The cost and the quality and the real value of their clothing depend upon it. It is wiser not to array oneself in opposition to such an overwhelming interest.

The situation discussed by the document above quoted may be summed up in a few words: the result of the elections of November last was regarded by manufacturers as a protest against the dearness of necessaries caused by the tariff. It was a sign, too, that protection was in danger of being kicked out of the field of politics by the electorate, weary of the monopolist rapacity. One method only remains to pacify the citizens of the country: goods must be cheapened. Either free woollens or free wool would enable this result to be brought about. The manufacturers, of course, choose free wool. We shall now see what the growers have to say on the question of free woollens.

Mr. H. Benttel, the New York agent for Messrs. John Crossley and Sons, the Yorkshire carpet manufacturers, is now in England. His European trip has been undertaken for the purpose of securing novelties.

In connection with the troubles at Clark's New Jersey Thread Mill, the firm will erect a boarding-house at Kearney with accommodation for 100 men, with whom the company expects to replace the striking spinners. Those who have so far been induced to work in place of the old hands have an ample supply of beer, and musical entertainments are frequently furnished for their edification and amusement. The strikers were puzzled to know how the new hands were smuggled into the mill until the fact leaked out that they were taken in between bales of cotton on one of the Clark Thread Company's trucks. The bales were fixed on each side of the lurry with a space in the centre, and in this improvised way the imported hands escaped the attention of the pickets.

With reference to the Canadian cotton trade a recent estimate places the annual product of the Dominion mills at £1,800,000. Nearly £800,000 worth of cotton goods were imported last year, making the total consumption £2,600,000. To produce the whole of this would, it is reckoned, occupy 6,000 looms. As the total number in the Dominion is 11,420 it is evident that there has been a good deal of overbuilding. The new syndicate controls about 4,400 looms. The first cotton mill was established about 15 years ago, and since then the industry has grown so rapidly that there are now nearly 30 mills in the Dominion, the spindles numbering about 600,000. In 1869 the imports of raw cotton for home consumption were 1,245,208 lb.; in 1888 they amounted to 23,727,725 lb. The average consumption of cotton goods per inhabitant is about 40 yards. In 1888 the imports were about 42,000,000 yards and the Canadian production 158,000,000. As to woollens, there are about 1,129 sets of cards, 3,758 looms, and 201,000 spindles in the Dominion. One of the most recent features of the Canadian cotton trade is the export of grey cottons to China. In 1888 over six and a half million yards were thus shipped.

Machinery and Appliances.

MACHINE STOKING OF BOILER FURNACES.

At the ordinary meeting of the institution of Civil Engineers, held on Tuesday, the 27th ult., the President, Sir John Coode, K.C.M.G., being in the chair, a paper was read on "Machine Stoking," by Mr. John Frederick Spencer, M.Inst.C.E.

Steam engineering, the author observed, included three processes: The combustion of fuel and production of heat, the generation of steam, and the utilisation of steam; and the paper was limited to the first of these. Experience had shewn that with hand-firing sometimes a quantity of oxygen, sufficient for the complete combustion of the fuel, was found in the waste gases leaving the boiler flues, this excess of air supply being due to the difficulty of mixing the carbon and the oxygen perfectly.

The inequalities of hand-firing were two-fold. First, air was admitted at the wrong time and place; and secondly, the fuel was added according to the pressure gauge, the imperfect human feeding machine being thus the direct cause of a great waste of fuel and of a large portion of the smoke produced. Steamship owners paid heavily for their human stokers, especially at the present time, when an Atlantic steamship might require 10 to 15 tons of coal per hour.

James Watt patented a machine stoker in 1785. It was worked by hand, and consisted of two sets of bars, one behind the other, the fuel being fed at the front, and pushed towards the back as it ceased to smoke, the smoke from the fresh fuel passing over and through the more advanced combustion at the back end of the grate.

A brief reference was then made to the principal steps in the development of machine stoking since that time, and one of the most successful machines of each type was selected for illustration, namely, the coking stoker of Messrs. T. and T. Vicars, of Liverpool and Earlstown, and the sprinkler machine stoker of Mr. E. Bennis, of Bolton.

