

the other. At each link the chains rest upon the masonry, either directly by means of pedestals or by means of short transverse girders, which transmit the pressure to the side walls of the tunnels in which the chains are laid.

Our illustration, Fig. 2, shows the four anchor plates in the central pit before the anchorage girder platform has been built over them. In Fig. 3 is shown a side platform completed, with deck beams in place ready for the masonry.

We are indebted to the chief engineer, Mr. L. L. Buck, for the plans from which the present article is prepared.

THE ARMED FORCES OF THE WORLD.

The plan of the Czar to disarm the standing-armies of Europe, admirable and humane though it be, is, perhaps, too indefinite in character to enable us to form any judgment as to its chances of success, or as to its ultimate results, should it prove successful. Universal peace may be a chimera, a mere dream, but one thing at least is certain—the imperial autocrat's manifesto to the Powers calling for a general convocation for the disarmament of European troops has concentrated the attention of the world on the enormous masses of men supported by the European governments. Time and time again it has been said that all Europe is but a vast camp, that every man is compelled



Russia. France. Germany. Austria-Hungary. Italy. Great Britain. United States.
RELATIVE SIZES OF THE WORLD'S STANDING ARMIES GRAPHICALLY REPRESENTED.

to spend part of his life in a barracks. The evil, instead of decreasing, has become more menacing with each succeeding year. For in the endeavor of a nation to bring its armies to as high a state of efficiency as that of some rival power, it is compelled to augment the number of its troops each year by a constantly increasing ratio. In the struggle for martial supremacy some nations have naturally surpassed others. It would be a most difficult task to ascertain exactly what army is the strongest;

for the efficiency of a force depends not upon numerical strength alone, but upon the discipline of the men constituting that force, upon the manner in which these men are armed, upon the term of service, and upon many other factors. It is, therefore, evident that no statistics, however accurate, can exactly indicate how much greater the efficiency of one army is when compared with another. So far as mere numbers are concerned, it would not be difficult to ascertain which army is the largest, and this we have endeavored to do in the present article.

According to the best information at hand, the peace-armies maintained by the principal nations exclusive of native colonial troops may be tabulated thus:

TABLE I.—ARMIES ON A PEACE-FOOTING.

Russia.....	860,000	Italy.....	231,365
France.....	615,413	Great Britain.....	168,569
German Empire.....	585,440	United States.....	25,000
Austria-Hungary.....	385,697		



IN GERMANY, 17 CIVILIANS ARE DEFENDED BY A SINGLE SOLDIER.



IN FRANCE, ONE SOLDIER GUARDS 15 CIVILIANS.



A RUSSIAN SOLDIER DEFENDS 37 CIVILIANS.



IN ENGLAND, ONE SOLDIER DEFENDS 72 CIVILIANS.



IN THE UNITED STATES, ONE SOLDIER DEFENDS 445 CIVILIANS.

From this table it is evident that Russia's army in time of peace exceeds that of any other nation. France and Germany are about equal in numerical strength, France, however, having the larger force. Our own army of 25,000 men appears but a handful when compared with the hundreds of thousands of men maintained by the European Powers.

Although Congress enacted last spring that the standing-army of the United States shall, in cases of emergency, be increased to 62,597 men, we have nevertheless retained the legal peace footing of 25,000 men, as the strength of our army under normal conditions. Our newly acquired territories will probably require a force considerably in excess of the 62,597 men already mentioned.

In endeavoring to estimate the number of men in the various armies when on a war-footing, it is somewhat difficult to obtain accurate figures. In time of war the entire male population of a European country may be drafted into the army. Of the war-strength of Germany no official statistics can be obtained; but with her present organization, Germany, in case of invasion, can muster an army of 3,000,000 men. Austria-Hungary has a "Landsturm" of 4,000,000 men, in which all citizens not members of the army, navy, or Ersatz-Reserve are obliged to serve from their nineteenth to their forty-third year. The following table gives the war-footing of the various countries:

TABLE II.—ARMIES ON A WAR-FOOTING.

Russia.....	3,503,000
German Empire.....	3,000,000
France.....	2,500,000
Austria-Hungary.....	1,527,173
Italy.....	1,263,308
Great Britain.....	526,220
United States.....	140,627

Our own army, even on a war-footing, again seems small when compared with the million men that constitute an Old World force. In arriving at the war-strength for the United States in the foregoing table, we have added together the number of men in our standing-army and in our drilled militia, these being the only effective forces of trained men at our disposal in cases of emergency, and therefore corresponding more nearly in character with the European war-armies than a force composed largely of volunteers.

