Technical Education.

CITY AND GUILDS OF LONDON INSTITUTE.

Below we reprint a further instalment of the questions given at the Technological Examinations, 1891 :—

INSTRUCTIONS.

The candidate must confine himself to one grade only, the Ordinary or Honours, and must state at the top of his paper of answers which grade he has selected.

The maximum number of marks obtainable is affixed to each question.

Three hours allowed for this paper.

19A. – CLOTH MANUFACTURE.

SECTION II.—WOOL AND WORSTED WEAVING.

INSTRUCTIONS.

The candidate must confine himself to one grade only, the Ordinary or Honours, and must select his questions from those of Division I. or II.

Point paper and patterns (pattern A for the Ordinary and patterns B and C for the Honours Grade) are supplied to each candidate.

Four hours allowed for this paper.

Not more than ten questions to be attempted in either grade.

The maximum number of marks obtainable is affixed to each question.

Candidates are requested to state the town in which they have been employed.
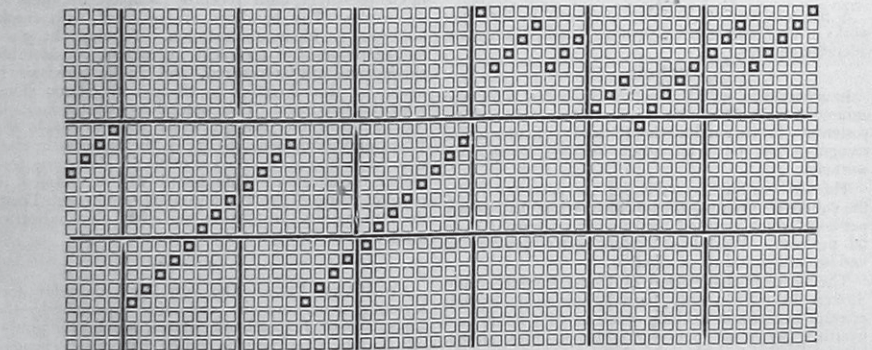
ORDINARY GRADE.

DIVISION I.

1. Give plan and particulars for accompanying pattern A, both as to counts of yarn and finish. (55 marks.)

2. Make draft and pegging plan to weave the accompanying design on the least possible number of shafts. (30.)
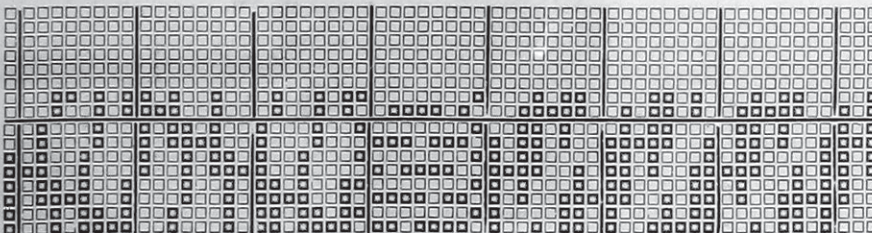
3. Find the number of healds per inch on each shaft in the following draft plan ; 12 reed, 8 in a reed. (30.)

4. How much weight of warp and weft will it require to make a piece of 20-cut gala warp, 14-cut gala weft, the length to be 50 yards ; 40 porties warp, 32 picks, 38 inches wide ? (20.)

5. Convert the following yarns into gala cuts :—2/60's worsted, 2/25's cotton, 80 2 spun silk, 16 skeins woollen (Yorkshire counts). (20.)

6. Complete the accompanying design. (25.)
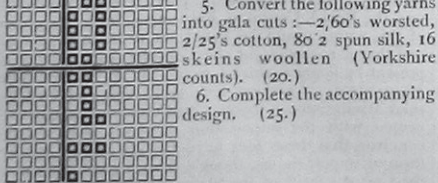
7. Complete the full design from the pegging plan, taking your draft plan from No. 3 question. (35.)
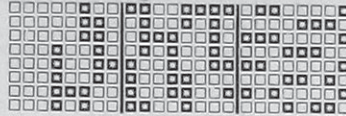
8. What would be the resulting counts of two yarns twisted together, as follows : one thread of 70's and one of 40's single worsted ? (20.)

9. Describe the witch or dobbie machine you are best acquainted with, single or double lift. (15.)

10. Describe the different processes of a piece of woollen or worsted cloth, as to undergo starting with the yarn until it is finished. (5.)

11. A pattern consists as follows :—

    40 pick dark colour,
    10 light colour,
    4 bright,
    4 mid.
    ——
    58 picks in the pattern ; there are 80 picks per inch. What is the proportion of picks per inch of each colour ? (20.)

12. Supply several weaves on four, six, seven, and eight shafts, including such weaves as swansdown, docskin, corkscrew, mayo, buckskin, and others. (30.)

ORDINARY GRADE.

DIVISION II.

1. Give a general description of woven fabrics, and explain the meaning of the terms "plain," "twilled," "figured," and "gauze" cloths. (15 marks.)

2. How many yards are there in a hank of cotton, also of worsted ? State how many hanks are contained in a pound of single 60's cotton and two-fold 40's worsted. Give separately. (15.)

3. Draw a tappet for weaving a six-end twill—viz., 1 warp, 1 weft, 1 warp, 3 weft, having a dwell of half a revolution. (25.)