There were two distinct types of machine, which were called coking and sprinkler stokers, and were both fed with coal from a hopper. In the coking stoker, fuel was pushed slowly on to the dead-plate, movable bars being provided for carrying it forward at a speed intended to be proportionate to the rate of combustion required. In the sprinkling system the fuel was more or less evenly distributed over the grate by fans, beaters, or shovels, with or without movable bars. In both systems it was claimed that when it arrived at the farther end of the furnace there was nothing left but ash and clinkers, which dropped into a space provided, and from which, as required, they were removed through the ash-pit.

In many cases a supply of steam was provided underneath and in front of the dead-plate, by means of a ¼ in or ⅜ in. pipe, perforated with holes about 3/32 in. in diameter, and so drilled that jets of steam and air were blown along and between the line of the fire-bars, the effect of this minute expenditure of steam being to prevent the adhesion of clinker to the bars, and to act as an aid to combustion.

Machine stokers of all kinds being fitted with hoppers, which were filled by hand, in lieu of the coal being thrown direct into the furnace, there was no saving of labour, except as regarded slicing and raking the fires; but where there were several boilers in a range the coal could be raised with a Jacob's ladder or elevator from the coal stock, and then conveyed in an overhead trough by a screw or tray chain to each hopper as required. The elevators and conveying screw were driven from a revolving shaft, which might be the one used for driving the machine stokers. Messrs. Coates, of Paisley, Campbell, of Perth, and other steam users in this country and in the colonies who had adopted machine stoking, were also working these power conveyors with great success. In some cases this conveying plant was also employed to remove the ashes and clinkers. Machine stokers were generally worked by a small engine, a 6-in. cylinder being ample for a range of twelve Lancashire boilers.

The advantages claimed for machine stoking were:

1. PREVENTION OF SMOKE.—The efficiency of a machine stoker as a smoke preventer was due to its "uniform careful firing." It was always working under Mr. C. Wye Williams's essential conditions of a green and bright fire on the same grate, and much better localised than with "alternate side firing," when it was possible for the gases to escape on the green side without combining with the oxygen on the hot side. With movable bars, machine stoking was at the least a greatly improved system of combustion, tending to smoke prevention. And, finally, one great cause of smoke was entirely absent, viz., the frequent use of the slice and poker to rouse the fire and clean the bars. An observer outside a mill where the boilers were hand-fired could count the firing and stoking times by the emission of smoke from the shaft. In machine stoking it was only at long intervals that the door was opened, and then for a much shorter time.

2. ECONOMY OF FUEL.—In the case of machine stoking this might result from two distinct causes. First, the use of a cheaper coal, either too dirty for, or the heat units of which could not be fully utilised by, hand-firing. Secondly, the more perfect combustion due to a uniform supply of fuel, and the automatic and progressive manufacture of carbonic acid. With reference to the economy from the use of a cheaper coal than was possible with hand-firing, the testimony was overwhelming, and was rarely contested; but it was not so generally known that, owing to the more perfect combustion in machine stoking, the cheaper coal realised also a higher evaporative duty per pound of fuel.

3. MACHINE STOKING tended to an increased and more uniform evaporative duty; of this there was a large amount of evidence available. There were good reasons for anticipating a greater evaporative power with sprinkler than with coking stokers in certain cases. The automatic supply and progression of the fuel gave great uniformity of evaporation, while the mechanism employed afforded facilities for varying it as might be required.

4. ECONOMY OF LABOUR might be and was realised by machine stoking, as the system permitted the automatic supply of fuel to the hoppers. In the mercantile steam navy, machine stoking was hardly known, only a few vessels being fitted with Henderson's movable self-cleansing firebars. It would be an efficient remedy for many sea troubles: it would save the loss in cleaning the fires, and would give a larger increase of evaporation duty than forced combustion by fans, with much less inconvenience. An increased duty of at least 10 per cent. would be obtained from the fuel, and less skilled labour would be required. In addition to these advantages, all classes of cheap coal would be available for steamships, and smoke would be prevented.

