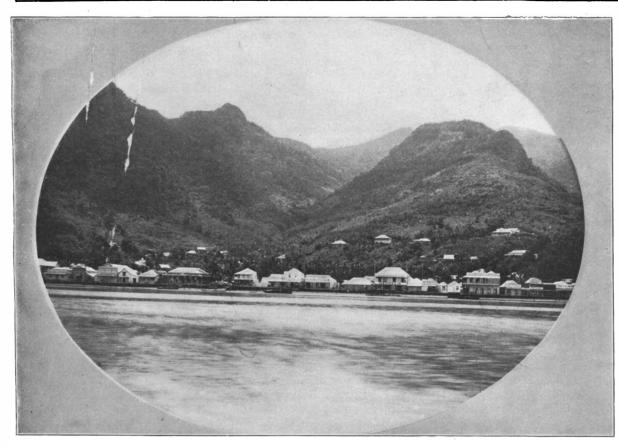
Vol. LXXXVI.—No. 26. ESTABLISHED 1845.

NEW YORK, JUNE 28, 1902.

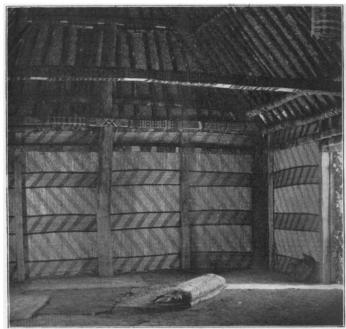
\$3.00 A YEAR. 8 CENTS A COPY



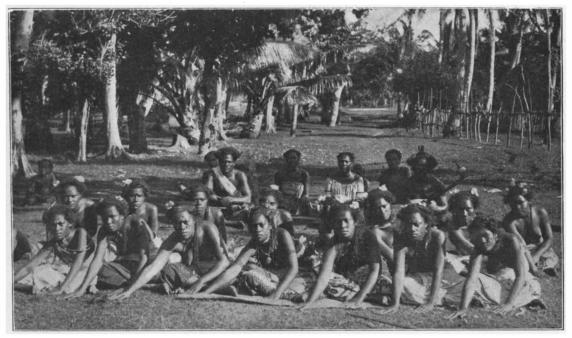


Levuka-Former Capital of the Fiji Islands.









The "Wave" Meke-Meke.



A Native Catamaran, Fiji Islands.



The Coral Strand.

SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States. Canada. or Mexico........ \$3.00 One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00 THE SCIENTIFIC AMERICAN PUBLICATIONS.

The combined subscription rates and rates to foreign countries will be furnished upon application.

Remit by postal or express money order, or by bank draft or check.

MUNN & CO 4 881 Broadway, New York.

NEW YORK, SATURDAY, JUNE 28, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates

THE SENATE PANAMA CANAL BILL.

It is gratifying to note that the international canal question is finally to be settled in a way that we have contended was the only practical one, that is in favor of the short Panama route—a route also favored by the Isthmian Canal Commission. The Senate on the 19th instant passed the Panama Canal bill by a vote of 67 in favor to 6 against.

The radical change in sentiment as here illustrated, in comparison with the Hepburn Nicaragua House bill, may be largely accounted for by the masterly way in which the Canal Commission placed the result of its investigations before Congress, sufficient to convince many men of a practical turn of mind of the several advantages of the Panama route. In addition to this the recent terrible disaster at St. Pierre, Martinique, caused by the tremendous volcanic eruption of Mont Pelée, fixed in the minds of many the futility of constructing a canal in a region having a record for volcanic disturbances and earthquakes.

Thus when the merits of the Panama Canal became fully known and the possibility of its acquirement for a reasonable sum and the probability of securing the desired right of way on equitable terms, there was an irresistible sentiment created in its favor which is reflected in the nearly unanimous vote of the Senate. In the debate preceding the vote the shortness of the Panama Canal as compared with the Nicaragua was emphasized as one of the important points of its advantage—49 miles, as against 183. The depth is to be 35 feet. The principal provisions of the Senate bill are:

- 1. That the President is to acquire for the United States, at a cost not exceeding \$40,000,000, all of the rights, privileges, franchises, concessions, grants of land, rights of way, unfinished work, plants, and other property owned by the New Panama Canal Company of France on the Isthmus of Panama and all its maps, plans, drawings, records on the Isthmus of Panama and in Paris, including all the capital stock, not less, however, than 68,862 shares of the Panama Railroad Company, owned by or held for the use of said canal company, provided a satisfactory title to all of said property can be obtained.
- 2. That the President is to acquire from the Republic of Colombia exclusive and perpetual control of a strip of land not less than six miles wide from the Caribbean Sea to the Pacific Ocean, and the right to use and dispose of the waters thereon, and to excavate, construct, and perpetually to maintain, operate, and protect thereon a canal of such depth and capacity as will afford convenient passage of ships of the greatest tonnage and draught now in use, from the sea to the ocean: this control to include the right perpetually to maintain and operate the Panama Railroad, if the ownership thereof, or a controlling interest therein, shall have been acquired by the United States: also jurisdiction over the strip and the ports at the ends thereof, to make the necessary police and sanitary rules and regulations, and to establish judicial tribunals to enforce the same. The President also may acquire such additional territory and rights from Colombia if deemed necessary.
- 3. \$40,000,000 is appropriated to pay for the property of the New Panama Canal Company and a sufficient amount to pay Colombia for the territory acquired from that country for building the canal. The President is then, through the Isthmian Canal Commission, authorized by the act to proceed with the construction of the canal, utilizing as far as practicable the work already done. The canal is to be supplied with all necessary locks and other appliances. Provision is made for the construction of safe and commodious harbors at the termini of the canal, and for such works of defense as may be necessary for the safety and protection of the canal and harbors.
- 4. In the event that the President is unable to secure a satisfactory title to the property of the New

Panama Canal Company and the control of the necessary territory from Colombia, and after first having obtained for the United States exclusive and perpetual control by treaty of the necessary territory from Costa Rica and Nicaragua, he is then to have authority to begin the construction of the canal over the Nicaragua route on the same general conditions as apply to the Panama Canal. An appropriation is provided for compensation, through a treaty, to Costa Rica and Nicaragua for rights and concessions they are to grant.

- 5. An appropriation of \$10,000,000 is made to begin the project, and by a further provision all appropriations are not to exceed in the aggregate the additional sum of \$135,000,000 if the Panama route be adopted, or \$180,000,000 should the Nicaragua route be selected.
- 6. In any agreement made with Colombia, Nicaragua or Costa Rica the President is authorized to guarantee them the use of the canal and harbors, upon such terms as may be arranged, for all vessels owned by those countries or by their citizens.
- 7. An Isthmian Canal Commission of seven members is created, to be nominated by the President and confirmed by the Senate. They are to have charge of construction of the canal and are to be subject to the direction and control of the Executive. Four of the seven are to be skilled in the science of engineering, one is to be an officer of the army, and one other an officer of the navy. Authority is given for the employment of engineers from the army and civil life and other necessary persons. The commission is to make reports to the President and to give Congress such information as may be required.
- 8. Outside of the \$10,000,000 appropriated authority is given for the issue of \$130,000,000 2 per cent 20-year gold bonds exempt from taxation in denominations of \$20, or a multiple of that sum, to be sold at par and open to popular subscription, the proceeds to be used on the construction work as required.

The provisions above stated appear to give the President ample authority to proceed with this great work in a common-sense, business-like way, while much will depend upon the character of the Commission whom he appoints as to whether the vast expenditures necessary for construction will be reasonable and economical or extravagant. As the personnel of the Commission must be confirmed by the Senate, it is to be presumed only the best men will be selected.

The assurance that a canal is positively to be constructed on a practical and economical basis with funds provided in part by popular subscription will create a national enthusiastic interest in it and insure its success. Its commercial advantages to this and foreign countries cannot be over-estimated. We trust that the differences between the House of Representatives and the Senate may be satisfactorily adjusted by the usual conference committee in the hope that by the next celebration of Independence Day the wishes of the country in respect to this great undertaking may be carried out.

THREE PHASE TRACTION IN AMERICA.

The announcement that the Whitney syndicate has joined hands with Ganz & Co., of Buda-Pesth, is fraught with more promise for the future of electric traction in the United States than many of us may be willing to admit. For years the Buda-Pesth firm has been identified with the growth of electrical traction in Europe. Not only did it install the first underground trolley, but it developed the three-phase system for roads of standard gage.

The number of electrical roads in this country of standard dimensions can be counted on the fingers of one hand. Probably, without exception, all of them use the direct current. In Europe, on the other hand, the foremost electrical engineers have adopted the alternating current, with results that have been most gratifying from the standpoint of economy and efficiency

Readers of the Scientific American will recall the article we published some time ago on the Valtellina road, in Italy. That road was converted from steam to electrical traction by the Buda-Pesth firm. After having been in continuous operation for over one year and a half, the company was able to announce that the three-phase electrical equipment had cut down the operating expenses fifteen per cent. Unfortunately, the Valtellina line had hardly been opened, when the London underground contracts were let. In the bitter fight in which Mr. Yerkes and the American advocates of the direct current finally triumphed, the merits of the three-phase system were ably and strongly put forth by its adherents. The Board of Directors of the London Underground, after a careful investigation, decided in favor of the three-phase system. But the strenuous protests of the Americans resulted in the submission of the controversy to a board of arbitrators, who rather weakly decided that the Buda-Pesth plan was too new.

It may be that the London controversy, however, brought home to the Whitney syndicate the merits of

three-phase traction. At all events, it is encouraging to find that American engineers are willing to try a system of which as yet they know next to nothing, and which has been offered to them as a vast improvement on their own; and it speaks well for the Buda-Pesth firm if sagacious American men of wealth are willing to invest millions in a plan which originated in Europe and developed there to its present importance.

TWO REMARKABLE RAILWAY RUNS FROM NEW YORK TO CHICAGO.

Probably no more praiseworthy feat is recorded in the annals of American railroading than the performance of the trains sent by the New York Central and Pennsylvania Railroads over the roads between New York and Chicago. At a speed which sometimes exceeded 80 miles an hour, and which averaged some 50 miles an hour including all stops, these trains, traveling east and west, covered the respective distances of 980 and 912 miles three minutes ahead of the schedule time of 20 hours.

With these two remarkable records, American railroads hold the record for fast, long runs. On the Orleans & Midi Railroad, the Sud express travels 486 miles from Paris to Bayonne in 8 hours 59 minutes, averaging 54.13 miles an hour. That is probably the fastest train in the world for the distance. But the length of track is little more than half that traversed on the shortest route between New York and Chicago. Other famous European runs that deserve mention are those made in England by the East Coast express and the West Coast express. The former runs to Edinburgh, and the latter to Glasgow from London. Both travel at an average speed of 50 miles an hour; but the distance covered is only about 400 miles.

It is difficult to award the palm to either of these new American trains. The New York Central's express covered a longer distance at a higher average speed than the Pennsylvania train. On the other hand, the Pennsylvania train, although its route was shorter and its average speed not more than 45½ miles an hour, encountered heavy grades in crossing the Alleghany Mountains. The officials of both roads claim that the journey from New York to Chicago could easily be covered in 18 hours.

GOVERNMENT IRRIGATION.

One of the best measures that has become a law in the beginning of this twentieth century is the scheme providing for the irrigation of the thousands of square miles of arid lands located in our Western States and Territories under government supervision, embodied in the bill recently passed and signed by the President and known as the Irrigation Bill.

The bill is based on the idea that the proceeds of sales of public lands shall be assigned from year to year to the building of irrigation works under contracts approved by the Secretary of the Interior, but only when there is sufficient money on hand to insure the completion of the work.

According to Mr. Newlands, the Representative from Nevada who has promoted the legislation on this subject, this bill is very complete and comprehensive in its scope and automatic (so to speak) in its plan of action.

It is estimated that during the next thirty years at least \$150,000,000 from the proceeds of the sale of lands will be available without further appropriations for public irrigation works.

The bill makes the present receipts from public lands, including those of the last fiscal year, stated to amount now to some \$6,000,000, immediately available and the average annual sum of \$3,000,000 (likely to be constantly increased) can be used each year for a steady continuation and enlargement of any work for which contracts are made.

The plan further provides against the acquirement of large tracts of land by individuals or companies by limiting the area to be owned by one person to 160 acres, subject to the provisions of the national homestead law, including its limitations, charges and conditions.

At least half of the arid land so acquired must be improved by irrigation and the owner must reside on or near the land.

After a plan of irrigation of a tract of land owned by several parties has been completed at government expense and the works are in order, the owners will be required to pay back to the government in not less than ten annual installments the estimated cost of the construction of the works, the money so paid to be returned to the general reclamation fund. Eight hours is fixed as a day's work, and Chinese labor is forbidden.

The public arid and semiarid lands mentioned are in the Territories and States of Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington and Wyoming.

The effect of the bill should be to encourage the settlement of the great wastes in a few of the States and greatly to increase their agricultural products. The Department of the Interior is not limited to any particular plan of securing the requisite supply of water for irrigation purposes, but must conform to the State laws bearing on this subject in providing for any given plan. The law is certain to make valuable land now considered valueless, and promote Western agriculture in a way to insure lasting benefit to the country.

THE HEAVENS IN JULY.

BY HENRY NORRIS RUSSELL, PH.D.

