St. Clemente, apse; St. Francesco Romana, apse; St. Maria in Trastevere, apse. Thirteenth century work—St. Paoli fuori le mura, apse; St. Clemente, triumphal arch, 1297; St. Giovanni Laterano, apse by Jacopo de Turrita, 1290; St. Maria Maggiore, apse and western end by Jacopo da Turrita, 1292-1299, and Taddeo Gaddi. Fourteenth century work—St. Peter's, nave, cella in atrium, by Giotto; St. Maria in Cosmedin, on walls, by Pietro Cavallini, c. 1340.

Jerusalem.—Seventh century work—"Dome of the Rock," arches of ambulatory, 688. Eighth century work—Mosque of Al-Aska, on dome. Eleventh century work—"Dome of the Rock," base and cupola, 1027.

Milan.—Fifth century work—St. Ambrogio, Chapel of St. Satiro, vault. Sixth century work—St. Lorenzo, Chapel of St. Aquilinus, vault. Ninth century work—St. Ambrogio, apse, 832.

Florence.—Thirteenth century work—Baptistery vault, c. 1225, by Fra. Jacopo; St. Miniato, apse and western front. Fourteenth century work—Baptistery, finished by Andrea Tafi.

Ravenna.—Fifth century work—Orthodox Baptistery, vault; Tomb of Galla Placidia, vault, 450; Archbishop's Chapel, vault. Sixth century work—Arian Baptistery, vault; St. Apollinare Nuovo, apse and nave, with ninth century additions; St. Vitale, apse and whole sanctuary, 547; St. Apollinare in Classe, apse and nave, 549.

Constantinople.—Sixth century work—St. Sophia, walls and vault, circa, 550. Eleventh century work—St. Saviour, walls and domes.

Venice.—Twelfth century work—St. Mark's, narthex, apse, walls of nave and aisles. Fourteenth century work—Saints Giovanni e Paolo, in arch over effigy of Doge Morosini.

Fundi.—Fifth century work—Cathedral, apse.

Nola.—Fifth century work—Cathedral, apse.

Thessalonica.—Sixth century work—Church of St. George, apse, etc.; St. Sophia, dome and apse.

Trebizonde.—Sixth century work—St. Sophia, apse.

Mount Sinai.—Eighth century work—Chapel of the Transfiguration.

Corдова.—Tenth century work.—Nihrab (sanctuary) of Mosque.

Capua.—Twelfth century work—Cathedral, apse.

Torcello.—Twelfth century work—Cathedral, apse.

Murano.—Twelfth century work—Cathedral, apse.

Salerno.—Twelfth century work—Cathedral, apse.

Palermo.—Twelfth century work—Capella Palatina, began 1132, the whole walls; Church of La Martorana, vault.

Monreale.—Twelfth century work—Cathedral, the whole walls, 1170-1190.

Bethlehem.—Twelfth century work—Church of the Nativity, 1169.

Afalú.—Twelfth century work—Cathedral, apse, 1148.

Pisa.—Fourteenth century work—Cathedral, east apse by Cimabue, 1302; north and south apses, by his pupils.

RUSSIA'S INDUSTRIAL DEVELOPMENT.

By H. L. GEISSEL.

DURING the last ten years Russian industries have made marvelous progress. The Russian government recognized long ago that the home money market was not able at all to bring about the desired development, and it therefore favored systematically the introduction of foreign capital. The latter was especially welcome for the exploitation of the great mineral resources of the empire, for the establishment of engineering works, for the extension of the Russian railway nets, for the formation of powerful banking institutions, insurance companies, etc.

During a period of six years, from 1894 to 1899, no less than 927 joint stock companies were formed in Russia, namely:

Year.	No. of Companies.	Stock capital, Rubles.*	Bonds rubles.	Foreign companies.
1894.....	63	54,600,000	19,500,000	3
1895.....	94	116,600,000	33,200,000	1
1896.....	131	197,300,000	36,000,000	24
1897.....	136	192,900,000	50,200,000	25
1898.....	176	229,800,000	53,900,000	28
1899.....	327	358,400,000	78,100,000	70

Total... 927 1,149,600,000 270,900,000 151

* The Russian ruble equals 52 cents United States currency.

Taking stock capital and bonds together, we arrive at a total amount of 1,420,500,000 rubles, or \$738,660,000, invested in stock companies during the above-mentioned period.

It is true that quite a number of these companies never engaged in business, while others were only conversions of already existing private firms into stock companies, and therefore should be left out of consideration. In spite of this, however, it is safe to estimate that at least 600,000,000 rubles were concentrated through the concession of Russian joint stock companies during the above six years.