The army of one country, in the relation which it bears to the population of that country, may be comparatively larger than the army of another nation. The proportion of inhabitants to the number of soldiers gives one a better conception of the enormous size of a European force than a mere statement of its numerical strength. In Table IV. these proportions of population to the various armies are given:

TABLE III.—POPULATION.

	Population.	Census.
Russia.....	129,166,561	1897
United States.....	62,422,250	1890
German Empire.....	52,279,915	1895
Austria-Hungary.....	41,231,342	1890
France.....	38,517,975	1896
Great Britain.....	38,104,975	1891
Italy.....	31,114,589	Estimated.

TABLE IV.—NUMBER OF INHABITANTS TO EACH SOLDIER.

	Peace.	War.
France.....	62,589	15,407
German Empire.....	89,300	17,427
Austria-Hungary.....	114,826	22,023
Italy.....	135,249	24,671
Russia.....	150,194	36,673
Great Britain.....	232,959	72,413
United States.....	2,488,890	445,907

What enormous armies France and Germany maintain, is shown by the fact that France requires one soldier to defend every fifteen of her citizens; and the Kaiser one soldier to protect seventeen of his subjects. The marked disparity between the conditions in Europe and in the United States will be appreciated, by comparing the figures in the foregoing table.

Of the relation of the armies to population, Table V. will give still further information:

TABLE V.—NUMBER OF SOLDIERS TO EVERY THOUSAND INHABITANTS.

	Peace.	War.
France.....	15,822	64,907
German Empire.....	11,200	57,883
Austria-Hungary.....	8,700	44,315
Italy.....	7,391	40,533
Russia.....	6,658	27,120
Great Britain.....	4,293	13,810
United States.....	0,399	2,246

A nation with a large expanse of territory requires a larger army than a smaller country. A vast country like Russia would, no doubt, be more difficult to defend against invasion than a country of comparatively small dimensions. What relation the armies bear to the territories which they defend is shown by the following tables:

TABLE VI.—AREA IN SQUARE MILES.

Russia.....	8,666,394
United States.....	2,970,000
Austria-Hungary.....	240,942
German Empire.....	308,830
France.....	204,092
Great Britain.....	120,979
Italy.....	110,646

TABLE VII.—NUMBER OF SOLDIERS PER 10 SQUARE MILES—PEACE.

France.....	30,154
German Empire.....	28,034
Italy.....	20,913
Austria-Hungary.....	14,846
Great Britain.....	13,521
Russia.....	0,993
United States.....	0,084

TABLE VIII.—NUMBER OF SOLDIERS PER 10 SQUARE MILES—WAR.

German Empire.....	143,657
France.....	122,494
Italy.....	114,627
Austria-Hungary.....	75,531
Great Britain.....	43,497
Russia.....	4,042
United States.....	0,473

On a peace-footing France provides a larger number of men for every ten square miles of territory than any other nation. On a war-footing, however, Germany, with her larger army, is enabled to assume the lead. Russia, by reason of her enormous possessions, can provide barely one man on a peace-footing and four

men on a war-footing for every ten square miles. The smallness of Italy, coupled with her large army, has enabled her to assume the third place in both tables. Great Britain in all these lists occupies a low position; but it must not be forgotten that her large navy compensates for the smallness of her army. In the tables, Russia's Siberian army has been included, because the European and Asiatic possessions of the Czar constitute one, unbroken realm.

The expense incurred in maintaining these large armies is enormous. It enervates a nation, drains its resources, imposes upon the people taxes which cannot but breed discontent, and paralyzes the productive forces and the elements of social well-being. What the maintenance of a standing army means to the youth of a country is well shown by a passage in a recently revived speech made by Lord Randolph Churchill. He said in part:

"Out of the life of every German, every Frenchman, every Italian, every Austrian, and every Russian, the respective governments of those countries took three years for compulsory military service. If they estimated these years at eight hours a day for six days a week, they would find that it came to this—that out of the life of Europeans in those nations . . . no less than 7,500 hours were taken for compulsory military service, during which time the individual so deprived was, for purposes of contribution to the well-being of the community, as a whole, by his labor, as idle, as useless, as unprofitable, as if he had never been born."

The Current Supplement.