The approximate number of furnaces fitted, and now working, with machine stokers was as follows:—

COKING.		
Juckes and others, old style	300	
Vicars	2500	
Sinclair, M'Dougall, and others	600	
Frisbie, Beely, and others	200	
		3,600
SPRINKLERS.		
Stanley, beater, or fan machines	20	
Dillwyn, Smith, and Henderson	1500	
Whittaker, Hodgkinson, Carver, Newton, Rye, Leech, and others	1000	
		2,520
SPRING MACHINES.		
Benais	5000	
Proctor	4000	
		9,000
Total		15,120

This would represent about 8,000 boilers out of an estimated total, in the United Kingdom, at the present time, of 140,000, or only 5·7 per cent. fitted with machine stokers, and it had taken nearly seventy years to achieve this limited success.

It was estimated that of the 140,000 boilers in the United Kingdom, about one-half were to be found in the three counties, Lancashire, Yorkshire, and Cheshire, and about the same number (70,000) were under inspection by the Manchester Steam Users' Association, and the several boiler insurance companies.

In two large boiler guarantee and insurance associations, there were approximately 1,010 boilers fitted with machine stokers, or about 8 per cent. of the total number under the inspection of these associations.

THE hand-loom weavers in the province of Brandenburg are suffering from the competition of the power-loom. The manufactures of Berlin, which used to be almost exclusively produced by hand-looms, are now, with the exception of woollen plushes, woven by power-looms, so that the hand-loom weaver can reckon on work only if he is contented with wages equal to those offered for power-loom work.

Designing.

NEW DESIGNS.

FANCY DIAGONALS FOR SPRING DRESS MATERIALS.

There is a great demand for cotton dress patterns, and we accordingly give a few designs which will admit of the greatest possible variety with simple materials.

No. 1 diagonal can be utilised in various ways, both as regards materials, colour changes, and finer or coarser counts of yarn: 76 ends per inch of 24's dark blue for warp, 56 picks per inch of 20's cop weft, soft spun, or 40's tow weft, would make a good union cloth, which is at present much sought after. Warp shades may consist of dark shades ranging from blue to light shrimp. A good effect in this class of texture can always be obtained by the use of contrasts, or harmonizing colours; to have harmony in colour, the nearest tint to the original is required, but farthest, except the original, from the contrasting colour. Different shades of the same colour would be effective; for instance, dark green warp, light green weft, dark red warp, light red weft, light and dark blues. The fabric may be made all slate warp and weft or any self-colours; also in grey warp and weft, then piece-dyed and nicely finished. From the details given it will be seen what an extensive field is open for variety.

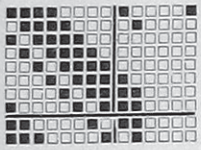
No. 2 may be made in a 70 ends per inch reed, 20's warp, 70 picks per inch of 20's weft. Warp pattern: 24 of cinnamon brown, 12 white, 4 reed, 12 white; all white or cop weft; second pattern: 16 dark green, 6 white, 2 red, 6 white; weft all white; third pattern: 6 white, 2 light blue, 4 red, 6 white, 2 light blue, 4 red, 6 white, 2 light blue, 4 red, 12 dark blue; checked with weft same pattern as warp.

No. 3 same reed and counts of weft and warp, 60 dark blue, 12 of cream. Weft pattern the same as warp. For a change the reverse, 60 of cream, 12 of purple; weft pattern the same; a stripe 4 dark blue, 4 fawn, 4 white, 4 dark blue, 16 turquois blue, 2 white, 2 red, 24 white; weft all grey soft cop; second stripe: 12 white, 2 dark blue, 4 white, 2 dark blue, 4 white, 2 dark blue, 4 white, 6 light blue, 4 white, 2 dark blue, 4 white, 4 dark blue, 12 white, 6 bright red; third stripe: 24 white, 6 light fawn, 2 very dark blue, 6 light fawn, 24 white, 6 light blue, 2 very dark blue, 6 light blue. A very pleasing check pattern if weft the same as warp. Another good stripe would be 24 cream, 6 red, 24 cream, 6 dark blue, 24 cream. 6 dark brown. Nearly all these stripes and checks would be suitable for shirtings and children's dress goods. *No.* 1, 2, 3 diagonals have all a straight over draft.

