (c) Measure, glass. | 1 litre. | 3 | 0-10-6 |
| (d) Moulds, briquette, for tensile test, gunmetal, with clamping screws. | B.S.S. No.12/ 1931. | 1 doz. | 7-15-0 |
| (e) Mould oil. | 5 gallons. | 1 drum. | 0-10-6 |
| (f) Shovel, small. | - | 3 | 0-7-6 |
| (g) Sieves, hand brass 8" diam. (i) | 170 meshes/in. | 3 | 1- 6-0 |
| (ii) | 72 meshes/in. | 3 | 0-17-6 |
| (h) Sieves cover and receptacle for above. | - | 3 | 1- 5-0 |
| (i) Sieves, hand, wood rimmed, for sand 10" diam. | 25 meshes/in. | 3 | 0 -6-0 |
| 12" diam. | 18 meshes/in. | 3 | 0 -7-0 |
| (j) Slab, glass, for gauging. | 18"x12"x¾" | 2 | 1-17-6 |
| (k) Slab, slate, planed both faces and all edges, for mixing cement. | 24"x9" x1" | 3 | 0-12-6 |
| (l) Spatula, cement, steel, with hardwood handle. | B.S.S. No 12/1931. | 1 doz. | 5-15-0 |
| (m) Tamping rod, mild steel, 4 lbs. | 15" long x 1" square. | 4 | 0- 7 -0 |
| (n) Trowel, gauging, steel, with hardwood handle. | B.S.S. No.12/1931. | 1 doz. | 0-4-0. |
| (o) Water tray, teak, zinc-lined, for storage of briquettes. | 24"x12"x 4" | 3 | 1-15-0. |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | £. s. d. |
| 5. Cement needle tester, Vicat. | - | 1 | 3-10-0 |
| 6. Cement slump tester. | - | 1 | 2-10-0 |
| 7. Cement tensile tester. | - | 1 | 50- 0-0 |
| 8. Cement voids determination apparatus. | - | 1 | 6-10-0 |
| 9. Depth gauge, vernier gauge. | - | 1 | 0-11-0 |
| 10. Extensometer, Ewings. | - | 2 | 35- 0-0 |
| 11. Extensometer, Lamb (roller type) | - | 1 | 25- 0-0 |
| 12. Micrometers. | 0-1" | 3 | 2-14-0 |
| 13. Micrometers. | 0-2" | 1 | 3- 0-0 |
| 14. Micrometers. | 0-3" | 1 | 3- 0-0 |
| 15. Microscope, vernier. | - | 1 | 22- 0-0 |
| 16. Scribers. | 8" | 2 | 0-3-0 |
| 17. Spring dividers. | - | 4 pairs. | 0-8 -0 |
| 18. Steel rules 0-12" x1/32" and x1/50". | - | 12 | 0-3- 0 |
| 19. Tensile testing machine, bench type, lever arm ratio 22.4:1, hand operated, mechanical. | upto 1000 kg. | 1 | 30-0-0. |
| 20. Universal tensile testing machine, hydraulic, motorised, automatic loading, electrically driven. | up to 10,000 kg. | 1 | 850-0-0 |
| 21. Weights, brass. | 10 kg x 1 gm. | 2 sets. | 11-0-0 |

## III SURVEYING.

| | | | |
|---|---|---|---|
| 1. Chains and arrows, steel, 100 ft. (25 metres) | 100 ft. | 4 | 1-5-6 |
| 66 ft. (20 metres). | 66 ft. | 4 | 0-19-6 |
| set of 10 arrows. 15" | 15"(38 cm). | 4 sets. | 0- 4-0 |
| 2. Compass, prismatic. | 4" | 4 | 5-10-0 |
| 3. Level, Abney; without slow motion. | 5" | 4 | 2-15-0 |
| 4. Level and tripod, builder's or engineer's. | 10"/12" | 4 | 22-10-0 |
| 5. Levelling staff. | 14 ft. (4.32 metres) | 4 | 4-10-0 |
| 6. Plane table and tripod. Board in canvas case with sight rule, spirit level and compass. | 24"x18" | 4 | 15-0 -0 |
| 7. Ranging rods 6 ft. ... | 6 ft. | 12 | 0-3 - 4 |
| 8 ft. ... | 8 ft. | 12 | 0-7 - 6. |
| 8. Tape, linen, in leathercase. | 66 ft. | | 0-15-0 |
| (tape, steel in leather case). | 66 ft. | | 1-15-0 |
| 9. Theodolite, vernier, with tripod. | 4" or 5" | 4 | 40-0-0. |

## ELECTRICAL ENGINEERING
(24 Students; £4,642)

| Article and Type | Size | Quantity 24 Students | Price per unit 1939 £. | s. | d. |
|---|---|---|---|---|---|
| (1). | (2). | (3). | | (4) | |
| **I. ELECTRICAL MACHINES AND POWER UNITS** | | | | | |
| 1. Accumulator storage battery | 240 v. 50 amp/hr. | 1 | 147 | 0 | 0 |
| 2. Battery charging set from 230 v., A.C. | 2 - 32 v., 5a. | 1 | 14 | 0 | 0 |
| 3. Motor Generator Sets: | | | | | |
| A.C. to D.C. 3-phase induction squirrel cage motor, shunt gene-rator with D.C. control panel and automatic thyratron voltage regulator. (D.C.booster) | 400 v. 50 c., 40 H.P.(1460 r.p.m.) 230 v, 25 kw. | 1 | 216 | 0 | 0 |
| A.C. to D.C. 3-phase induction squirrel cage motor, compound generator, with separate excita-tion, star-delta starter, field rheostat. | 230 v., 50 c. 5 H.P (1420 r.p.m.) 50 v. 3 kw. | 1 | 50 | 0 | 0 |
| A.C. to D.C. (3-machine set) A.C. 3-phase in-duction motor, D.C. compound generator | 230 v., 3 H.P. (1390 r.p.m.) | 1 | 104 | 0 | 0 |
| D.C. compound motor, with 2 brakes 2 field rheostats, 2 starters | 230 v., 3 H.P. | | | | |
| D.C. to A.C. shunt motor 3-phase, 4-pole, rotating field alternator with brake drum, 2 field rheostats, starter. | 230 v., 5 H.P. 1400-2000 r.p.m. 230 v. 3 kva | 4 | 100 | 0 | 0 |
| D.C. to A.C. compound interpole motor, compound generator, with brake drum, panel, 2 field rheostats, starter, separate excitation. | 230 v. 3 H.P. 1200-1500 r.p.m. 230 v, 2 kw | 2 | 112 | 10 | 0 |
| D.C. to A.C. shunt motor, shunt generator with brake drum, panel, 2 field rheostats, starter, separate excitation. | 230 v, 3 H.P. 1200 - 1500 rp.m 230 v., 2 kw. | 2 | 111 | 0 | 0 |

| (1) | | (2) | (3) | (4) |
|---|---|---|---|---|
| 4. Motors. | | | | |
| A.C. 1-phase induction, | capacitor | 230 v., ¼ H.P. | 1 | 3-15-0 |
| -do- | repulsion start | 230 v., ½ H.P. | 1 | 7-10-0 |
| -do- | , split-phase | 230 v., ¼ H.P. | 1 | 3-10-0 |
| | | 230 v., 1/10th H.P. | 1 | 4-10-0 |
| A.C. 3 phase induction | | | | |
| -do- | ,squirrel cage | | | |
| with brake and star-delta starter | | 230 v., 5 H.P. (1440 r.p.m.) | 1 | 12- 0-0 |
| A.C. Schrage, with brake, starter, thermal relay | | 230 v.,4/1.3 H.P. (2050-683 r.p.m.) | 1 | 76-10-0 |
| D.C. Compound | | 230 v. ½ H.P. | 1 | 7-10-0 |
| D.C. Series (crane type) with brake, grid resistance, reversing drum controller | | 230 v., 2 H.P. 1440 r.p.m. | 1 | 25-13-0 |
| D.C. Shunt | | 240/250 v.½ H.P. | 1 | 7- 7-0 |
| Universal (A.C. or D.C.) (vacuum cleaner type) | | 230 v. | 1 | 2-10-0 |
| 5. Rectifier | | | | |
| Hot cathode, 3 phase transformer | | 400 v.input 250 v.,20 kw output. | 1 | 183- 0-0 |
| Mercury arc, 3-phase,grid control | | 200/400 v.input 200/325 v. 4.6/6.5 kw output | 1 | 70- 0-0 |
| 6. Rotary converter set. 2 six-ring machines coupled at variable angle, with Joubert contact maker, search coil, 2 rheostats, 2 starters and transformer | | 230 v., 3 kw., 1500 r.p.m. | 1 | 200- 0-0 |
| 7. Switchboard. | distribution | | 1 | 63- 0- 0 |
| | main supply, with oil circuit-breakers: one 100 a and three 60a | | 1 | 69- 0- 0 |
| 8. Transformers | | | | |
| Fixed, 1 phase, with Scott tappings on high voltage side | | 3 kva, 100/200,300 v | 3 | 6- 6-0 |
| Fixed, 1 phase | | 2 kva, 100/200 v | 2 | 8- 0-0 |
| Fixed, 1 phase | | 2 kva, 140/115, 200 | V3 | 9- 0- 0 |
| Fixed, 1 phase | | 100 va, 140/70 v. | 1 | 3- 0-0 |
| Fixed, 1 phase, with potential regulator | | 230/30,000v | 1 | 60- 0-0 |
| Fixed, 3 phase | | 30 kva 400/230,200v | 1 | 30- 0-0 |
| Fixed, 3-phase | | 4 kva.Prim.2x100v sec.200.230 v | 2 | 10- 0-0 |
| Variable, 1-phase | | 2 kva, 230/0-230 v | 2 | 11-18-0 |
| Variable, 1-phase | | 580 va, 230/0-270v | 2 | 5-10-6 |
| Variable, 1-phase | | 60 va,230/0-10 v | 1 | 3- 0-0 |
| Variable, 3 phase | | 2 kva 230/0-230 v | 1 | 37-10-0 |
| 9. Voltage Regulator. | | | | |
| Moving coil, 3 phase, ± 10% accuracy | | Output ± 10% and 380v 25 kva and 5 kva Input 400v 3 ph. | 1 | 56- 0-0. |

## II MEASURING INSTRUMENTS AND STANDARDS

| | | | |
|---|---|---|---|
| 1. Ammeters: | | | |
| Hot wire, switchboard | 5a, 7" scale | 2 | 5- 2-0 |
| Induction (A.C.)"clip on",rectifier, portable | 2.5" scale | 1 | 8-10-0 |
| Magnetic field (A.C. or D.C.)"Tong Test" portable. | 2.6" scale | 1 | 3-15-0 |
| Moving coil: 1-range,portable | | 2 | 8- 0-0 |
| Moving coil: 1-range,switchboard | 3" scale | 2 | 2- 5-0 |
| Moving coil: 1-range, switchboard | 6" scale | 9 | 4- 2-0 |
| Moving iron:1-range, switchboard | 3" scale | 10 | 1- 5-9 |
| Moving iron:1range, switchboard | 6" scale | 20 | 2-15-0 |
| Moving iron: 2-range, portable | | 3 | 5- 0-0 |
| 2. Ampere-hour meter (D.C.) | 230 v.5a | 1 | 2- 9-0 |
| 3. Attenuator, audio-frequency, 40 db by 2 db | 3 watt | 1 | 25- 0-0 |



| 1. | 2. | 3. | 4. |
|---|---|---|---|
| 4. Brake pulley with spring balance | 5 H.P. | 4 | 10- 0-0 |
| 5. Cell, standard, Weston, with thermometer | | 5 | 4- 7-6 |
| 6. Condensers: | | | |
| Air, variable | 0.001 microfarad | 2 | 6- 6-0 |
| Paper, fixed | 0.1 " | 3 | 0- 2-2 |
| " " | 2 " | 1 | 0- 4-0 |
| " " | 4 " | 2 | 0- 7-3 |
| " " | 8 " | 2 | 0-14-0 |
| " " | 15 " | 2 | 1- 5-0 |
| Mica, standard | 0.3 " | 1 | 8-10-0 |
| Mica, sub-divided plug | 0.1 - 1 " | 1 | 16- 8-0 |
| Mica, sub-divided , switch | 0.001-1 " | 1 | 15- 0-0 |
| Paper, sub-divided, 3 dial | 10x0.1 " ) | 2 | 7-13-0 |
| | 10x0.01 " ) | | |
| | 10x0.001 " ) | | |
| Paper, variable, 3-phase, 240 v. | 20 " | 2 | 1-13-0 |
| | 180 " | 1 | 18-10-0 |
| 7. Electrometer, Dolezlek | | 1 | 10- 0-0 |
| 8. Fluxmeter | | 2 | 15-10-0 |
| 9. Frequency meter, pointer type, | 250 v,40-60 c | 1 | 13- 5-0 |
| reed type | 250v,40-60 c 6"dial | 1 | 12- 9-1 |
| 10. Galvanometers: | | | |
| Ballistic | 10 sec., 2000 ohm | 2 | 10- 7-0 |
| Bench, pointer | 2-0-2 ma. 40 ohm | 4 | 1-18-0 |
| Bench, with self-contained lamp & scale | | 3 | 6- 6-0 |
| Cable testing | 2 sec., 20 ohm | 1 | 5- 0-0 |
| Demonstration, pointer | 0.1 ma | 1 | 4-12-0 |
| Demonstration, with lamp and 1 m.scale | 5 sec., 300 ohm | 1 | 8- 2-0 |
| Vibration, with self-contained lamp and scale and 100 ohm shunt | 50 c. | 3 | 11-10-0 |
| Vibration | 60 - 500 c | 1 | 32- 0-0 |
| 11. Galvanometer lamp and scale | 6 v lamps | 7 | 2- 5-0 |
| 12. Inductance | | | |
| fixed | 1 mh | 1 | 4- 1-0 |
| variable | (self 55/139 mh (mutual ± 29 mh | 1 | 22-10-0 |
| 13. Magnetic Standard, Hibbert's, with 10 and 100 turn coils. | | 1 | 11- 7-0 |
| 14. Megger, bridge | 500 v. | 1 | 30- 0-0 |
| Continuity tester | 500 v., 0-100 ohm | 1 | 20- 7-6 |
| Insultion tester | 500 v., 0-100 Megohm | 1 | 18- 7-6 |
| 15. Oscillator | | | |
| 1. Beat frequency | 0 - 15,000 c; 5w | 1 | 65- 5-0 |
| 2. Beat frequency with amplifier | 800 c | 1 | 25- 0-0 |
| 16. Oscilloscope, cathode ray, double beam | | 4 | 25- 0-0 |
| 17. Potentiometers: | | | |
| A.C. student's with phase shifting transformer, 1a, 10a shunts, and 2 potential dividers, 300/2, 1v | | 1 | 38-18-0 |
| D.C. direct reading, student's | | 3 | 9- 0-0 |
| D.C. standardising | | 1 | 30- 0-0 |
| 18. Power-Factor Meter 1-phase | 5a, 250v | 1 | 19- 8-11 |
| 3 phase | 5a, 250v | 1 | 12-12-6 |
| 19. Resistance Box | | | |
| 3-dial | 1,110 ohm | 2 | 7-15-3 |
| 6 dial | 11,111.1 ohm | 2 | 11-18-6 |
| Low Inductance, 4 dial | 11,110 ohm | 1 | 14- 6-0 |
| Low " 6 dial | 11,111.1 ohm | 1 | 21- 0-0 |
| Plug | 11,110 ohm | 3 | 5- 5-0 |
| Ratio | 2 x (10,100,100)ohm | 3 | 2-10-0 |
| Ratio, low inductance (6 dial decade) | 2 x (10,90,900)ohm | 1 | 9- 0-0 |
| Volt box, 5 ranges | 0-300v, 15,000 ohm | 1 | 11- 0-0 |