4. Make three designs for "fancy twills"—

1st, one where the warp should predominate.
2nd   ,,   ,, weft   ,,
3rd   ,,   ,, warp and weft should be equal.
And why ? (20.)
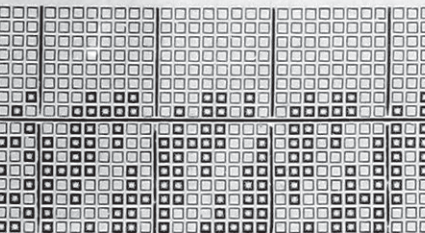
5. State formulæ used for finding weight of warp in a piece of cloth, also for weft. (10.)
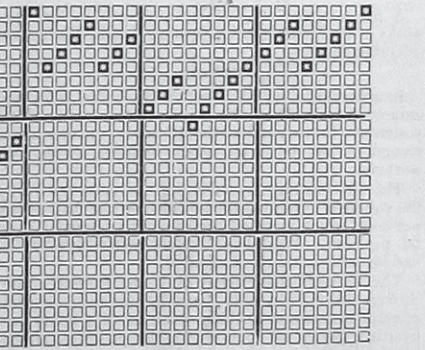
6 What would be the cost of material in a piece of cloth made as follows : 3,200 ends of twofold 60's worsted warp, 56 yards long, at 3s. per lb., woven with 60 picks per inch of single 30's worsted weft at 2s. 9d. per lb. Piece to be 48 inches wide, in reed or slay, and 52 yards long. Allow 10 per cent. for waste of weft in weaving ? (25.)

7. Describe the motion which is fitted to a loom to prevent thin places being made in the cloth, should the weft break and the loom run two or three picks before stopping. (10.)

8. What is the difference between a single and double lift "dobbie" or "shedding motion," and for what classes of goods are each particularly adapted ? (10.)

9. What are the chief causes of reediness in plain woven fabrics, and what are the means adopted for preventing same ? (10.)

10. Given 90 lb. of twofold 60's worsted yarn, and you wish to make a warp containing 2,500 ends, how many yards long should it be made to use up the whole of the material ? (20.)

11. What will be the change wheel required to give 60 picks per inch, with ratchet wheel 60 teeth, intermediate wheel 120 teeth, intermediate pinion wheel 20 teeth, roller wheel 120 teeth, circumference of beam 12 inches, ratchet moving 2 teeth at once ? (25.)

12. From the following draft draw on point paper the pattern it will produce, based on a 6-end twill, 3 warp and 3 weft. (25.)

QUESTION 12 : DRAFT.

QUESTION 9, HONOURS, DIVISION I : SKETCH.—(*See next col.*)
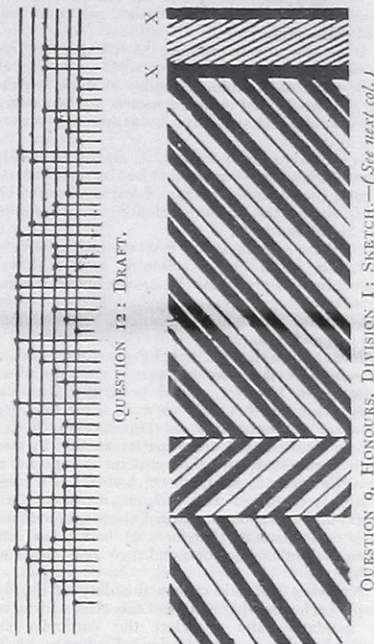
13. What are the comparative advantages and disadvantages of single and double lift Jacquard machines ? What considerations would guide you in selecting one or the other for any particular class of goods ? (15.)

14. Arrange the following spot pattern in a 5-end satin order, plain ground, the full design when completed to occupy 30 ends and 30 picks ; to have an equal quantity of ground between the spots. (25.)

HONOURS GRADE.

DIVISION I.

1. Give plan and particulars for accompanying pattern B, both as to counts of yarn and finish. (60 marks.)

2. What are the counts and price of two threads twisted together, one 30 skeins woollen and 2/100's worsted, the price of woollen 2s. 6d. per lb. and worsted 5s., allowing for the twisting up of the worsted 5 per cent. (20.)

3. A cloth woven with 68 ends per inch and 44 picks, 24 skeins woollen (Yorkshire counts), what number of picks and ends should it have to make the same class of cloth if you make it of 2/36's worsted ? (30.)

4. Put a backing warp on the accompanying plan, one end of face to one end of backing. (25.)

5. A worsted warp, made with 4,000 ends 60 yards long of 2/24's should weigh 35⅚ lb., but on being weighed is only 28 lb. What are the actual counts of the yarns, also the price ; the price for 2/24's 2s. 6d. per lb. ? (35.)

6. What would be the average grist of yarn in a cloth made with two threads of 2/60's and one of 2/40's cotton ? (10.)

7. Calculate weight and cost per yard of following cloth :—40 ends per inch of 2/16's worsted at 2s. 6d., 36 picks of 15 cut (gala counts) at 1s. 8d. per lb., 50 yards warp 70 inches wide in loom, 40 yards when finished ; 5 per cent. waste ; cost of production £2 10s. (30.)

8. (*a*) Work out on point paper a double cloth, a six-end Celtic, three up and three down ; put a back on, one end of face to one end of back ; work your back six-end twill, and stitch so as not to shew. (*b*) Also give plan for cloth, cashmere face ; one end of face, one of back ; weft two of face to one of back, and stitch together. (30.)

9. Make a plan on point paper from accompanying sketch. The large twill stripes to have an angle of 45° ; the small stripe to have an angle of 65° ; to be made in fine worsted not thicker than 2/48's, or woollen not thicker than 35 skeins. Give number of ends and picks. The two dark lines marked X to form a rib made by the weft. (30.) *(For sketch, see previous column.)*

10. (a) Supposing you have a Jacquard 384 hooks in three inches, you want to weave a design consisting of 60 threads in the plan. How many ends per inch will it allow you to weave your cloth with ? (b) Also give drawing of a machine, with neck-bands attached, eight-hooked cylinder, needles, spring-box in position. (15.)

11. Work out on point paper, an original design, a figured mantling in double plain, to be warped of light and a thread of dark colour ; pick and pick same colours. Give thickness of yarns, and reed, and pick. (25.)