The summer evening skies, though not perhaps equal to those of winter, present at this season a noble spectacle. To identify the principal constellations, we may begin with the two brightest stars in sight-Vega and Arcturus. The former of these is nearly overhead at 9 o'clock in the evening in the middle of July, while the latter is some distance to the westward. Starting from Arcturus toward Vega, we first reach the little circlet of stars which is known as the Northern Crown. Next comes a keystone-shaped figure which marks the constellation Hercules. Following the same line beyond Vega, we come to Cygnus—a fine cross of stars in the Milky Way. The bright stars rising in the east below this belong to Pegasus.

In the Milky Way, to the right of Cygnus, the bright Altair shows the position of the constellation of the Eagle. Below this is Sagittarius. Its most noteworthy feature is a little inverted "dipper," known as the Milk Dipper, because it lies in the Milky Way.

Scorpio, the finest of the zodiacal constellations, is due south. The brilliant red star Antares, at the creature's heart, and the long curving line of the tail. streaming down to the horizon and then bending upward again, make this one of the easiest star groups to recognize when once learned. Above it are the large but rather formless constellations of Ophiuchus and Serpens. The conspicuous isolated star in the southwest is Sorca. the brightest one in Virgo. Leo is setting, a little north of west. Ursa Major is well up on the left of the pole, the Great Dipper being the highest part of the constellation. The Little Dipper is right above the pole-star. Half-way between its bowl and Vega is the head of Draco, whose long coils may easily be traced through the space between the Great and Little Bears. In the Milky Way, low down on the right of the pole, is Cassiopeia.

THE PLANETS.

Mercury is morning star throughout July. On the 15th he is farthest west of the sun, and about this time he can be seen a little north of east, about an hour before sunrise. By the end of the month he disappears again in the sun's rays.

Venus is morning star in Taurus and Gemini, rising about two hours earlier than the sun.

Mars is also morning star, though far away and faint. On August 1st he is in conjunction with Venus, being about 1¼ deg. north of her—not quite so close as he was last fall. As the moon is close by at the time, there will be something worth looking at in the eastern sky that morning.

Jupiter is approaching opposition, and is conspicuous in the southeast in the latter part of the evening. On the 15th he rises at about 9 o'clock, and is due south at half-past 1.

Saturn is in Sagittarius, and is in opposition on the 17th. It is interesting to note that at this time the earth passes directly between Saturn and the sun, so that as seen from the planet it would appear to transit across his disk. It may help us to realize how small a body the earth is, in comparison with even the solar system, when we find that it would appear to an observer on Saturn as a black dot barely two seconds of arc in diameter—too small to be seen at all without a good-sized telescope.

Uranus is in Ophiuchus, well placed for evening observation. Neptune is morning star, too near the sun to be well seen.

The asteroid Vesta, as we mentioned last month. comes to opposition on the 14th. It is in Sagittarius. and is moving parallel to a line drawn from Saturn to the middle of the bowl of the Milk Dipper, but about a degree below this line. On July 1st it is about 1 deg. southwest of Saturn, and on the 31st it is 3-5ths of the way toward the Milk Dipper. It is of the 6th magnitude, and is consequently just visible to the naked eye under favorable conditions. Without a very good star-map it will be necessary to sketch the stars visible in this region with a field-glass and pick out the asteroid by its motion.

Vesta is the brightest-though the third in order of discovery-of the hundreds of small planets between Mars and Jupiter. It revolves about the sun at an average distance of 220,000,000 miles, and takes about three years and eight months to complete its journey. At the present opposition it is nearer than usual, being 203,000,000 miles from the sun, and 109,000,000 miles from us. While it is ordinarily just too faint to be seen by the naked eye, this unusual nearness carries it just within the limit.

In the most powerful telescope Vesta, like a few others of the brighter asteroids, shows a perceptible disk. According to Prof. Barnard's measures, it is about 200 miles in diameter, so that it is decidedly a world in miniature.

On so small a body the force of gravity is much less than on the earth. A man, if he could exist on the surface of Vesta, would weigh about 1-50th of what he does here, and his capabilities would be correspondingly increased. This would have some interesting consequences. An athlete, for example, could easily jump to a height of 300 feet or so, coming down with no more jar than after a six-foot leap on earth. A batted ball, which here rises to a height of a hundred feet, and drops into the fielder's hands after a flight of five seconds or so, would on Vesta, if struck as hard a blow, rise a mile high, stay in the air more than four minutes, and drop nearly four miles away. A cannon-ball, fired at the usual speed, would fly clean off into space, and never come back at

Clearly life on such a planet would be rather remarkable. However, as it is almost certain that the asteroids have no atmosphere, such calculations as we have just been making really belong to the realm of idle speculation.

THE MOON.

New moon occurs on the morning of the 5th, first quarter on that of the 12th, full moon near noon on the 20th, and last quarter on the night of the 27th. The moon is nearest us on the 4th, and farthest off on the 16th. She is in conjunction with Venus on the 2d, Mars on the 3d, Mercury and Neptune on the 4th, Uranus on the 17th, Saturn on the 20th, Jupiter on the 21st, and Mars and Venus once more on the morning of August 1st.

FORCED AND SHRINK FITS.

BY C. D. KING.

Forced and shrink fits have long been used by engine, ordnance and machinery builders, the forced fits being obtained by driving with a heavy weight or by hydraulic and screw presses. While it was once the custom to taper the holes and shafts in forced fits, it is now conceded to be much better to have them perfectly cylindrical throughout.

If we wish to shrink a sleeve or ring of metal onto a shaft or tube, we bore the hole a trifle smaller than the diameter of the shaft to go in it-1-80 inch per foot of diameter of shaft is a common practice, then by heating the sleeve, we expand it, hole and all being increased in diameter until it will slip onto the shaft. When it cools it is in a state of tension, and the shaft inside of it is compressed, the amount of tension or compression depending upon the difference in the diameters of the two pieces. If we attempt to pull the sleeve off the shaft, it is found that we require a large amount of force to do it. Both sleeve and shaft were brought to a smooth finish apparently, where they were to fit together, but upon careful examination with a miscroscope, we find numerous irregularities on those surfaces that are to come together. The irregularities are mostly annular groovings formed by the lathe tools and files. Now when we shrink the sleeve on, in cooling, the little projections on one piece will sink into the depressions in the other and vice versa. Thus the sleeve is firmly locked upon the shaft. Reasoning from the above analysis we conclude that the surfaces in contact should be finished rather roughly to the touch, so that the irregularities and minute groovings of one piece may hold more firmly on those of the other.

It has been found in the crank-pin fits for locomotives, that if the pin and hole are finished to very smooth and true surfaces, the pin will be pressed in by a force of six tons per inch of diameter, but when they are rougher the force may have to be increased to as much as nine tons for each inch of diameter. This leads us to conclude, that it will be more difficult to withdraw a rough piece than a smooth one, and consequently more difficult for it to work loose. although the tension in the crank and the pressure on the pin may be nearly the same as when the pin was smooth, which is a most desirable feature. Inasmuch as heating and cooling tend to change the form of pieces, and if they are of cast iron, is apt to crack them, we prefer the forced fit where practicable, but the turning of the fits must be done accurately, and they must be truly round. They must also be of uniform diameter throughout, and not tapered in the least. Both the commencement of the hole, and the end of the piece to go in it, should be slightly rounded so as to start in readily. When one piece is forced into another as described above, the little projections have a tendency to be rubbed backward on one piece, and in a forward direction on the other, forming, we could say, little ratchet teeth. If we provide a shoulder or collar on one of the pieces for the other to stop against, we have the pieces pretty effectively locked against working loose.

A point in the manufacture of chainless bicycles, came recently to the attention of the writer, regarding the fastening of the gears to the crank shafts and rear hubs. The shafts and rear wheel hubs are threaded externally with right hand threads. The gears are threaded internally with threads which fit so tightly that considerable force is required to turn them onto the shafts and hubs. A fixture is made purposely for this work with a chuck to hold the hub or shaft and a "crab" to hold the gear. A very long crank is used to get sufficient power to turn the gears into position. The force in back pedaling, it is found can never be sufficient to turn them off even to the slightest amount.

The minute irregularities of the external threads on the hub coming in contact with other irregularities in the internal threads of the gear, form, as it were, a ratchet with innumerable pawls preventing it from turning backward.

---ENGINEERING NOTES.

Texas oil is to be used by the great Minneapolis flour mills instead of coal. From the experiments made it would seem that the use of oil is entirely practicable. A street railway company of Minneapolis and St. Paul is also conducting tests with Beaumont oil.

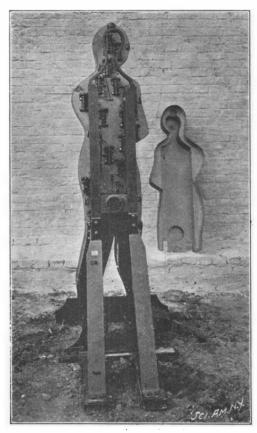
A marine engineer of Rochester, England, has patented a new system for steering twin-screw steamships. His device consists of a special throttle valve attached to each set of engines, the valves being connected by means of bell cranks and linkwork to a tiller. When the tiller is resting centrally an equal supply of steam enters each engine, but directly the tiller is deviated from its central position in either direction, the throttle valve fitted to one set of engines reduces the supply of steam, so that the propeller actuated by that particular engine revolves more slowly, the rotatory motion of the screw diminishing according to the degree to which the tiller is moved over.

The great scheme of the late Mr. Cecil Rhodes, the Cape to Cairo railway, is being pushed forward with all possible celerity. The road has been surveyed as far as the Zambesi River, which is to be crossed by a great steel bridge, having one span of 500 feet, at the Victoria Falls. The whole section from Bulawayo to the Zambesi, 275 miles in length, is to be opened next year. Locomotives for contractors' purposes are now running on it for a short distance north of the present terminus, and a railway exploration party has been dispatched over the railway route beyond Victoria Falls as far as Lake Tanganyika. For forty miles north of Bulawayo the embankment of track is more or less complete, bridging work on the Victoria Falls section is in progress, and about five miles of the line are finished. The work of connecting the Bulawayo and Salisbury sections is also progressing rapidly, and rails are already laid from Salisbury to Sebakwe, a distance of sixty miles. From the Bulawayo end of this line the railroad has reached the Arguza River, so that when this gap is filled and the line completed, as it is hoped it will be by the end of the present year, trains will be able to run from Cape Town to Beira via Bulawayo, Salisbury and Umtali.

Salt mining constitutes one of the staple industries of the little European country, Roumania. There are four mines in all. The most peculiar feature in connection with this industry is that the mineral is mined in three of the principal mines by convicts condemned to life and lengthy sentences of penal servitude. The reason for this is that crime in Roumania is practically unknown, and there is no death penalty. Under these circumstances the compusory mining of the convicts is beneficial both to the government and the laborers. In the case of the mine in which convict labor is not employed, the quarrying is performed by peasants, the work being assisted as far as possible by the most upto-date mechanical time and labor-saving appliances, for the employment of which skilled labor is essential. In all there are about one thousand convicts at work in the three mines. The laborers are not provided with any mechanical apparatus whatever, the whole of the work being performed by hand, each convict having to quarry a specific quantity of salt daily. The mines are controlled by a state official, whose position is similar to that of governor of a prison. The mines are thoroughly well ventilated, and illumined with electric light, so that the lot of the convicts is somewhat alleviated, though to those who are serving life sentences it represents a living grave. The mines are worked in galleries, and the pure white crystal presents a weird and peculiar aspect, especially in reflecting the fitful electric light. The main shaft terminates at the bottom in a huge apartment with a dome-shaped roof, and from which all the working galleries radiate. The mine contains a chapel and numerous other apartments, all cut out of the salt by the prisoners. The director keeps a record of the name of each convict who enters the mines, his conduct and the efficiency and quantity of his work. Periodically the King of Roumania visits the mines and examines the official record, and in those instances where the results warrant such action, he extends a free pardon to the prisoner, or at any rate reduces the length of his sentence, so that good conduct and efficient work is an incentive to a royal pardon.

CHEVALLIER ELECTRIC TARGET.

Capt. Charles Chevallier, of the French army, collaborating with M. Eugène Cadet, has invented a most ingenious target which is so constructed that the hits are registered by an annunciator. By means of this device, the marksman simply by referring to the annunciator can ascertain at a glance what his success



BACK OF THE DUMMY TARGET WITH COVER REMOVED.

has been without walking several hundred yards to the target.

The target itself consists of two sets of metal panels of segmental form, arranged in different vertical planes. One series of segments overlaps to a certain extent the next series of segments, in order that an entirely full surface may be presented to the marksman. Behind each series of segments lies a fixed disk, serving as a guide and support for rods secured to the segments. Coiled springs are placed between the segments and the disk, in order to return the segments after they have been driven in by a projectile.

Opposite each rod, secured to the segments, an electric contact device is placed, which, as shown in our detailed views, consists of a screw, h, mutilated for about 7-16 of an inch. In its normal position, an insulated plate, k, having threads of a corresponding pitch to those of the screw, lies opposite the neck thus formed in the screw, and is therefore out of contact with the screw. The vertical screw, h, turns in a fixed nut or support, i. The upper part of the screw, h, is fitted with a crosspiece, j, provided with counterweights at its ends so as to form a balance member. The plate, k, constitutes one terminal of the circuit, the wires, P, being secured to the other terminal. The wires, P, are equal in number to the segments of the target and are assembled together in a cable leading to an annunciator of ordinary construction, placed near the marksman.

