The inequalities of hand-firing were two-fold. First, the air was not entirely supplied, and place; and secondly, the fuel was added according to the pressure gauge, the pressure being the mechanism, thus the direct cause of a great waste of fuel and of a large portion of the smoke produced. Steamship owners paid extra for hand-firing, especially at the present time, when an Atlantic steamship might require to take 10 to 20 tons of coal at times.

James Watt patented a machine stoker in 1785. It was a hand-operated, and consisted of two sets of bars, one behind the other, fastened to the floor at the front, and pushed towards the back as it ceased to smoke, the smoke from the fresh fuel passing over and through the openings 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, namely, the cylinder stoker of Messrs. T. and T. Vickers, of Liverpool and Congleton, 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 to the back, and a small, moving iron 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 cases the idea was the same, and when it arrived at the further end of the furnace there was nothing left but ash and cinders, which were occasionally raked provided, and from which, as required, they were removed through the ash-pits.

In many cases a supply of steam was provided underneath and in front of the deal-plate, by means of 2½ or 2½, 5½, pipe, perforated with holes about ½ in. in diameter, jets of steam and air being blown along and between the line of the fires, the effect of this arrangement of steam being to prevent the adhesion of cinders to the bar-slat and to aid in combustion.

Machine stokers may be divided into coking and sprinkling, the former being fitted with hoppers, which were filled by hand, in lieu of the coal being thrown directly into the furnace. There was no moving of bars, excepting in the case of those with movable bars. In the raised grates the cinders were removed by means of a hand operated scoop, and this was then replaced by the continuously moving scoop. In cases where large quantities of cinders were to be removed, the scoop was driven by a revolving shaft, which might be the one used for driving the machine stokers. In the case of the coking stoker, the fuel was supplied by means of a hopper, and not by means of a shovel, as in the case of the coking stoker. In the case of the sprinkler stoker, the fuel was supplied by a hopper, and not by a shovel, as in the case of the coking stoker.

1. **Prevention of Smoke.** The efficiency of a machine stoker was based on the fact that its uniformity and cleanliness was due to the following causes: the coal was coal, and the smoke was smoke. The coal was coal, and the smoke was smoke. The coal was coal, and the smoke was smoke. The coal was coal, and the smoke was smoke. The coal was coal, and the smoke was smoke. The coal was coal, and the smoke was smoke. The coal was coal, and the smoke was smoke. The coal was coal, and the smoke was smoke. The coal was coal, and the smoke was smoke.

2. **Economy.** In the case of machine stoking, this might result from two distinct causes. First, the use of the machine was cheaper than manual labor, and secondly, the testing of the fuel was more accurate and the cost was lower. In machine stoking, it was only at long intervals that the door was opened, and then for a much shorter time. Evidently, the saving in cost of machine stoking might result from two distinct causes. First, the use of the machine was cheaper than manual labor, and secondly, the testing of the fuel was more accurate and the cost was lower. In machine stoking, it was only at long intervals that the door was opened, and then for a much shorter time.

3. **Machine Stoking to a Tendency to an Increased and More Uniform Evaporation.** In this there was a large amount of evidence available. There were good reasons for anticipating a greater evaporative power with sprinkler stokers in certain cases. The automatic supply and progression of the fuel gave great uniformity of evaporation, while the even evaporation employed afforded safety as well as might be required.

A hand-furred LAMOS-M might be and was realised by machine stoking, as the system permitted the automatic supply of fuel to the hoppers. In the mercurial furred LAMOS-M, the stoker was a few vessels being fitted with Henderson’s more or less satisfactory system of furnaces. It was an efficient remedy for many sea troubles: it was easy to clean the fires, and would give a larger burning area of fuel, with less efficiency of 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, the automatic system of keeping the stokers supplied for steamships, and smoke would be prevented.

The approximate number of furnaces fitted, and working with machine stokers was 22,600.

**COKE.**

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<td>Whitaker, Hodgson, Company</td>
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<td>Newton, Eve, Leach, and others</td>
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**SPRINKLES.**

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**MACHINERY AND APPLIANCES.**

**MACHINE STOKING OF BOILER FURNACES.**

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

Steam engineering, the author observed, included three main points, the introduction of fuel and provender of heat, the generation of steam, and the utilization of steam; and the paper was limited to the first of these. It has been shown that with the use of 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 being produced by the combustion facility of raising the carbon and the oxygen perfectly.

**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. 3 diagonal can be utilized in various ways, both for clothing and furnishing. It was found that softer or coarser counts of yarn: 76 ends per inch of 24¼ dark blue for warp, 56 picks per inch of 20½ and soft spun, or 40½ wool, 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 brown. A good effect in this class of texture can always be obtained by the use of colors, or harmonies, to have harmony in color, the nearest tint to the original is required, but farthest, except the original, from the natural. Different shades of the same color would be effective; for instance, dark green warp and light green weft, dark red warp and light red weft, etc. The fabric may be made all slate warp and weft or any self-colors, also in grey warp and light grey weft, etc. The details given in the present open for variety.

**Designing.**
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: 3 of cinnamon brown, 12 white, 4 red, 12 white; all white or cop weft; second pattern: 16 dark green, 6 white, 2 red, 6 white, 2 light blue, 6 red, 6 white, 2 light blue, 4 red, 6 white, 2 light blue, 4 red, 12 dark blue; checked with weft same as 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, 6 of cream, 12 of purple, weft pattern the same; a stripe 4 dark blue, 4 fawn, 4 white, 4 dark blue, 16 turquoise blue, 2 white, 2 red, 2 white; weft all gray soft cop; second stripe: 12 white, 2 dark blue, 4 white, 2 dark blue, 4 white, 2 dark blue, 4 white, 2 dark blue, 4 white, 2 dark blue, 4 white, 2 dark blue, 4 white, 2 dark blue, 4 white, 2 dark blue; checked with 6 light blue, 2 very dark blue, 6 light fawn, 2 very dark blue, 6 light fawn, 2 very dark blue, 6 light fawn, 2 very dark blue.

DRESS FABRICS.

We are probably not aware of the extent to which weather, even in the towns, independ- ence 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 season. That this is true, a glance at the goods exposed at the present time as spring wearing apparel will amply prove, and particularly this is 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 beauti- ful light napped green ground. But it is use- less 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 desire felt from time to time for the introduction of the beautiful goods mentioned, which cannot be of great service in suggesting the lines to take in the coming autumn and winter.

Design 17 is an effect that may be applied in many ways. It consists of a welt with twist, capable of being produced in two colours on a plain ground, upon which is introduced an extra welt or warp spot. There are several minor points which should be considered in such the way in which the plain joins up to the extra weft figure, the direction in which this figure is broken, and the principles 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 silk weft for the extra figure.