HONOURS GRADE.
DIVISION II.

1. If you twist together three threads—viz., 30's, 40's, and 60's worsted—what would be the resulting counts, and what proportion of each would be contained in 100 lb. of yarn ? (15 marks.)

2. Give a cross-section drawing of a single and double lift Jacquard machine, and state the comparative advantages and disadvantages of each. What considerations would guide you in selecting one or the other for any particular class of goods ? (20.)

3. With what counts of yarn would you double a thread of single 30's, so that it would be equal to single 20's when doubled ? (15.)

4. If you have a cloth made of twofold 40's worsted warp and single 32's worsted weft, 64 ends and 56 picks per inch, weighing 16 oz. to the yard, and you wish to make a cloth of same character weighing 20 oz. to the yard, what counts of warp and weft, and how many ends and picks per inch will you require ? (25.)

5. Draw a tappet to weave a twill pattern of the following particulars :—3 warp, 1 weft, 1 warp, 2 weft, 1 warp, 2 weft, and explain clearly how you proceed to divide the circle, so that when the tappet is working it imparts to the healds an eccentric motion. (20.)

6. How much a yard would a cloth cost made as follows :—5,600 ends of twofold 48's worsted warp 56 yards long at 2s. 6d per lb , 72 inches wide in reed, 20 picks per ¼ inch at 6d. a pick weaving, of single 50's weft (worsted) at 2s. 3d. per lb. Allow 5 per cent. for waste in weft. Dyeing and finishing to cost 20s. and other expenses 18s. Piece when finished to be 48 yards long ? (25.)

7. Give a description of gauze weaving, and explain how the doup thread is drawn through the healds, and its movements in weaving, and state why it is necessary to ease the doup warp during crossing ? (20.)

8. Draw a design on point paper, to be a combination of gauze, a shalloon twill (2 warp and 2 weft) ; the whole to occupy 40 ends ; and give draft shewing least possible number of healds it can be woven on. (20.)

9. A worsted cloth is made with twofold 50's, and has 72 ends per inch, and it is required to make a similar cloth with two-fold 60's cotton How many ends per inch will be required of the cotton ? (20.)

10. Arrange the subjoined spot pattern in the order of an 8-end satin plain ground, the whole design to occupy 76 ends and 76 picks, for a 60 sett harness. Supposing you wish to weave same design in a 40 sett, and have only 60's harnesses to do it in, how many ends and picks would the design occupy, and how many ends would you have to cast out to weave straight in the harness ? (30.)

11. A cloth is required to be made in the design given below, the warp to be single 40's cotton. How many ends per inch will be required to make a cloth of perfect structure ? (20.)

12. What will be the change wheel required to give 60 picks per inch, with ratchet wheel 60 teeth, intermediate wheel 120 teeth, intermediate pinion wheel 20 teeth, roller wheel 120 teeth, circumference of beam 12 inches, ratchet moving two teeth at once ? What intermediate wheels will be required to weave a 9-pick pattern, tappet shaft wheel 120 teeth, top or crank shaft wheel 24 teeth ? (25.)

13. Draw a design on point paper for a double cloth as follows :—Face and back to be 6-end twill, 3 warp and 3 weft ; only back cloth to be twilled contrary way to face. Shew best method of binding same to prevent any stitching shewing through on to the face. (20.)

14. Analyse attached sample of blue serge cloth C, and give following particulars :—Sett, counts of warp and weft (approx.) picks per inch and draft for weaving on lowest number of healds. (25.)

20.—LACE MANUFACTURE.
ORDINARY GRADE.

1. Illustrate three different kinds of net made on the warp machine, and state also the name of the inventor of point net, on what kind of machine it was produced, what its faults were, and when it was superseded. (30 marks.)

2. Give the name of the inventor of the machine that superseded the point net machine, and describe the machine and the net as well, also state its advantages over every other kind of net since made. (30.)

3. On how many different kinds of machines is the net mentioned in question 2 now made ? State the various gauges on which it is made, and the principal purposes for which it is used. (30.)

4. Give an illustration of the modern warp machine with main warp and 60 steel bars, and explain its method of working. (30.)

5. Give an illustration of the newest kind of traverse warp machine, made to produce *Milanese* taffeta, and describe at length its method of working (30.)

6. Give a description of the method of producing an imitation *Chantilly* net on the curtain or go-through machine when a top jacquard is used to jacquard the warp threads, also the motion of the wheels or cambs to operate the guide bars. How many guide bars are necessary, and how must they be threaded ? (30.)

7. Give a detailed sketch of a section of the machine mentioned in question 3. (30.)

8. What is the distinctive character of nets made on warp machines, plain net machines, and Lever's machines ? (30.)

9. Which is the best method of producing lace or nets with designs worked on them at the same time as the net is being produced ? (30.)

10. How is silk of various kinds, cotton, linen, and wool—such as are used in the manufacture of lace—computed ? (30.)

HONOURS GRADE.

1. Why are laces sometimes called single warps, double warps, and treble warps ? Name two varieties of each kind, and give illustrations of them. (30 marks.)

2. How many motions of the carriages does it require to make a mosquito net, and what kind of machine is necessary on which to produce it ? (30.)

3. Illustrate the motions required to make a *Valenciennes* net, 10 holes to the inch and a 12-inch single rack, the mesh to resemble an ensov net. (30.)

4. Give a plan of the marking out of the sley, for the net in question 3, for a 4-inch lace having 40 thick threads. (30.)

5. In making *Mechlin* on a single tier machine, how would you move the guide bars to produce a twelve motion net ? Describe also the movement necessary to produce the same net on a double tier machine. (30.)

6. Give the movements of the guide bars to produce on the double tier machine an extra twist traversed bobbin net. (30.)

7. Which kind of cotton is the best in your opinion to use on the warps of Lever's machines, and also in the bottom, giving the reason why ? (30.)