| (1) | (2) | (3) | (4) |
|---|---|---|---|
| Resistance Box. (Continued) | | | |
| Post Office, 4-dial, 0.1% accuracy | | 1 | 11- 5-0 |
| Post Office, plug | 13,000 ohm | 3 | 11-16-6 |
| Standard | 0.1 ohm, 10a | 1 | 2- 5-0 |
| " | 0.1 ohm | 1 | 10-17-0 |
| " | 1.0 ohm | 2 | 4- 1-0 |
| Standard, sub-divided, 0.02% accuracy | 0.1 megohm, 15 ma | 1 | 5-10-0 |
| -do- | 1.0 megohm | 1 | 13-17- 2 |
| Standard, tubular, (air cooled shunt) | 0.002 ohm, 75a | 1 | 15- 0-0 |
| -do- | 0.02 ohm, 15a | 1 | 15- 0-0 |
| -do- | 0.1 ohm, 5a | 1 | 7- 4-0 |
| 20. Revolution counter, hand | 10,000 rev. | 2 | 0-10-0 |
| 21. Shunt, universal | 10,000 ohm | 2 | 2-10-0 |
| 22. Synchroscope | 150v. 8" scale | 1 | 19- 2-0 |
| 23. Tachometer, electrical | 500/2000 r.p.m. | 5 | 5- 1-0 |
| 24. Thermometer | 0 - 100°C | 10 | 0- 1-10 |
| 25. Transformer, current, class B. | 15/5a, 5va | 2 | 3- 6-0 |
| " " | 20/5a, 5va | 2 | 3- 6-0 |
| " " | 50/5a, 5va | 2 | 3- 6-0 |
| " " multi-range | Primary 25,10,5, 2.5a to 5,1a,5va | 2 | 7- 0-0 |
| potential | 440/110v.,50 va | 2 | 12- 5-0 |
| 26. Universal Meter | | | |
| A.C. | 5a, 100, 600 v | 1 | 10- 9-0 |
| A.C. testing set | | 1 | 40- 8-0 |
| A.C. D.C. | | 2 | 16- 0-0 |
| D.C., with shunts | 6a, 3" scale | 3 | 3-15-0 |
| D.C., with shunts | | 3 | 8- 0-0 |
| D.C., with shunts and resistances | | 2 | 1-10-0 |
| D.C., demonstration, with shunts and resistances | 15" scale | 2 | 16-10-0 |
| D.C. sub-standard, with shunts and resistances | | 1 | 14-14-0 |
| 27. Voltmeter | | | |
| Dynamometer, portable, 3 range | | 1 | 27-10-0 |
| Electrostatic | 50-300v | 1 | 4-15-0 |
| Electrostatic, (Kelvin) 3-range | 1-5kv, 2-10kv, 4-20 kv | 1 | 34-13-0 |
| Electrostatic, multicellular, (Kelvin) | 30-120 volts | 1 | 24- 4-0 |
| Moving coil, switchboard, various ranges | 6" scale | 9 | 4-15-0 |
| " " portable | 6" scale | 2 | 8- 0-0 |
| " " " 3 range | 8" scale | 2 | 8- 9-8 |
| " " rectifier, 2 range | 6" scale | 4 | 4- 2-0 |
| Moving iron, switch-board, various ranges | 6" scale | 9 | 3- 5-0 |
| Moving iron, switch-board, 2 range | 6" scale | 8 | 4- 0-0 |
| 28. Watch, stop- | 0.1 sec. | 3 | 4-15-0 |
| 29. Watt-hour Meter | | | |
| D.C. | 10a, 230v | 1 | 4-11-6 |
| Induction, 1-phase | | 2 | 2- 0-0 |
| Induction, 3 phase | | 1 | 6- 0-0 |
| 30. Watt-meter | | | |
| Portable, 1 phase | 1/2a, 150/300v, 6" scale | 2 | 10- 0-0 |
| -do- | 5/10a, 150/300v, 6" scale | 4 | 12- 0-0 |
| -do- | 5/10a, 40/100/200 6" scale | 2 | 10- 0-0 |
| Portable, 3 phase, 2 elements | 5a, 250v, 6" scale | 1 | 21-16-0 |

## III. MISCELLANEOUS ACCESSORIES

| | | | |
|---|---|---|---|
| 1. Accumulator lead-acid | 2v, 60 amp/hr | 12 | 0-14-6 |
| lead-acid, motor car type | 6v, 84 amp/hr | 2 | 2-17-6 |
| 2. Apparatus for: Electromagnetic induction (Stenzl) | | 1 | 18- 3-0 |



| (1) | (2) | (3) | (4) |
|---|---|---|---|
| Apparatus for (continued) | | | |
| Temperature co-efficient of resistance | | 2 | 5-10-0 |
| 3. Arc lamp, lantern type | | 1 | 3-10-0 |
| 4. Arc lamp resistance | 5a | 1 | 2- 5-0 |
| 5. Circuit breaker, with inverse-time characteristic | | 1 | 3-12-0 |
| 6. Head-phone, receiver | 4,000 ohm | 2 | 0-10-6 |
| | 60 ohm | 2 | 1- 5-0 |
| 7. Kettle, electric | | 2 | 1- 4-0 |
| 8. Lamp, "Mercra" with choke | 230 v. | 1 | 3- 3-0 |
| resistance, portable (4 lamps and switch) | 3a. 230v. | 6 | 1- 4-6 |
| 9. Photo-cell rectifier | | 2 | 1- 0-0 |
| 10. Photometer, bench | | 2 | 10- 0-0 |
| 11. Plug key with large terminals for shorting instruments | | 2 | 0- [illegible]-0 |
| 12. Plug, series, and socket | | 6 | 0- [illegible] -6 |
| 13. Radiator, electric, bowl fire | 230v, 500w | 2 | 0-10-6 |
| 14. Resistance, loading, portable | 230v, 8kw | 6 | 7- 3-0 |
| | 25a, 2.5 ohm | 6 | 5- 3-6 |
| | 10a, 25 ohm | 9 | 6- 0-6 |
| 15. Rheostat | | | |
| Carbon | 40 plates, 2" x 2" x ¼" | 10 | 2-19-0 |
| Field, various | | 10 | 1-10-0 |
| Slide Wire | 1400 ohm, 0.3a | 2 | 1- 5-0 |
| | 800 ohm 0.45a | 2 | 1- 6-0 |
| | 220 ohm 1.5a | 2 | 1- 8-0 |
| | 200 ohm 1a | 4 | 1- 5-0 |
| | 145 ohm, 1.5a | 2 | 1- 9-0 |
| | 115 ohm, 2.8a | 1 | 2- 8-0 |
| | 70 ohm, 2a | 2 | 1- 5-0 |
| | 31 ohm, 2a | 2 | 0-18-0 |
| | 9 ohm, 12a | 1 | 2-16-0 |
| | 9 ohm, 2.8a | 3 | 0-18-0 |
| | 4.7 ohm, 8.5a | 4 | 1- 6-0 |
| 16. Switch, knife, on slate panel 1 pole, 1 way | | 3 | 0-11-0 |
| -do- 2 way | | 2 | 0-12-4 |
| -do- 2 pole, 1 way | | 3 | 1- 2-0 |
| -do- 2 way | | 2 | 1- 4-8 |
| -do- 3 pole, 1 way | | 3 | 1-13-3 |
| -do- 2 way | | 2 | 1-17-0 |
| reversing, mercury cup | | 2 | 0- 8-6 |

'RN'
250-16/3/47-D.

## HYDRAULICS.

40 Students. £ 689.

| Article and Type. | Size. | Quantity for 40 Students. | Price per Unit. (1939). £. | s. | d. |
|---|---|---|---|---|---|
| 1. Flowmeter measuring column ... . (a) | 25 gall/min | 1 | 12. | 0. | 0. |
| . (b) | 100 gall/min | 1 | 40. | 0. | 0. |
| 1a. Flow through orifices, apparatus for :constant head tank with aperture and interchangeable knife-edged orifices; with micrometer and depth gauges. | | 1. | 28. | 0. | 0. |
| 2. Friction in pipes: lengths of pipe of various materials and diameters with pressure tappings and manometers. | 0.5" diam to 1.5" diam. | 1 set. | 80. | 0. | 0. |
| 2a. Pitot tube ... | | 1 | 6. | 0. | 0. |
| 3. Pump, centrifugal, with 12.5 H.P. D.C. motor - dynamometer. | 2 to 250 gallons per minute. | 1 | 200. | 0. | 0. |
| 3a. Tubing, rubber. ... | ¼" bore. | 50 ft. | 1. | 0. | 0. |
| 4. Turbine, small demonstration model, complete with rope-brake. | | 1 | 210. | 0. | 0. |
| 4a. Venturi tube. .. | 1½" pipe. | 1 | 6. | 0. | 0. |
| 5. Weirs, set of : weir tank with baffles, and interchangeable rectangular and V-notches. | 350 gallons per minute. | 1 | 21. | 0. | 0. |
| 6. Wheel, Pelton: Small single-jet demonstration model with rope-brake. | 18" diam. | 1 | 85. | 0. | 0. |

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## HEAT ENGINES.

(40 Students: £ 4,967.)

| Article and Type. | Size. | Quantity for 40 students. | Price per Unit (1939). £. s. d. |
|---|---|---|---|
| 1. Air compressor, 2-stage, electrically driven, with accessories for testing, 10 H.P. motor and torque reaction dynamometer. | 10 H.P. | 1 | 500 0 0 |
| 2. Balance, student's type. | - | 1 | 5 0 0 |
| 3. Boiler (Marcet's) for 160 lb. per sq. in. steam pressure. | - | 1 | 18 0 0 |
| 4. Boiler plant, coal-fired. | Pressure 200 lbs/sq.in. | 1 | 550 0 0 |
| 5. Boiler plant, gas-fired, Babcock water-tube, complete with all auxiliaries and gauges. | pressure 120 lbs/sq.in. | 1 | 267 0 0 |
| 6. Bomb calorimeter. | - | 1 | 47 10 0 |
| 7. Condenser, experimental, and condensate tanks with water meter. | 4 sq.ft. | 1 | 40 0 0 |
| 8. Engine indicator, high speed, cathode ray oscillograph, "Standard Sunbury" | - | 1 | 164 0 0 |
| 9. Engine indicator, high speed, electric recording "Farnboro". | - | 1 | 272 0 0 |
| 10. Engine indicators, for indicator diagrams, pencil type. | - | 2 | 12 0 0 |
| 11. Flash point apparatus, Pensky Martin. | - | 1 | 7 0 0 |
| 12. Four line pipe lagging set. | - | 1 | 20 0 0 |
| 13. Gas analysis, wet analysis (Orsat). | - | 1 | 6 0 0 |
| 14. Gas calorimeter, standard Boys'. | - | 1 | 17 0 0 |
| 15. Gas Calorimeter, standard Thompson. | - | 1 | 20 0 0 |
| 16. Gas engine, horizontal slow speed, fitted with an Appold test brake and accessories. | 11 H.P. | 1 | 250 0 0 |
| 17. Oil engine, horizontal, slow speed, compression ignition 475 r.p.m., fitted with an Appold test brake and accessories. | 10 H.P. | 1 | 150 0 0 |
| 18. Petrol engine, any automobile engine, suitably mounted, provided with a Heenan Froude hydraulic dynamometer and gauges. | - | 1. | 250 0 0 |
| 19. Planimeters, taking areas of indicator diagrams, etc. | - | 3 | 4. 0 0 |

## HEAT ENGINES.

| Article and Type. | Size. | Quantity for 40 students. | Price per Unit. (1939). £ | s. | d. |
|---|---|---|---|---|---|
| 20. Pressure gauge, (dead weight) and indicator spring tester. | - | 1 | 15 | 0 | 0 |
| 21. Refrigerator, methyl chloride, vapour compression machine, complete with gauges, compressor, ¾ H.P. motor. | 1- ton rating. | 1 | 180 | 0 | 0 |
| 22. Speed indicators: ranges 50-300 r.p.m., fixed type. | - | 3 fixed. | 6 | 0 | 0 |
| 0-4000 r.p.m., multi-range hand type. | | 2 hand. | 5 | 0 | 0 |
| 23. Steam Engine. Compound medium stroke vertical experimental steam engine; 130/150 lbs./sq.in. pressure with piston valves to high and low pressure cylinders, two water rim brake flywheels, rope brake testing gear governors, indicator gear, thermometer, pressure gauge, tachometer, steam separator, reducing valve surface condensing plant, motor driven, 24 sq.ft. cooling area with vacuum gauge and air pump. | 8 H.P. | 1 | 1,030. | 0. | 0. |
| Steam Engine Accessories. | | | | | |
| (a) Boiler, vertical watertube, 150 lbs/sq.in., gas-fired, injector. | 3' 6" diam x 8' 6" high | 1 | 703. | 0. | 0. |
| (b) Superheater, gas-fired, pressure 150 lbs/sq.in., with safety valve and drain valve. | - | 1 | 205. | 0. | 0. |
| (c) Tank, feed water, with ball float and cock and piping. | 3' 0"x2'0" x 2' 6". | 1 | 141. | 0. | 0. |
| 24. Stop watches, reading to 1/10 second. | - | 3 | 4 | 15 | 0 |
| 25. Thermometers centigrade ranges. boiler work 200 - 400° refrigeration 0-70° and - 40 - +40° steam engines 0-100° and 0-230° | - | 1 | 10 | 0 | 0 |
| 26. Viscometer, Redwood (lubricating oils). | - | 1 | 9 | 0 | 0 |
| 27. Water U- tube gauges. | - | 2 | - | 10 | 0 |
| 28. Weighing machine, lever type, platform plus weights. | up to 200 kg. | 1 | 11 | 5 | 0. |