When a projectile strikes one of the segments, one or more of the springs, coiled about the rods, e, are compressed, and the corresponding rod or rods, e, are

driven in through the perforations of the disk, d, and strike the counterweights of the balance member, j. The impulse thus given to the balance member, j, causes the screw, h, to turn and rise. The lower threaded part of the screw is then engaged in the screw threads of the plate, k, and the circuit is completed. When the circuit is completed the annunciator near the marksman indicates the exact spot of the target which has been struck.

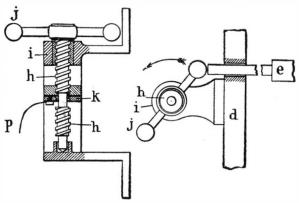
Instead of disks, portions representing the human figure can be used.

This electric target has been successfully used in the armies of France, Spain, Roumania and Portugal.

Heavy Engines Money Savers.

All new orders from the big railway companies are for monster freight engines these days, and not a few are of the compound type.

The Union Pacific, Oregon Short Line, Rio Grande system, Burlington, Illinois Central, Northern Pacific, Pennsylvania, New York Central, Rock Island, Colorado Midland, Colorado & Southern, Missouri Pacific, the Erie road and others, have large orders in for locomotives and all of them include great freight-hauling machinery. For the past year or two a particular study has been made of the power problem, and while there is some difference of opinion among master mechanics and enginemen upon some points, yet there is unanimity with reference to some general facts, and among these latter is the preference for heavy engines as money savers. A. W. Sullivan, assistant second vice-president of the Illinois Central, has paid great attention to this phase of railway operation, and his conclusions are entitled to much weight. He refers to the difficulties in the system of double heading, which constitute offsets to the economy of the plan in other respects. Among these are delays on the road, the consequent overtime, the damage that is done to cars in

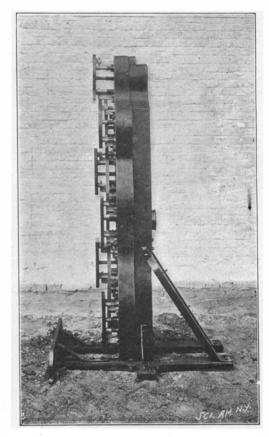


ELECTRIC CONTACT DEVICE OF THE TARGET.

"sawing" trains at meeting points where the siding is not long enough to clear the main line, the difficulties of handling the train over hilly portions of the road, and the uncertainty of trains' moving on orders to make meeting points on short time.

Precisely the same conditions apply to the movement of trains with very large engines, contends Mr. Sullivan, who claims that the Illinois Central at one time had the two largest locomotives in existence. They were simple engines, with cylinders 23 x 30; they carried 210 pounds of steam, had 82-inch boilers, long fire-boxes. One was a consolidation, the other a 12-wheeler. It was sought to find out what this size of engine could do in the way of ultimate pulling capacity, so the order was given to start with a train of 1,500 tons on a run out of Chicago of about fifty miles, in the middle of which was the ruling grade of that district, about 24 feet to the mile; and each day the engine made the trip, increasing the train load by 500 tons until the

train got to 3,500 tons, or 82 loaded cars. The engine hauled the train easily; the trouble was to handle the engine. This was about two years ago. When the engine arrived at the station at the summit of the grade, it had to cross over to the other track to let an important passenger train pass it, necessitating a short back-up movement to enter the crossover track.

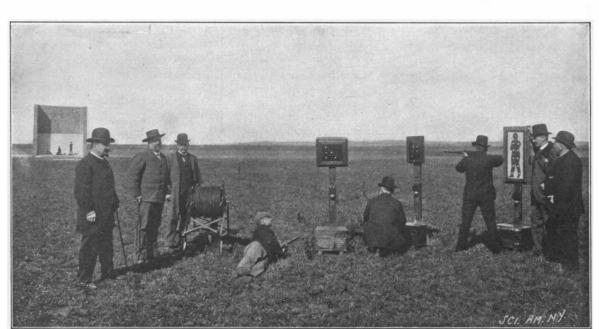


SIDE VIEW OF THE DUMMY TARGET.

In making this back and forward movement the train broke in two eight or nine different times, on one occasion shearing the twelve 1-inch drawbar pocket bolts—so great was the power of the engine. Two hours and three-quarters were consumed in crossing over and getting back, and the train that it was intended to let by without causing any delay was delayed an hour and a half.

"We came to the conclusion," says Mr. Sullivan, "that it was quite possible to get an engine that was large enough to handle a bigger train than was practicable, as a transportation proposition, to move over the road.

"These large engines have now been in service nearly two years. We give them each trains of 1,800 tons on portions of the road where mogul engines of 19 x 26inch cylinders handled trains of 900 tons. Each of the big engines takes a double train. The total expense of moving 10,000 tons one mile with the big engines is \$1.86, as against \$2.02 with the mogul. By reducing the train to a tonnage that could be handled readily, we have been able to operate the large engines successfully, having them take their turn in the service just as it comes—one day with a heavy coal train, next day with a stock train or with a banana train, making speeds anywhere up to forty-five or fifty miles an hour, and doing that without any trouble. We think that such an engine is, if anything, larger than economical locomotive practice demands, and we have purchased no more of them. We find that a mogul engine with 20 x 28-inch cylinders, carrying 200 pounds steam pressure. will take the same train over the road just as well as the engine with 23 x 34-inch cylinders. In other words, the 80-ton engine will do the work just as well as the engine which weighs 110 tons, and either of them will do better .than a double-header."



THE TARGET AND THE ANNUNCIATOR SET UP IN THE FIELD.



BLECTRICAL DISK TARGET.

THE TRACTOR IN LUMBERING OPERATIONS.

The success which has attended the use of steam power in farming operations on the Pacific coast, has resulted in the use of the traction engine in lumbering and other industries where extensive horse power is required. The roads in the hill country of California, Oregon and Washington, where are located the principal lumber camps, are in a very crude condition, most of them having no paved surface, while the grades

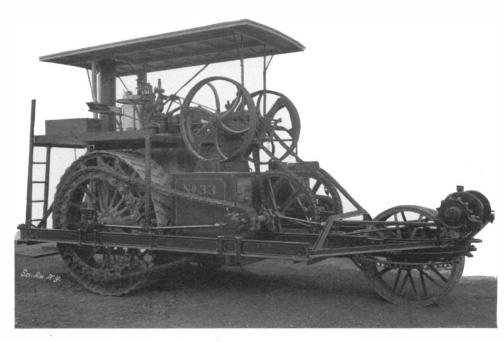
are extremely steep in many instances. Much of the formation is of a red clay, which in wet weather is turned into liquid mud, through which an ordinary wagon can scarcely be forced, although three or four horses or mules may be attached to it. Loose stones falling from the hillsides increase the difficulty of travel over these mountain highways, so that where animal power is used, double and treble the ordinary number of teams are required to "freight" lumber or other material from the woods to the mills or the railroad stations.

For the purpose of substituting steam power for animals, the Holt Brothers, of Stockton, the inventors of the farm tractor, have designed a very powerful engine, which accomplishes remarkable results where it has been placed in service. The sizes range from 40 to 60 horse power, and the plan of construction followed is similar to that of the farm engine which has already been described in the Scientific American. The driv-

ing wheels, however, have narrower tires, although they range from 18 to 24 inches in width, with corrugated or roughened surface, in order to give them more traction upon the highways. Power is communicated to the driving wheels by roller chains on each side of the truck, which revolve about an axle which is driven by two sprocket wheels, also connected by roller chains with the engine. The tractor is guided or steered by a smaller front wheel, which is connected with a hand-wheel by a sprocket chain, so that the motorman can turn it in any direction desired, merely by using the strength of one hand. Most of the engines are provided with a steel drum upon the forward end of the truck frame. Upon this is reeled a wire rope or heavy manila cable kept for

the purpose of hauling when the tractor may be detached from the cars of logs or material to be transported.

On a level surface, the motor will readily pull a train of trucks loaded with lumber weighing from 200 to 250 tons, without difficulty. On the highway it can attain a speed of from 8 to 10 miles an hour if desired. It is used, however, in the forests, where no highways exist for transporting logs from the



General View of the Freighting Engine.

stump lots to the mills or the railroad stations. In this case, the logs are usually chained together, sometimes mounted upon rollers, and then attached to the tractor, which pulls them to their destination by the most convenient route. Such is the strength exerted that it can actually be forced through bushes and over young trees five and six feet in height; while being able to turn in a circle of 150 feet, it can be guided in and out among the trees. It will haul in this way a dozen large trunks, a single one of which would require the strength of ten or twelve horses or mules to move ordinarily.

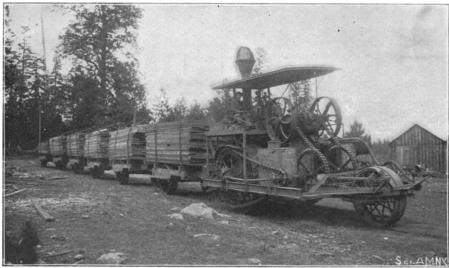
The ordinary highways have such steep ascents, that frequently the tractor can reach the summit only by being separated from the trucks or cars which it is

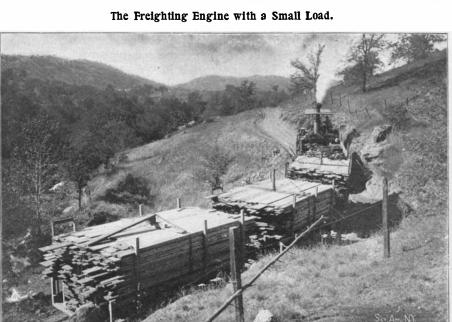
drawing. To haul its load to the top of the hill is the object of the drum and cable. The latter is unwound, fastened to the cars or trucks at the bottom, and the tractor converted into a stationary engine, exerting all its power upon the rope. In this way trips can be made over routes which are literally impassable for wagons. Another great difficulty encountered, especially in California, is sand. This is partly overcome also by the broadness of the tires, which prevent

> the engine, in spite of its weight, from sinking into the surface of the road to such an extent as to become stalled.

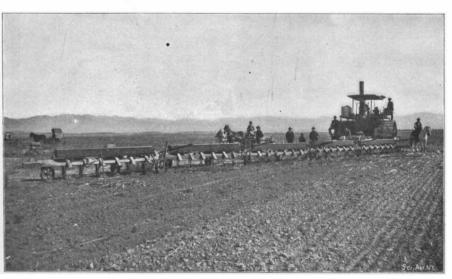
> The type of tractor used especially in lumbering and mining operations is what is termed the freighting engine, and weighs from 14 to 21 tons when equipped and ready for service. It will consume about 225 pounds of coal an hour when working at its full capacity, or about one ton daily. while its consumption of water is about 300 gallons an hour. Since the use of oil in industries on the Pacific coast has extended into Oregon and Washington, some of the tractors have been fitted with apparatus for burning oil in place of coal. It is calculated that one will utilize about 28 gallons of the ordinary oil hourly when in service. The boilers furnished are of two types-corrugated-flue and water-leg. In freighting outfits a smaller force of hands is required than in farming operations with the tractor. The larger types have an engineer and fireman,

if coal is used. The latter may also act as "trainman," coupling and uncoupling the cars and trucks when necessary, so that really only two men are required to transport the material. The photographs which show the tractor hauling lumber on the level, also ascending steep grades and going over sandy roads, include a view showing the manner in which it is employed in duty on the farm. As a substitute for horse drills, in planting seed, the motor has been very successful, accomplishing from twenty to thirty times as much at a time as two or three teams of the heaviest draft horses. In fact, calculations made of the economy of operating with the tractor show that it will plow and harrow, seed and harvest a certain area at about one-sixth of what it costs when men and horses are

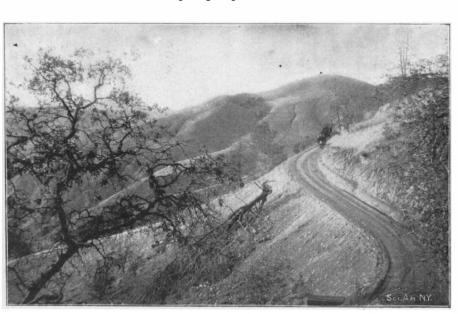




Hauling a Load up a Heavy Grade.



The Freighting Engine in the Field.



The Freighting Engine Descending a Hill.

used. Lumbermen who have tested it for freighting purposes estimate that the cost is about one-third of the sum expended when teams are employed. In these estimates the fuel and water and repairs are all carefully estimated and deducted.

FIJI AND THE FIJIANS.

A TRAVELER'S OBSERVATIONS IN THE PARADISE OF THE PACIFIC.

BY SIDNEY DICKINSON, M.A., F.R.G.S., BOSTON.

Few travelers, comparatively, have penetrated the mysterious regions of the Southern Seas. Many have, indeed, wandered as far as the Hawaiian Islands, and

returned enraptured with the mingled beauty and grandeur of these, our new possessions—but even there the traveler stands merely upon the threshold of the Sub-Tropical Wonderland.