The current SUPPLEMENT, No. 1201, has many interesting articles. "A Problem in Shipbuilding" describes the lengthening of the "Spree." "The Cox Type-Setting Machine" deals with an ingenious type-setting and justifying machine. "The Mining and Minting of Gold and Silver" is a full paper. "A Short History of Scientific Instruction" is by Sir Norman Lockyer. There are a number of other interesting articles and the usual short notes.

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RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

CULTIVATOR AND DRAFT-EQUALIZER.—WILLIAM F. NATSCHKE, Cissnapark, Ill. With this draft-gear and cultivator, it is possible to employ four horses abreast, means being provided to direct the course of the cultivator in accordance with the direction given to the horses. A vertical frame has upright side bars connected at their upper ends by a top bar. A horizontal frame is provided with ways and slides thereon below the top bar. The horizontal frame can be adjusted in position by means of a lever and detent-mechanism.

COMBINED HAY RAKE AND LOADER.—PETER McA. LEONARD, Lac du Flambeau, Wis. This invention is an improvement in that class of hay-rakers and loaders in which a rake and endless traveling carrier are mounted on an inclined frame supported by transporting-wheels. The machine is connected with the rear end of a wagon, and when drawn across the field the rake-teeth will gather the hay and pass it to the endless carrier-belt. After the hay has been dumped into the wagon, rearward-projecting arms or presser bars act to prevent the hay's being blown away.

Electrical Contrivances.

COIN-FREED APPARATUS FOR GENERATING X-RAYS.—MAURICE VIDAL, Paris, France. This apparatus comprises a mechanical, automatic system connected with a fluoroscopic chamber provided with an automatic shutter and with a Crookes tube automatically illuminated. A coin dropped into the apparatus causes the dark, fluoroscopic chamber and the Crookes tube to be simultaneously operated. The apparatus contains an accumulator for supplying the current to a Ruhmkorff coil, the poles of which are in communication with the vacuum or Crookes tube. The circuit of the accumulator is closed by an automatic mechanism operated by a coin.

SYSTEM OF ELECTRIC TRACTION.—MICHEL-ANGELO CATTORI, Rome, Italy. The traction system devised by this inventor permits the continuance on the same track of whatever system may have previously been employed. The railway is provided with two parallel sectional conductors arranged in two circuits. In each circuit an independent generator is included. Terminal switches enable one pole of each generator to be connected with the corresponding terminal of either conductor of the same circuit. By means of junction switches, the other pole of each generator may be connected with the other end of either conductor of the same circuit.

AUTOMATIC MAGNETIC CIRCUIT-BREAKER.

CHARLES M. CLARK, New York city. The purpose of this invention is to provide a circuit-breaker which can be set to break a circuit automatically in case of an overload, underload, or a combination of both, on single, two wire, or multiple circuits. Within the casing of the apparatus, a shaft consisting of two sections is mounted. A pawl is carried by one of the sections, and is adapted for locking connection with the other section. A disk is mounted on one of the shaft-sections, and is rotated by a spring. A contact-block carried by the disk is engaged by brushes in the electric circuit. A solenoid is placed in the circuit, and contains a core which operates to release the disk upon an overload, and to move the pawl out of its locking position. The block's being moved out of engagement with the brushes, by the action of the disk, will cause the circuit to be broken.

Bicycle Appliances.

SUPPORT.—WILLIAM F. WILLIAMS, London, England. By means of this improved device, a bicycle may be held in an upright position when traveling very slowly or when stopped altogether, so as to avoid the necessity of the rider's dismounting when stopped. The support, when brought down upon the ground, projects laterally at each side of the machine in position to act as a broad base, and to afford the desired stability. When raised, the support assumes a fore-and-aft position, the construction and operation of the support being such that the vertical and turning motions are independent, the latter motion being always performed when the support is out of contact with the ground.

Engineering Improvements.

GOVERNOR.—WILLIAM E. BROWN, Aral, Mich. To provide a sensitive device for controlling the slide-valve of an engine, this inventor has devised a governor which is provided with a casing secured on a shaft. A slide is fitted to slide in the casing and is pressed by a spring, the tension of which may be regulated. Weighted arms, fulcrumed in the casing, have segmental gear-wheels in mesh with racks on the slide. When the weighted arms swing outwardly by centrifugal force, an eccentric is operated by the arm to swing across the shaft and to operate the valve-gear accordingly.

Mechanical Devices.