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## MECHANICS AND ENGINEERING MODELS
( 16 Students: £655 )

| Article and Type | Size | Quantity: 16 Students. | Price per Unit (1939) £ | S. | D. |
|---|---|---|---|---|---|
| Accelleration, see:- "Attwood's machine" "Centrifugal force" "Flywheel and vibrator" "Trolley, Fletcher's" "Trolley with vibrator" "Trolley, circular" | | | | | |
| 1. Attwood's machine, Cusson's model, with vibrator and paper ribbon, in glass fronted wall case complete with weights, riders, arrestment table, paper, brushes and ink | - | 1 | 16. | 10. | 0. |
| 2. Balancing, dynamic, apparatus for Ballistic pendulum see "Pendulum ballistic" | | 1 | 35. | 0. | 0. |
| Beam theory, see:- "Bending moment" "Strain, linear" "Shear force" | | | | | |
| 3. Bending moment apparatus, comprising pitchpine beam, hinged, with dynamometer and compensating screw fixed across hinge, supports and weights | - | 1 | 3. | 12. | 6. |
| 4. Building science apparatus, for the study of frame stresses, consisting of supporting stand and sufficient rods, multiple hinges, loading hangers, spring balances and weights to construct:- (a) Simple roof truss (b) Roof truss (c) Simple cantilever (d) Cantilever with 4 members (e) King post roof truss | - | 1 | 25. | 0. | 0. |
| 5. Centrifugal force apparatus, comprising 25" diameter steel wheel, on ball bearings, mounted on tripod base, with two graduated beams with sliding weights fixed to diaphragm at centre. Complete with hand wheel, belt drive and revolution counter | - | 1 | 17. | 18. | 6. |
| 6. Clock, stop, 60 minutes x 1 second. | 20 cm. dial. | 2 | 1. | 12. | 6 |

| Article and Type | Size | Quantity: 16 Students | Price per Units. (1939) £ | s. | d. |
|---|---|---|---|---|---|
| Compound pendulum, see "Pendulum compound" | | | | | |
| Connecting rod, see "Couplings" | | | | | |
| 7. Couplings:- | | | | | |
| (a) Connecting rod and crank | - | 1 | 5. | 0. | 0. |
| (b) Hooke's universal joint | - | 1 | 10. | 0. | 0. |
| (c) Oldham's | - | 1 | 9. | 0. | 0. |
| Elasticity, see:- "Youngs'Modulus" "Torsion" | | | | | |
| Epicyclic gear see:- "Gear epicyclic" | | | | | |
| 8. Flywheel and vibrator, for study of acceleration, comprising cast iron wheel, 12 lbs, removable for weighing, on ball bearings in cast iron bracket; with vibrating pencil attachment | - | 1 | 8. | 0. | 0. |
| Frame stresses see:- "Building science apparatus" "Sheer legs" | | | | | |
| 9. Friction:- | | | | | |
| (a) Coil friction apparatus: Pulley 12" diameter fixed to rotable graduated wooden disc 24" diam. carrying small pulley on circumsference with wall brackets; 2 sets machined pulleys, flat and grooved, belt and rope | - | 1 | 7. | 18. | 6. |
| (b) Journal friction apparatus: Heavy machined pulley for belt drive mounted on cast-iron wall brackets, with weighted brake, supplementary pulley, scale pan and weights | - | 1 | 8. | 10. | 0. |
| 10. Gauge, micrometer screw, external | 2.5 cm. | 3 | - | 17. | 6. |
| 11. Gear, epicyclic | - | 1 | 6. | 0. | 0. |
| 12. Governor, Watt's experimental | - | 1 | 18. | 0. | 0. |
| 13. Gyroscope brass, mounted in adjustable pivot bearings with hardened steel pivots, complete with adjustable heavy brass stand and box | $2\frac{7}{8}$"diam | 1 | 7. | 17. | 6. |
| Hydraulic jack, see "Jack hydraulic" | | | | | |
| Impact, apparatus for study of; see: "Trolley, with vibrator" "Pendulum ballistic" | | | | | |



| Article and Type | Size. | Quantity: 16 Students | Price per Unit (1939) £ | s. | d. |
|---|---|---|---|---|---|
| 14. Jack: (a) hydraulic | 2000 kg | 1 | 10. | 0. | 0. |
| (b) screw | " | 2 | 4. | 10. | 0. |
| Kater's pendulum see "Pendulum Kater's" | | | | | |
| 15. Level, sprit | 8 cm. | 6 | - | 2 | 6. |
| Machines and mechanisms see:- Couplings, Gear epicyclic, Governor Watt's, Jack, Winch, Worm and wheel, | | | | | |
| Micrometer screw gauge see "gauge" | | | | | |
| 16. Pendulum:- | | | | | |
| (a) ballistic Hick's, wooden framework with cm. scale, 2 suspended wood platforms with pointers | - | 1 | 1. | 15. | 0. |
| (b) compound, consisting of steel bar bored at intervals, movable knife edge with bracket support | - | 1 | - | 17. | 6. |
| (c) Kater's reversible: brass bar divided in cm., steel knife-edges, one heavy and two light adjustable weights | - | 1 | 3. | 5. | 0. |
| Roof truss see "Building science apparatus" | | | | | |
| 17. Rule: ... (a) boxwood | 1 m. | 20 | - | 3. | 0. |
| ... (b) steel | 30 cm. | 20 | - | 2. | 0. |
| Screwjack see "Jack, screw" | | | | | |
| 18. Shear force apparatus: hinged pitch-pine beam 6 ft. long, with dynamometer and adjusting, screw for restoring line of beam under load, complete with supports and weights | - | 1 | 3. | 15. | 0. |
| 19. Shear legs, with tubular compression balances and tension balance | - | 1 | 4. | 15. | 0. |
| Sprit level see "Level" | | | | | |
| 20. Springs, apparatus for study of; consistin of metal frame for wall-mounting, measuring scale with vernier, complete with 3 compression and 3 extension springs | - | 1 | 7. | 15. | 0. |
| Stopclock see "Clock, stop" | | | | | |

| Article and Type | Size | Quantity: 16 Students | Price per Unit (1939) £ | s. | d. |
|---|---|---|---|---|---|
| 21. Strain, linear, apparatus for study of: consisting of pitch-pine beam, roller, pointer and scale for magnifying strain, end supports, and four weight hangers | - | 1 | 1. | 7. | 6. |
| 22. Torsion: (a) Oscillation method: comprising brass cyclinder with pointer and fixing screw for wire, angular scale and wall clamp | - | 1 | - | 15. | 0. |
| (b) Static method (Searle): comprising pulley on ball bearings, with axial self centring chuck, 3/16" torison rods of brass, bronze, iron and tool steel, movable index and angular scale, (without weights). | - | 1 | 5. | 10. | 0 |
| 23. Trolley, circular, with centrifugal force attachment: 12" diam. disc on ball bearings, vibrator and brush, ball bearing pulley, scale pan cord and weights, and detachable arm with adjustable sliding weights, for experiments in angular accelleration and centrifugal force | - | 1 | 9. | 10. | 0. |
| 24. Trolley, Fletcher's: pair of trolleys running on planed steel rails 5 ft. long, adjustable for angle of tilt; two spring vibrators, impact arm, and heavy cast iron rolling disc | - | 1 | 22. | 0. | 0. |
| 25. Trolley with vibrator and pull recorder, for experiments on force, velocity and variable acceleration | - | 3 | 2. | 11. | 3. |
| 26. Weights, iron, slotted, with hanger | 2 kg.x0.1kg | 14 sets | - | 15 | 11 |
| 27. Weights, iron with ring | 20kg.x0.05 kg | 8 sets | 1 | 19 | 6. |
| 28. Winch, hoisting crab | - | 1 | 9. | 10. | 0. |



| Article and Type | Size | Quantity: 16 Students | Price per (1939) £ | s. | Unit d. |
|---|---|---|---|---|---|
| 29. Worm and wheel | - | 1 | 9. | 0. | 0. |
| 30. Young's modulus apparatus (Searle's pattern): comprising sensitive level mounted between two brass frames suspended on identical wires, and micrometer for measuring extension of one wire relative to the other, complete with ceiling bracket | - | 1 | 4. | 10. | 0 |

## ENGINEERING MODELS.

| Mechanisms and Machines | Qty. 16 Students. | £. | s. | d. |
|---|---|---|---|---|
| (a) Boiler water level alaram, high and low | 1 | 6. | 10. | 0. |
| (b) Bremme reversing gear | 1 | 9. | 10. | 0. |
| (c) Centrifugal pump | 1 | 7. | 0. | 0. |
| (d) Claudel Hobson carburetter | 1 | 8. | 0. | 0. |
| (e) Compound engine D valve and piston valve | 1 | 24. | 0. | 0. |
| (f) Connecting Rod & Crank. | 1 | 5. | 0. | 0. |
| (g) Corliss engine with trip gear | 1 | 30. | 0. | 0. |
| (f) Diesel engine model | 1 | 12. | 0. | 0. |
| (g) Gas engine model | 1 | 12. | 0. | 0. |
| (h) Geneva stop mechanism | 1 | 6. | 0. | 0. |
| (i) Goschs link motion | 1 | 15. | 0. | 0. |
| (j) Holdsworth differential motion | 1 | 22. | 10. | 0. |
| (k) Lever safety valve | 1 | 6. | 0. | 0. |
| (l) Mayers valve gear | 1 | 16. | 0. | 0. |
| (m) Model of Bourdon pressure gauge | 1 | 4. | 0. | 0. |
| (n) Petrol engine model, 2 stroke | 1 | 9. | 0. | 0. |
| (o) Petrol engine model, 4 stroke | 1 | 10. | 0. | 0. |
| (p) Reciprocating pump | 1 | 8. | 0. | 0. |
| (q) Reducing valve | 1 | 8. | 0. | 0. |
| (r) Slide crank motion (4 motions) | 1 | 8. | 0. | 0. |
| (s) Steam engine model valve gear | 1 | 12. | 0. | 0. |
| (t) Stephenson link motion | 1 | 18. | 0. | 0. |
| (u) Walschearts valve gear | 1 | 18. | 0. | 0. |
| (v) Watts straight line motion | 1 | 4. | 0. | 0. |
| (w) Zenith craburtter | 1 | 7. | 10. | 0. |
| **Machine Details.** | | | | |
| (a) Eccentric, with ring bolts | 1 | 2. | 10. | 0. |
| (b) Foot step, with loose bush and disc | 1 | 1. | 7. | 6. |
| (c) Pedestal, with loose cap, brasses and bolts | 1 | 1. | 2. | 6. |
| (d) Simple bearing for 1½" shaft | 1 | - | 12. | 6. |

| Article and Type. | Quantity: 16 Students. | Price per unit (1939) £ | s. | d. |
|---|---|---|---|---|
| **Various Methods of Keying** | | | | |
| (a) Crane hook | 1 | 1 | 2 | 6 |
| (b) Saddle key | 1 | - | 5 | 0 |
| (c) Side pin, to allow rotation | 1 | - | 7 | 6 |
| (d) Staking on | 1 | - | 7 | 6 |
| (e) Sunk key | 1 | - | 7 | 6 |
| (f) Taper pin through collar | 1 | - | 7 | 6 |
| (g) Wrought iron crank and shaft | 1 | 1 | 10 | 0 |
| **Methods of Using Cotters** | | | | |
| (a) Cast iron flange joint | 1 | 1 | 7 | 6 |
| (b) Foundation bolt | 1 | - | 12 | 6 |
| (c) Gib and cotter joint, in section | 1 | 1 | 2 | 6 |
| (d) Gland and suffing box, with bolts | 1 | 1 | 17 | 6 |
| (e) Piston, with spring rings, part of piston rod and nut | 1 | 1 | 15 | 0 |
| (f) Poppet valve, with seating and portion of pump body | 1 | 0 | 18 | 6. |
| (g) Pump rod joint | 1 | 1 | 0 | 0 |
| **Sections of Wrought Iron, Rolled.** | | | | |
| (a) Angle iron | 1 | - | 3 | 0 |
| (b) Box coupling; with part of shaft | 1 | 1 | 10 | 0 |
| (c) Bulb angle | 1 | - | 7 | 6 |
| (d) Channel iron | 1 | - | 4 | 6 |
| (e) Crosshead for small engine with slide blocks | 1 | 2 | 17 | 6 |
| (f) Girder iron | 1 | - | 6 | 6 |
| (g) Tee iron | 1 | - | 3 | 6 |
| (h) Z bar | 1 | - | 6 | 0 |
| **Riveted Joints** | | | | |
| (a) Angle iron joint | 1 | - | 12 | 6 |
| (b) Box girder | 1 | - | 12 | 6 |
| (c) Countersunk bolt | 1 | - | 8 | 6 |
| (d) Double riveted lap joint | 1 | - | 12 | 6 |
| (e) Eybolt | 1 | - | 12- | 6 |
| (f) Knuckle joint | 1 | 1 | 2 | 6 |
| (g) Lewis bolt | 1 | - | 10 | 0 |
| (h) Ragbolt, 1 in. with nuts | 1 | - | 10 | 0 |
| (i) Single riveted butt joint | 1 | - | 10 | 6 |
| (j) Single riveted lap joint | 1 | - | 10 | 0 |
| (k) Slide valve, with spindle and nuts | 1 | 1 | 8 | 6 |
| (l) Wall bracket for pedestal to suit pedestal | 1 | 1 | 12 | 6 |
| (m) Wrought iron plates, in section, showing six various forms of rivets | 1 | 1 | 2 | 6 |
| **Various Screws in Brass, Polished.** | | | | |
| (a) Box connecting rod end, with loose steps and cotter. | 1 | 1 | 15 | 0 |
| (b) Butt-ress thread, brass | 1 | - | 18 | 6 |
| (c) Pulley | 1 | - | 7 | 6 |
| (d) Spur wheel | 1 | - | 10 | 0 |
| (e) Square thread, brass | 1 | 1 | 0 | 0 |
| (f) Standard bolt, nut and washer (Whitworth thread) | 1 | - | 10 | 0 |
| (g) Whiteworth vee thread, brass | 1 | - | 17 | 6 |



| Article and Type | Size | Quantity: 16 Students | PRICE PER UNIT (1939) £. | s. | d. |
|---|---|---|---|---|---|
| 1. Asbestos sheet. | ¼" thick | 1 lb. | - | 8. | 0. |
| 2. Balance, 2nd quality, with specific gravity hooks | 100 gm. loading | 1 | 7. | 7. | 0. |
| 3. Basins:- (a) Crtystallising, P., without soput. | 75 mm diam | 1 doz. | - | 7. | 0. |
| (b) Evaporating, Worcester Porcelain | 100 mm diam | 1 doz. | 1. | 7. | 0. |
| 4. Bellows foot, with spare diaphragm | - | 1 | 2. | 9. | 6. |
| 5. Blower, fan, centrifugal, to suit number of furnaces used | - | 1 | 30. | 0. | 0. |
| 6. Bottle: (a) N.M. for reagents and suspensions of polishing powders | 350 ml | 2½ doz. | - | 12. | 0. |
| (b) Winchester quart. | 2 l | 6 | - | 1. | 3. |
| 7. Carbon rods, for stirring | 8" x 6 mm. | 1 doz. | - | 6. | 6. |
| 8. Chisel, cold, flat | 7" x ¾" | 2 | - | 1. | 0. |
| 9. Clock, stop; 60 mins | 60 mins. x 1 second. | 1 | 1. | 12. | 6. |
| 10. Cloth: (a) Selvyt(for polishing) | 9½" diam | 6 | - | 3. | 0. |
| (b) Swab open wove | | 1 doz. | - | 4. | 0. |
| 11. Cotton wool. | - | 1 lb | - | 2. | 0. |
| 12. Crucibles, without lids:- (a)"Battersea" round (i) | Size D | 1 doz. | - | 5. | 6. |
| (ii) | Size J | " | - | 15. | 3. |
| (b)"London" round (i) | No. 3. | " | - | 4. | 9. |
| (ii) | No. 5. | " | - | 10. | 6. |
| (c) "Salamander" (see also "Furnaces") | No. 2. | " | - | 15. | 0. |
| 13. Cylinders, measuring, glass (a) | 25 ml. | 1 | - | 1. | 8. |
| (b) | 100 ml. | 1 | - | 2. | 0. |
| (c) | 250 ml. | 1 | - | 3. | 0. |
| 14. Dessicator, Schiebler's, with ground glass cover and perforated zinc shelf. | 8" diam. | 3 | - | 14. | 6. |
| 15. Dish, developing, porcelain (a) | 4¼" x 3¼" | 12 | - | 1. | 6. |
| (b) | 8½" x 6½" | 6 | - | 2. | 3. |
| (c) | 18" x 12" | 2 | - | 5. | 9. |
| 16. Duster, yellow | | 1 doz. | - | 6. | 0. |
| 17. Emery cloth, blue-back (a) | No.1. | 4 doz. sheets | - | 1. | 6. |
| (b) | [illegible] | 4doz. sheet | - | 1 | 6. |