Far below his horizon roll immeasurable leagues of iridescent seas: his ear cannot hear the roar of distant surf upon the coral reefs; the melting skies, the amethystine mountains, the vales "with verdure clad," lie far beyond his ken. There is perpetual summer; beauty that never fades: a year whose cycle knows no blight of frost or shroud of snow; flowers that bloom in never-fading generations; days of unbroken sunshine; nights in whose violet depths strange constellations glisten, and from whose bosom subtle perfumes emanate and intoxicate the air. Here nature wears her native and immaculate garb-virgin as she appeared on creation's morning, when the Spirit moved upon the waters. and from the womb of primeval Night brought forth these Islands of Eternal Day. Audacious the tongue that attempts to utter, the pen to record, the brush to paint the wonders of these happy archipelagoes-yet will I try to lift a corner of the veil that hides their beauties, confident of indulgence if I

fail in my endeavor to describe the indescribable. Most interesting, perhaps, of all these lands of the Southern Seas in natural charm, strange and somber history, and present importance as illustrating the work of civilization in that part of the globe, are the Fiji Islands. Upon the chart of the world they appear as mere pin-pricks amid the vast expanses of ocean that surround them—a small galaxy among the thousand systems that form that Milky Way of the Pacific known to geographers as "Oceanica." A vast continent, ages ago, may have existed here, and, subsiding slowly, have left its loftiest peaks and table-lands to stand above the waves as monuments to mark its place of burial. Cyclopean remains upon certain of the groups, whose builder no man knows, and present languages and customs seem to refer to some mighty and longburied past. The glamor of mystery that broods about those seas is fascinating—all the more so that their secrets seem likely to be pre-

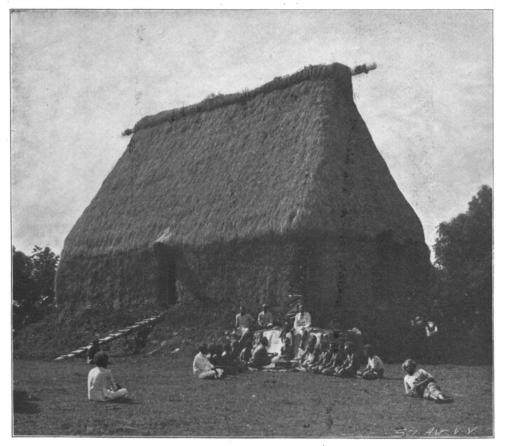
served inviolate until eternity solves the riddles of time.

The Fiji group, lying south of the equator at about the distance that the Hawaiian Islands lie north of it, covers five degrees of latitude and three of longitude. Forty of the islands are of considerable size, while some two hundred more are of decreasing importance. the tale dwindling to barren and uninhabited rocks hardly large enough to be christened. These islands lie in an irregular oval—300 miles in longest, and 120 miles in shortest diameter, around the Koro Sea, and, like our own West Indies, are composed of two groups, known as the "Greater" and "Lesser Fijis."

"Fiji" is a corruption of the native "Viti," which appears in the name of the largest land of the group—"Viti Levu," or "Big Fiji"—which contains an area of 4112 square miles; "Vanua Levu," or "Big Land," coming next with 2432 square miles. Roughly speaking, the total land area of the Fiji Islands about equals that of the State of Connecticut, and the

Ocioninic American

population is estimated at a quarter of a million. Travel to this land of the whilom cannibals is to-day a commonplace matter. Steamers from San Francisco make regular calls, and at least two lines from Australia convey the voyager in luxurious comfort. My own approach to Fiji from Melbourne was by the "Taviuni" of the New Zealand Union Line—a boat which was then making her first trip after steaming from her birthplace in Scotland to Melbourne around the Cape of Good Hope—a trifle of 12,000 miles—without once stopping her engines. As to one's treatment by the sea—that is a matter of luck and temperament. The Pacific has its whims, and, despite its



Example of Fiji Architecture—A Thatched Hut.

name, I have never encountered worse weather or heavier seas than around Australia and New Zealand. When the discoverer of this sea, looking from the hills at Panama, saw its languid swell and the lazy break of its surf on the shore, he might well have thought he was looking upon the waters in their constant mood, and have had reason for calling the ocean the "Pacific." If, however, he had set sail upon it, and made test of its capricious temper, we can fancy him looking over the side of his caravel with a face of anguish, and declaring between his qualms that he was the biggest failure that ever lived in the matter of christening large bodies of water.

Early on the morning of the seventh day from Melbourne, a patch of misty blue appears upon the horizon, and by degrees the verdant shores of Fiji rise into view. Passing through the opening in the coral reef, we enter the placid harbor of Levuka—ly-

ing, like Honolulu, under precipitous hills, sprinkled with the white bungalows of the European residents. There is a strange sense of unreality in coming, in our present fashion, to the Land of the Cannibals, and the air of peace and serenity which broods over the beautiful harbor and town afford a striking contrast to the conditions that one has imagined after reading Fijian history. The former things, however, have passed away, and the stranger may now wander pretty freely over the islands, without fortifying himself with the hope that Sydney Smith urged upon his departing missionary friend—"that he would disagree with the man who ate him."

As we approach the shore, a flotilla of boats puts out to meet uscatamarans made of cocoanut logs hollowed out, pointed at each end, and rendered stable by wide outriggers. Natives, clad only in loin cloths, or sulus, of calico or snowy tappa cloth, paddle these craft rapidly toward us, and swarm aboard to sell their cargoes of fruit and curios-somewhat to the consternation of our lady passengers who precipitately flee to the cabin at sight of these brawny savages; but soon return, for it is not in feminine breasts to resist the fascinations of the bargain counter.

These Fijians are a stalwart race: very tall and muscular, for the most part, their skins soft as velvet from anointings of cocoanut oil, their countenances strong and in most cases pleasing, rather than forbidding. A thing that at once impresses the visitor is the varied and striking manner in which both men and women—the former especially -arrange their hair. Here a man is seen whose pate seems covered with a thick coating of whitewash; there another, whose locks, radiating in every direction from his skull as if they were electrified, could hardly be inserted in a bushel basket. The former state is but a preliminary to the second. The natives

plaster their hair with a kind of paste made of powdered coral mixed with water, which, after hardening and then being broken up, stiffens the hair and bleaches it from its natural black to odd shades of red and dull yellow—thus producing strange effects in combination with the dark-brown skins of the people. Each form of head dressing has its meaning—the chiefs wear one, famous warriors another, men of counsel a third, yet all with variations at the caprice of individuals, which give great picturesqueness to a native gathering. Married men are distinguished from bachelors by the cut of their hair; the latter are of little account in Fiji, and by the way, are barbered, to announce to a scornful population their independent and degraded condition.

Both sexes are attired in the airy and simple manner which residence in a climate where the sun is hot, and the rainfall from eight to twelve feet a year.

would naturally suggest. An elaborate female costume is shown in the picture of a chief's daughter, who is arrayed as to her trunk with a necklace of "trade" beads, and from her waist downward with a mantle of beautifully decorated "tappa" cloth, of creamy white ground relieved by designs of dull reds and browns. This "tappa" cloth is a characteristic product of Fiji, and is made from the inner bark of the paper-mulberry tree, which is macerated in water and the pulp beaten out upon hard ground with heavy wooden mallets, making a sort of vegetable felt of varying thickness -some as heavy as a blanket, others as light and thin as gossamer. The average female dress, however, is less elaborate—consisting simply of a fringe of cocoanut husk or hibiscus fiber dved black and hanging from the waist to the knees. This adapts itself to every movement of the wearer, and is at once a sensible and decent dress.

The interior of a native house illustrates another use of the omnipresent "tappa" in wall



Chiefs Drinking Kava.
FIJI AND THE FIJIANS.

hangings and decorative coverings of beams. Piles of the cloth spread upon the floor, make delightfully cool and elastic beds, and upon the rafters are placed huge rolls of the finer textures, which by their number and total of yards represent the family wealth. When a woman of means marries she displays her social position by winding about herself all the "tappa" cloth her family can muster—so that a bride from the Fiji "Four Hundred" resembles a cotton bale with her head sticking out of the middle, and has to be carried to the altar by half a dozen muscular male relatives.

At short intervals along the shore, and in the cleared spaces of the tropical jungle, are the homes of the natives-some isolated, others collected into considerable villages, but all swarming with the brown children of the sun. These houses are always wide open, and one can enter at will, the people and the visitor seeming to take an equal enjoyment in the curious appearance that each presents to the other. A Fijian house is perfectly adapted to the climate, and affords protection alike against the torrid rays of the sun and the frequent tropical deluges of rain. It is made by driving stout posts into the ground, across which are laid beams fastened to the supports by ropes of cocoanut fiber, and from this framework rafters are run up to a central ridge-pole. Roof and sides are covered with a thatch of grass and reeds, sometimes two or three feet thick, the whole structure being elevated on rough blocks of coral, thus affording freedom from the dampness of the ground. In ancient times the four corner supports of chiefs' houses were set in holes wherein captured enemies had been buried alive, while a chaste and agreeable decoration of the front would be a row of stones indicating the number of captives the chief had eaten during his career. Thus, the tales of stones of a famous chief, counted by a missionary in 1849, was 872-for which the chief apologized, saying there should have been more, but he had been indolent of late, and had neglected to post up his ledger.

A country like Fiji, with its copious rainfall, is naturally full of watercourses, and the mountainous character of the land gives opportunity for numerous waterfalls, which are among the most charming features of the islands. Nothing can be more beautiful than these silvery cascades, set, as they are, in a dense jungle of flowering trees, variegated shrubs and mottled crotons, or in ravines where enormous orangecolored spiders swing in webs that glitter like diamonds from the spray of the falls, and where the flight of the "orange" and "rainbow" doves, and crimson and green parakeets, gives movement and shifting color to the scene. The natives are a cleanly folk, and spend much time in the water of the inland streams or in the sea within the coral reefs, where the sand is of dazzling whiteness and the water shows every shade of the opal, turquoise and sapphire.

Along the edge of the sea, extending for miles on both sides of Levuka, runs a smooth and level path, which, built up on the wall of coral rock that rises a few feet above the water, leads by gentle curves around projecting promontories into avenues of palmtrees, and picturesque glades where sleepy villages drowse under the rustle and shade of the cocoanuts, and in hearing of the perpetual symphony of the waves. From this path the eye extends to the encircling coral reef, against which the ponderous waves of the Pacific burst in clouds of foam. The heavenly blue of the water inside the reef forms a beautiful contrast with the purplish-indigo expanse without, and the drowsy air is made drowsier still by the incessant reverberant roar of the distant breakers. This sound is heard nowhere else in the voice of the sea. It has no intervals, but resembles the continuous passage of a heavily loaded railroad train, the hollow, semi-elastic structure of the coral giving it a metallic, ringing quality that is as noticeable as it is difficult to describe.

If you will launch a boat at noon, when the vertical sun lights up every detail in the bottom of the shallow lagoon, you may introduce yourself to a strange and lovely spectacle. You float over fairy grottoes, looking into which, through translucent fathoms, you see coral in every tint of blue, green, pink and creamy brownthe recollection of which will give you ever after a distaste for its bleached and ghastly skeletons in cabinet or on bric-a-brac table. Through its finest of branches float armies of fish the color of topages and rubies, and of quaint or monstrous forms; enormous purple and crimson starfish sprawl upon snowy sands, while around them the hideous (but edibly delicious) sea-slug—the famous bêche-de-mer—glides in writhing progression, and sea-urchins expand and contract their iridescent spines. Now and then you drift over spaces dusky with depth, through which enormous congereels pass with wavering fins, and green turtles flap like strange, unwieldy birds—while rainbow-hued shells incrust everything in wanton profusion, and add to the beauties of fish, coral and swaying weed to produce a scene of exquisite loveliness, which lingers in the recollection like an enchanted dream.

A view of Fiji would be incomplete without some illustration of the old cannibal practices which, until

less than fifty years ago, made the country a section of hell transplanted to earth. Instances of this era are found most numerously at Mbau, the old heathen capital, and headquarters of the late King Thakombau (to give the English pronunciation of his name), who, as the last ruler of Fiji, ceded his country to Great Britain for a pension of £1500 a year and other considerations, and whose war-club, sent to the Queen as mark of fealty, holds worthy place at Windsor beside the umbrella of King Koffee of Dahomey-reminders to the world of two as thorough scoundrels as ever cumbered it. Before his conversion to Christianity the city of Mbau was covered with trees forming sanctuaries like the groves of Baal, and as one of his first acts on reformation was to cut these down. Mbau now lacks many interesting arboreal growths. Chief of these was the famous "Mbau Larder"-an enormous tree upon whose spreading branches tough victims were hung to acquire that "gamey" flavor which Fijians like in "long pig" (as they facetiously term the human bake meat) and Englishmen in pheasants and grouse. The Wesleyan Mission House to-day fronts the ground where banquets were served and victims prepared for the oven. A huge stone stood at one end, upon which the subject's brains were knocked out as a preliminary; to-day it is in the church at Mbau, and is used as a baptismal font for native converts, its top having been hollowed out.

I met an aged man at Mbau who gave me much interesting information.on cannibalism. His father, he said, had been a famous trencherman in the good old days, and although he denied that he himself had ever eaten the flesh of his kind, yet in the course of his description he fingered my arms and pinched my legs and poked me in the ribs in a manner which seemed to me not altogether platonic. Fijian flesh, he stated, was superior to that of white men, who tasted of the salt they ate with almost everything-while a tough old sailor was practically a waste of raw material from the tobacco and grog with which a life before the mast has a tendency to flavor the human system. Interrogated as to choice cuts, he gave the palm to the head—the brains and eyes being particularly desirable, and the cheeks, especially in young subjects, submitting to baking very kindly indeed. The upper part of the arm, too, and the calf and upper portion of the leg, were not to be despised-but, said this epicure, as for the rest of the body, "throw him away." In the afternoon this interesting savage came around for me to get my gun and go into the bush with him, where he would "show me plenty parrots." After the enthusiasm of his morning description, however, I thought it prudent to decline.