8. Illustrate your method of laying out the sley for a *Chantilly* lace 6-inch wide, 9½ point, with 20 centre gimps, 40 thick threads. (30.)

9. What count of cotton would it be on a warp weighing 100 lb. composed of 5,760 threads, each 1,312 yards long ? and what size raw silk would the same warp be made of if it weighed 29 lb. 8 oz ; (30.)

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19 E.—JUTE MANUFACTURE.
SECTION II.—WEAVING.
ORDINARY GRADE.

1. Give the number of yards in a cut, in a heer and in a spyndle of yarn. (10 marks)

2. Why do some manufacturers prefer to buy their weft in bundle rather than in cop ? (10.)

3. Describe a chain-beaming machine, and explain the use of the " evener." (20.)

4. How many dressing machines would be required for a factory of 150 looms, each 40 inches wide ? (15.)

5. (a) Can a 12 porter camb be used for 11 porter cloth ? (b) If so, shew how the yarn is drawn. (c) How many mails or heddles are there in each leaf of a 12 porter camb for 40 inch plain cloth ? (20.)

6. (a) Why does the yarn beam drag require to be slackened as the beam empties ? (b) What is the effect on the cloth if it is slackened too much ? (20.)

7. Describe briefly the up-take motion of the power loom, and state in what respect it is not a positive motion. (25.)

8. In a pair of plain wipers, with one wiper larger than the other, state which leaf of the camb is worked by the larger wiper, and give the reason. (20.)

9 When the reed reaches the fell of the cloth, the upper half of the shed is slack, while the under half is in tension ; give reason for this, and state by what means it is accomplished. (25.)

10. For a loom making 27 inch 3 leaf 16 oz. sacking give:—

(a) Speed of crank.
(b) Speed of wiper shaft.
(c) Number of teeth in wheel on crank.

(d) Number of teeth in pinion on wiper shaft.
(e) Shew by sketches the arrangement of wipers and camb rollers.
(f) Shew by calculation the number of teeth in the various pinions required to give the proper speed to the wipers. (35.)

11. Give a brief description of the warp protector. (20.)

12. You are required to make 50 cuts of cloth, each 100 yards long, 11 porter, 10½ oz., 58 inches, 12½ shots ; what sizes of warp and weft would you use, and how many spyndles of each would be required, allowing for waste ? (30.)

13. State a cause of cloth being worked too slack. Why is this most liable to happen in the first cut from a beam ? (20.)

14. How many inches in width should cloth measure in the loom, which is required to turn out 77 inches wide, (a) when finished by calender, (b) when finished by mangle ? (15.)

15. In a week of 56 hours, how many cuts, each 108 yards long, of standard 10½ oz. Hessian, 40 inches wide, ought a loom to produce ? (15.)

HONOURS GRADE.

The candidate is supplied with one sample of cloth, and a piece of point paper.

1. Shew by a sketch the best mode of arranging Hessian looms on the floor of a factory. State whether you prefer tunnel shafting, or overhead shafting. (15 marks)

2. How many horse-power would be required to drive a factory of 250 looms, varying in breadth from 36 inch to 60 inch reed space, with the necessary dressing machines ? How much floor space would be required ? (15.)

3. Give an estimate for weaving 3,000 yards of cloth same as sample, 27 inches wide, weight 14 oz. for 27 inches. Warp costing 2⅛d. per lb. and weft 1¾d. per lb. And give details of weaving, etc., as follows :—

(1.) Size of warp.
(2.) Size of weft.
(3.) Porter.
(4.) Shots per inch.
(5.) Quantity of warp required.
(6.) Quantity of weft required.
(7.) Number of leaves of heddles required.
(8.) Time required to weave, with 5 looms. (40.)

4. Write an order to the spinner for chains for the above cloth. (15.)

5. In a carpeting, having alternately a stripe 2 inches broad of broken twill, and a stripe 4 inches broad of arrowhead ; say least number of leaves of heddles that can be employed, and shew the drafts by sketches, and give the order of treading. (25.)

6. Shew by sketches the arrangement of gearing for driving a 4 leaf wiper, and give the number of teeth in the wheels required, the wiper shaft revolving half the speed of the crank. (20.)

7. Shew by sketches the drafts for tubular cloth, made by heddles ; state number of leaves required, and describe any special mechanism you may have seen for making tubular bagging. (30.)

8. What additional mechanism would be required to convert a common Hessian loom into a check loom ? (20.)

9. Make a design on point paper for any kind of carpet, say what machine you would use in weaving, and explain how the design is read by the card-cutter. (30.)

10. Give one or two examples of carpets for the weaving of which a Jacquard machine is necessary. (15.)

11. Explain why it is not desirable to weave, say a 10 porter cloth with a 20 porter reed, one in the split. (20.)

12. What are the principal considerations in the construction of a shedding wiper for plain work ? Shew upon what system it is made. (30.)

13. What is meant by " calender finish " ? Describe the process fully. (10.)

14. In what way does calendering affect the porter and shotting of a web ? (15)

21.—FRAMEWORK KNITTING.
ORDINARY GRADE.

Not more than twelve questions to be answered.

1. Describe the difference between knitting by hand and by machinery. (15 marks.)

2. Give a short outline of the working of the stocking frame. (30.)

3. What are the various apparatus used in connection with the hand frame, and how are they worked ? (30.)

4. Describe four kinds of fancy stitches produced by such apparatus, of which not more than two shall be rib work. (30.)

5. Describe the working of an ordinary circular wheel frame, and also one kind of latch needle circular frame. (30.)

6. Describe the German circular frame, shewing wherein it differs from the English circular frame ;

also what are the advantages and disadvantages of each system. (30.)