| 1 | 2 | 3 | 4 £. s. d. |
|---|---|---|---|
| 18. Emery paper (a) | Grade 0 | 4 doz. sheets. | - 1 6. |
| (b) | Grade 00 | 4 doz. sheets. | - 1 6 |
| (c) | Grade 000 | 4 doz. sheets. | - 1 6 |
| (d) | Grade 000 | 4 doz. sheets. | - 1 6 |
| 19. Ferrotype plate for glossy prints, chromium plated. | 14" x 10" | 6 | - 2 6 |
| 20. File, flat, second cut, with handle. | 8" | 6 | - 1 9 |
| 21. Frame, printing, photographic | 4¼" x 3¼" | 2 | - 2 9 |
| 22. Furnace, electric, combined crucible and muffle, 1000°C, sliding doors, refractory plug drilled to take thermo-couple sheath, with spare silica tube, wound, regulating resistance, and switchboard with ammeter and fuses. | 6" x 3" | 1 | 15 1 0 |
| 23. Furnace, electric, 1350°C (see also section on "industrial Equipment" at end) | | 1 | 22 15 0 |
| 24. Furnace, muffle, gas-fired, 1100°C, with integral pyrometer. | 4"x2½"x2½" | 1 | 13 10 0. |
| 25. Furnace, salt-bath, (small size) suitable for both Cyanide Hardening and salt-bath tempering. | | 1 | 37 15 0 |
| 26. Glass, plate, ground edges | 9"x6"x¼" | 12 | - 1 0 |
| 27. Hammer, ball pene | 1 lb | 2 | - 1 8 |
| 28. Hardometer (hardness testing machine), with holders for 1,2 and 4 mm balls, and for 136° pyramidical diamond indenter, complete with indenters, standard check piece and reference tables. | | 1 | 40 2 6 |
| Ingot mould, see "Mould" | | | |
| Iron test samples, see "Test samples". | | | |
| 29. Jar, stoneware, with lid for storage of specimens. | 8" x 5" diam. | 24 | - 2 8 |
| 30. Labels, plain, with black border | 3" x 1" | 500 | - 2 0 |
| 31. Lamp, darkroom, refelecting type | 12"x10" | 1 | 1 17 6 |
| 32. Lamp, Wratten safelight, (a) orange. | | 1 | - 12 6 |
| (b) red. | | 1 | - 12. 6 |
| 33. Magnifier, electically illuminated, "Ultra", with battery and graticule. | | 1 | 4 5 0 |
| 34. Measure, conical, glass. | 4 oz. | 1 | - 1 0 |
| 35. Microscope, metallurgical with integral vertical illuminater iris diaphragm, mechanical stage, 2 achromatic objectives 2/3" (N.A.=0.28), 1/6" (N.A.=0.83) 2 eyepieces x 6, and x 10. | | 2 | 18 10 0 |



| 1: | 2. | 3. | 4. £. s. d. |
|---|---|---|---|
| 36. Microscope, metallurgical with integral vertical illuminator iris disphragm, mechanical stage, 2 achromatic objectives 2/3" (N.A.=0-28), 1/6"(N.A.=0-83) 2 eyepieces x 6, and x 10. | | 2 | 18. 15. 0. |
| 37. Microscopical accessories:- (a) Eyepiece, with pointer incorporated | x 7.5. | 1 | 1. 5. 0. |
| (b) Mechanical stage, with Vernier scales. | | 1 | 4. 15. 0. |
| (c) Objective, oil immersion | 1/12"(N.A.1.25) | 1 | 6. 0. 0. |
| 38. Mould, ingot, cast iron. (a) | 3"x½"x½" | 6 | - 1. 0. |
| (b) | 3⅛"x¾"x¾" | 6 | - 1. 4. |
| 39. Mounting rings, brass | 1"diam x ¾" high | 6 | - 2. 6. |
| 40. Nickel blocks, drilled for thermometer or thermocouple | 1" x ¾"x¾" | 3 | - 2. 0. |
| Objectives, microscope see "Microscope", and "Microscopical Accessories". | | | |
| 41. Paper, photographic, gaslight, glossy, normal, in packets of 12 sheets. (a) | 4¼"x3¼" | 3 doz. pkts. | - - 9. |
| (b) | 8½"x6½" | 1 doz. pkts. | - 3. 0. |
| 42. Plates, photographic, speed H and D/350, packed, in packets of 1 doz. | 4¼"x3¼" | 2 pkts. | - 2. 3. |
| 43. pliers, combination | 7" | 2 | - 2. 3. |
| 44. Polishing machine, single disc with belt drive from ¼ H.P. electric motor, with lifting irons, cover plate and drain tap, and 2 spare brass discs and garters for "non-ferrous" and "special" work. | | 2 | 27. 10. 0. |
| 45. Polish, Metal, in 1 lb tins | | 1 | - 1. 3. |
| 46. Projection Metallograph (Vickers), comprising traversing and rotating stage universal illuminator unit, projection eyepiece, camera and focussing screen with adjustable effective length, ½ plate (8½" x 6½") double dark slides, illuminating train consisting of pointolite lamp, condenser, water bath, green filter diffusing screen, electric control pannel: | | 1 | 300. 0. 0. |
| Also the following accessories:- (i) Dark slide adaptors, for using ¼ plate in ½ plate holders. | | 2. | - 7. 6. |

| 1. | | 2. | 3. | 4. £. | s. | d. |
|---|---|---|---|---|---|---|
| 46. Projection Metallograph (Vickers) (Contd.) | | | | | | |
| (ii) Eyepiece, Huygens | (a) x5 | | 1 | 1. | 5. | 0. |
| | (b) x 10 | | 1 | 1. | 5. | 0. |
| (iii) Objectives, with magnetic centring mount | (a) 2/3" | | 1 | 2. | 6. | 0. |
| | (b) 1/6" | | 1 | 3. | 18. | 6. |
| | (c) 1/12" | | 1 | 8. | 3. | 6. |
| 47. Puncher, letters and numbers, set of | | ⅛" | 1 set | - | 18. | 0. |
| 48. Pyrometer, optical, disappearing filament type, two ranges 0-600°C and 400-1200°C with accumulator. | | | 1 | 19. | 16. | 0. |
| spare bridge-bulb unit for above | | | 1 | 4. | 10. | 0. |
| 49. Pyrometer, thermocouple type comprising inner and outer silica sheaths, one Pt/Pt-Rh junction, one Hoskin's base * on stand with thermometer, indicator graduated for both couples, with compnesating leads 6 ft. long. | | | 1 | 22. | 0. | 0. |
| 50 Spare Pt/Pt-Rh couple and silica sheath for above. | | | 1 | 4. | 0. | 0. |
| 51 Spare base metal couple and silica sheath for above. | | | 1 | 2. | 3. | 6. |
| 52. Rack, photographic, drying, wood, to hold 12 plates. | | | 1 | - | 3. | 6. |
| 53. Saw, hack, pistol-grip | | 10" | 2 | - | 5. | 0. |
| 54. Saw blades, hack | | 10" x 18 T.P.I. | 3 doz. | - | 3. | 9. |
| 55. Shears, tinsman's | | 8" | 1 | - | 2. | 9. |
| 56. Sheath, refractory, thermometer | | 2" long x ½" diam. | 1 doz | - | 3. | 0. |
| 57. Slide, microscope, glass | | 3" x 1" | 1 gross | - | 5. | 0. |
| 58. Slides, lantern, of matallurgical structures | | | 30 | - | 1. | 6. |
| 59 Squeegee, photographic | (a) | for plates 4¼"x3¼" | 1 | - | 5. | 0. |
| | (b) | for plates 8½"x6½" | 1 | - | 5. | 0. |
| Stamps, letters, numbers, see "Punches". | | | | | | |
| Stopclock, see "Clock, stop" | | | | | | |
| Steels, all kinds, see "Test samples". | | | | | | |
| 60. Tank, fixing photographic glazed, porcelain | | to hold 12 plates 4¼" x 3¼" | 1 | - | 7. | 6. |

* base metal junction, oil-filled cold junction.



| 1. | | 2. | 3 | 4. £. | s. | d. |
|---|---|---|---|---|---|---|
| 61. Tank, washing, for prints, automatic changing | | 24"x18" | 1 | 1. | 15. | 6. |
| 62. Tensometer, (Tensile testing machine) with* elongation and reduction-of area gauges, graph paper, long base model, set of specimen gauges and chucks. | | | 1 | 130. | 0. | 0. |
| 63. Test Samples: | | 2" x 1" | 1 set | | | |
| I. Hardness Tests. Metal slips, one each aluminium, brass, copper, iron, monel, nickel, steel, zinc. | | | | | | |
| II. Heat Treatment tests. | | | | | | |
| (a) Iron, cast, including high duty | | | 1 set. | | | |
| (b) Steel, carbon, 0.1, 0.15, 0.3, 0.6, 0.9, 1.2 and 1.35% carbon | | ½"x¾" | 1 set | 1. | 5. | 0. |
| (c) Steel, alloy, Cr-V, stainless, 3% Ni-Cr, Mn-Cr-Mo, Mn-Mo | | | 1 set. | 1. | 5. | 0. |
| (d) Non ferrous | | | | | | |
| III. Tensile Tests. | | | | | | |
| (a) Aluminium | | | 1 doz | - | 6. | 0. |
| (b) Brass | | | 1 doz. | - | 6. | 0. |
| (c) Steel, mild | | | 1 doz | - | 7. | 6. |
| (d) Steel, cold drawn | | | 1 doz | - | 7. | 6. |
| (e) Steel, carbon, quenched | | | 1 doz | - | 7. | 6. |
| (f) Steel, carbon, annealed | | | 1 doz | - | 7. | 6. |
| 64. Thermometers, nitrogen-filled | | 0-400°, x1°C | 2 | 1. | 10. | 6. |
| Themometer sheaths, see "Sheath". | | | | | | |
| 65. Tongs. | | | | | | |
| I. Charcoal | | 12" | 2 | - | 2. | 6. |
| II. Crucible: ( ) | | | | | | |
| (a) basket type | | for 2½" crucible | 1 | - | 17. | 0. |
| (b) bent end type | | small | 1 | - | 4. | 6. |
| (c) Gunmetal, without bow | | | 6 | - | 1. | 6. |
| (d) with bow and bend | | small | 1 | - | 5. | 6. |
| III. Cupel | | small | 2 | - | 5. | . |
| 66. Towels | | | 1 doz | - | 12. | 0. |
| 67 Transformer, mains for metallurgical microscope illuminator | | 4 volts 1 amp. | 1 | - | 15. | 0. |
| 68 Vice, engineer's, parallel Jaw | | 3" | 2 | - | 14. | 6. |
| 69. Weights, brass | | 100 gm. x 0.001 gm. | 1 | 1. | 10. | 0. |

* jaws for No. 11 and No. 12 specimens,

## METALLURGY - CHEMICALS.
( 16 Students- £ 875).

| Article and type | Quantity 16 Students | Price per Unit (1939) £. | s. | d. |
|---|---|---|---|---|
| 1. Acid, acetic, glacial, B.P. | 1 Winch | - | 7. | 6. |
| 2. Acid, hydrochloric pure | 1 Winch | - | 2. | 6. |
| 3. Acid, hydrofluoric(40%) in gutta percha bottle | ½ lb. | - | 3. | 4. |
| 4. Acid, nitric, pure | 1 Winch | - | 3. | 9. |
| 5. Acid, picric, pure | 1 lb. | - | 6. | 0. |
| 6. Acid, Sulphuric, pure. | 1 Winch | - | 3. | 9. |
| 7. Alcohol, amyl, pure, | 1 lb. | - | 2. | 6. |
| 8. Alcohol, (industrial methylated spirit) | 1 winch | - | 2. | 6. |
| 9. Alumina, for polishing, (5 micron) | 1 lb, | - | 12. | 0. |
| 10. Ammonium persulphate | ½ lb. | - | 2. | 6. |
| 11. Antimony, metal, for alloying | 2 lbs. | - | 2. | 10. |
| 12. Beeswax | 1 lb. | - | 6. | 0. |
| 13. Benzene | 1 Winch | - | 4. | 2. |
| 14. Bismuth, metal for alloying | 1 lb. | - | 12. | 8. |
| 15. Cadmium, metal for alloying | 1 lb. | - | 14. | 6. |
| 16 Calcium oxide, for dessicators | 2 lb. | - | - | 5. |
| 17. Charcoal, animal | 2 lb. | - | - | 6. |
| 18. Chromium oxide, for polishing | 1 lb. | - | 6. | 8. |
| 19. Copper, metal, granulated, for alloying. | 2 lbs. | - | 3. | 2. |
| 20. Cotton wool, lintless | 1 lb. | - | 3. | 0. |
| 21. Ferric chloride | 1 lb. | - | - | 10. |
| 22. Ferrous ammonium chloride | ½ lb. | - | 2. | 0. |
| 23 Fixing salt, photographic, acid. | 1 lb. | - | 1. | 6. |
| 24. Lead Granulated, pure, for alloying. | 3 lb. | - | 1. | 4. |
| 25. Metol-quinol developer, single solution | 1 litre | - | 2. | 6. |
| 26. Oil , cedar wood, for microscope objectives | 25 gms | - | - | - |
| 27. Oil, paraffin | 1 pint | - | - | 6 |
| 28. Plasticene, any colour | 1 lb. | - | 1. | 4. |
| 29 Silver Nitrate | 2 oz. | - | 2, | 2. |
| 30. Sodium hydroxide, stick | 1 lb. | - | 3. | 0. |
| 31. Sodium hyposulphite | 3 lb. | - | - | 2. |
| 32. Sodium picrate, moist | 2 oz. | - | 2. | 0. |
| 33. Tin, metal, granulated, pure for alloying | 1 lb. | - | 6. | 9. |
| 34. Xybl(free from sulphur) | 2 oz. | - | - | 4. |
| 35. Zinc, metal, granulated, pure, for alloying. | 2 lbs. | - | 3. | 8. |

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## METALLURGY - INDUSTRIAL EQUIPMENT

(OPTIONAL)

Note:- This equipment necessitates a separate Furnace Room, well ventilated and fire-proof, provided with a 2" diameter gas main, with governor.

| Article and type | Quantity for 16 students |
|---|---|
| 1. Blower, centrifugal fan, direct-coupled to driving motor for air supply to furnace, ( air delivery required depends upon number of furnaces installed). | 1 |
| 2. Furnace, air-recirculating, electically fired, with integral fan. Small tool room size, | 1 |
| 3. Furnace, crucible, gas fired, to take 12" high by 8" diam. crucible, with air and gas regulating valves. | 1 |
| Crucibles for above | 6 |
| 4. Furance, high-speed steel heat treatment, with double chamber. (May incorporate 'Controlled Atmosphere' producer if required). | 1 |
| 5. Pyrometer, immersion type thermo-couple. | 1 |