A quaint feature of Fijian life is "kava" drinkingthe beverage being made from the root of the angona shrub, which, being macerated and mixed with water, ferments and forms a mild intoxicant. It tastes like soap-suds and ginger-ale mixed, and the relish for it has to be acquired. It is drunk with solemnities at meetings of chiefs and at conferences generally, and its absorption is governed by strict rules of etiquette. It must not be sipped, but swallowed at a gulp, as a Western cowboy assimilates his whisky, and it is a fine touch, and an instance of savoir faire after drinking to "skitter". the cocoanut-shell cup in which the beverage is served along the ground to the presiding genius at the supplying bowl. In native circles the root is chewed by women and expectorated in the bowl to be mixed with the water. This is said to give a peculiar and agreeable flavor, but the less robust white residents reduce the root by a grater.

The "Meke-Mekes," or descriptive songs and dances of the Fijians, are wonderfully impressive. The illustration shows a party of girls giving the "Wave" Meke, describing the movement of the sea on the reefs. The hands sweep the ground slowly, with waving motions of the fingers, to show the ripples crisping in the wind. Then the bodies sway in unison to show the roll of the ocean—other movements of rising and falling figures show the leap and fall of the breakers. Action grows more violent and confused, the performers rise to their knees, then to their feet; at last, with a spring and a clapping of hands, the wave is described overleaping the barrier of the reef, and as it falls into the still lagoon the dancers drop to the ground in unison with a long cry in diminishing cadence, and the "Meke" is over.

Delicious is the life in the tropic seas, dreamy as the lotus that typifies it—not to be understood by residents in our colder and ruder North, but delicious even in the aftertaste to him who has experienced it. Even I, who have sparingly partaken of this divine food, cannot forget its flavor; forevermore will rise before me, in smoky London, perchance, or in bustling New York, visions of the slumbering palms in the moonlight at Levuka, and my ears hear the murmur of the surf and the plaintive *Mekes* of Fiji.

Professor J. H. Sears, Curator of Mineralogy and Geology at the Peabody Academy of Science, in Salem, Mass., has unearthed in newly opened claybanks in Danvers fossils of the mollusk Portlandia lucina.

Sorrespondence.

Coal or Oil—An Early Suggestion from the Founder of the Guion Steamship Line.

To the Editor of the Scientific American:

In the summer of '79 or '80 I was crossing the ocean on the steamship "Arizona." The managing director, Mr. William H. Guion, was on board. Among the many interesting conversations with him was one upon the possible use, at some future date, of oil in the place of coal. The discussion came up on account of the vast amount of black smoke that almost constantly poured from the funnels of the steamship. The enormous amount of waste which he told me occurred from this unconsumed carbon was almost incredible. He then declared that the time would come when oil would be used in the place of coal, and gave as an interesting fact, or opinion, that the saving in freight room by the use of oil, in one trip between England and Australia, would be worth £6,000 (\$30,000). Mr. Guion was a very practical, energetic, progressive man, and his line furnished the first of the ocean greyhounds. His remark was truly prophetic.

George G. Rockwood.

New York, June 17, 1902.

Prizes for Photographs.

The Bausch & Lomb Optical Company, Rochester, N. Y., announce a photographic competition open to amateur and professional photographers, residents of foreign countries, as well as the United States, the object being to bring together as large and representative a collection of photographs as possible, in order that the present development of the photographic art and the progress in lens and shutter construction which has been made during the past quarter century may be made evident. It is during the last quarter century that the greatest progress in photography has been made. In order to enhance the interest of photographic work, the awards have been divided into a number of classes, such as landscape, portrait, genre, instantaneous, architectural, interior, etc. Several special awards for telephoto and other work have been provided, also a special award for users of the Bausch & Lomb rectilinear lenses on various makes of hand cameras, kodaks, etc.

The Current Supplement.

A fully illustrated article on the American cut-glass industry opens the current Supplement. Next comes a dissertation by Dr. E. Fischer on temperature experiments with butterflies. Dr. Fischer has proved the remarkable fact that by breeding certain European butterfiles at low temperatures species are obtained which probably existed in the glacial period, and that by breeding these same European butterflies at high temperatures species which never existed before are produced. The Peterson boat-launching apparatus is made the subject of an illustrated description. The compressed air cars used in France are fully described. The results of the Interstate Commerce Commission's report on safety appliances for trainmen are also published. Mr. Guglielmo Marconi in an entertaining way tells something of the practicability of wireless telegraphy. Prof. Pedersen, Valdemar Poulsen's assistant, has made an important improvement in multiplexing the telegraphone. The improvement is fully described. The wonderful Mexican istle plant and the many uses to which it can be put are fully set forth in an account illustrated by a series of very handsome pictures. The usual minor articles are also published.

An Odd Method of Heating Cars.

The Northwestern Railway Company of England has equipped some of its trains with a system of heating to which the much abused term "unique" may well be applied. Two concentric cylinders are employed, the annular space between which communicates with a steam-pipe extending from the locomotive-boiler. The inner cylinder contains acetate of soda—a compound remarkable for its property of liquefying when heated, and of cooling very slowly. The radiators thus constituted are incased in asbestos-lined boxes having hinged doors. By opening or closing the door of a box the heat is turned on or off.

The United States Shipbuilding Company has absorbed the Bethlehem Steel Company, with the result that one of the most completely equipped and self-contained shipbuilding plants in the world has been formed. The new company is thus able to make every part of a ship, including armor plate and guns. The plant of the Bethlehem Steel Company, which is at South Bethlehem, Pa., covers an area of one and one-quarter miles long by one-quarter of a mile wide, of which about thirty acres are under cover. The works are particularly well equipped for the manufacture of armor plate and gun forgings.

THE PACKING INDUSTRY OF CHICAGO.

BY DAY ALLEN WILLEY.

The industry of killing and packing beef, pork and mutton has reached such proportions at Chicago—the greatest center of this industry in the world-that the most modern processes have been introduced for the purpose of economizing both time and labor, as well as utilizing all of the products of the carcass. The Union Stock Yards, where are located some of the largest packing plants, are the most extensive in the world, having accommodations for nearly 125,-000 hogs, 20,000 cattle and 15,000 sheep. Yearly 3,000,000 cattle and 5,000,000 hogs are slaughtered and converted into packing-house products in what is known as "Packing Town," which really forms a section of the yards. A further estimate of the extent of the industry can be gained when it is stated that the space devoted to pens alone comprises 200 acres, while the yards are traversed by 150 miles of railroad track and 20 miles of streets, and the troughs from which the live stock are fed and watered aggregate 75 miles in length.

As far as possible, machinery has been em-

ployed, with the result that one of the large companies treats 7.000 hogs in a day, where by hand less than 10 per cent of this number can be disposed of. While the killing itself is still done by manual labor, the butcher has every appliance to further, his work. The drove of hogs, for example, is passed from the yards into specially-shaped pens, thence forced, single file, into a compartment where a large metal wheel revolves slowly but continuously. An attendant seizes each of the animals by one of the hind feet and fastens it to the wheel by a short chain. As it is lifted into the air, the butcher with a thrust of the knife opens the throat; the work occupies but a second. The blood from the carcass flows into a trough, which passes it on to vats, where it is kept until utilized in the manufacture of fertilizer. The carcass revolves on the wheel until it reaches a point where it is automatically removed and fastened to a trolley system which conveys it into the scrapingroom. Here it passes through a machine, provided with revolving blades, which removes most of the bristles, preserving them so that they can be later made into brushes. The carcass is then passed into a vat or tank of boiling water, which softens the balance of the bristles so that they can be easily removed by hand. From this apartment it is conveyed by machinery into the chill-room, where it remains for 24 hours before being cut into sections.

The carcass, freed from blood and bristles, is now ready for the cleaver, who separates it into the hams and sides for bacon, and removes the fat, which is to be converted into lard and other products. The cutting is done so dexterously that a few minutes suffice for one man to separate the hog into the several portions. Then the hams and bacon are placed in reservoirs filled with a pickling composition, of which each company has its own formula. The other portions for provisions are placed in the salt-room, where they remain from forty to sixty days. The same length of time is required also for the hams and bacon. Following the pickling and salting processes comes the smoking, which is done in compartments where thousands of pieces can be cured at the same time.

The lard is extracted, or tried, in immense kettles heated by steam, and while in the liquid state it is forced through pipes into the packing-room, the pails and other receptacles being filled by merely opening valves connected with the pipes. It is then allowed to cool and is ready for shipment. The pork sausage is also largely a machine product, the meat being chopped into fine particles by rapidly revolving blades, and then forced into skins made of the intestines of the hog, these intestinal skins being, of course, first thoroughly cleaned by machinery. A part of this

machinery, which is operated by compressed air, will fill several feet of sausage skin in a few seconds. The links are made by merely tying the skin with strings in sections a few inches in length. Before it is sent to market, sausage is usually hung in the storehouse for a few days to "season."

Except for fastening the hog to the wheel, the killing process, the cutting into pieces, and fastening the packages, the animal passes through the packing-house



Wrapping Butterine.

with scarcely a touch of the hand. Sheep are treated in a somewhat similar manner, except that the carcasses are not made into so many products. When slaughtered they are swung from the fioor by chains fastened to the hind feet. The throat is opened by the single thrust of the knife, and the body is conveyed mechanically into the chill-room. It is usually kept in this department forty-eight hours, when the hide is removed, and it is cut into halves or quarters as desired. Formerly the skins were sold with the wool on, but the packers have invented a process by which the wool



Filling Lard Pails.

can be easily stripped from the hide. The wool is then cleaned thoroughly in hot water, dried and packed in bales to be shipped direct to the cloth manufacturer, the hide being sold to the tanner. The mutton intended for shipment is usually placed in the refrigerating department, which may contain 10,000 pieces at one time. Here it can be kept for an indefinite period, as the air is maintained at an even temperature by a refrigeration system which extends to all portions of the department. When the time arrives for shipment, the refrigerator cars can be run into the refrigerator

compartments, and the meat transferred without exposing it to the warm air. In the modern method of killing cattle the stunning process is still retained. As the beeves are driven into the gangways in single file, men upon elevated platforms knock them senseless by a blow between the horns with a heavy hammer quite similar in shape to the implement used in spiking railroad ties. As the animal falls a door in the side of the gangway is opened, allowing the carcass to slide to

the floor below, where it is slaughtered. Here the transferring machine is attached to the body, and as fast as an animal is killed it starts on its journey through the several departments. First comes the chill-room, then the compartment where it is skinned. While one man is removing the hide, another cuts off the head and removes the tongue, and another the feet. Next it is halved or quartered in the cleaving-room, and cleaved ready for shipment to the centers of consumption, either in this country or abroad. The carcasses are usually left in halves, being transferred to the cold storage department, where, like the sheep, they may be kept an indefinite period.

The beef affords a much greater variety of products than either the sheep or the hog, although, as already stated, every portion of the animals is put to some use in the modern process. The fat, boiled in large kettles, is resolved into oleo and stearine, oleo, or oil of the beef, forming the basis of butterine and oleomargarine. This

and stearine are utilized in some of the soaps which are now manufactured. The blood is converted into fertilizer, and also into buttons of a cheap grade, which are now manufactured in Packing Town, within a short distance of the slaughter-houses. The hoofs, of course, are converted into glue. In the fertilizer compound, practically all of the offal of the beef can now be utilized.

Within three or four years the manufacture of soaps and liquid foods has been undertaken on a very large scale in connection with the Chicago packing industry. Scores of products which have beef for the basis are distilled, refined and placed in bottles and jars in plants adjacent to the packing houses. The principal concerns of Chicago manufacture their own cans for liquid and solid products, and own the factories for making boxes and barrels, while one company operates a mill for making bagging for hams. As 100,000 packages may be filled in a week with liquid and solid food, the economy of this plan is apparent. Even in the preparing of what is known as canned corned beef the tins are filled with the cooked meat by machinery, the contents of each package being molded so that they fit to a nicety. After filling and soldering, the package is placed in boiling water, then a hole is made in the top to allow the gas to escape, and it is resoldered, keeping the contents in good condition for a period of years in any climate.

The trolley system is being used not only in the abattoirs for transferring the carcasses, but for the general transfer of packages and cars from one point to another. The electric motor hauls everything, from a truck to a railroad car. The method used for transferring the carcasses usually consists of an overhead bar or rail, along which the trolley is moved, taking its current from wiring or a feedbar. To the trolley are attached short chains ending in hooks, so that the animals can be easily fastened to it. The "hog-killing wheel," as it is termed, also revolves by electric power.

Mrs. George E. Hobbs, of Bridgeport, Conn., recently secured a patent on a car truck which enables trains to round curves without lowering the speed, and also permits the substitution of a broken wheel without the necessity of running the car into a repair shop. The invention was recently inspected by two representatives of the Manhattan road of New York.



Cutting up Hogs.



Pulling Wool.

Export of American Horses. BY GEORGE E. WALSH.