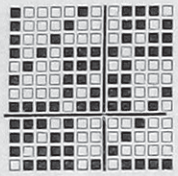
No. 4 is on the same principle as *No.* 1, and the details there given are in every way applicable to this design. As will be seen it appears on 18 shafts, but the cloth may be made with 10 by using this draft—1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 18, 17, 16, 15, 14, 13, 12, 11; this is known as the O draft, and may be carried to a great extent by doubling or trebling the repeats. We have in these four designs given a variety sufficient to create a number of choice patterns, which ought to attract attention.

DRESS DIAGONALS.

No. 1.



No. 2.



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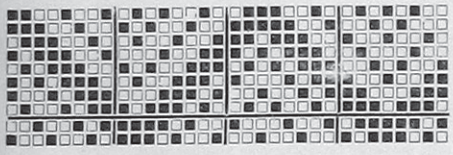
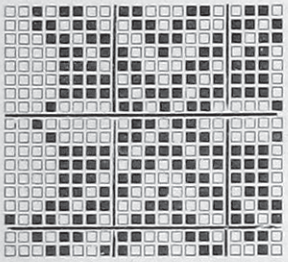


No. 4.



FANCY SPRING VESTINGS.

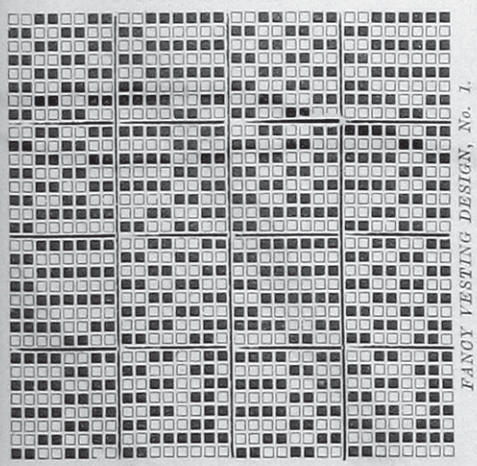
No. 1.—This design is for a spring and summer vesting, all cotton, linen and cotton, or a combination of silk, cotton, and worsted. It can be made with a 32-end draft, on 8 shafts of healds, 16 picks to the round (see pegging plan and draft). If made all cotton the following particulars will be found useful as a guide to work from: 140 ends per inch of 24's twist, 20's weft, two in a shed, 90 picks per inch, one shuttle; warp end and end. Colours: black and gold, fawn and duck-egg green, reddish heliotrope and cream, pale tints of Persian lilacs and white, clear dark browns, such as otter, bronze, and coffee brown, with maize; also yellowish browns, as tabac, light bison, castor, and beige shades. These will harmonise with moss green, royal blue, and white, chasseur blue, and very faint orange; peacock blues, which are nearly green, with white, form a good arrangement. The weft may be one of the two colours composing the warp. If the pattern is one of blue, one of maize, then the weft may for choice be either all blue, or maize. This combination gives the warp ends full predominance in the run of the diagonal, and a very rich, beautiful effect is obtained. If the warp is silk end and end, the weft, being neutral, might with advantage be all cotton or linen. We merely point out the changes and varieties that can be developed. A breaker shaft will be found useful for the purpose of dividing the warp ends from crowding and creating runners, as the fabric is of a matting make.

No. 2.—This vesting is on 12 shafts, straight-overdraft, 12 to the round, 80 ends per inch of 20's twist; 60 picks per inch of 16's soft spun cop weft; all grey warp and weft, and piece-dyed in any of the light fashionable tints. A variety may be produced by all cotton warp, in grey, cream, maize, orange, lilac, light green, and red brown, the weft for each either a sharp contrast or harmoniser; a good cloth, and very effective, would be the result if spun silk wefts of various colours are made use of. The number of ends and picks per inch may be reduced or increased for light, medium, or heavy makes of cloth to suit different demands.