## PRODUCTION ENGINEERING.

15 STUDENTS - £ 7,479

(Items additional to "Workshop Practice and "Metallurgy)

| | Article and Type | Quantity for 15 students. | Price per Unit 1939 £. | s. | d. |
|---|---|---|---|---|---|
| 1. | Auto-Collimator, "angle Dekker" with surface plate, stand and rhodiumised optical flat. | 1 | 60 | 0 | 0 |
| 2. | Balls, steel, precision, ± .0001", set of 30 | 1 set | 5 | 0 | 0 |
| 3. | Broaching machine, small vertical or horizontal with set of broaches. | 1 | 350 | 0 | 0 |
| 4. | Camera, high speed, Vinten type or similar. | 1 | 250 | 0 | 0 |
| 5. | Converter, rotary, A.C. to D.C., 25 kw. | 1 | 200 | 0 | 0 |
| 6. | Comparator, electro-limit, with variable magnification and three gauge frames. | 1 | 77 | 5 | 0 |
| 7. | Compressor, small, for general purposes, and air supply in workshop, 5 cubic feet free air per minute, 100 lb./sq. in., with 1½ H.P. motor and starter, and compressed air reservoir. | 1 | 70 | 0 | 0 |
| 8. | Diameter measuring machine, 0-4", floating micrometer type with full set of thread measuring cylinders and vees. | 1 | 58 | 10 | 0 |
| 9. | Dilatometer, Gale type, for critical points in steel. | 1 | 15 | 0 | 0 |
| 10. | Draw-bench for wire, 12" drum, for 9 S.W.G. copper or 12 S.W.G. steel wire, with three sets of dies and motor with starter. | 1 | 300 | 0 | 0 |
| 11. | Dynamometer, for registering tool pressures. | 1 | 25 | 0 | 0 |
| 12. | End bars, Pitter or Coventry type, for sizes up to 24" or 30" | 1 set | 48 | 0 | 0 |
| 13. | Gauges, limit; check gauges for testing of screw ring gauges, 1 set of 12 covering threads 0.5 mm to 7.0.mm. diameter. | 1 set | 14 | 0 | 0 |
| 14. | Gear box, 4 speed, close ratio, 15 H.P. for varying speed of main drive. | 1 | 30 | 0 | 0 |

| Article and type. | Quantity for 15 students. | Price per Unit 1939 £. | s. | d. |
|---|---|---|---|---|
| 15. Grinders | | | | |
| (a) Cylindrical grinder, plain, 4" diam. x 18", with magnetic chucks, one electro-magnetic, one permanent magnet with demagnetiser. | 1 | 850 | 0 | 0 |
| (b) Surface grinder, table 20" x 6", adjustable table travel with automatic traverse; feed range approximately 0.01" to 0.09" per stroke. | 1 | 330 | 0 | 0 |
| (c) Universal cylindrical grinder 18" x 6" diam., with internal grinding attachment and accessories. | 1 | 505 | 0 | 0 |
| 16. Jig borer, miniature, Boley Lemnen pattern, or similar. | 1 | 116 | 10 | 0 |
| 17. Lathes | | | | |
| (a) Capstan lathe, with motor, Herbert, No.1., or similar, to take bar material up to 1", with all accessories for demonstrating collet and chuck work, including concentric chucks with renewable jaws, full set of collets, square and hexagonal collets. | 1 | 400 | 0 | 0 |
| (b) Turret Lathe, Herbert No. 7 or similar, horizontal cross-sliding hexagon turret type, single pulley drive, all geared head, saddle type suitable for chucking work requiring larger and heavier turning cuts than on capstan lathe, with full set of tooling attachments. | 1 | 1000 | 0 | 0 |
| (c) Relieving lathe, small, suitable for small tools and cutters. | 1 | 700 | 0 | 0 |
| (d) Automatic screw machine, Brown and Ward, or similar, single spindle, 3 operations. | 1 | 298 | 0 | 0 |
| 18. Level, precision, block, 8", with hardened and lapped steel base, sensitivity 0.0005" in 10" (as Type I. B.S.S.958/1941) | 1 | 23 | 0 | 0 |
| 19. Milling Machines. | | | | |
| (a) Vertical attachment for universal milling machine specified in "Workshop Practice III" Item 93. | 1 | 20 | 10 | 0 |
| (b) Rotary table for use with vertical milling machine specified in "Workshop Practice III" Item 94, size 12" - 15", with accurate divisions. | 1 | 30 | 0 | 0 |
| 20. Micrometer, bench, 0-2", with fiducial indicator | 1 | 35 | 0 | 0 |



| Article and Type | Quantity for 15 Students. | Price per Unit 1939 £. | s. | d. |
|---|---|---|---|---|
| 21. Microscope, toolmaker's, with graticule eye-piece, for screw thread measurement. | 1 | 5 | 1 | 6 |
| 22. Optical Flats. (a) for micrometer checking, set of 3, 35 mm. diam., 006" differences. | 1 set | - | 15 | 0 |
| (b) for surface inspection, quarts, 2" diam. | 1 | 7 | 0 | 0 |
| 23. Pitch measuring machine, 6" x 9" (N.P.L. type or similar) | 1 | 213 | 10 | 0 |
| 24. Press, small, single acting, for simple blanking and forming die sets. | 1 | 68 | 0 | 0 |
| 25. Pressure recording apparatus, comprising Cossor double cathode ray oscillograph and piezo-electric pick-up. | 1 | 70 | 0 | 0 |
| 26. Projector and screen, with 2 lenses, 3 lamps, transformer and working auxiliaries. | 1 | 620 | 5 | 0 |
| 27. Stroboscope, discharge lamp type, (General Radio or similar) flashing speed 600 - 14,000 per minute with calibrated dial. | 1 | 25 | 0 | 0 |
| 28. Surface tester, (Taylor Hobson or similar), stylus type, magnification 2000, with pick-up unit, stand, gear box, pen recorder, averaging meter, amplying unit, all mounted on trolley. | 1 | 659 | 0 | 0 |

| Article and Type | Quantity: 40 Students | Price per Unit (1939) £. | s. | d. |
|---|---|---|---|---|
| 1. Accumulator,lead,glass case,2 volt,60 amp/hr | 60 | - | 19 | 3 |
| 2. Ammeter,A.C.,rectifier type,2½ dial(Ferranti) | | | | |
| (a) 0-1 ma | 6 | 3 | 19 | 3 |
| (b) 0-5 ma | 6 | 3 | 4 | 3 |
| (c) 0-10 ma | 6 | 3 | 4 | 3 |
| (d) 0-50 ma | 6 | 3 | 4 | 3 |
| 3. Ammeter,D.C.,moving coil,2½" dial(Ferranti) | | | | |
| (a) 0-100 µa | 6 | 4 | 6 | 6 |
| (b) 0-1 ma | 16 | 2 | 12 | 0 |
| (c) 0-2 ma | 16 | 2 | 7 | 0 |
| (d) 0-5 ma | 16 | 1 | 17 | 3 |
| (e) 0-10 ma | 16 | 1 | 17 | 3 |
| (f) 0-25 ma | 16 | 1 | 17 | 3 |
| (g) 0-50 ma | 16 | 1 | 17 | 3 |
| (h) 0-100 ma | 16 | 1 | 17 | 3 |
| (i) 0-500 ma | 16 | 1 | 17 | 3 |
| 4. Ammeter,D.C., moving coil,4" dial(Taylor) | | | | |
| (a) 0-100 µa | 20 | 4 | 14 | 6 |
| (b) 0-250 µa | 20 | 3 | 17 | 0 |
| Ammeters, thermojunction type,see"Thermojunction, vacuum,"and"Galvanometer,Unipivot" | | | | |
| Avometer, see "Meter, universal" | | | | |
| 5. Battery,dry | | | | |
| (a) 9 volts grid bias | 20 | - | - | 9 |
| (b) 60 volts | 40 | - | 5 | 6 |
| 6. Bridge, audio-frequency,ratio arms 1,10,100,1000 and 10,000 ohms,with auxiliary variable condenser for balancing residual capacity.Accuracy 0.1% from 0-50 Kc/second (Sullivan) | 2 | 44 | - | - |
| 7. Bridge, capacity,simple,with buzzer,Accuracy 1% -2%, range 0-8000 µµf (Sullivan) | 1 | 8 | - | - |
| 8. Bridge,inductance,with temperature compensated standard inductance.Accuracy 0.1%,range 1 µ H to 100 H(Sullivan) | 1 | 88 | - | - |

| 1 | 2 | 3 £. | s. | d. |
|---|---|---|---|---|
| 9. Bridge,Wheatstone,rotary switch pottern,with built-in galvanometer,ratios,1,10,100 and 1000. Accuracy 0.1% (Sullivan) | 2 | 20 | 10 | 0 |
| Cable, all kinds, see "Radio . . Tool List" | | | | |
| 10. Condenser,electrolytic,25 mfd,50 v | 40 | - | 5 | 0 |
| 11. Condenser, fixed, paper,3-dial boxes,1st grade 1.1 mfd.x .001 mfd (Muirhead) | 6 | 16 | 2 | 0 |
| 12. Condenser,fixed,radio component,mixa(Telegraph construction Co) | | | | |
| (a) .001 mf | 12 | - | 1 | 5 |
| (b) .01 mf | 12 | - | 2 | 0 |
| (c) .05 mf | 12 | - | 5 | 6 |
| (d) .10 mf | 40 | - | 8 | 0 |
| 13. Condenser, fixed, radio component,paper(Telegraph Construction Co) | | | | |
| (a) .01 mfd | 12 | - | 1 | 9 |
| (b) .05 mfd | 12 | - | 1 | 9 |
| (c) .10 mfd | 12 | - | 1 | 10 |
| (d) .5 mfd | 12 | - | 2 | 4 |
| (e) 1.0 mfd | 12 | - | 2 | 6 |
| (f) 4.0 mfd | 12 | - | 5 | 6 |
| 14. Condenser, variable,precision,40-300 µµf(Sullivan) | 2 | 16 | 0 | 0 |
| 15. Condenser,variable,precision,80-1200 µµf(Sullivan) | 2 | 16 | 0 | 0 |
| 16. Condenser,variable,radio quality | | | | |
| (a) 0-25 µµf | 6 | - | 7 | 6 |
| (b) 0-75 µµf | 6 | - | 9 | 0 |
| (c) 0-200 µµf | 6 | - | 12 | 0 |
| (d) 0-500 µµf | 6 | 1 | 0 | 0 |
| (e) 0-1000 µµf | 6 | 2 | 0 | 0 |
| (f) 0-20 µµf on ceramic base(for H.F.) | 12 | - | 10 | 0 |
| 17. Connectors, H.F.,co-axial plug and socket for solid dielectric cable. (Belling-Lee) | 24 | - | 3 | 6 |
| Crystal oscillator,see "Oscillator,quartz crystal" | | | | |
| 18. Galvanometer,moving coil,reflecting,portable, with built-in lamp and scale,complete with lamp transformer, 140 ohms,400 mm/µa (Tinsley) | 6 | 9 | 0 | 0 |
| 19. Galvanometer,unipivot,with thermal scale.(Cambridge) | 6 | 12 | 0 | 0 |

.0.



| 1 | 2 | 3 £. | s. | d. |
|---|---|---|---|---|
| 20. Head phones,(Ericsson) | | | | |
| (a) resistance 60 ohms | 6 pairs | - | 10 | 6 |
| (b) resistance 2000 ohms | 12 pairs | - | 10 | 6 |
| 21. Inductance, self,variable,50 millihenries(Sullivan) | 2 | 16 | 12 | 6 |
| 22. Inductometer,0-110 and 0-1,100 millihenries (Cambridge Instrument Co) | 1 | 80 | 17 | 0 |
| 23. Key, tapping,self-cleaning contacts(Gambrell) | 12 | - | 9 | 0 |
| Knife switch,see "Switch,knife" | | | | |
| 24. Meter,universal,"Triplett" | 36 | 7 | 0 | 0 |
| 25. Meter,universal, "Avomajor" | 6 | 13 | 13 | 0 |
| 26. Oscillator,audio frequency,tuned circuit pattern 20-10,000 c.p.s. (Standard Telephones) | 6 | 40 | 0 | 0 |
| 27. Oscillator,beat frequency,0-16,000 c.p.s.,5 watts. (Birmingham Sound Reproducers Ltd) | 2 | 70 | 5 | 0 |
| 28. Oscillator,H.F.,radio signal generator(Avo) | 8 | 9 | 0 | 0 |
| 29. Oscillators,quartz crystal standard,plug mounting | | | | |
| (a) 10 Mc/second | 1 | | 10 | 0 |
| (b) 1 Mc/second | 1 | 10 | 0 | 0 |
| 30 Oscilloscope,double-beam,with amplifiers,time base and position controls(Cossor) | 10 | 40 | 0 | 0 |
| 31. Power packs(mains transformer,rectifier and smoothing condensers) | | | | |
| (a) 10 volts, 4 amps | 12 | 7 | 10 | 0 |
| (b) 300 volts, 50 ma | 20 | 10 | 0 | 0 |
| (c) 1000 volts, 100 ma | 6 | 15 | 0 | 0 |
| (d) 5000 volts, 50 ma | 4 | 25 | 0 | 0 |
| 32. Potential dividers, rotary,radio type | | | | |
| (a) 1000 ohms | 12 | - | 3 | 6 |
| (b) 2000 ohms | 12 | - | 3 | 6 |
| (c) 5000 ohms | 12 | - | 4 | 0 |
| (d) 10,000 ohms | 12 | - | 5 | 0 |
| (e) 20,000 ohms | 12 | - | 5 | 0 |
| (f) 50,000 ohms | 12 | - | 5 | 6 |
| (g) 100,000 ohms | 12 | - | 5 | 6 |
| (h) 250,000 ohms | 12 | - | 6 | 0 |
| (i) 500,000 ohms | 12 | - | 7 | 6 |
| 33. Resistance box, screened,4 dial,L.F. 111 ohms x 0.1 (Sullivan) | 10 | 9 | 17 | 6 |

| 1 | 2 | 3 £. | S. | d. |
|---|---|---|---|---|
| 34. Resistance box, screened, 4 dial, L.F., 1110 ohms x 1.0 (Sullivan) | 10 | 10 | 2 | 6 |
| 35. Resistance box, screened, 4 dial, H.F., 0.1-100 ohms (Sullivan) | 10 | 9 | 17 | 6 |
| 36. Resistance box, screened, 4 dial, H.F., 1-1000 ohms (Sullivan) | 10 | 10 | 2 | 6 |
| 37. Resistances, fixed, 1 watt radio type, 1 doz of each value; - 500; 750; 1000; 2000; 3000; 4000; 5000; 6000; 7000; 8000; 9000; 10,000; 20,000; 40,000; 60,000; 80,000; 100,000; 200,000; 400,000; 600,000; 800,000. ohms, and 1, 2, and 5 megohms. | 24 | - | 12 | 0 dozens. |
| 38. Rheostat, fixed, radio filament type, 20 ohms, 0.1 amp | 40 | - | 3 | 6 |
| 39. Rheostat, variable, radio filament type, 6 ohms, 0.1 amp | 40 | - | 2 | 6 |
| 40. Rheostats, variable, tubular, 3-terminal (Zenith) | | | | |
| (a) 230 ohms, 2 amp | 6 | 3 | 17 | 0 |
| (b) 500 ohms, 1 amp | 6 | 3 | 17 | 0 |
| (c) 1100 ohms, 0.5 amp | 6 | 2 | 10 | 0 |
| (d) 2000 ohms, 0.15 amp | 6 | 2 | 17 | 6 |
| 41. Shunt, galvanometer, universal, 7-range: 1, 3, 10, 30, 100, 300, 1000 (Cambridge Instrument Co) | 6 | 5 | 10 | 0 |
| 42. Screens, copper, 20 S.W.G., 7" x 4" x 4", with lid | 40 | - | 10 | 0 |
| 43. Switches. | | | | |
| (a) Knife, porcelain base, quick break, single pole, single throw, 10 amps | 12 | - | 2 | 6 |
| (b) Knife, porcelain base, quick break, double pole, single throw, 10 amps | 12 | - | 3 | 6 |
| (c) Knife, porcelain base, quick break, double pole, double throw, 10 amps | 12 | - | 4 | 6 |
| (d) Knob, radio type single pole, one. way | 24 | - | 1 | 6 |
| (e) Knob, radio type, double pole, one-way | 24 | - | 2 | 0 |
| (f) Knob, radio type, double pole, two-way | 24 | - | 2 | 6 |
| (g) Mercury-in-glass, 3-point contact, 5 amps (Isenthal) | 24 | - | 3 | 6 |
| (h) Rotary, stud, 10 point, 2 arms (Muirhead) | 10 | 2 | 17 | 6 |
| (i) Rotary, 10 point, radio type (Ferranti) | 24 | - | 5 | 0 |
| 44. Thermojunctions, vacuum (Elliott) | | | | |
| (a) 0-5 ma | 6 | 2 | 15 | 0 |
| (b) 0-10 ma | 6 | 1 | 5 | 0 |
| (c) 0-25 ma | 6 | 1 | 5 | 0 |
| (d) 0-50 ma | 6 | 1 | 5 | 0 |
| (e) 0-100 ma. | 6 | 1 | 5 | 0 |
| (f) 0-150 ma | 6 | 1 | 5 | 0 |