The revival of the horse does not necessarily mean a decline in the popularity of the bicycle, automobile, and trolley. These latter will go on independently of our four-footed beast of burden, and the latter, it may be said, will have his day again in spite of harnessing all the agencies of nature for performing the work of man. Wars and rumors of wars stimulate

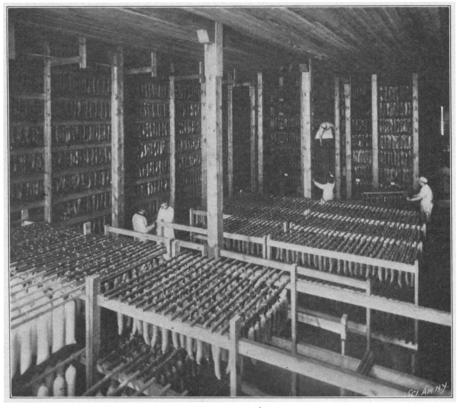
the demand for horses and mules, and in times of peace new forms of sport and pleasure introduce ways of utilizing them. The world to-day appears to be suffering a horse famine, and the heavy drafts made upon the resources of this country contribute largely to the steadily advancing prices for good horseflesh. England has been an excellent purchaser of our horses and mules for her South African campaign, where the animals were killed off by insects and the climate so rapidly that it seemed as if a sufficient number could never be shipped there to keep the army in the field well equipped.

In Europe to-day not a single country raises enough horses to meet its own actual demand in times of peace, and the facilities for breeding and raising horses are growing poorer every year. There are few good grazing lands and stock-breeding farms in Europe where horses can be raised on a large scale, and consequently this country becomes more and more the land for keeping the European armies supplied with their proper complement of horses and mules. In recent years the American trotters and fine carriage horses have become important factors in the export trade, and whereas a few decades ago such a thing as an American horse was hardly to be found abroad, to-day we have a

steady stream of them going to all the European centers. Not even Russia has hesitated to avail herself of our best blooded stock, although for years the Orloff strain of trotting stock held complete supremacy in the minds of the Czar's patriotic citizens. But loyalty to a ruling house cannot forever last, and the best thing the Russian horse lovers could do was to import American stallions for crossing with their Orloff breed, and then get a few American breeders and trainers to go over and show them how the Americans did it. So we have to-day not only American horses and trotters in abundance in Russia, but American trainers and breeders practically in control of the royal stables and stock farms. Each year a good-sized consignment of the best American trotters go abroad to add new blood and speed to the Czar's stock.

Germany next to England is probably one of our best European customers for horses, and there is a steady, healthy demand from that country that promises to continue and develop indefinitely as the years

races. In fact, to-day very few French races are open to horses from other countries, and the French sportsmen have this show practically all to themselves; but unfortunately for them the small glory attached to a restricted competition of this character makes it almost an empty honor. However, a good many French horsemen are purchasing American trotters, and in a roundabout way getting the American horses to the front in the home races. In time it will be



A Sausage-Drying Room.

necessary for the sake of the sport to open the races to more general competition. A good many American horses are sent to Belgium, and then they are taken across to France, and within a very short time appear on the French turf as home-bred horses.

Italy, Denmark, and Holland are good buyers of our trotting horses, and the annual shipments to these countries are considerable, while far-off New Zealand and Australia make small drafts upon our resources. To see that these American trotters exported are as represented, the National Trotting Association has export offices in a number of our seaports to issue certificates of pedigrees and identity to the high-grade horses shipped. This is to prevent fraud, and thus injure the American horse trade in foreign countries, and it was first suggested by the European trotting associations. Several thousand certificates have been issued to high-class racing stock; but these do not include the trotting-bred roadsters or fine carriage horses.

In this export trade of American horses not a little

proving the horse is needed, and it partly accounts for a good deal of our success in supplying the world with the finest and fastest horses.

Mountains and Hail.

The influence of mountains on the fall of hail has frequently been the subject of controversy, but up to the present time no certain conclusion appears to have been arrived at. The Italian Meteorological Office has

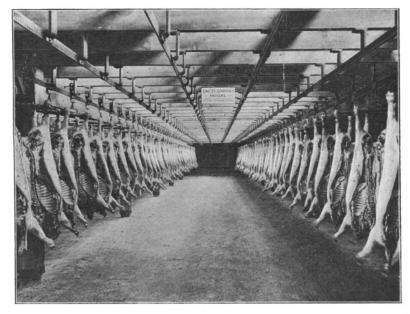
> recently published an interesting note upon the question by Prof. V. Monti. .The positions chosen were perhaps the most suitable for the purpose of any among the Italian network of stations, viz., the Collegio Romano and Montecavo, an isolated station near Rome, situated at an altitude of about 1.009 meters; the complete observations at both stations, for the years 1880-87, are contained in the Annals of the Italian Meteorological Office. During this period, forty-one days of hail were recorded at Rome against eighty at Montecavo; the monthly values show two maxima, in April and October, and two minima, in July and December, as regards the excess of days of hail at the mountain station. A comparison of days of thunderstorms shows, on the other hand, that there were 76 such storms at Rome, against 29 at Montecavo. This seems to show the excess of hail at the mountain station is not attributable to a greater intensity of atmospheric electricity. The author gives a table showing that the monthly mean temperature at Rome is at times about 10 deg. higher than at Montecavo, and suggests that the fusion of hail traversing a warmer stratum of air may account for the smaller amount at Rome.

The Louisiana Purchase Exposition authorities have offered a prize of two thousand dollars for the best design for an emblem. It may be either in relief or color, but if color is used symbolically, red, yellow, blue and white should be selected, as these are the colors involved in the national flags of the countries in which ownership of this territory at various times has been invested. The design must be one which will be available for letterheads, medals, posters or for any purpose in connection with the dignified exploitation of the Exposition.

Marconi's Improvement.

In a lecture at the Royal Institution, June 12, Marconi announced that he had made important improvements in coherers. He said his new invention, which is a magnetic detector, rendered it perhaps possible to receive several hundred words a minute. At the present time he could read thirty words a minute.

In commenting on his February experiments, when readable messages were received aboard ship 1,551



Dressed Meat Hung in a Storage Room.



Machines for Making Sausage-Meat.

THE PACKING INDUSTRY OF CHICAGO.

go by. The American trotting horses at the Vienna race tracks are not only features of the exhibitions, but they capture a large percentage of the prizes. There is no better way to advertise American horses and methods of training than to take a few of them abroad and enter the races in competition with the European horses. France became so jealous of our success in this line on her native soil, that she practically prohibited foreign horses from entering the

attention should be directed to the American breeding methods and training. It is pretty generally recognized that our trainers and methods are superior to those found abroad, and we are to-day busily engaged in exporting trainers as well as racing horses. Most of the best European stables have American trainers connected with them, and American methods of breeding and raising the best stock are adopted. No better testimony to our national efforts in im-

miles from Cornwall, and signals were transmitted to a distance of 2,099 miles, Marconi stated that at a distance of over 700 miles signals transmitted by day failed utterly. Those sent at night, however, remained strong up to a distance of 1,551 miles, and were even decipherable at a distance of 2,099 miles. Marconi explained this peculiar phenomenon by diselectrification of the very highly charged transmitting elevated conductor when operated by daylight.

THE GRISSON CONTINUOUS-ALTERNATING CURRENT TRANSFORMERS. BY A. FREDERICK COLLINS.

The evolution of the circuit-breaker or interrupter for induction coils has been slow, owing to the lack of commercial utility of large coils prior to the introduction of the X-rays as an accessory in surgery. After Roentgen's great discovery, an impetus was given to the art of constructing induction coils and the necessary device with which to operate them, and this was greatly added to upon the advent of wireless telegraphy.

Probably the first attempt to make and break the circuit of a primary coil, by which alternating currents would be induced in the secondary coil, was by sliding one terminal of a copper wire over a coarse file. Sturgeon, the inventor of the electromagnet, exhibited his coil in 1837 equipped with this primeval device. Various forms of mechanical contact breakers were then constructed, by means of a ratchet and spring, and operated by hand.

These finally gave way to forms better adapted for the purpose, one of which was the revolving contact breaker of Barker, who employed a star-shaped wheel or spur to dip in mercury.

Dr. C. S. Page invented the first automatic contact breaker, which he described in 1838. Wagner and Neef improved upon the mercurial breaker by constructing one operated automatically and having the vibrating armature arranged with platinum points where the break took place. This simple electromechanical arrangement is now used on all coils of small size. From that time to the discovery of the X-rays many different forms of contact breakers were designed to give a long make and a short break, but no very wide divergence in the design or construction of interrupters was made until the mercurial turbine and Wehnelt electrolytic interrupters were brought. out. In the former, a hollow spindle containing a steel worm, when revolved, draws the mercury from a well below up to two diametrically opposite, lavatipped steel tubes, by centrifugal force; it is then projected against a pair of sheet-iron sectors, where the circuit is completed. In this way the interruptions may be varied from 10 to 10,000 per minute.

In the electrolytic interrupter 1,000 to 10,000 per minute. It consists in its usual form of a small surface platinum anode and a large surface lead cathode immersed in a solution of one part of commercial sulphuric acid and five parts of water. When connected in series with the primary coil or inductor, bubbles of a non-conducting gas are formed on the anode by electrolytic action, and bursting, complete the circuit. In wireless telegraphy it has been found that continued working produces a heating loss of more than three or four amperes, and forty or fifty volts—the E. M. F. required to operate it—are used.

In the mercury turbine interrupters, especially of foreign manufacture, the deposits require frequent cleaning of the apparatus, and this has called forth fresh effort on the part of inventors to introduce a form that would eliminate the objectionable features and retain the good qualities of both. This is the purpose of the Grisson transformer.

In the SCIENTIFIC AMERICAN of December 28, 1901, I described the wireless telegraph system designed by Dr. A. Slaby and Count d'Arco, and which is now manufactured by the General Electric Company of Berlin. This company has recently placed on the market a substitute for the electrolytic and turbine interrupters in the form of the Grisson continuous-alternating current transformer, shown in the engraving and

diagram. This apparatus changes a direct continuous current into a pure alternating current, hence its name. Its periodicity or frequency of alternation may be varied from 900 to 6.000 per minute, and, though this is less than in the electrolytic and turbine forms, currents of any amperage may be easily employed. Different from other interrupters in the Grisson transformer, there is no interruption of the current at the maximum value, and consequently there is particularly no sparking of the brush, B^3 . at U^1U^2 . The use of heavy currents for feeding the inductor is thus made possible, besides reducing the size of the condenser in shunt with the interrupter, if not dispensing with it entirely.

Referring to the dia-

gram, Fig. 2, it will be observed that in the development of this system the inductor or primary coil, $P^1P^2P^3$ (the secondary coil and iron core is not shown) has besides its principal terminal, which is common to all induction coils and transformers, a leading-in wire, L, joined to the middle convolution of the inductor at P^3 . The terminals, L and L^1 , are connected directly to the source of energy. By means of a shunt from the leads, L and L^1 , current is supplied to a small motor, M, of which C is the commutator and R a variable resistance, whereby the speed of the rotat-

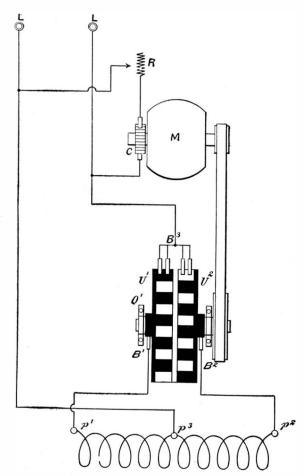


Fig. 2.—DIAGRAM OF TRANSFORMER.

ing transformer or contact disks, V^1V^2 , may be varied between comparatively wide limits.

The main current from L^1 is divided at the brush, B^2 , on U^1U^2 , which alternately make and break contact on the commutator segment of the contact disks; these disks, U^1U^2 , are fastened on a common shaft, but are isolated one from the other and send forth two continuous currents from the leads, B^1 and B^2 ; the brush, B^3 , on the opposite side slides interchangeably on the lamella or thin layers of V^1V^2 , or temporarily unites them as the case may be. The shaft upon which the contact disks are keyed is fitted with a pulley and is driven by the motor, M, belted to it.

The principle of the Grisson transformer will now be easily understood. The current is transmitted to the inductor, p^1p^2 , directly from the continuous flow for the length of time the brush, B^3 , rests on the metal segment and the insulating segment of the contact disks, and the circuit, including the source of energy and the inductor, is thus closed, and the maximum value of the current is therefore effectual; but the instant this critical value is reached, the contact disks

will have reversed the flow of current and p^1 and p^3 is cut off. As both portions of the inductor have a common iron core, i. e., the same core, and are magnetized in an opposite sense, a counter-electromotive force is produced by means of isolating the current, p^2p^3 , in the first current circuit when the primary current strength is lessened, and as the beginning of one segment approaches and the other leaves the brush, B^3 , the value of the current is brought to 0.

At the moment the first circuit is interrupted, the current quickly reaches a critical maximum value in p^2p^3 . This is accomplished by the automatic closing of one or the other circuit, or both, at the same time by the contact disks, which, as the illustrations show, are arranged like a continuous-current dynamo commutator, except that the metal segments are insulated by insulating segments of equal peripheral width instead of thin sheets of mica.

The General Electric Company (Berlin) recommend this type of transformer especially for their standard station wireless telegraphy sets and the equipments they supply for armored war vessels.

Ozone for Sterilizing Water in Germany.

Ozonized air has long been known to be a very efficient sterilizer for water, although the dry gas has been found to possess little bactericidal power. Its use has, therefore, been suggested for the purification of potable waters, but the early experimental installations, which were erected at Blankenburg, Oudshorn, and Paris, are reported to have been abandoned, and, at present, the process is only known to be in operation at Lille in France, at Bole in Mexico, and at Moscow in Russia. The method is a simple one, but hitherto the cost has been a considerable factor against it. One of the London water companies is at present conducting experiments with a view to introducing the process there. Considerable interest, therefore, attaches to the publication of details regarding the working of the small experimental installation which was erected by Siemens & Halske, at Martinikenfelde, near Berlin, in 1898.