7. In what respect do rotary frames differ from hand and circular frames? (25.)

8. How are the numbers of cotton and worsted yarns calculated, and what is the number of yards in a hank of cotton and a hank of worsted yarn? (15.)

9. Describe the principal imperfections to which hosiery fabrics are liable. (15.)

10. State how the imperfections mentioned in your last answer are to be avoided. (20.)

11. What is the difference between narrowing and widening, and how is each performed so as to leave the work without any holes in? (20)

12. What instructions would you give for making a woman's 24-gauge cashmere hose and a man's 18-gauge merino half-hose, both full fashioned? Give the number of narrowings required. (30.)

13. Shew how a circular ribbed hose, with ribbed instep, plain foot and narrowed toe, is made. (30.)

14. How is the gauge of a stocking frame calculated? (25)

15. State the different kinds of needles used in the stocking frame, and for what purpose they are employed. (25.)

16. Explain the difference between ordinary and frizzed narrowings. (25.)

17. Say how the pocket heel is made, and whether it is preferable to the ordinary fashioned heel. If so, say why. (30.)

Honours Grade.

Not more than twelve questions to be answered.

1. Describe a flat knitting machine, and shew how any complete articles are made upon it. (25 marks.)

2. Describe a circular knitting machine, producing plain and ribbed work, and shew how a complete half-hose is made upon it. (25.)

3. Shew the working of a warp loom, and give the laps of a fabric made with two guide bars half filled. (30.)

4. Describe the construction and working of a double-rib warp loom, and the making of any fabrics you know are produced upon it. (30.)

5. Shew either what are the processes in trimming lambs' wool hosiery, or the dyeing and finishing of merino hosiery. (25.)

6. How many yards are there in 40/2 worsted, 24/2 cotton, and 30/3 hosiery spun silk? (20.)

7. What is the difference between the numbering of spun silk for hosiery and for lace? (20.)

8. What number in single would 18, 42, and 36 be equal to when doubled together in either cotton or woollen yarns? (20.)

9. Shew how a wrought shirt and how ladies' fashioned combinations are made. (30.)

10. Design on the accompanying point paper a pattern of tuck work made upon a circular frame with four feeders and 1,280 needles, and shew how to cut the presser wheels. (30.)

11. Describe the making of wrought frame-made gloves, and also of gloves cut from a piece of fabric. (25.)

12. Shew how a Cotton's patent frame differs from the old jack and sinker rotary, and describe any improvements and additions that have been made to the original Cotton's frame. (30.)

13. Cost a dyed merino half-hose, shewing all the various items, and leaving a profit of 7½ per cent., and allowing a discount of 2½ per cent. (30.)

14. Explain the difference between the fibres of cotton and wool, and shew how each is bleached. (25.)

15. Say whether cotton or wool is most easily dyed a fast colour, and why. Explain the action of mordants upon the fibre. (30.)

19A.—CLOTH MANUFACTURE.
Section I.—WOOL & WORSTED SPINNING.
Ordinary Grade.

1. Which wools are sold as combing and clothing? (5 marks.)

2. Which system of wool washing do you prefer, and why? (10.)

3. On what machines, worsted and woollen, are wastes made, and what use is made of them? (10.)

4. Particularise the dimensions and clothing of a Botany carding machine. (15.)

5. In combing machinery, describe the parts known as—star wheel, inclined plane, noil knives, square motion, dabbing brush, and coiler. (10.)

6. In woollen machinery, what is meant by scribbling, carding and double doffer condensing? (10.)

7. Describe the following machines:—Gill box, two-spindle drawer, second finisher, rover and cap frame. (15.)

8. Give the meaning of such trade terms as sliver, slubbing, roving, laps, soft and hard waste, faller, carrier, flyer. (10.)

9. Give an explanation of the various stop and trap motions in twister and many-folder frames. (10.)

10. What is the meaning of "counts," and what is their relation to length and weight?

(a) Worsted counts. (5.)
(b) Woollen counts. (5.)

11. In what various forms are yarns sent out to purchasers? (5.)

12. How is the weight of a warp calculated when the number of ends, counts and length are known? Give examples in both woollen and worsted. (10.)

13. How many yards are there in 6lb. 7oz. of 42's single yarn worsted and 18 skeins woollen respectively? (5.)

14. What are characteristics of yarns spun on mule, cap, ring and fly frames? (5.)

15. What are the general defects in yarns, and the cause of them? (10.)

Honours Grade.

1. Give an average percentage of the net results after washing of the following wools:—
Port Philip washed fleece.
Sydney scoured.
Adelaide greasy.
New Zealand crossbred greasy.
Lincoln Hogs, South Downs and Cheviots.
(10 marks.)

2. What detergents, other than soap, are used in wool washing, and how applied. (5.)

3. Why are worsted and woollen carding machines made of different dimensions? Describe both machines and the card clothing. (15.)

4. How many systems of combs are in general use, and what is the advantage claimed by each, giving a description of the main features? (15.)

5. In woollen carding, describe the "Scotch feed" and the "Blamires feed." Which do you prefer, and why? (15.)

6. Design a "set" of Botany drawing, capable of producing 2,000 lb. of 2-drams rovings per week; giving details of each machine. (15.)

7. Design a "set" of woollen machinery, capable of producing 2,000 lb. of 16's skein yarn per week, giving details of each machine. (15.)

8. Mark by arrows in which direction the cylinders, doffers, strippers, workers, and fancies run, starting at the feed end of the card; also in which direction the bend or angle of the card wire is put on. (15.)

9. Give the cost per lb. of a "blend" composed of
1,000 lb. Cape at 18d. per lb., yielding 80 per cent.
500 ,, greasy at 11d. per lb., ,, 50 ,,
302 ,, locks ,, 9d. ,, ,, 60 ,,
200 ,, waste ,, 4d. ,, ,, 90 ,,
charging ¼d. per lb. on the raw wool for washing (10.)