DRESS FABRICS.

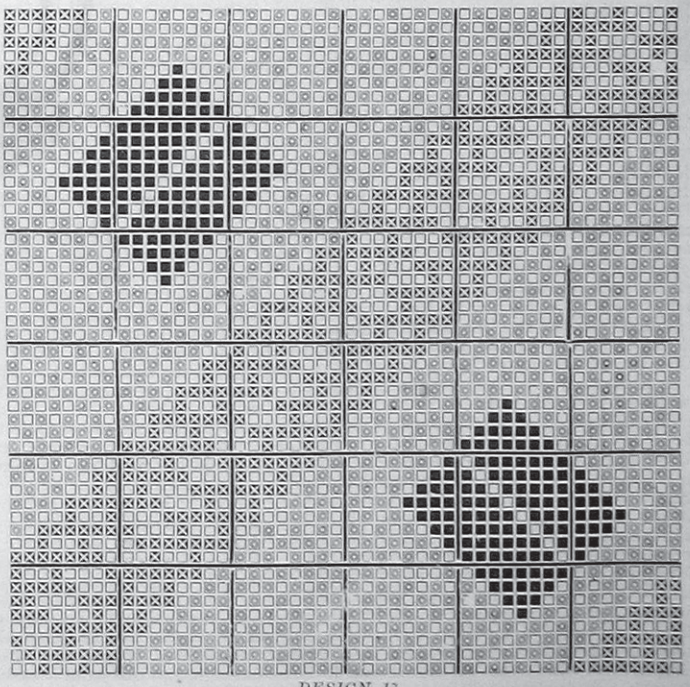
We are probably not aware of the extent to which weather, even in the luxurious independence of the nineteenth century, affects our desires in the way of clothing. Of course heat and cold always produce a desire for light and heavy goods respectively, but human nature is susceptible to much more delicate sensations than these, and the coming of spring, of autumn, and of winter is attended with the demand for goods which more or less partake of certain characteristics attributable only to the seasons. That this is true, a glance at the goods exposed at the present time as spring wearing apparel will amply prove, and particularly is this so in the case of the Scotch tweeds, among which some most beautiful and delicate combinations of colour will be found: for example, a subdued but intense red (produced by twist) on a beautiful light mottled green ground. But it is useless to attempt to describe such combinations on paper, their beauty depends so much on the most delicate toning of the colours. We have previously directed attention to the production of such goods for autumn and winter wear, but we would impress upon manufacturers the benefits to be derived from due consideration of the beautiful goods mentioned, which cannot but be of great service in suggesting the lines to take for the coming autumn and winter.

Design 17 is an effect that may be applied in many ways. It consists of a weft flush twill, capable of being produced in two colours on a plain ground, upon which is introduced an extra weft or warp spot. There are several minor points which should claim consideration, such as the way in which the plain joins up to the extra weft figure, the direction in which this figure is broken, and the principle of tying the warp under the weft flush to produce a firmer cloth; but since the principles involved in all these cases have previously claimed attention, nothing further need be said, save that the conditions adopted must largely depend upon the size, shape, sett, etc., of the figure being dealt with. We would suggest for this design a rough cross-bred or woollen yarn for the ground, open sett, and a mohair or silk weft for the extra figure.

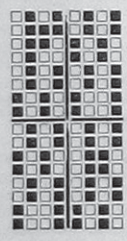


FANCY VESTING DESIGN, No. 1.

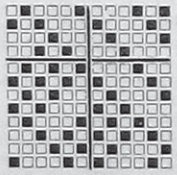
No. 1 DRAFT.



DESIGN 17.



No. 1 VESTING PEGGING PLAN.



No. 2 VESTING DESIGN STRAIGHT OVER DRAFT.