The ozonizers employed here are of the Siemens & Halske plate and tube type, and yield from 20 to 25 grammes of ozone per E.H.P. hour, with an E.M.F. of 12,000 volts. Air is first forced through a drying chamber, and then passes into the ozonizers, on leaving which it contains from 25 to 3 grammes of ozone per cubic meter. It is then led to the base of the sterilizing tower, a square structure packed with flints, and as it rises through these, it meets a descending stream of the water to be sterilized, which has undergone preliminary filtration through sand. The plant in question is capable of treating 240 cubic meters of water in 24 hours (1 cubic meter is equal to about 220 gallons), and the results of the exposure to ozonized air will be seen from the following tests made with water from the River Spree. With a consumption of 2 grammes of ozone per cubic meter of water, the number of bacteria per cubic centimeter was reduced from 600,000 to 10; the permanganate absorption figure was diminished by 18 per cent, and the aeration of the water was increased from 10 to 12 per cent.

The capital outlay for an installation capable of treating 150 cubic meters of water per hour is estimated to be \$33,750, of which total the ozonizers and sterilizing tower absorb \$18,750. The actual cost of treatment for a plant of this size is given as 1.736 pfg. per cubic meter, and the total cost, including interest and depreciation, amounts to 5.031 pfg. per cubic meter, the latter figure being equivalent to about \$55 per million gallons. In addition it may be

noted that Siemens & Halske have recently patented a method of clearing turbid water by the combined action of ozone and iron.

Trial of a Motor Fishing Boat.

The first completely equipped motor fishing boat has recently made her trial trip most satisfactorily at Lowestoft. This is the first fishing craft which will rely upon petrol to generate the force required for all purposes -hauling her nets, hoisting sails, working the capstan, and driving her pumps. The motor is of 24 horse power, and is fitted in a case 4 feet by $2\frac{1}{2}$ feet. It is only 3 feet high, and the top cover serves for a table. The motor is of the three-cylinder, two-cycle type, and self-starting and reversing.

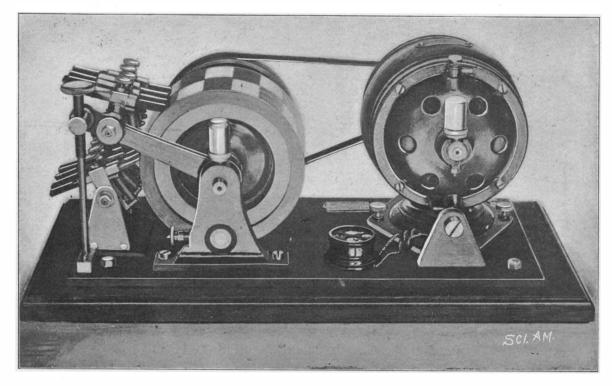
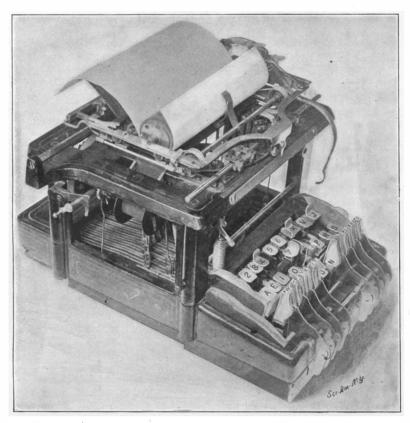


Fig. 1.—GRISSON CONTINUOUS-ALTERNATING CURRENT TRANSFORMER.

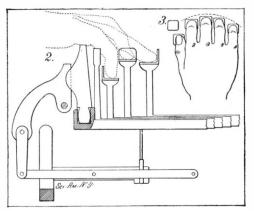
NEW TYPEWRITER KEYBOARD.

Notwithstanding the great number of inventors who have concentrated their minds on the improvement of typewriters, one important field for invention seems, up to the present time, to have escaped all. It has



1.-KEYBOARD CONFORMING TO THE ANATOMY OF THE HAND.

evidently been taken for granted that the present arrangement of the keyboard was the very best, and no study has been devoted to this part of the machine. Now comes forth an inventor from Cuba with a keyboard radically different, which is so arranged as to conform to the outline of the hand, as clearly shown in Diagram 3. The front tier of keys is adapted to be operated by the first or second phalanges of the thumbs or fingers, while the other two tiers, which



2 — THE PHALANX MECHANISM. 3.—OUTLINE OF THE TIERS.

are curved to the shape of the hand, are operated by the finger-tips. Each finger-tip operates two keys, the upper tier being engaged when the finger is distended, and the lower tier when the finger is bent at the first joint. L-shaped guides are provided on certain of the keys, to enable the more clumsy digits to instinctively find their proper locations.

A very important feature of this keyboard is the

peculiar construction of the front tier, whereby each key is adapted to print either of two characters. This construction is shown in Diagram 2, and it will be seen that each phalanx-piece is directly connected by a socket joint to one of a pair of key-levers, and in-

directly connected to the other key-lever by secondary levers and links. Operation of the latter mechanism is accomplished by drawing the phalanx-piece backward. A slot in the phalanx-piece receives the upper end of a curved lever, which is so connected by a link to a secondary lever below that any backward movement of the phalanx-piece will result in the depression of the latter lever. Thence connection is made to the proper key-lever above, but not directly, for the depression would be insufficient for the purpose. A third lever loosely pivoted to the front of the machine is connected near its center to this secondary lever and at the end to the keylever. By this arrangement the leverage is increased and proper depression can be made to operate the type-bar. The directly-connected key-lever is operated by the mere depression of the phalanxpiece. and we, therefore, have an effective mechanism for operating two type-bars by the manipulation of a single key.

A very complete keyboard is thus afforded, which comprises but three tiers of keys, and which is further augmented as in the stand-

ard machine, with a shift mechanism for obtaining the upper-case characters. This keyboard can be easily applied to nearly all the typewriters now on the market and a few lessons will teach anyone to operate the machine rapidly. Great speed may be obtained, for every digit is brought into play, and each finger, with the exception of the thumbs, has four distinct movements, each of which produces a different character. The possibility of printing a wrong character is remote, for the hand is not moved during the writing, even for printing capitals or spacing, and each finger is continually in engagement with its individual set of keys. A typewritist can therefore perform his work without looking at his machine. Patents for this keyboard have recently been granted to Mr. Juan Vidal, care of his agent, Delgado de Lemos, 44 W. 10th Street, New York city.

A RECENT REAR-END COLLISION ON THE NEW YORK CENTRAL RAILROAD.

A collision similar in its effects to the horrible tunnel disaster in New York city last January, occurred on the New York Central Railroad at Peekskill early on the morning of June 14. A passenger train standing at the station, luckily having two trailing empty passenger cars, was run into at the rear about 3 o'clock in the morning by a night fast freight train. Either the engineer or fireman failed to heed the block signal set against them, or the block signalman failed to set the signal, about which no explanation is given. Had the rear cars contained passengers there would have been a great loss of life.

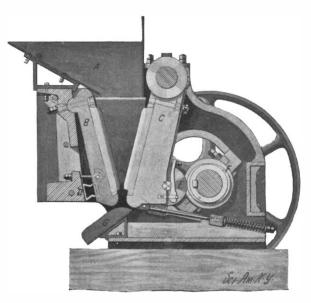
As it was, the freight engine plowed right through the passenger car, the roof sliding over the top of the engine, as shown in one of the illustrations, the

sides of the car also passing over the sides of the engine. The other illustration shows the effect of the concussion in telescoping the following freight car with the tender. The car being filled with soft material prevented serious damage to the tender. Strange to say, neither the freight locomotive engineer nor fireman was seriously injured.

The collision emphasizes the need of automatic safety appliances for stopping trains when signals are ignored.

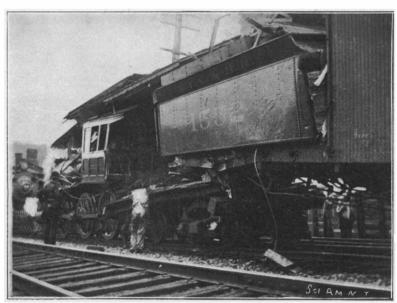
CRUSHER.

Mr. Alexander G. Morris, of Tyrone, Pa., is the inventor of a new crusher which we show in sections in the accompanying illustration. The machine is designed to crush rock, ore and other like material, which is broken into fine particles between powerful jaws operated by suitable mechanism. The material to be crushed is poured into the feed hopper, A, and falls between a series of open jaws, B and C. The jaws, B, are stationary, while the jaws, C, are oscillated toward and away from the jaws, B. Each jaw, C, carries a roller wheel, E, loosely mounted therein and adapted to bear under spring tension

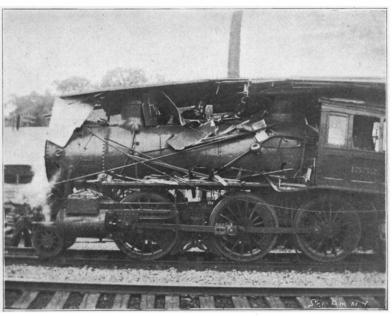


SECTION OF AN ORE-CRUSHER.

against the periphery of its respective cam. F. on the main shaft, thus imparting an oscillatory motion to the jaw. The ore is thus intermittently crushed and allowed to drop between the inclined jaws until sufficiently reduced in size to permit of its falling onto the chute, G, arranged to direct the crushed rock toward the front of the machine. Each jaw is provided with a wearing surface which may be readily removed, when worn out, and replaced by a new one. The jaws, B, are provided with transverse extensions which are held in corresponding cavities in the frame by bolts slightly movable therein to permit the jaws to swing. The proper inclination of the jaw, B, i3 maintained by hook-bolts working in connection with spacers, D. By placing spacers of various sizes in position, the jaws may be regulated to crush ore to different degrees of coarseness. Furthermore, the spacers act as safety devices to prevent the destruction of the machine by overloading it, for they are made of such strength as to stand the strain of the load which it is desired they should bear. If the crusher be overloaded, these spacers will fracture and give way, thus relieving the machine of its strain, and preventing the destruction of other and more expensive parts of the apparatus.



TELESCOPED TENDER AND FREIGHT CAR.



THE LOCOMOTIVE THAT CAUSED THE WRECK.

RECENTLY PATENTED INVENTIONS. Agricultural Implements

DEVICE FOR LOADING CORN-SHOCKS. W. A. TEA, Bellevue, Ohio. This device, which is wheel-supported, is adapted for attachment to the rear of an ordinary farm wagon for the purpose of automatically carrying the shocks from the ground up an inclined track to the wagon bed and delivering them therein, thus facilitating the gathering of shocks adapted to be transported to husking and shredding machines.

COTTON-CHOPPER.-F. M. and L. SHARP, Partridge, Okla. Ter. .The machine belongs to that class of machines which are adapted to be drawn over a drilled row of cotton plants for chopping out portions of the crop, thus leaving the plants in bunches or This invention comprises a new construction whereby the cutter is adapted to rotate when in action and may be set at different depths or thrown up entirely out of

Apparatus for Special Purposes.

GAS-WASHER.—PAUL RIECKE, Dessau Germany. The gas washer belongs to that class known as "standard" washers, in which several wheels or disks are arranged on a common shaft revolving in a cylindrical casing. the lower part of which contains the washing liquid. The object of this invention is to get a maximum amount of washing surface in a minimum amount of room while leaving a perfectly free passage for the gas and, at the same, to clean the washing surfaces while the apparatus is working.

WEIGHT AND PRESSURE RECORDING APPARATUS .- E. McGARVEY, Bellefonte, Pa. It is a recognized desire by scale manufac turers and users to have an attachment by which the weight as indicated on the scale beam may be quickly and accurately recorded, thus avoiding mistakes liable to be made by the weighman and supplying a correct record for verifying his weights in case of dispute. Such an apparatus is provided in this invention.

TAPPING - JACKET. - M. BARRETT, Grand Forks, Canada. The jacket is used in connection with the tap-hole in metallurgical fur naces. The object of the invention is to circulate cold water or some other cooling fluid around the tap-hole for the purpose of preventing the same from becoming unduly heated.

Electrical Apparatus.

TELEPHONE-CALL FOR PARTY-LINES.-W. A. WILLIAMS, O. L. INGRAM, and J. B. WILSON, Walla Walla, Wash. This system belongs more particularly to that class wherein several stations are located on the same circuit. The operator at the central station may call any desired station on a party line by depressing the usual form of push button a proper number of times. This signals the station required without sounding a call at any other station on the line The duration of each depression of a push-button as it is ordinarily given at central is sufficient to operate this machine.

Engineering Improvements.

TRAIN AND SIGNALLING APPARATUS -W. A. and B. S. H. HARRIS, Greenville, S Two patents have been granted to these inventors for improvements on a previously patented invention in train-signalling apparatus, whereby signals were transmitted to the engineer through a slight reduction of pressure in the train pipe without the necessity of using a separate signal pipe. In the present inventions the system is simplified and made more certain and efficient. Means operated by the exhaust are provided for intercepting the air passing through the signal valve to the whistle, so as to prevent the whistle from sounding by any operation of the engineer's brake valve in the application of the brakes.

Hardware.

WRENCH.-W. M. TREGLOWN. Sr., New York, N. Y. The improvement relates to pipe wrenches, and its object is to provide a wrench arranged to permit of quick and convenient adjustment for gripping large and small articles and turning the same in either

cutter is particularly adapted for use by dressmakers for cutting cloth in strips to form ruffles and the like. It consists of a transverse ly extending bar in which are arranged, side by side, a number of pins carrying rotary cutters at their lower ends.