10. What are the number of turns per inch in roving? the following dimensions given:—Spindle pulley 3 inches diameter, the cylinder 10, the cylinder pulley 4, the twist pulley 12, the twist wheel 30, the front roller wheel 80, and the circumference of front roller 20. (10.)

11. What is the use of a "knocker-off" in drawing frames? Give a calculation shewing how a certain length is arrived at, when a front roller is 5 inches diameter, and the two wheels have 34 and 46 teeth respectively. (10.)

12. If "tops," which weigh 4 ounces to 10 yards, are put in the drawing to produce roving of 2 drams to 40 yards, how many operations, and ends up in each box should be arranged, with a uniform draft of 7? (15.)

13. How is the drag on bobbins regulated in fly, ring, cap, and mule spindles? (5.)

14. Explain the methods of "traversing" to form cops, tubes, spools, and double-head bobbins. (5.)

15. Explain the proceess of genapping yarns. (10.)

19E.—JUTE MANUFACTURE.
Section I.—SPINNING.
Ordinary Grade.

Not more than fifteen questions required to be answered.

1. Describe shortly the process of jute cultivation.

2. Explain the mode by which the jute is prepared for the market, and the best means for preparing the fibre for safe shipment.

3. State what are the four kinds of jute in general use, and give shortly the general characteristics of each.

4. What kinds of oil do you consider most suitable for batching? State the quantity of oil used and the water per bale, and state what the effect of the oil is upon the fibre.

5. How many jute softeners would be required for a mill of 2,000 spindles, spinning 8 lb. and 9 lb.?

6. A spinner pays £10 a ton for jute, but has to cut off 25 per cent., at a cost for wages of 5s. a ton. What is the cost per ton of the 75 per cent. of jute, if the value of the cuttings is £6 a ton?

7. Name the rollers in a jute breaker, beginning with the feed roller, and explain the function of each.

8. Do you prefer to feed the finisher card with cans or with balls? What weight per hundred yards of sliver do you think will give the most satisfactory work?

9. What type of machine do you prefer for first drawing? Give your reasons. How many heads would

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be required to take up the sliver delivered by two finishers?

10. Give a sketch plan of the arrangement of the machines in a system of jute preparing.

11. How much jute would you think it advisable to put over a breaker per day?

12. Supposing the sliver delivered by the finisher to weigh 7 lb. per 100 yards, what drafts would be required to give a rove suitable for 8 lb. warp on (a) first drawing (link or slide) doubling 2 into 1 at back, and 4 into 1 at front; (b) on second drawing, spiral 1 into 1 at back, and 2 into 1 at front; (c) roving spiral? (d) Give turns per inch or rove, and shew full calculations.

13. Give speed you prefer for spinning frame spindles (a) 4in. + 4; (b) 5 × 5.

14. What traverse and pitch of spindles do you prefer for spinning (a) 8 lb., (b) 14 lb., (c) 16 to 20 lb., (d) 28 to 36 lb.?

15. Give a sketch of the relative positions of the wheels comprising the draft gearing of a spinning frame, and calculate the drafts from the following particulars:—
Diameter of drawing roller, 5 inches.
Drawing roller wheel, 36 teeth.
Stud roller wheel, 60 teeth.
Socket roller wheel, 40 teeth.
Retaining roller wheel, 72 teeth.
Diameter of retaining roller, 2½ inches.

16. Explain the difference between 1 lea yarn and 48 lea yarn.

17. What is the most convenient number of bobbins to put on a reel?

18. A cop machine is making cops 1½ in. diameter. Explain how it is altered so as to make cops 1⅝ in. diameter.

19. Give in yards the length of (a) a cut, and of (b) a spyndle of jute yarn.

Honours Grade.

Not more than fifteen questions required to be answered.

1. Give a short history of jute, its cultivation, introduction to this country, original modes of spinning it, and shew the progress of the industry and the uses to which jute is now applied.

2. State what are the faults in jute which most seriously affect its value to the spinner.

3. State the most economical mode of removing (a) from jute having a short root and square end, and (b) from jute having a long root with "runners" and low coloured pieces running through the strikes.

4. Give a batch for (a) a first rate 7 lb. warp; (b) for a common 8 lb. weft; (c) for common heavy weft, say 1 lea.

5. State the best mode for feeding a breaker and finisher, so as to keep the yarn at the weight.

6. In a jute breaker what are the functions of (a) the shell; (b) the workers; (c) the strippers?

7. Shew by a sketch the direction in which the pins of a worker are bevelled relatively to those of the stripper and the cylinder, and explain why the worker pins are more bevelled than those of the stripper.

8. Discuss briefly the merits of large diameters of workers and strippers, as opposed to small workers and large strippers.

9. Shew by a sketch the relative positions of the wheels comprising the draft gearing of a finisher card, and calculate the draft from the following particulars:—
Diameter of drawing roller, 4 inches.
Upper stud wheel, 108 teeth.
Upper socket wheel, 36 teeth.
Lower stud wheel, 96 teeth.
Lower socket wheel, 28 teeth.
Feed roller wheel, 120 teeth.
Diameter of feed roller, 3¾ inches.
State what other part of the machine ought to be taken into consideration, in order to obtain the accurate draft.

10. What preparing would be required for a system to spin 20 tons per week of 28lb. sucking weft, giving the following particulars?—
(a) Number of breakers.
(b) Number of finishers.
(c) Type of drawing frames.
(d) Number of drawing frames.
(e) Type of roving frames.
(f) Number of spindles in each.
(g) Weight of rove most suitable.
(h) Shew calculation to give the desired weight of rove.