On January 1, 1899, there existed altogether in Russia 1,181 stock companies, capitalized at 1,736,856,000 rubles. These 1,181 companies were divided among the various industries as follows:

	No of companies.	Capital in rubles
Mining and metallurgy....	300	531,000,000
Textile.....	215	311,000,000
Food products.....	218	143,000,000
Chemical.....	60	78,000,000
Banking.....	52	280,000,000
Commercial.....	50	59,000,000
Wood pulp.....	46	32,000,000
Transportation.....	44	61,000,000
Insurance.....	21	41,000,000
All others.....	175	201,000,000
Total.....	1,181	1,737,000,000

Among the foreign companies formed in Russia from 1894 to 1899, 135 companies, with a capital of 450,000,000 francs, or about \$90,000,000, were Belgian.

The total foreign capital invested in the above-mentioned 1,181 stock companies amounted to 2,075,000,000

francs, or nearly \$415,000,000, divided among the different nations as follows:

	Francs.
French	792,000,000
Belgian	734,000,000
German	261,000,000
British	236,000,000
Dutch	18,000,000
United States	12,000,000
Austrian	11,000,000
Swiss	5,000,000
Swedish	4,000,000
Italian	2,000,000

Of this immense amount, at least fully two-thirds, or about \$140,000,000, was invested during the period from 1894 to 1899.

What influence the investment of such huge sums has had upon the rapid development of Russian industries will best be seen from the following figures:

The production of the "manufacturing industries" in Russia amounted in 1877 to 541,000,000 rubles; ten years later, in 1887, to 802,000,000 rubles; 1892, to 1,010,000,000 rubles; and in 1897, to 1,816,000,000 rubles. The value of the output of the Russian textile mills rose from 298,000,000 rubles in 1877 to 464,000,000 rubles in 1887, to 582,000,000 rubles in 1892, and to 946,000,000 rubles in 1897. The metal industries produced goods to the value of 89,000,000 rubles in 1877, while ten years later, in 1887, the value was 113,000,000 rubles, which rose to 162,000,000 rubles in 1892, and to 311,000,000 rubles in 1897. The average annual increase thus amounted to 26,100,000 rubles from 1878 to 1887; 41,600,000 rubles from 1887 to 1892, and to 161,200,000 rubles from 1892 to 1897. Immense strides ahead were also made in the Russian mining industries. The pro-

DRILLING POST AND BRACE

duction of bituminous coal aggregated the following amounts for the years cited:

	Poods.
1877.....	110,000,000
1887.....	277,000,000
1892.....	424,000,000
1897.....	684,000,000
1898.....	746,000,000

The production of naphtha increased from 13,000,000 poods in 1877 to 167,000,000 poods in 1887, 189,000,000 poods in 1892, 478,000,000 poods in 1897, and to 507,000,000 in 1898. The figures for pig iron are as follows:

	Poods.
1877.....	23,000,000
1887.....	36,000,000
1892.....	64,000,000
1897.....	113,000,000
1898.....	134,000,000

Too many columns would be necessary to enumerate the production of all the Russian industries.

The number of industrial works in European Russia was 30,333 in 1893, and 39,029 in 1897; the value of their output was 1,735,000,000 rubles in 1893, and 2,839,000,000 rubles in 1897, while the number of workmen employed in these industrial establishments rose from 1,582,904 in 1893 to 2,098,262 in 1897.

The period of this immense industrial development coincides with that covering the building up of the enormous state and private railway enterprises of the country, for from 1894 to 1900 no less than 1,273,000,000 rubles were expended in the construction of new lines and in the purchase of additional rolling stock.

But, in spite of this extension, Russia, in order to reach the level of other great European countries, would have to construct 80,000 versts (53,000 miles) more of railways, not including Siberia, and this only in proportion to population. And, taking area into consideration, the total still needed would be 200,000 versts (132,600 miles), at an annual cost of 240,000,000 rubles, calculating cost at 60,000 rubles per verst (0.663 mile) and spreading 12,000,000,000 rubles over fifty years; while in 1899 for state and private lines in European Russia 40,000,000 rubles were spent in construction.

The railways of Russia now practically run from the White to the Black Sea on the one hand, and from the Baltic to the Yellow Sea on the other. The vast expanse of territory thus covered, great portions of which may be said to be still but partially exploited or else

entirely undeveloped, will need an increasing extension of subsidiary lines, some of which by their extent and importance partake more of the character of main thoroughfares.

The general progress has likewise been considerable. The number of passengers during 1899 was 75,710,000, or 5,000,000 more than in 1898. The freight traffic was 6,614,000 poods, or 10 per cent over the total of 1898. The rolling stock has increased since 1894 some 50 per cent, 290,000,000 rubles being assigned in this period for the purchase of engines and cars. Double lines have been laid down over 8,247 versts.*

During the same period the brandy monopoly was introduced, on account of which the government spent 72,500,000 rubles on new buildings and their outfit.