VENEER-PRESS.—AXEL K. HATTEBERG, Mattoon, Wis. This invention seeks to provide a veneer-press arranged to press the veneers quickly, to insure good work, and to permit the handling of a large amount of work in

a comparatively short time. The invention consists principally of a bed, a platen over the bed; a pressing device, adapted to be temporarily connected with the platen to press the veneers held on the bed, and means for locking the platen to the bed after pressing, to permit the removal of the pressing device, and to keep the veneers locked between the bed and platen until the glue is set.

DIAMOND-POLISHING MACHINE.—AUGUST WAUTERS, New York city. The inventor of this machine has endeavored to provide a means whereby the dop of his apparatus can be adjusted according to the desired number of facets to be formed on the diamond, and to insure a proper polishing relative to the desired inclination to be given to the facets and relative to the grain of the diamond. The invention consists essentially of a dop provided with a ball-and-socket joint; one member carries the diamond and the other is adjustably held in the supporting arm.

DITCHING-MACHINE.—WILLIAM WILGUS, Lafayette, Ind. In this ditching-machine, a scoop of semi-circular shape is employed and operated to enter the ground at one point, to pass through the ground, and to find exit at the opposite point, means being provided for forcing the scoop into and through the ground. The scoop is provided with a semicircular cover, both cover and scoop being pivoted upon the same shaft, so that when the cover is over the scoop, a cylindrical receptacle is formed for the dirt removed from the ground. The cover and scoop may be locked together when the scoop has received its load. The cylinder, comprising the scoop and cover, may be released from its support, and rolled from the opening in the ground to any point where the contents of the cylinder are to be discharged. In this manner a ditch of moderate depth may be made section by section, each time the scoop-section of the cylinder has been made to enter the ground.

Railway Contrivances.

LOCOMOTIVE COALING DEVICE.—WILLIAM M. PRICE, Ellsworth, Iowa. The purpose of this invention is to enable a locomotive to be coaled while under way, and thus save the time otherwise lost. This result is obtained by means of an apparatus, comprising a discharging-bin suspended on inwardly-inclined links, means for supporting the links, an operating lever, and a link connecting the lever and bin, by which the bin may be swung to one side and tipped. The device is mounted upon the tender of a locomotive, or upon a car. The locomotive upon which the apparatus is mounted, or to which it is attached, is to run upon a track parallel with the track carrying the locomotive to be coaled, and,

regulating its speed to that of its neighbor, discharges its coal into the tender of the locomotive to be coaled.

CAR-COUPLING.—SETH BEDFORD, Charleston, Mo. This car-coupler is so constructed that the jaws may be automatically set in position to receive each other as the cars come together; that the jaws may be uncoupled by means of air-pressure; that air-pressure may be utilized to control the passage of air to the uncoupling devices under the control of the engineer, in order to enable him to uncouple a train of cars at any point; and that the couplings for the air pipes may be automatically united when pressed together by the meeting bumpers. Varying pressure is employed to effect the uncoupling at different points, such varying pressure being supplied to the pressure pipe by means of the pressure-devices now commonly employed on locomotives.

Miscellaneous Inventions.

HEATING-DRUM.—HERBERT E. HARRINGTON, Walden, Vt. A drum has been devised by this inventor which conducts the heated currents by centrifugal force to the outer surface of the drum, causing the hot air and products of combustion to be utilized to the utmost. The drum is self-cleansing and is designed to arrest sparks, it being well-nigh impossible for a burning particle to pass through. When set up, the drum may be turned out of the way.

MEANS FOR RACKING BEER.—EMIL KERSTEN, Richmond, Va. During one stage of the manufacture of beer the liquid is cleared in large casks partly filled with chips and shavings. After having been cleared the beer is filled into kegs, during which process a filter must be used to remove the sediment which has been shaken up during the filling. To avoid this the inventor of this new method draws the beer through an outlet vessel contained in the bottom of a cask having two inflows at different levels, so that the fine and clear portion of the beer above the sediment level is caused to flow through the outlet vessel; the remaining portion is subsequently withdrawn from the cask through the outer vessel by the inflow below the sediment level. By this arrangement the sediment is not disturbed, and the last portion of the beer contains impurities too small in amount to clog the filter.

COMBINATION ARTICLE FOR HOUSEHOLD USE.—CHARLIE E. KUHN, Mont Alto, Pa. An improvement in combination articles for household use has been herewith provided, which improvement has for a base a frame provided with corner posts secured together by cross bars. The end frames are joined by suitable braces, so that the frames may be folded when desired and may be provided with means by which various