11. Discuss briefly the advantages and disadvantages of spinning frames of 80 spindles 4 in. × 4 in., as compared with 56 spindle frames for spinning 8lb. warps, as regards saving of power, belting, wages, etc.

12. If 8lb. yarn is spun with 4 turns, how many turns will be required to give 12lb. (a) proportionate twist? (b) does the twist of the rove affect the twist of the yarn?

13. When the rove on a spinning frame "runs," i.e., comes through the drawing roller without being drawn, what means are used to make it draw properly? Give a full description of the parts of the machine for this purpose.

14. State the kind of (a) warp (bobbin) winding machine you prefer ; (b) what size of bobbin do you prefer ? How many spindles can one attendant work, and how many cwts. per week can one attendant take off ?

15. State whether, in erecting a jute mill, you prefer a mill on the ground floor or in flats.

16. How many horse power is required to drive a mill, producing 100 tons per week, half 8 lb. warp, half 9 lb. cop ?

17. Do you prefer rope gearing or wheel gearing ? Give your reasons.

Miscellaneous.

SPITALFIELDS AFFAIRS.

Spitalfields statistics, says the *Warehouseman*, have been at a premium again this week, consequent upon the opening of another English Silk Exhibition on a small scale by Mr. Goodyer, of Bond-street. It has been worth something to know that the number of looms have declined from 25,000, in full work in 1828, to less than 800, not constantly employed, at the present time, while the fact that close upon a ton and a half of Jacquard cards are required for some elaborate brochés, or that some of the fabrics will fetch from £3 to £5 a yard, has been as precious as the tones of a picture to an art enthusiast. But while the movement in favour of home-manufactured silks may be pressed upon the attention of retailers as a matter in which business benefit will probably be found, it may be well to point out to those who are endeavouring to bring the industry to the front again some of the reasons which have been put forward to account for its present position. In the multitude of critics there is truth somewhere, and, without putting all the blame upon the French Treaty of 1860, there must be some good cause for a prosperous and long-established industry coming to grief in this manner. It is in the passion for cheapness, the pressure of power - loom competition, the aversion naturally felt for trashy and overweighted materials which will not wear, say some. It is in the lack of technical education, according to others. It is in the manufacturers, declares a third party, because they are not adaptive enough, or careful enough, or enterprising enough, as circumstances require ; because they have not the knack of giving good appearance and finish at a moderate price, or because they have been ruthless in grinding down the wages of their skilled workers, and thus have driven them away and deterred others from joining them, while the manufacture is absolutely dependent on the skill and intelligence of the operatives and on the continuity of the occupation from father to son, or weaver to apprentice. This is a remarkable array of opinions, as varied almost as the recruits of fat Jack Falstaff. But whether one or the other may be accepted, there should be much hope for an industry which had a fair record from 1629, when the silk throwsters of London were incorporated, down to 1860, and with the publicity and support that is at present being given to the movement in its favour, there should be some advantage in following it up.

Although Spitalfields enjoyed so much of the sunshine of prosperity, there was storm and stress of weather in the trade at times ; and, in fact, there were few branches of industry so much troubled by dissensions between masters and men. There were constant complaints, besides of foreign competition, and under the elaborate tariff, which either imposed heavy specific rates or *ad valorem* duties at the option of officials, ranging from 20 to 40 per cent., the cry of smuggled goods was often raised. In a periodical of 1764 there appeared a remarkable letter " from a Manufacturer of Spitalfields, proposing a Remedy for the Decay of the Silk Trade in England." The blame of the decay of that period is put first upon people of fashion, who insisted on having French silks, but still more upon the mercers, who not only played the traitor " by a fraudulent, illicit, and underhand importation for the purpose of serving their customers, the persons of fashion above described," but even ordered English silks to be woven to foreign patterns, or would sell native fabrics with a show of great caution as though they had been smuggled. " This, then," writes the manufacturer, "is the channel by which the French silks are distributed in London ; and the French tailors and the French habit and mantua makers are the people who carry the pattern books from house to house and promote the sale of them as much as in them lies." If the goods happened to be seized, there were appeals to some lord, through his French valet or through mademoiselle my lady's waiting maid, which generally ended in release of them, and so this poor silk manufacturer could not but advocate severe repressive measures, nothing less than a fine of £500 for selling English silks as French, stricter search for foreign goods, and an elaborate system of licences to wear them. No persons but such as were qualified by their estates to sit in the House of Commons should be licensed to wear French silks, the licence to be £20 per annum, and the names of those taking them out to be published quarterly, with all particulars, in the *London Gazette*, to let people know the enemies of their country. No mercer to be allowed to sell French silks without such licences were first produced under a penalty of £500, and the borrowing of licences to be punished by a fine of £50, or the wearing of silks without licence by £100. Mercers were to pay a licence of £40 per annum for the privilege of retailing the goods, and to be compelled to keep a stock account of purchases and customers, subject to inspection of excisemen. The writer was either foolish or sanguine enough to anticipate a revenue of £40,800 from these sources, which was to be devoted to the relief of distressed weavers, the encouragement of the manufacture by premiums, and a heavy bonus upon the importation of raw silk ; but, of course, nothing more was heard of his proposals.

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CHINESE VELVET.—" The manufacture of velvet," says United States Consul Jones, of Chin-Kiang, China, " is mostly for the Imperial household. The manufacture of ribbons is done on small looms by women and young girls. Their wages are from 80 to 100 cash a day ; that is from 8 to 10 cents, besides their food. The looms employed in manufacturing silk, etc., for the Imperial household, are about 200. Last year (1889), on account of the Emperor's marriage, there were about $3,000,000 worth of goods made. The wages of those employed on this work are greater than on the ordinary looms."

