NEW FRET SAWING MACHINE.

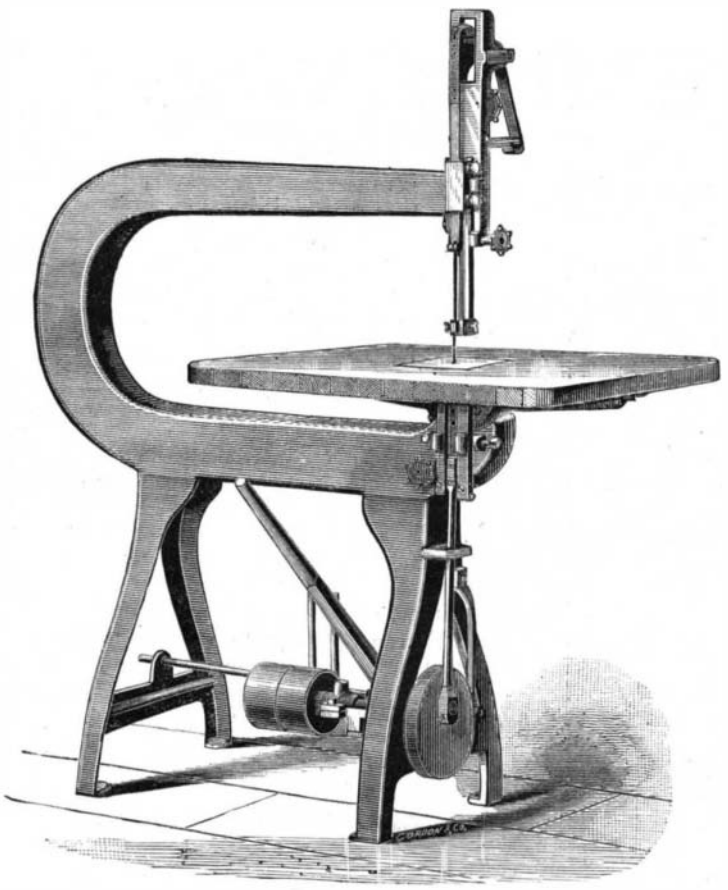
This machine is made from entirely new designs, and avoids many of the difficulties experienced in the use of the ordinary suspension or "clear-sweep" scroll saws. It is a fact that five-sixths of all the curved sawing that is done is within the compass of an ordinary band saw arch, and it is for work of this kind that the portable machine shown in the engraving is especially adapted.

The arch is cast in one piece, in tubular form, and is sufficiently strong to sustain the saw rigidly against its work and resist the vibration caused by the action of the strain. The table is of kiln dried hard wood, firmly secured to a heavy tilting bar, so as to be adjusted for bevel sawing. The vibrating parts are of steel and wood, and while amply strong for the work, are extremely light, admitting of a high speed without special foundations for the machine. The strain is of steel, and is designed on a new principle, whereby an even tension is maintained on the blade throughout the stroke, and friction and wear are avoided. The crank plate is balanced for the pitman according to the best known methods. A combined brake and shifter is attached, by which the machine may be stopped almost instantly. Hardened steel guides are provided both above and below the table, and the blade is thus held rigidly in its track. The shaft is of steel, and runs in connected bearings of good Babbitt metal. The loose pulley is self-oiling, and has extra long hubs. The lower slide ways have rake adjustment, and the upper guide has adjustments in every direction. Ample provision is made for oiling all the working parts.

Careful attention has been paid in designing this machine to secure all the qualities desirable in a good high-speed jig saw, while avoiding many of those common to the old-fashioned suspension machine.

The No. 1 size has 4 m. stroke, saws 6 m. deep, and to the center of 84 inches. The pulleys are 6 m. in diameter, and may run 1,200 to 1,300 per minute. No. 2 has 5 m. stroke, saws 8 m. deep, and to the center of 100 inches. The pulleys are 6 m. diameter, and 3 m. face, and may run 1,100 to 1,200 per minute.

For further information address Frank H. Clement, 122, 124, 126 Mill St., Rochester, N. Y.



CLEMENT'S FRET SAWING MACHINE.

A Study of the World's Carrying Trade.

A statistician of ability has just produced a series of comparisons between the commerce, the railroads, the shipping, tonnage, and carrying power of the world, and contrasts the work accomplished in 1880 with that in 1850. If the commerce of the globe represented $4,280,000,000 thirty years ago, in 1880 it was $14,405,000,000, or there was the amazing increase of 240 per cent. To carry this augmented quantity, railroads have had 398 per cent more of mileage, while tonnage of ships has been made larger by a capacity represented in the thirty years by 171 per cent. In 1850, with 6,905,000 of ships' tonnage, the carrying power was 8,464,000 tons; last year it was 18,720,000, with a carriage capacity of 34,200,000 tons, or with the wonderful augmentation of 304 per cent.