A direct result of this evolution was a heavy increase in the revenue of the state, and a feature hitherto unknown in the Russian budget, viz., a considerable surplus! The revenues derived from commercial taxes increased from 40,500,000 rubles in 1893 to 61,100,000 rubles in 1898, that is 50 per cent; while the customs house receipts grew from 147,100,000 rubles to 219,600,000 rubles, an increase of 49 per cent; and the receipts from the excise tax, which amounted to 345,900,000 rubles in 1893, rose to 449,600,000 rubles in 1898, an increase of 40 per cent. In almost the same ratio increased the receipts of the Post and Telegraph Service, namely, from 35,500,000 rubles in 1893 to 47,000,000 rubles in 1898, an increase of 32 per cent.

That such an immense industrial development created a demand for machinery is a matter of course. In 1899 the imports of machinery into Russia amounted to the enormous value of \$58,200,000.

The magnitude of the foreign trade Russia transacts in machinery will be better understood by a few comparisons. In 1899 the imports of machinery into some leading European countries were as follows:

Great Britain (in round figures)....	\$16,000,000
Germany	15,400,000
France	14,000,000
Austria Hungary	9,500,000

Or together

From these figures it will be seen that Russia's machinery imports exceeded those of Great Britain, Germany, France and Austria-Hungary combined.

Up to the present time the great bulk of machinery imported into Russia has chiefly come from Germany and Great Britain. To the immense imports of 1899, the United States contributed less than 6 per cent.

There is every probability that the imports of all kinds of industrial machinery into Russia will continue to increase for years to come.

BRACE AND DRILLING POST.

THE small drilling apparatus illustrated is of French origin, and is being introduced to the English market by Wallach Brothers, of Gracechurch Street. We are informed by a circular which accompanies the tool that, "by means of this machine holes of up to more than 1/2-inch diameter can be drilled in any kind of metal, by hand, without fatigue, almost without effort, with a rapidity equaled only by stationary machines, anywhere, in any position, in every direction, without having to be taken to pieces." Wonderful claims, expressed in more wonderful English! We take it that "up to more than 1/2-inch" means but little more than that diameter, for the machine is of light construction, the post being about 11-16-inch diameter, and the radius of the handle only 4 1/4 inches. The length of the post is 13 inches, of the horizontal arm 5 1/2 inches, and the maximum distance of the drill from the post is 5 inches. The apparatus has, it will be seen, a clamp, the lower member of which can be turned at right angles on the post, so that the clamp may then be used on a vertical column, for example. The horizontal arm may also be moved into a variety of positions, and the drill spindle inclined to any angle, so that in combination with a few accessories some thirty to thirty-five different applications are possible. The spindle passes through a screwed sleeve which is employed for the feed, a ball-thrust bearing is provided, and a ratchet—which, by the way, is left-handed—allows of the drill being worked by a reciprocating motion when the handle cannot be revolved. For light work we can imagine that this apparatus might be found very useful.—Engineer.

To Remove Spots from Parquet Floors.—Just as numerous as the causes of the formation of spots on the parquet floors are the remedies for their removal. A wrong treatment usually causes the stains to grow larger or penetrate more deeply. The much-practised treatment with sharp lye to remove the evil is fallacious. If this has been done and no wax has been put on, the spot occasioned by the acid is removed with vinegar. If the dark color should remain, coat the place with diluted hydrochloric acid. But if wax has been applied to the spot it must first be taken off with a scraper. In the case of old oil stains, the place is moistened with benzine, and benzine is stirred with fine pipe clay, which is applied quite thick on the places. Benzine softens the oil and the pipe clay absorbs the softened oil, but the windows have to be opened to allow the benzine fumes to escape. In the case of fresh grease or oil stains cover them with blotting paper and place a hot flatiron on top, renew the paper until the stains have disappeared. Ink stains are removed with oxalic acid, likewise rust stains. But if the stains are of aniline ink, it is well to scrape off the spot, and put on moistened chloride of lime. It is preferable to have the sun rays act on it. When not certain of the origin of the stains and they look like fusty, a trial may be made with spirit of sal ammoniac or hydrochloric acid. Claret stains are removed with dissolved tartaric acid, at the same time it can be seen whether the wine had been artificially colored or not. If dyed with fuchsine only the natural color disappears upon the above treatment and the fuchsine remains, which will only give way to chlorine or to light.—Maler Zeitung.

*1 verst equals 0.664 mile.