THE Motilal Hirabhai Mill at Ahmedabad seems to be working with considerable success. It started work towards the end of last year with 5,600 ring spindles and preparation from Messrs. Howard and Bullough, to which a further eleven to twelve hundred spindles were added subsequently, and arrangements have just been completed, we hear, for the further supply of some additional nine thousand ring spindles, with preparatory machinery by the same makers. The extension will include new compound, condensing, Corliss engines, by Mr. Benjamin Goodfellow, of Hyde, capable of indicating about 600 horse-power, with gearing, also an additional boiler and economiser. The pillars and girders for the building, which is fire-proof, will also be of English manufacture. The mill was originally furnished throughout by Messrs. Greaves, Cotton and Co., of Bombay, with whom the orders for the additional machinery have also been placed.

MENTION of the supposition that the needlework circles on the characteristic smock frocks of English country labourers may be connected with ancient forms of worship, brings to mind the unquestionable instances in which there has been expression in fabrics, and gives, to those who need it, another proof of the wonderful range and interest of textile study. Of cases in which words or sentences have been woven into materials there are enough and to spare, if that subject were entered upon, but it is rather to veiled or secret utterances, by means of threads or weaving, to which we are now referring. The Jew to this day complies with the Levitical law which brings the Commandments to his remembrance, through the fringes upon the borders of his garments, by an arrangement which gives the name of the Almighty in the alphabetical value of the number of threads in the fringes sometimes worn, and an alphabet in the colours and weaving of Cashmere shawls discovered after much trouble and enquiry by a learned Professor, was posted up some years ago in the Indian Museum. The Egyptians of old had such textile language, and the Patagonians, with perhaps many another uncivilised race besides, also have a sort of symbolic writing through the patterns and colours of such garments as they wear, but in their case the secret has never been revealed or discovered.—*Warehouseman.*

Textile Markets.

** Owing to the present being Whit-week, *The Textile Mercury* is printed two days earlier than usual ; consequently the market reports and some other features are necessarily somewhat curtailed.

COTTON.

MANCHESTER, WEDNESDAY.

The holidays this week have, of course, completely disorganised the usual course of business. On Friday last Liverpool "knocked off" until Wednesday morning, leaving such business as Manchester might attempt to transact to be done without such stimulating guidance as the city upon the Mersey is always willing to afford. No material disadvantage was experienced from this source, however, as a disposition was very generally prevalent to adjourn over the week everything that would bear such treatment ; and there was little that would not.

The ultimate out-turn of the current crop of cotton continues to engage attention, more now, however, out of curiosity than from any conviction that the highest point possible to reach will have any further material effect in depressing prices. In our opinion that point, as stated weeks ago in this column, will be close upon if it does not slightly exceed 8,750,000 bales. Perhaps this full figure may not be sent forward from the plantations, owing to the abundant supplies at every centre of distribution, but that it will be in existence we have no doubt whatever. By carrying a fair proportion over, planters may possibly think that their chances of advantage over forwarding it may be increased. It has been quite evident for three or four weeks past that prices have been at bottom : that is, depressed as far as it was possible for the current crop —even if of the magnitude stated above—to send them down. There is, in our opinion, very little likelihood that they can be further reduced by this influence.

It is a very natural course for operators and dealers in cotton, who confine their views to the raw material and its statistics, and who have for a good while been 'bears' and pessimists, to transform their natures and become 'bulls' and optimists. In ordinary circumstances the conditions would afford a complete justification of their course. But we hold that the present circumstances of the world's commerce are entirely exceptional, and afford no safe basis for going in heavily for a rise. Let us briefly glance at the salient facts, and begin with what we may term competing countries. Each of these, say the United States, Canada, Russia, Germany, France, and other Continental states, have materially increased their takings of the raw material. Presumably this will be worked up, and will meet all the requirements of their respective markets, owing to increased consumption. The same may be said of India. The possibly increased requirements of all these centres are thus already provided for, and therefore we cannot reasonably expect an accession of demand from these sources such as will give our market any stimulus. We now come to the consuming markets, and amongst the most important of these must be reckoned the countries of South America. The financial and political disturbances ruling there in almost every centre forbids the indulgence of a reasonable hope that an early resumption of a satisfactory business with these quarters will be seen. Next take the countries of the Mediterranean ; from those on the European shore we can expect no material improvement such as could in any way make itself felt in affecting the demand for the raw material. Egypt and the Levant may improve their takings very considerably, but whatever they may do in this respect they are not of sufficient magnitude to give the market a start on the up-grade. There only remain India, China, and Japan, with the few small subjacent countries. The potentialities of these lands are great, but whether any material stimulus will spring from them or not is difficult to predict with any degree of certainty. We regret we do not see much probability at present, but a demand on an enlarged scale may spring up at any moment. These are the points that will require the closest attention from spinners and manufacturers, and should they begin to send us a full and free demand then will be the time for manufacturers and spinners to buy in advance of their requirements.

Yesterday was the only one during which business of any importance has been transacted since Friday last, and under the circumstances it was of a very limited description. Even the small orders, which usually drop in at this period, have not come forward in appreciable quantity. The Indian mail brought a little fresh business, and there was a quiet demand generally. In yarns there is practically nothing doing, all the current business being confined to cloth.

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WOOLLENS AND WORSTEDS.

BRADFORD.

The holidays are welcomed as affording relief, in the present state of trade, by spinners and manufacturers. Very little attention is given to business.

HUDDERSFIELD.

There has been very little business done this week. The finer weather has helped distributors to reduce stocks, but so far this has not been felt here.

LEEDS.

Prices for cloth are firmer, in consequence of the advance established in wool quotations. Yeadon and Guiseley are doing a satisfactory trade in all-wool dress goods. Medium and low tweed looms are rather slack.

ROCHDALE.

The mills were running on Whit-Monday, but business was slow. Merchants' travellers are on the road, but it is not yet known how stocks in the hands of retailers will appear.