| 1. | 2. | 3. |
|---|---|---|
| 45. Thermojunction holders, B.C. | 12 | 0 - 2 - 9 |
| 46. Transformers. | | |
| (a) intervalve coupling, L.F., 6 ma primary ratio 1:7 | 6 | 1 - 10 - 0 |
| (b) -do- 1:3 | 6 | 0 - 8 - 6 |
| (c) hybrid, for impedance measurements upto 15 Kc (Siemen's) | 6 | 1 - 0 - 0 |
| (d) -do- 60 Kc ( " ) | 6 | 1 - 10 - 0 |
| (e) mains, constant voltage output, 150 watts (Advance Components) | 3 | 9 - 10 - 0 |
| (f) mains, filament supply, 4 volts 2 amps | 20 | 0 - 10 - 0 |
| (g) mains, " " 6.5 " 2 " | 20 | 0 - 12 - 6 |
| (h) mains, centre-tapped, double winding, 350-0-350 volts 4-0-4 volts | 6 | 0 - 18 - 6 |
| Tubing, all kinds, see "Radio Tool List" | | |
| 47. Tuning forks, set of 13 Co to C', in leather case | 1 set | 2 - 15 - 0 |
| 48. "Variac" transformers (Zenith) | | |
| (a) 270 volts, 2 amps, type 200 CMH | 16 | 6 - 10 - 0 |
| (b) 230 volts, 8 amps, type 100L | 4 | 11 - 18 - 0 |
| 49. Valves, thermionic, A.C. heated | | |
| I. L.F. Valves | | |
| (a) diode, 1000 volt, self capacity less than 10 µµf, for construction of diode valve voltmeter | 12 | 1 - 5 - 0 |
| (b) double diode, output 500-1000 volts, 25 ma | 24 | |
| (c) -do- 100 ma | 24 | 1 - 10 - 0 |
| (d) screened grid, medium impedance | 24 | 0 - 12 - 6 |
| (e) screened grid, high impedance | 24 | 0 - 10 - 6 |
| (f) triode, low impedance, 200 volt anode | 24 | 0 - 10 - 0 |
| (g) triode, medium impedance, 200 volt anode | 24 | 0 - 12 - 6 |
| (h) triode, high impedance, 200 volt anode | 24 | 0 - 15 - 0 |
| (i) pentode, low impedance | 24 | 0 - 10 - 6 |
| (j) pentode, high impedance | 24 | 0 - 10 - 6 |
| (k) pentonde, beam power | 24 | 1 - 5 - 0 |
| II. H.F. Valves | | |
| (a) diode, H.F. 500 volt, self capacity less than 2µµf, for constructing valve voltmeter | 6 | 0 - 15 - 0 |
| (b) assortment of latest types of H.F. valves including Magnetrons as developed for war purposes, when available | 10 doz. various types | 0 - 10 - 0 |

| 1. | 2. | 3. |
|---|---|---|
| 50. Voltmeter, A.C., rectifier type, multirange:- | | |
| 5,25,125,250 volts (Turner) | 12 | 5 - 10 - 0 |
| 51. Voltmeter, D.C., moving coil, 2½" dial (Ferranti) | | |
| (a) 0-5 volts | | |
| (b) 0-25 " | | |
| (c) 0-100 " | | |
| (d) 0-250 volts | | |
| (e) 0-500 volts | | |
| 52. Voltmeter, D.C., moving coil, 4" dial, 0-800 volts (Elliott) | 16 | 4 - 10- 0 |
| 53. Voltmeters, electrostatic, 2½" dial (Ferranti) | | |
| (a) 100-450 volts | 12 | 4 - 19 - 0 |
| (b) 150 -750 volts | 12 | 3 - 11 - 0 |
| 54. Voltmeter, valve, triode, H.F., precision(Marconi) | 2 | 50 - 0 - 0 |
| 55. Wavemeter, absorption, 40 Kc - 30 Mc/second, complete with batteries (Sullivan) | 2 | 47 - 0 - 0 |
| 56. Wavemeter, heterodyne, with coils covering range 75 Kc - 40 Mc/second, without batteries(Sullivan) | 1 | 12 - 0 - 0 |

## Radio - Tools.

40 Students : £ 313

| Article and Type | Size. | Quantity: 40 Students | Price per Unit (1939) £. s. d. |
|---|---|---|---|
| 1. Auger bits | Set of 5, ¼"-¾" | 1 set | - 12 9 |
| 2. Bench stop, spring, steel | - | 1 | - 3 2 |
| 3. Bits, centre | Set of 6, ¼"-1" | 1 set | - 4 3 |
| 4. Blades, hacksaw | 12" | 1 doz | - 3 9 |
| 5. Brace, carpenter's | 8" sweep | 1 | - 3 6 |
| 6. Bradawl | - | 2 | - - 5 |
| 7. Carborundum stone, medium | 6" x 2" x 1" | 1 | - 4 0 |
| 8. Carborundum stone, fine | 6" x 2" x 1" | 1 | - 4 0 |
| 9. Chisel, firmer | ¼" | 1 | - 1 0 |
| 10. Chisel, firmer | ⅜" | 1 | - 1 1 |
| 11. Chisel, firmer | ½" | 1 | - 1 2 |
| 12. Chisel, firmer | ¾" | 1 | - 1 3 |
| 13. Chisel, firmer | 1" | 1 | - 1 7 |
| 14. Chisel, cold | 6" x ⅜" | 1 | - - 8 |
| 15. Compasses, wing | 6" | 1 | - 3 3 |
| 16. Drill, bench, with 3 - jaw chuck and ⅛ H.P. electric motor | capacity ¼" | 1 | 5 10 0 |
| 17. Drill, hand, with 3 - jaw chuck | capacity ¼" | 1 | - 12 6 |
| 18. Drills, twist, carbon steel | set of 13, 1/16" -¼" | 1 set | - 4 9 |
| 19. File, flat, medium, with handle | 8" | 1 | - 1 2 |
| 20. File, flat, fine, with handle | 8" | 1 | - 1 2 |
| 21. File, half-round, medium, with handle | 8" | 1 | - 1 5 |
| 22. File, half-round, fine, with handle | 8" | 1 | - 1 5 |
| 23. File, round, medium, with handle | 8" | 1 | - - 10 |
| 24. File, round, fine, with handle | 8" | 1 | - - 10 |
| 25. File, triangular, medium, with handle | 6" | 6 | - - 9 |
| 26. Gauge, marking, beechwood | - | 1 | - 1 0 |
| 27. Glasscutter, diamond | - | 1 | - 16 6 |
| 28. Gimlet | - | 1 | - - 8 |

| 1. | 2 | 3 | 4. £. | s. | d. |
|---|---|---|---|---|---|
| 29. Hammer, carpenter's | Warrington No 4 | 1 | - | 1 | 9 |
| 30. Hammer, claw | 12 oz | 1 | - | 2 | 0 |
| 31. Iron, soldering, electric, R.H. | Mains voltage to be stated | 1 | - | 11 | 6 |
| 32. Iron, soldering, gas, R.H. | - | 1 | - | - | 10 |
| 33. Iron, soldering, gas, straight | - | 1 | - | - | 10 |
| 34. Lathe, plain, 2½", with ⅓ H.P. electric motor, 8 speed countershaft, and 30 assorted lathe tools. | - | 1 | 25 | 0 | 0 |
| 35. Mallet, joiner's | 4½" block | 1 | - | 2 | 0 |
| 36. Nails, brad | 1" | 1 lb | - | - | 3 |
| 37. Nails, French | 1½" | 1 lb | - | - | 3 |
| 38. Nails, French | 2" | 1 lb | - | - | 3 |
| 39. Oil can | ½ pt. | 1 | - | 3 | 5 |
| 40. Pincers | 6" | 1 | - | 1 | 8 |
| 41. Plane, jack | 2¼" iron | 1 | - | 12 | 0 |
| 42. Plane, smoothing | 2¼" iron | 1 | - | 9 | 6 |
| 43. Pliers, electricians | 6" | 1 | - | 3 | 0 |
| 44. Pliers, lever, end-cuttings | 6" | 3 | - | 3 | 0 |
| 45. Pliers, round nose | 5" | 2 | - | 2 | 3 |
| 46. Punch, centre | 4" | 1 | - | - | 9 |
| 47. Punch, nail | - | 1 | - | - | 6 |
| 48. Rasp, flat, medium, with handle | 10" | 1 | - | 1 | 6 |
| 49. Rasp, half-round, medium, with handle. | 10" | 1 | - | 1 | 9 |
| 50. Rawplugs, set of, complete with tools | - | 1 set | - | 3 | 6 |
| 51. Rule, carpenter's, folding | 2ft x 1" | 1 | - | 3 | 2 |
| 52. Screwdriver, cabinet | 8" | 1 | - | 2 | 3 |
| 53. Screwdriver, electricians | 8" x 3/16" | 3 | - | 1 | 7 |
| 54. Saw, hack, adjustable | 8" - 12" | 1 | - | 4 | 0 |
| 55. Saw, hand | 20" | 1 | - | 9 | 9 |
| 56. Saw, keyhole, with 3 blades | 12" | 1 | - | 1 | 10 |
| 57. Saw, tenon | 12" | 1 | - | 6 | 6 |
| 58. Shears, metal cutting | 8" | 1 | - | 2 | 6 |
| 59. Spanner, adjustable | 6" | 1 | - | 3 | 2 |
| 60. Spanners, 0-8 B.A., set of | - | 1 | - | 8 | 6 |



| 1 | 2 | 3 | 4 £. | s. | d. |
|---|---|---|---|---|---|
| 61. Spanner, double ended, Whitworth | ¾" and 5/16" | 1 | - | 1 | 3 |
| 62. Spanner, double ended, Whitworth | ⅜" and 7/16" | 1 | - | 2 | 0 |
| 63. Spanner, double ended, Whitworth | ½" and ⅝" | 1 | - | 3 | 6 |
| 64. Spirit level, oak | 10" | 1 | - | 2 | 0 |
| 65. Square, engineer's, steel | 4" | 1 | - | 3 | 3 |
| 66. Square, joiner's | 9" | 1 | - | 4 | 9 |
| 67. Square, joiner's | 4½" | 1 | - | 2 | 9 |
| 68. Taps and Dies, B.A., in case, complete | 0 B.A. - 10 B.A. | 1 set | 2 | 1 | 6 |
| 69. Vice, parallel | 3½" jaws | 1 | - | 17 | 0 |
| 70. Vice, woodworkers | 9" jaws | 1 | 1 | 4 | 9 |

## RAW MATERIALS

| | | | | |
|---|---|---|---|---|
| 1. Brass foil | | | | |
| (a) 2 mil thick | 200 sq.ft. | - | - | 2½ |
| (b) 4 mil thick | 200 sq.ft. | - | - | 4 |
| 2. Brass rod | | | | |
| (a) ⅛" diameter | 60 ft | - | - | 2 |
| (b) ¼" diameter | 60 ft | - | - | 4 |
| (c) 5/16" diameter | 40 ft | - | - | 6 |
| (d) ⅜" diameter | 30 ft | - | - | 9 |
| (e) ½" diameter | 30 ft | - | 1 | 4 |
| (f) ⅝" diameter | 20 ft | - | 2 | 0 |
| (g) 1" diameter | 10 ft | - | 5 | 4 |
| 3. Brass strip | | | | |
| (a) 1" x ⅛" | 60 ft | - | 1 | 0 |
| (b) 1" x 1/16" | 60 ft | - | - | 2 |
| 4. Brass tube, telescopic, 22 S.W.G., in standard pairs, approximately 4 ft long | | | | |
| (a) ¼" diameter | 6 pairs | - | 2 | 6 |
| (b) 5/16 diameter | 6 pairs | - | 3 | 2 |
| (c) ⅜" diameter | 6 pairs | - | 3 | 6 |
| (d) ½" diameter | 6 pairs | - | 4 | 9 |
| (e) ¾" diameter | 6 pairs | - | 6 | 0 |
| (f) 1" diameter | 6 pairs | - | 7 | 9 |
| 5. Cable, H.F., for 100 magacycles (Telcon, | | | | |
| (a) co-axial, ⅛" diam type P.T.1(M) | 100 yds | 2 | 14 | 3 |

P.T.O.

| 1 | 3 | 4 £. | s. | d. |
|---|---|---|---|---|
| 5. (b) screened twin, type V.A.3(PFM) | 100 yds | 4 | 17 | 7 |
| (c) screened twin, type V.A.9(AP) | 100 yds | 1 | 2 | 11 |
| (d) screened twin, type A.S.46(M) | 100 yds | 12 | 6 | 10 |
| 6. Copper foil, in rolls 6" wide | | | | |
| (a) 2 mil thick | 200 sq.ft. | - | - | 2½ |
| (b) 4 mil thick | 200 sq.ft. | - | - | 4 |
| 7. Copper rivets, assorted, 1/16" to 3/16" | 1 box | - | 10 | 0 |
| 8. Copper sheet, 20 S.W.G., in standard sheets 4ft x 3ft | 20 sheets | - | 17 | 0 |
| 9. Flex, twin, rubber and cotton insulation, in 100 yds. reels. | | | | |
| (a) 5 amp | 10 reels | 1 | 2 | 6 |
| (b) 10 amp | 2 reels | 1 | 12 | 6 |
| 10. Flux, non corrosive, in 1 lb tins | 2 tins | - | 5 | - |
| 11. Mica, in sheets 4" x 3" | 12 doz. sheets | - | 5 | - |
| 12. Micalex sheet | | | | |
| (a) ⅛" thick | | | | |
| (b) ¼" thick | | | | |
| Nuts, see "Screws" | | | | |
| 13. Panel pins | 7 lbs. | - | - | 4 |
| 14. Paper, emery | | | | |
| (a) fine | 2 doz sheets | - | 1 | 6 |
| (b) medium | 2 doz sheets | - | 1 | 6 |
| (c) coarse | 2 doz sheets | - | 1 | 6 |
| 15. Paper, glass | | | | |
| (a) fine | 2 doz sheets | - | 1 | 6 |
| (b) medium | 2 doz sheets | - | 1 | 6 |
| (c) coarse | 2 doz sheets | - | 1 | 6 |
| 16. Paxolin sheet | | | | |
| (a) ⅛" thick | 20 sq. ft. | - | 7 | 6 |
| (b) ¼" thick | 10 sq. ft. | - | 15 | 0 |
| 17. Paxolin tube | | | | |
| (a) 1" diameter x 1/16" wall | 50 ft | - | 1 | 6 |
| (b) 2" diameter x 1/16" wall | 40 ft | - | 2 | 6 |