Representing it in another light, for every $5,000,000 worth of commodities carried in 1850, there were 52 miles of railroad and a carrying capacity on the water of 9,900 tons. In 1880 these goods could be moved by 77 miles of railroad and 12,000 tons of shipping. What a vast power must be that of the United Kingdom, which represents a sea traffic that controls 49 per cent of the world's carriage!

It is the introduction of steamships which has so visibly increased the commerce, not so much by means of their tonnage as by their ability to multiply their carrying power. In compiling the tonnage entries of 1879 for all nations figures seemed to show that if the number of voyages made by a sailing ship in the year were 3½, a steamer made almost 17 in the same time. It is, therefore, assumed from the best of proof that the carrying power of a steamer is quite fivefold that of a sailing vessel. That this is quite evident is deduced from the fact of the decline in the building of sailing vessels, as they are becoming every day less profitable. When the proportions of steam and sail freights are considered, the first has gone up every ten years with rapid bounds, while the last has just as quickly gone down. In 1850, by steamer 14 per cent of the world's freight was carried, and by sail 86 per cent; in the next decade it was 29 and 71, in the next 43 and 57, and last year steam carried 61 and sail 39.

Distinguishing the steam tonnage of the world into the two simple categories of British and not British, the first, in 1880, has 2,580,000 tons, and all other nations 1,530,000 tons. There is something distressing when we look at the shrinkage of American shipping in studying the carrying power of England and our country. Comparing the aliquot carrying power of Great Britain with that of the United States, in 1850 we had 15 parts of the world's freighting business, while England had 41; in 1870 we had only 8 to England's 44, and last year it had dwindled to 6, while England's had augmented to 49.

When individual size and capacity of English steamers are examined with sailing vessels, the latter are one-fourth less in size than the first. Bringing together the differences in tonnage in 1880, English ships averaged 748 tons; French, 320; German, 250; American, 560; Norwegian 190; and Italian, 156.

It is undoubtedly true that the Suez Canal has caused a notable increase in size of steamers. Nine years ago the average tonnage of such ships passing to the Red Sea being 995, in 1880 it was 2,146 tons. When the Panama Canal is opened there is every reason to suppose that the impulse given to steam freighting will be notably increased, and we may look for additional vessels and of greater size.

If the world builds more ships, what is their term of individual life? Have we, by means of better material and additional skill in navigation, decreased the risks? Statistics seem to show that vessels belonging to the United States have the shortest existence. Mr. Kiaer, a Norwegian statistician, states that the life of a United States ship is 18 years, a French one 20, a German 25, an English 26, but that a Norse vessel has a good chance of 30 years. Averaging the wrecks into the two divisions of steamers and sailing vessels, the British average of the first was 2·94, and of the latter 3·93; against the American 4 and 5·45 per cent. If sailing vessels make 3 trips a year and steamers 15, a sailing vessel is good for 72 voyages and a steamer for 490. Vessels die, then, at the rate of 4 per cent a year, but there is a birth rate of 5 per cent; or 750,000 tons pass out of existence and are replaced every twelvemonth by 950,000 tons, though this hardly represents exactly the increase, since, as sailing vessels are taken away and steamships are substituted, and as these are being built of higher capacity, 4 per cent of increase must be added.

When the character of the accidents is noted, in 1880 there were to be counted in the bills of mortality of the world's shipping 101 vessels missing, 205 sunk by collision; lost by fire, 229; stranded and lost, 1,108; and waterlogged, 550; or a total loss of 2,193 ships. If the disasters of last year seem immense, when we consider how great has been the augmentation of shipping, it is satisfactory to learn that it was only 1 per cent over the average of the 14 preceding years.

Most curious are the speculations which are derivable from the dangers of the sea in respect to the individual. Not counting fishermen, the total number of sea-going vessels last year was thought to be not less than 90,000, and the estimate is that 1,000,000 people are always on the high seas. The rate of death from sea risks is considered to be about 3½ per cent per 1,000. If, then, a man lives in London, he would be subject to a death rate of 22 per 1,000, while if he was at sea it would be 25½. But if he lived in Dublin or Naples, his chances at sea would be better than on the land.

Counting the earnings of British sailors, some 200,000, as £60,000,000, it is equivalent to £300 for each per annum, while the shipowners get for their share £10,000,000. "That toll which all nations pay Great Britain for the carrying trade is equal to nearly 4 per cent of the exported value of the earth's products and manufactures."—*N. Y. Times.*

The Belgian Geographical Prize for 1885.