| 1 | 3 | 4 £. | s. | d. |
|---|---|---|---|---|
| 17. (c) 3" diameter x ⅛" wall | 20 ft | - | 8 | 6 |
| (d) 6" diameter x ⅛" wall | 10 ft | - | 15 | 0 |
| 18. Phosphor bronze sheet | | | | |
| (a) 4 mil thick | 6 lbs | - | 2 | 6 |
| (b) 8 mil thick | 6 lbs | - | 2 | 6 |
| 19. Plugs, wander, red, black and green | 24 doz | - | 1 | 0 |
| 20. Polythene, rod, in 1 ft lengths | | | | |
| (a) ¼" diameter | 50 lengths | - | - | 2½ |
| (b) ½" diameter | 20 lengths | - | - | 10 |
| (c) 1" diameter | 10 lengths | - | 2 | 3 |
| 21. Polythene sheet, 24" x 15" | | | | |
| (a) ⅛" thick | 6 sheets | 1 | 0 | 0 |
| (b) ¼" thick | 6 sheets | 2 | 0 | 0 |
| 22. Presspahn sheets, in sheets 24" x 32" | | per 100 sheets | | |
| (a) 4 mil thick | 100 sheets | 2 | 16 | 0 |
| (b) 10 mil thick | 100 sheets | 4 | 5 | 6 |
| (c) 20 mil thick | 50 sheets | 5 | 12 | 6 |
| (d) 32 mil thick | 50 sheets | 8 | 0 | 0 |
| (e) 60 mil thick | 20 sheets | 13 | 10 | 0 |
| 23. Resin | 14 lbs | - | - | 7 |
| 24. Screws, nuts and washers | | | | |
| I. Brass, cheesehead, B.A. | | | | |
| (a) 0 B.A., 1" | 1 gross | - | 10 | 0 |
| (b) 2 B.A., 1" | 1 gross | - | 6 | 0 |
| (c) 4 B.A., ⅝" | 1 gross | - | 3 | 6 |
| (d) 6 B.A., ⅝" | 1 gross | - | 3 | 3 |
| (e) 8 B.A., ½" | 1 gross | - | 3 | 0 |
| (f) 10 B.A., ⅜" | 1 gross | - | 2 | 10 |
| II. Brass, countersunk, B.A. | | | | |
| (a) 0 B.A., 1" | 1 gross | - | 7 | 6 |
| (b) 2 B.A., 1" | 1 gross | - | 4 | 6 |
| (c) 4 B.A., ⅝" | 1 gross | - | 2 | 9 |

| 1 | 3 | 4 £. | s. | d. |
|---|---|---|---|---|
| 24- II. (d) 6 B.A., $\frac{5}{8}$" | 1 gross | - | 2 | 6 |
| (e) 8 B.A., $\frac{1}{2}$" | 1 gross | - | 2 | 6 |
| (f) 10 B.A., $\frac{3}{8}$" | 1 gross | - | 2 | 3 |
| III. Brass, wood screwa, countersunk | | | | |
| (a) 1" x No 6 | 2 gross | - | 2 | 9 |
| (b) $\frac{3}{4}$" x No 6 | 2 gross | - | 2 | 3 |
| (c) $\frac{1}{2}$" x No 5 | 1 gross | - | 1 | 7 |
| IV. Brass, wood screwa, round head | | | | |
| (a) 1" x No 6 | 1 gross | - | 3 | 7 |
| (b) $\frac{3}{4}$" x No 6 | 1 gross | - | 3 | 0 |
| (c) $\frac{1}{2}$" x No 5 | 1 gross | - | 2 | 0 |
| V. Iron, wood screwa, countersunk | | | | |
| (a) 2" x No 8 | 2 gross | - | 2 | 0 |
| (b) $1\frac{1}{2}$" x No 7 | 2 gross | - | 2 | 0 |
| (c) $1\frac{1}{4}$" x No 6 | 2 gross | - | 1 | 4 |
| (d) 1" x No 6 | 2 gross | - | 1 | 2 |
| (e) $\frac{3}{4}$" x No 5 | 2 gross | - | - | 11 |
| VI. Iron, wood screwa, round head | | | | |
| (a) 1" x No 6 | 1 gross | - | 1 | 5 |
| (b) $\frac{3}{4}$" x No 5 | 1 gross | - | 1 | 1 |
| (c) $\frac{1}{2}$" x No 4 | 1 gross | - | - | 11 |
| VII. Nuts, brass, hexagon, B.A. | | | | |
| (a) 0 B.A. | 2 gross | - | 3 | 9 |
| (b) 2 B.A. | 2 gross | - | 3 | 0 |
| (c) 4 B.A. | 2 gross | - | 2 | 7 |
| (d) 6 B.A. | 2 gross | - | 2 | 5 |
| (e) 8 B.A. | 2 gross | - | 2 | 8 |
| (f) 10 B.A. | 2 gross | - | 2 | 3 |
| VIII. Washers, brass, B.A. | | | | |
| (a) 0 B.A. | 2 gross | - | 2 | 9 |
| (b) 2 B.A. | 2 gross | - | 2 | 3 |
| (c) 4 B.A. | 2 gross | - | 1 | 10 |
| (d) 6 B.A. | 2 gross | - | 1 | 6 |



| 1 | 3 | 4 £. | s. | d |
|---|---|---|---|---|
| 24-VIII. (e) 8 B.A. | 2 gross | - | 1 | 6 |
| (f) 10 B.A. | 2 gross | - | 1 | 6 |
| 25. Silk, oiled, in sheets 24" x 32", 4 mil thick | 20 sheets | - | 6 | 0 |
| 26. Sleeving | | | | |
| (a) Sistoflex, plain, 2 mm bore | 1 gross yds | 1 | 4 | 0 |
| (b) screened | 6 doz yds | - | 6 | 0 |
| 27. Tape | | | | |
| (a) bitumen, $\frac{3}{4}$" wide in 25 yd reels | 30 reels | - | 1 | 5 |
| (b) linen, white $\frac{5}{8}$" wide | 2 gross yds | - | 12 | 6 |
| (c) rubber, in $\frac{1}{2}$" lb reels | 7 lbs | - | 4 | 0 |
| (d) silk | 1 gross yds | 1 | 9 | 6 |
| 28. Terminals | | | | |
| (a) instrument 2 B.A. insulated (Bulgin) | 24 doz | - | 8 | 0 |
| (b) Spade | 24 doz | - | 2 | 0 |
| Washers, see under "Screws" | | | | |
| 29. Wire | | | | |
| I. Copper, bare, tinned | | | | |
| (a) 16 S.W.G. | 6 lbs | - | 1 | 8 |
| (b) 18 S.W.G. | 6 lbs | - | 1 | 8 |
| (c) 20 S.W.G. | 6 lbs | - | 1 | 9 |
| (d) 22 S.W.G. | 6 lbs | - | 2 | 0 |
| (e) 26 S.W.G. | 4 lbs | - | 2 | 4 |
| (f) 32 S.W.G. | 4 lbs. | - | 2 | 10 |
| II. Copper, double cotton covered | | | | |
| (a) 18 S.W.G. | 6 lbs | - | 2 | 3 |
| (b) 20 S.W.G. | 6 lbs | - | 2 | 8 |
| (c) 22 S.W.G. | 6 lbs | - | 3 | 0 |
| III. Copper, double silk covered | | | | |
| (a) 20 S.W.G. | 6 lbs | - | 4 | 6 |
| (b) 22 S.W.G. | 6 lbs | - | 5 | 9 |
| (c) 24 S.W.G. | 6 lbs | - | 6 | 3 |
| (d) 26 S.W.G. | 6 lbs | - | 7 | 3 |
| (e) 28 S.W.G. | 6 lbs | - | 8 | 3 |
| (f) 30 S.W.G. | 6 lbs | - | 9 | 3 |

## RADIO TOOLS.

| 1 | 3 | 4 £. | s. | d |
|---|---|---|---|---|
| 29-III.(g) 32 S.W.G. | 2 lbs | - | 10 | 9 |
| (h) 34 S.W.G. | 2 lbs | - | 12 | 6. |
| (i) 38 S.W.G. | 1 lbs | 1 | 0 | 0 |
| (j) 40 S.W.G. | 1 lb | 1 | 4 | 0 |
| (k) 42 S.W.G. | ½ lb | 1 | 10 | 0 |
| (l) 44 S.W.G. | ½ lb | 2 | 8 | 0 |
| (m) 48 S.W.G. | ¼ lb | 7 | 5 | 0 |
| IV. Eureka, double silk covered | | | | |
| (a) 18 S.W.G. | 3 lbs | - | 7 | 0 |
| (b) 20 S.W.G. | 3 lbs | - | 8 | 0 |
| (c) 22 S.W.G. | 3 lbs | - | 9 | 0 |
| (d) 24 S.W.G. | 3 lbs | - | 10 | 0 |
| (e) 26 S.W.G.) | 3 lbs | - | 11 | 3 |
| (f) 28 S.W.G. | 3 lbs | - | 13 | 6 |
| (g) 30 S.W.G. | 2 lbs | - | 16 | 6 |
| (h) 32 S.W.G. | 2 lbs | - | 19 | 6 |
| (i) 34 S.W.G. | 2 lbs | 1 | 2 | 0 |
| (j) 36 S.W.G. | 1 lb | 1 | 7 | 0 |
| (k) 38 S.W.G. | 1 lb | 1 | 14 | 0 |
| (l) 40 S.W.G.) | ½ lb | 2 | 3 | 0 |
| (m) 42 S.W.G. | ½ lb | 2 | 10 | 0 |
| (n) 44 S.W.G. | ½ lb | 4 | 1 | 0 |
| (o) 48 S.W.G. | ¼ lb | 11 | 10 | 0 |

## STRENGTH OF MATERIALS.

(40 Students £ 1,761.)

| Article and type | Size | Quantity for 40 students | Price per Unit (1939) £. | S. | D. |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | | |
| 1. Caliper guage | | 1 pair | 7. | 16. | 0 |
| 2. Calipers and dividers, Combination | | 2 pairs | 1. | 2. | 6. |
| 3. Cement Testing Accessories:- Balance ... ... | 10 kg x 0.2 gm | 2 | 14. | 10. | 0. |
| Damp box, mahogany, for briquettes, with canvas lid | 21" x 19" x 3½" | 3 | 2. | 7. | 0. |
| Knife, pallet | - | 3 | - | 8. | 0. |
| Measure, glass | 1 litre | 3 | - | 10. | 6. |
| Moulds, briquette, for tensile test, gunmetal with cramping screws | B.S.S. No.12/1931 | 1 doz. | 7. | 15. | 0. |
| Mould oil | 5 gallons | 1 drum | - | 10. | 6. |
| Shovel, small | - | 3 | - | 7. | 6. |
| Sieves, hand, brass, 8" diam (a) | 170 meshes/in | 3 | 1. | 6. | 0. |
| (b) | 72 meshes/in | 3 | - | 17. | 6. |
| Sieve cover and receptacle for above | - | 3 | 1. | 5. | 0. |
| Sieves, hand, wood-rimmed, for sand 10" diam | 25 meshes/in | 3 | - | 6. | 0. |
| 12" diam | 18 meshes/in | 3 | - | 7. | 0. |
| Slab, Glass, for gauging | 18"x12"x¾" | 2 | 1. | 17. | 6. |
| Slab, slate, planned both faces and all edges for mixing cement. | 24"x9"x1" | 3 | - | 12. | 6. |
| Spatula, cement, steel, with hardwood handle | B.S.S. No.12/1931 | 1 doz. | 5. | 15. | 0. |
| Tamping rod, mild steel, 4 lbs. | 15" long x 1" square | 4 | - | 7. | 0. |
| Trowel, gauging, steel, with hard wood handle | B.S.S. No. 12/1931 7" | 1 doz. | - | 4. | 0. |
| Water tray, teak, zinc-lined for storage of briquettes | 24"x12"x4" | 3 | 1. | 15. | 0. |
| Weights, brass, in block | 10 kg x 1 gm | 2 sets | 11. | 0. | 0. |
| 4. Cement needle tester, Vicat | - | 1 | 3. | 10. | 0. |
| 5. Cement slump tester | - | 1 | 2. | 10. | 0. |
| 6. Cement tensile tester, standard | - | 1 | 5. | 0. | 0. |
| 7. Cement voids determination | - | 1 | 6. | 10. | 0. |

## STRENGTH OF MATERIALS.

| | | | | £. | s. | d. |
|---|---|---|---|---|---|---|
| 8. | ~~Depth gauge, vernier type~~ | - | 1 | 2. | 11. | 0. |
| 9. | Extensometer, Ewings | - | 2 | 35. | 0. | 0. |
| 10. | Extensometer, Lamb, roller type | - | 1 | 25. | 0. | 0. |
| 11. | Fatigue testing machine, overhung rotating bar N.P.L. design | - | 1 | 220. | 0. | 0. |
| 12. | Hardness testing machine, standard Brinell, hydrualic, hand operated | - | 1 | 175. | 0. | 0. |
| 13. | Impact machine, Izod | 120 ft/lb | 1 | 135. | 0. | 0. |
| 14. | Micrometers | 0 - 1" | 3 | 2. | 14. | 0. |
| 15. | Micrometers | 0 - 2" | 1 | 3. | 0. | 0. |
| 16. | Micrometers | 0 - 3" | 1 | 3. | 0. | 0. |
| 17. | Microscope, vernier | - | 1 | 22. | 0. | 0. |
| 18. | Scribers. | 8" | 2 | - | 3. | 0. |
| 19. | Spring dividers | - | 4 pairs | - | 8. | 0. |
| 20. | Steel rules | 0-12"x1/32" & x1/50". | 12 | - | 3. | 0. |
| 21. | Tensile testing machine, bench type, lever arm ratio 22.4:1, hand operated, mechanical | up to 1000 kg | 1 | 30. | 0. | 0. |
| 22. | Torsion testing machine, mechanical, hand operated | - | 1 | 40. | 0. | 0. |
| 23. | Universal testing machine, (hydraulic), motorized, automatic loading. | 10 tons | 1 | 850. | 0. | 0. |

"GUPTA"
2-67.

## WORKSHOP PRACTICE (INCLUDING METROLOGY)

15 STUDENTS - £ 6,058.

| | Article and Type. | Size. | Quantity for 15 Students. | Price per Unit (1944.) £. | s. | d. |
|---|---|---|---|---|---|---|
| | Ammeter, moving iron, double range | 0-250 v.) 0-450 v.) | 3 | 7 | 0 | 0 |
| | Angle plate, see "Plate, angle" | | | | | |
| | Anvil | 1 cwt. | 1 | 3 | 18 | 9 |
| | Anvil | 1¼ " | 1 | 4 | 13 | 6 |
| | Anvil stake, see "Stake, anvil" | | | | | |
| | Bar, side | 125 mm. | 1 | 8 | 0 | 0 |
| | Bath, quenching | - | 2 | 2 | 0 | 0 |
| | Bath, salt, gas-fired. | - | 1 | 25 | 0 | 0 |
| | Bevel, combination. | - | 2 | - | 14 | 9 |
| | Blade, hacksaw, frame | 12" | 48 | - | - | 6. |
| | Blade, hacksaw, power. | - | 72 | - | - | 8¼ |
| | Block, rectangular, square | 10" x 8" x 2½" | 1 | - | 8 | 6 |
| | Block, V-, and cramp | 2" x 1½" | 1 | - | 12 | 0 |
| | Blower, motor | - | 1 | 25 | 0 | 0 |
| 13. | Brazing hearth and pipes, with motor blower. | - | 2 | 18 | 10 | 0 |
| | Buffer, see "Grinder, buffer". | | | | | |
| 14. | Caliper, divider, spring, | 150 mm. | 6 | - | 5 | 7½. |
| | Caliper, inside, spring. | 150 mm. | 6 | - | 4 | 1½ |
| 16. | Caliper, odd leg. | 150 mm. | 2 | - | 2 | 3 |
| 17. | Caliper, outside, spring. | 150 mm. | 12 | - | 4 | 1½ |
| | Caliper, vernier. | 6" | 1 | 8 | 10 | 0 |
| 19. | Can, oil | ½ pint | 2 | - | 2 | 3 |
| 20. | Centre grinding attachment for lathe. | - | 1 | 20 | 0 | 0 |
| 21. | Chisel, cross-cut. | 7" x ¼" | 5 | - | 1 | 0 |
| | Chisel, flat. | 8" x ¾" | 12 | - | 1 | 6 |
| | Cleaner, file. | 2" x 4" | 12 | - | - | 9. |
| | Combination set | - | 2 | 2 | 16 | 3 |
| 25. | Comparator, mechanical, magnification 1000 | - | 1 | 48 | 0 | 0 |
| 6. | Cutters, milling, sets. | - | 3 sets | 12 | 16 | 6 |
| | Drill, breast, stock. | ½" | 1 | 1 | 2 | 6 |