The King of Belgium has decreed a prize, to be offered in 1885, for the best system of popularizing the study of geography. The competition for the prize is to be international. Competitors may send their works, either printed or in manuscript, and either in the French, Flemish, English, German, Italian, or Spanish language, to the Minister of the Interior, at Brussels, before January 11, 1885. It is necessary that the prize manuscript shall be published in the course of the year following that in which the prize shall have been awarded.

Amalgams.

Opinion is still divided with regard to the nature of amalgams, some considering them to be isomorphous mechanical mixtures, others true chemical compounds. The former view derives support from those cases in which amalgamation is associated with an absorption of heat, as in the solution of a salt or in dilution of a solution; the latter is supported by the fact that many amalgams are formed with a strong development of heat. A contribution to the subject has been lately made by Herren Merz and Weith, in the Berlin Chemical Society. These chemists have investigated whether, with regular heating, amalgams part with their mercury continuously or in distinct gradations.

The experiments consisted in placing the amalgam in a porcelain dish within a glass tube, contracted below, and inclosed in a second tube, having a bulb at its lower end. This bulb of the outer tube contained the substance of the vapor bath (sulphur, mercury, or diphenylamine). To guard the amalgam from air, a lively current of an indifferent gas was passed through the interior tube while the experiment lasted. The amalgams used, which were always directly produced by known methods, contained on an average 60 to 80 per cent of mercury. This heating was continued, wherever possible, until after several hours no decrease of weight (or hardly any) was perceptible. There were examined gold, silver, copper, lead, tin, bismuth, zinc, cadmium, sodium, and potassium amalgams. The results for the first eight are very briefly communicated, those for the last two, whose easy oxidability required special precautions, more fully. In the case of these alkali amalgams, the authors also sought to determine the melting points, but, for certain reasons, very accurate results were not reached. In general the melting points of the amalgams rise at first very quickly with the proportion of alkali metal, then gradually fall. It was thus observed that, when mercury is heated under paraffin to 250°, and then some sodium is added in portions, the whole mass solidifies with four to five per cent of sodium; but with further addition of some percentages the mass fuses completely.

The results of their investigation are summed up by the authors as follows: A survey of the results described shows, for a series of amalgams, that even with moderate heating they do not furnish determinate compounds.

The amalgams of gold, silver, copper, bismuth, lead, tin, zinc, and cadmium lose their mercury entirely, or nearly so even at or under the boiling temperature of mercury. Where no mercury remained, the cause is to be sought rather in a mechanical exclusion than in a chemical action. But, on the other hand, the easy decomposability of these amalgams evidently offers no proof that there are no chemical compounds in them.

For the rest, if we consider the great variability of amalgams, together with the fact that, in squeezing the so-called mercury solutions of metals, these latter do not remain behind, but certain mercury compounds, the view acquires the greatest probability, that at least very many amalgams may be, indeed, molecular combinations, but in fixed relations.

Most pronounced does chemism appear to be in the amalgams of potassium and sodium. They lose their mercury extremely slowly, even at the boiling point of sulphur, as also in a gas current, and so in circumstances highly favorable to removal of mere mixed substances. The remarkable relations, too, as regards the melting point, seem to speak for the presence of true chemical compounds. Probably these amalgams, at a comparatively low, as well as at a high temperature, consist of different compounds, none of which, however, have a durable existence, and therefore recurrent, fixed relations of composition are not to be met with. Alkali-metal amalgams of fixed composition would probably be obtained on production of larger quantities of amalgam; perhaps also by heating considerably above the boiling temperature of mercury.

The Decline of Irish Industries.

The revival of Irish manufacturing industries, largely destroyed by hostile legislation, is much agitated. The statistics of the decline are given as follows:

In 1800 there were in Dublin 91 master woolen manufacturers and 4,918 hands; in 1840, 12 masters and 602 hands, 30 master woolcombers and 230 hands; in 1834, 5 masters and 66 hands. The carpet manufacturers in 1800 were 13 masters and 720 hands; in 1841, 1 master. The blanket manufacturers in Kilkenny in 1800 were 56 masters and 3,000 hands, in 1822, 42 masters and 925 hands. The broad silk loom weavers in Dublin in 1800 at work were 2,500; and in 1840, 250. The calico looms in Balbriggan in 1799 in full work were 2,000; and in 1841, 226. The flannel looms in the County of Wicklow in 1800 were 1,000; in 1841, not one. The case of the Cork braid weavers, worsted weavers, hosiers, woolcombers, cotton weavers, linen check weavers, was even worse. These industries employed thousands of hands up to 1820; now there is nothing left but a few wheezy hand looms near Shandon Church and an almost extinct colony of calico weavers at Clonakilty. The linen trade once throve in Mayo, but there is not a trace of it now.