| Article and Type. | Size | Quantity for 15 Students. | Price per Unit 1944 £. | s. | d. |
|---|---|---|---|---|---|
| 28. Drill, chuck, No. 2 taper, for drilling machine. | ½" | 1 | 3 | 10 | 0 |
| 29. Drill, drift, for drilling machine. | - | 2 | - | 2 | 6 |
| 30. Drill, hand, stock. | ¼" | 1 | - | 11 | 3 |
| 31. Drilling machine, bench. | 5" | 2 | 48 | 0 | 0 |
| 32. Drilling machine, pillar. | 1" | 1 | 90 | 0 | 0 |
| 33. Drills, high-speed, straight shank, sets. | 1/16" - ½" x 1/64" | 2 sets | 7 | 0 | 0 |
| 34. Drills, high-speed, taper shank, sets. | ½" - 1" X 1/32" | 1 set | 10 | 13 | 0 |
| 35. Drill sleeve, for drilling machine | Nos. 1-2 | 2 | - | 9 | 0 |
| 36. Drill sleeve, for drilling machine | Nos. 2-3 | 2 | - | 12 | 0 |
| 37. Drills, set. | 1/16" -½" | 1 set | 3 | 18 | 0 |
| 38. Drills, set. | Nos.1-60 | 1 set | 3 | 8 | 0 |
| 39. Engraver, with normal minimum equipment for letter-engraving (Taylor and Hobson) | - | 1 | 180 | 0 | 0 |
| Extinguisher stake, see "Stake, extinguisher" | | | | | |
| 40. File, flat, bastard, second cut. | 8" | 24 | - | 2 | 0 |
| 41. File, flat, bastard, second cut. | 10" | 24 | - | 2 | 6 |
| 42. File, half-round, bastard. | 8" | 24 | - | 2 | 1½ |
| 43. File, half-round, bastard, smooth | 8" | 24 | - | 2 | 9 |
| 44. File, pillar. | 8" | 12 | - | 2 | 0. |
| 45. File, pillar, smooth. | 8" | 12 | - | 2 | 4½. |
| 46. File, round, bastard. | 6" | 12 | - | 1 | 3. |
| 47. File, round, bastard, smooth | 6" | 12 | - | 1 | 7½. |
| 48. File, square, bastard. | 10" | 12 | - | 2 | 1½ |
| 49. File, square, bastard, smooth | 10" | 12 | - | 2 | 10½. |
| 50. File, 3-square, bastard. | 4" | 12 | - | 1 | 1½. |
| 51. File, 3-Square, bastard, smooth. | 4" | 12 | - | 1 | 6. |
| Flypress, see "Press, fly". | | | | | |
| 52. Forge, hearth, with motor and tools | - | 1 | 33 | 0 | 0 |
| 53. Furance, high-temperature, double chamber, gas heated. | 15" x 10" x 5" | 1 | 90 | 0 | 0 |
| 54. Furance, muffle, electrically-heated, 1350°C | 17" x 11" x 4" | 1 | 22 | 15 | 0 |
| 55. Furance, muffle, gas-heated, with natural draft. | 10" x 5" x 2½" | 1 | 26 | 0 | 0 |



| Article and Type. | Size. | Quantity for 15 Students. | Price per Unit 1944. £. | s. | d. |
|---|---|---|---|---|---|
| 56. Gas heater, for soldering iron | - | 6 | - | 11 | 3 |
| 57. Gauge, cylindrical, grade A, with plug and ring. | - | 5 | 1 | 5 | 0 |
| 58. Gauge, dial, graduated. | .01 mm. | 3 | 3 | 0 | 0 |
| 59. Gauge, height, vernier. | 250 mm. | 1 | 14 | 0 | 0 |
| 60. Gauge, limit, external, adjustable. | - | 14 | 1 | 1 | 3 |
| 61. Gauge, limit, plug, "Go/Not Go" | - - | 1 | 1 | 18 | 0 |
| 62. Gauge, screw, plug, "Go/Not Go" | - | 1 | 1 | 18 | 0 |
| 63. Gauges, slip, workshop grade B, set of 50. | - | 1 set | 45 | 11 | 6 |
| 64. Gauge, surface. | 75 mm. base | 6 | 1 | 9 | 7½ |
| 65. Grinder-buffer, double machine | - | 1 | 35 | 0 | 0 |
| 66. Grinder, semi-universal. | - | 1 | 70 | 0 | 0 |
| 67. Grinder, surface, magnetic chuck | 18" x 6" | 1 | 340 | 0 | 0 |
| 68. "Grinder, Tool and Cutter" Capable of plain cylindrical work and internal grind-ing. | - | 1 | 25 | 0 | 0 |
| 69. Grinder, twist-drill, attachment for | - | 1 | 7 | 0 | 0 |
| 70. Grind-ing wheel, for lathe. | - | 3 | 1 | 0 | 0 |
| 71. Guillotine, hand. | 6" | 1 | 10 | 10 | 0 |
| 72. Hammer, engineer's, ballpein. | ½ lb. | 6 | - | 1 | 10 |
| 73. Hammer, engineer's, ballpein. | 1½ lbs. | 6 | - | 2 | 7½ |
| 74. Hammer, hollowing. | 3 lbs. | 1 | - | 13 | 6. |
| 75. Handle, file. | 3½" | 12 | - | - | 1½ |
| 76. Hardometer (hardness meter) | - | 1 | 42 | 0 | 0 |
| Hatchet stake, see "Stake, hatchet" | | | | | |
| 77. Indicator, dial, test, with accessories. | - | 3 sets | 5 | 8 | 0 |
| 78. Iron, Bick. | 15 lbs. | 1 | 1 | 18 | 9. |
| 79. Iron, creasing. | 11 " | 1 | 10 | 10 | 0 |
| 80. Iron, soldering, copper bit. | 1 lb. | 6 | - | 2 | 0 |
| 81. Iron, soldering, electric | 1 lb. | 3 | - | 10 | 6 |
| 82. Lathe, brass finishing | 6½" | 1 | 73 | 0 | 0 |
| 83. Lathe, screw cutting. | 4½" | 2 | 150 | 0 | 0 |
| 84. Lathe, screw cutting, all-geared | 6¾" | 2 | 320 | 0 | 0 |

| Article and Type. | Size. | Quantity for 15 Students. | Price per Unit 1944 £. | s. | d. |
|---|---|---|---|---|---|
| 85. Lathe, screw cutting, cone-drive | 6½" | 2 | 235 | 0 | 0 |
| 86. Mallet, tinman's Mandrell, see Press, mandrell. | 2¾" x 5½" | 6 | - | 3 | 6 |
| 87. Meter, watt-hour, 3-phase, 2 element. | - | 1 | 30 | 0 | 0 |
| 88. Micrometer, depth. | 0 - 75 mm. | 1 | 4 | 3 | 0 |
| 89. Micrometer, internal. | 50 - 200 mm. | 1 | 2 | 9 | 0 |
| 90. Micrometer, outside. | 0 - 25 mm. | 5 | 1 | 14 | 0 |
| 91. Micrometer, outside. | 25 - 50 mm. | 5 | 2 | 11 | 6 |
| 92. Micrometer, outside. | 50 - 75 mm. | 1 | 2 | 16 | 6 |
| 93. Milling machine, plain, horizontal. | 26" x 8" | 1 | 170 | 0 | 0 |
| 94. Milling machine, universal. | 32" x 7½" | 1 | 380 | 0 | 0 |
| 95. Milling machine, vertical. | 25" x 5½" | 1 | 315 | 0 | 0 |
| 96. Parallels, double, wedge. | 1" x 1½" | 1 | 1 | 5 | 6 |
| 97. Planer, with single tool box, overhead belt drive, motor and starter (Alfred Herbert, London). | 4" x 2" x 2" | 1 | 230 | 0 | 0 |
| 98. Plate, angle, solid. | 6" x 5" x 4½" | 2 | - | 16 | 10½ |
| 99. Plate, angle, swivel type | 10" x 8" | 2 | 9 | 0 | 0 |
| 100. Plate, surface, scraped. | 12" x 8" | 6 | 4 | 11 | 0 |
| 101. Plier, flat-nosed. | 6" | 2 | - | 4 | 6 |
| 102. Press, fly. | - | 1 | 40 | 0 | 0 |
| 103. Press, mandrell. | - | 1 | 40 | 0 | 0 |
| 104. Protractor, bevel, universal. | - | 3 | 4 | 16 | 0 |
| 105. Punch, centre. | 4" | 12 | - | - | 9 |
| 106. Punch, grooved, set of 3 | ⅛", ¼", ⅜" | 2 sets. | - | 15 | 0 |
| 107. Punch, tinman's. | ¾ lb. | 2 | - | 3 | 9 |
| 108. Punch, tinman's. | 1 lb. | 2 | - | 4 | 10½ |
| 109. Punch, tinman's. | 1¼ lbs. | 2 | - | 6 | 0 |
| 110. Pyrometer. | - | 2 | 22 | 0 | 0 |
| 111. Rivet set, tinman's | ⅛" | 2 | - | 2 | 9 |
| 112. Rivet set, tinman's | 3/16" | 2 | - | 3 | 4½ |
| 113. Rollers, Hoffman, set of 13 | - | 2 sets | 1 | 15 | 0 |
| 114. Roll, for sheet metal. | 25⅜" x 1⅝" | 1 | 15 | 0 | 0 |



| Article and Type. | Size. | Quantity for 15 Students. | Price per Unit 1944 £. | s. | d. |
|---|---|---|---|---|---|
| 115. Rule | 300 mm. | 24 | - | 3 | 6 |
| 116. Saw, hack, frame. | 12" | 6 | - | 3 | 9 |
| 117. Saw, hack, power. | - | 1 | 8 | 0 | 0 |
| 118. Scraper, flat. | 6" | 6 | - | 2 | 1½ |
| 119. Scraper, half-round. | 6" | 5 | - | 2 | 0 |
| 120. Screwdriver | 3" x ¼" | 2 | - | 1 | 1½ |
| 121. Screwdriver. | 5" | 2 | - | 1 | 6 |
| 122. Screwdriver. | 8" x ½" | 2 | - | 2 | 6 |
| 123. Scriber | 7" | 24 | - | 1 | 4½ |
| 124. Shaper, medium, with vice. | 10" | 1 | 250 | 0 | 0 |
| 125. Shaper, heavy, with vice and swivel. | 14" | 1 | 250 | 0 | 0 |
| 126. Snips, tinman's, bent. | 10" | 2 | - | 6 | 4½ |
| 127. Snips, tinman's, straight. | 12" | 5 | - | 8 | 5 |
| 128. Spanner, adjustable. | 6" | 1 | - | 4 | 2 |
| 129. Spanner, adjustable. | 9" | 1 | - | 5 | 3 |
| 130. Square. | 100 mm. | 24 | - | 4 | 6 |
| 131. Square, engineer's, workshop grade | 6" | 1 | - | 5 | 8 |
| 132. Square, engineer's, workshop grade | 12" | 1 | - | 10 | 8 |
| 133. Stake, anvil. | 14 lbs. | 2 | 2 | 16 | 3 |
| 134. Stake, extinguisher. | 7 lbs. | 2 | 1 | 4 | 6 |
| 135. Stake, half-moon. | 8 lbs. | 2 | 1 | 10 | 0 |
| 136. Stake, hatchet. | 14 lbs. | 2 | 1 | 18 | 6 |
| 137. Stamp, set of letters. | ⅛" | 1 | - | 19 | 6 |
| 138. Stamp, set of numbers. | ⅛" | 1 | - | 7 | 2 |
| 139. Stone, India oil. | 8" x 2" x 1" | 2 | - | 9 | 4½ |
| 140. Straight edge, cast iron, grade A | 300 mm. | 1 | - | 19 | 0 |
| 141. Straight edge, cast iron, grade A | 600 mm. | 1 | 1 | 7 | 0 |
| 142. Straight edge, toolmaker's, set of 4 | - | 1 set. | 2 | 6 | 0 |
| Surface plate, see "Plate surface" | | | | | |
| 143. Table, marking off, grade B. | 3' x 2' | 1 | 12 | 0 | 0 |
| 144. Taps and dies, stock, with wrench, B.A. | Nos. 6 - 0. | 1 | 3 | 0 | 0 |
| 145. Taps and dies, stock, with wrench, B.S.F. | ⅛" x ½" | 1 | 2 | 16 | 8 |

| | Article and Type. | Size. | Quantity for 15 Students. | Price per Unit 1944 | | |
|---|---|---|---|---|---|---|
| 146. | Taps and dies, stock, with wrench, White-worth. | ¼" - ½" | 1 | 6 | 0 | 0 |
| 147. | Tongs, blacksmith's. | 19" | 2 | - | 4 | 0 |
| 148. | Tools, cutting, high-speed. | ½" sq. | 4 doz. | 1 | 10 | 9 |
| 149. | Tools, cutting, high-speed. | ⅝" sq. | 3 " | 2 | 5 | 6. |
| | V-blocks, see "Blocks". | | | | | |
| 150. | Vice, bench. | 3" | 24 | 1 | 1 | 9 |
| 151. | Vice, hand. | 5" | 2 | - | 10 | 6. |
| 152. | WELDING EQUIPMENT. | | | | | |
| | (a) Arc Welding: | | | | | |
| | Apron | - | 4 | - | 5 | 0 |
| | Boshe Water | 30"x24"x12" | 2 | 5 | 12 | 0 |
| | Brush steel | - | 4 | - | 3 | 6 |
| | Butt welder, capacity up to ⅜" mild steel rod | - | 1 | 30 | 0 | 0 |
| | Cable, rubber covered. | 50 yds. | 1 | 3 | 10 | 0 |
| | Electrode holder. | - | 4 | - | 15 | 0 |
| | Electrode welding for mild steel and stainless steel. | - | - | 20 | 0 | 0 |
| | Generator motor welding set A.C./D.C. single operator: output 15-175 amps., 20-35 volts with accessories. | - | - | 40 | 0 | 0 |
| | Gloves gauntlet, leather. | - | 4 prs. | - | 15 | 0 |
| | Goggles | - | 12 " | - | 2 | 6 |
| | Grinder portable, electric ½ h.p. | - | 1 | 20 | 0 | 0 |
| | Hammer | - | 4 | — | 8 | 0 |
| | Hammer chipping. | - | 4 | - | 7 | 6 |
| | Hammer Sledge. | 14 lbs. | 1 | - | 10 | 0 |
| | Machine shearing, capacity ⅜" | 10" | 1 | 25 | 0 | 0 |
| | Screen observers | - | 4 | 1 | 0 | 0 |
| | Screen welding. | - | 4 | 1 | 0 | 0 |
| | Seam welder small, for sheet metal | - | 1 | 30 | 0 | 0 |
| | Shield, head | - | 4 | - | 10 | 0 |
| | Spot-welder, small, for sheet metal | - | 1 | 25 | 0 | 0 |
| | Table setting up. | 3' x 3' | 1 | 12 | 0 | 0 |
| | Tongs. | - | 12 prs. | - | 5 | 0 |
| | Transformer welding, 80-90 k.V.A. with separate regulators for three operators; maximum current per operator 300 amps. | - | 1 | 60 | 0 | 0 |
| | (b) Gas welding: | | | | | |
| | Blowpipe oxy-acetylene, combined welding-cutting with interchangeable nozzles . | - | 9 sets. | 5 | 10 | 0 |
| | Cylinder key. | - | 9 | - | 1 | 6 |
| | Regulator acetylene and pressure gauge. | - | 9 | 2 | 10 | 0 |
| | Regulator oxygen and pressure gauge. | - | 9 | 2 | 10 | 0 |
| | Tubing, rubber pressure, for oxygen, three yard lengths. | - | 9 lengths. | - | 10 | 0 |