CHEESE-CUTTER.-W. J. SPILLMAN, Pullman, Wash. The invention relates to a de vice for carrying cheese and for facilitating the work of slicing it in regularly formed pieces. The device is particularly adapted for use by retail merchants.

Machines and Mechanical Devices.

PAPER-STOP.-H. F. DUNBAR, Turners Falls, Mass. The device is arranged for use in connection with paper or other material while winding on a drum, the object being to produce a simple stop to permit the paper from sliding endwise off the drum, or from band-shaper is readily adjustable to different up-stream. In the present invention the gate sliding one layer upon another. The stop sized neckbands, and may be conveniently apand its fender are permitted to assume hori-

FIRE-ESCAPE.-J. and P. J. SETBACKEN Cynthiana, Ind. This fire escape belongs to that class in which a line or rope is provided for the descent of a person. The rope is used in connection with certain governing mechanism for causing it to be paid out at a uniform rate.

BURNER.-H. C. ZENKE, New York, N. Y. In burners for linotype melting pots, as here-tofore constructed, reliance is had on pressure of the gas to draw sufficient air into the mixing chamber to form the blue flame at the tip of the burner. But as soon as the pot is heated to the desired degree, and the gas partly shut off, very little, if any air, is drawn into the mixing chamber and a poor flame at the tip is the result. To avoid this difficulty, Mr. Zenke employs an air-inlet for the mixing chamber and an independent inlet for a combustion chamber under the pot to insure a perfect burning of the gas and conequent proper heating of the pot at all times.

SKYLIGHT-OPENER. — G. BICKELHAUPT, New York, N. Y. This skylight-opener is easily manipulated and may be opened a desired distance for ventilating or other purposes, and after this adjustment is made, means are provided for locking the skylight in place.

FRICTION GEAR .- E. P. DAWSON, Butte, Mont. The friction gear is peculiarly constructed for variable speed and is adapted particularly for connection with sewing machines. Two cones are employed with their tapering faces parallel. A shiftable transmitting wheel connects the two cones, transmitting the power from one cone to the other. The speed can be regulated by shifting the transmitting wheel along the surface of the driving cone away from or toward its apex.

Medical Apparatus.

RECEPTACLE FOR ETHYL CHLORID. L. SCHWARTZ, New York, N. Y. The invention relates to improvements in receptacles for ethyl chlorid and other fluids, such for example, as in devices for use by dentists or surgeons for producing local anesthesia. The receptacle is provided with an improved form of spray nozzle adapted to so tightly close the receptacle as to prevent the escape of the highly volatile fluid.

Railway Improvements.

CAR-SEAT .- L JANSON, Brooklyn, N. Y. The car seat is of that class in which two seats proper are mounted on a common support and connected by devices for causing them to turn in unison. The seats are held to turn on vertical axes, but are not allowed other move A latch is pivotally mounted on top of the base and is arranged to normally en gage and hold the seats from turning.

COAL-CHUTE.-W. H. SIMMS, Grand Isl and, Neb. The coal-chute is designed to be used in connection with bottom-dump coal cars The chutes are built in series along a high trestle work, so that the coal cars on the tracks along the top of the trestle may discharge their coal directly into an engine or car standing on tracks at the bottom of the chute on either side thereof.

Vehicles and Their Accessories.

BRAKE-BLOCK .- J. S. ODGERS, Central City, Col. The invention is designed to furnish an improved brake-block for buggies, wagons and all wheeled vehicles which shall pro vide a stiff and rigid connection for the rub iron to the operating bar that carries it, so that the brake-shoe will not become loose and tilt on its point of support, and yet provide a construction which will permit the position of the brake-shoe and rub-iron to be adjusted to the plane of the wheel, whose dish is some times changed in adjusting new tires to the wheel.

PEDAL-BALANCE. — F. H. ANDERSON Walhalla, N. D. The object of this invention is to provide a suitable construction whereby to properly balance a pedal provided with a toe-clip so as to prevent its being turned by the weight of such clip.

REIN-HOLDER .- J. GRANGER, Springer, New Mexico. The rein-holder may be readily attached to a dashboard or other part of the vehicle and the reins may be easily engaged CUTTER.—F. L. LEVY, Duluth, Minn. The and clamped thereby, especially when the harness trace is slack, so that the reins cannot be drawn out by a forward pull.

Miscellaneous Inventions.

DOUBLE IRONING-BOARD.—J. M. GER-NERT and J. F. ATEN, Bellevue, Ohio. ironing boards are foldably connected with each other, which enables the use of either board. The boards are of different marginal forms, and one board becomes the base for the support of the other, which is being put in

NECKTIE-FASTENER .-- A. N. Dow, Exeter, N. H. The device which is of simple construction is designed to effectually hold a tie or bow of any form and prevent it slipping upward at the front of the collar.

NECKBAND-SHAPER.—M. H. ELLENBOGEN and A. L. LEVY, Paterson, N. J. The neck-

size of the paper roll while the winding proper position during the ironing of the shirt yoke to insure proper setting and uniformity in shape.

> BELT-CLAMP FOR BUCKLES.—L. SAN DERS. Brooklyn, N. Y. The invention pro vides a clamp for a belt adapted to be used in connection with a buckle, and the device is so constructed that the ends of the belt may be readily and conveniently connected and the belt rendered larger or smaller to any ex tent within the limit of its adjustment.

> BOOK-COVER .- F. C. G. KNIBB, London, and THOMAS R. TOWLER, Woodford, England. The improvement relates particularly to book covers of yielding material, such as are designed to be carried in the pocket. The invention provides means for rendering the cover stronger at the edges than are the usual covers.

> TRIPOD.-W. K. HOLMES, Brooklyn, N. Y. The tripod is constructed with telescopic leg sections, which are so arranged that when drawn out to their full extent they may be held in this lengthened position by simply turning the sections slightly in one direction.

> KITE .- H. J. TRAINOR, Jersey City, N. J The kite has certain peculiarly arranged whistles therein, and a telephonic receiving device connected therewith which is adapted to be held in the hand of the person flying the kite, the connection being such that the noise of the whistles will be communicated to the re-

> VEIL-FASTENER. - W. BERNSTEIN. New York, N. Y. The veil fastener is adapted for permanent use on a lady's hat, to allow of quickly and conveniently securing the veil in place. The fastener is rather inconspicuous and hence does not mar the appearance of the hat.

CALENDAR-BLOTTER.—S. M. DEWEY Rutherford, N. J. Mr. Dewey has provided a convenient blotter and a daily calendar in such a manner that a new blotting sheet or a new calendar can be readily inserted and securely held in position for convenient blotting of sheets and for displaying the day of the week, month, and year, together with suitable advertising matter.

BUILDING-BLOCK. — A. DE MAN York, N. Y. The building block is designed for use in fireproof flooring constructions, especially such as have I-beams for floor supports. The building block reaches from one floor-supporting beam to the next adjacent one, and is arranged to permit the convenient handling and placing of the blocks in position. one alongside the other, to form a sectional slab of great strength and durability, producing a flat ceiling and straight top sur-

STOP-MOTION FOR MECHANICAL TOYS. A. D. Converse, Winchendon, Mass. The device provides an effective means whereby when the motor or mechanical toy is wound up it will not act upon the axle or wheel of the toy with which it is connected until the toy is brought in contact with the support upon which it is adapted to travel.

NECKTIE-FRAME.—A. COLE, Hood River, Oregon. The frame is made from one piece of spring wire, thus dispensing with a separate cardboard or metal piece, and the de vice is so constructed as to constitute an efficient form of support for the body or knot portion of the tie and provides means for attachment to a collar-button and any style or turndown collar.

CHURN-COVER.—T. H. B. VAN HOOZER, CO manche, Texas. The churn-cover embodies a closed, dead air space above the body of the churn, a guide tube for the dasher rod, and a special construction at the outer edge of the base of the cover which provides a channel to fit upon the upper edge of the churn body

SHOWCASE.—A. REINLE, Baltimore, Md. In this invention Mr. Reinle provides a novel form of resilient joint strip for application between the abutting plates of glass. The strip is so constructed that it will overlap both edges of the plate of glass, thus dispens ing with the necessity and expense of grinding the edge of such plate.

SHOE-LACE FASTENER.—L. H. HANCOCK Fargo, N. Dak. This device is adapted to securely hold and clamp the loose ends of a lacing or string to the upper part of a shoe, thus obviating the necessity and inconvenience of tying the strings.

GARMENT-STRETCHER.-H. A. Brown, By this produced a simple device which is light, so it can be easily carried in a valise and will occupy but little room therein and which can be used for creasing trousers whenever desired. This result is effected without the use of irons.

BURGLAR-ALARM .-- W. H. MOODY, Dallas, Texas. This economical, portable, cartridgedischarging burglar alarm is adapted for attachment to a window or a door, and is so constructed that it will be quick and positive in its action, and may be left indefinitely in firing position without detracing from its usefulness.' A simple locking device is provided which may be set to hold the hammer cocked. permitting the device to be carried with com-

- H. B. CASPERSON, St. FLOOD-GATE. -Marys, Ohio. This flood-gate belongs to the class wherein a horizontally-hung gate is associated with a fender that is arranged to face

may be readily adjusted to the increasing plied to the neckband to hold the same in zontal confined positions on the rising of the water, so as to float thereon when the flood is at its height. Means are provided for opposing the rising motion of the gate and the fender, which means is also free to be lifted thereby on an increase in the volume of the flood, thus minimizing all liability of injury to the parts.

Designs.

ORNAMENTAL FRAME FOR TEAPOTS OR SIMILAR ARTICLES .- E. PIEPENBRING, Washington, D. C. The design is in the nature of a silver or other metallic frame of orna mental character embracing the body of the vessel, and is jeweled and ornamented to represent holly sprays with the berries, and has a shield-like figure and edge ornamentations producing an extremely ornamental and attractive frame.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY,—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desir ing the information. In every case it is neces-sary to give the number of the inquiry. MUNN & CO.

Marine Iron Works. Chicago. Catalogue free. Inquiry No. 2790.—For a good second-hand gasoline marine engine from 2 to 3 horse power.

AUTOS.-Duryea Power Co., Reading, Pa.

Inquiry No. 2791.—For dealers in mining machinery. For logging engines. J. S. Mundy, Newark, N. J.

Inquiry No. 2792.—For dealers in broom corn cutting machines. "U.S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 2793.—For manufacturers of novelties and Christmas toys.

WATER WHEELS. Alcott & Co., Mt. Holly, N. J. Inquiry No. 2794.—For dealers in vacuum pans for evaporating maple sap or fruit juices.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 2795.—Parties to manufacture an improved handle for Mrs. Potts' sadirons. Sawmill machinery and outfits manufactured by the

Lane Mfg. Co., Box 13, Montpelier, Vt. Inquiry No. 2796. For a spring motor for propelling a sewing machine.

Gear Cutting of every description accurately done.

The Garvin Machine Co., 149 Varick, cor. Spring Sts., N.Y. Inquiry No. 2797.—For parties to make an endless combination belt of hair and rubber exposing immovable hair on the face and rubber on the inner side.

We design and build special and automatic machinery for all purposes. The Amstutz-Osborn Company, Cleve land, Ohio.

Inquiry No. 2798.—For dealers in corks coated with a rubber-like composition.

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 2799.—For a knurling tool for making embossed paper of special pattern.

Designers and builders of automatic and special machines of all kinds. Inventions perfected. The W. A. Wilson Machine Company, Rochester, N. Y.

Inquiry No. 2800.—For parties engaged in ball-bearing and model work.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Ma-chine Company. Foot of East 138th Street, New York. Inquiry No. 2801.—For dealers in appliances for chemical work.

IDEAS DEVELOPED.-Designing, draughting machine

work for inventors and others. Charles E. Hadley, 584 Hudson Street, New York. Inquiry No. 2802 —For makers of tincaus about 4 inches high and 134 inches in diameter, with enameled advertising thereon.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Inquiry No. 2803.—For a burner for attaching to a house furnace so that oil can be used instead of coal. INVENTORS, ATTENTION!—Highest prices paid for novelties in card or paper. Established 30 years. Ad-

dress The Tablet and Ticket Co., No. 87 Franklin Street. Chicago, Ill. Inquiry No. 2804.—For an apparatus for reproducing written reports in numbers.

Inquiry No. 2805.—For dealers in cigar-vending achines, selling them outright.

Inquiry No. 2806.-For dealers in blades for lawn

Inquiry No. 2807.—For manufacturers of roof

Inquiry No. 2808.—For galvanized wire hoops similar to those used on candy buckets. Inquiry No. 2809.—For manufacturers of bent wood.

Inquiry No. 2810.-For spring motor ceiling fans. Inquiry No. 2811.—For a light, portable distilling apparatus for use in deserts where water is strongly

Inquiry No. 2812.—For parties to make glass balls 2 inches in diameter, ground and polished and of different colors.

Inquiry No. 2813.—For manufacturers of portable houses.

Inquiry No. 2814.-For a large practical dish

Inquiry No. 2815.—For carpet-cleaning apparatus or machinery, Inquiry No. 2816.—For a floor mop that does not equire wringing by the hands.

Inquiry No. 2817.—For an apparatus for placing in a vertical furnace so as to use oil as fuel.

Inquiry No. 281%.—For some economical fuel to be used instead of coal.

Inquiry No. 2819.—For dealers in rubber special-ties.

Inquiry No. 2820.—For makers of double-action suction pumps.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

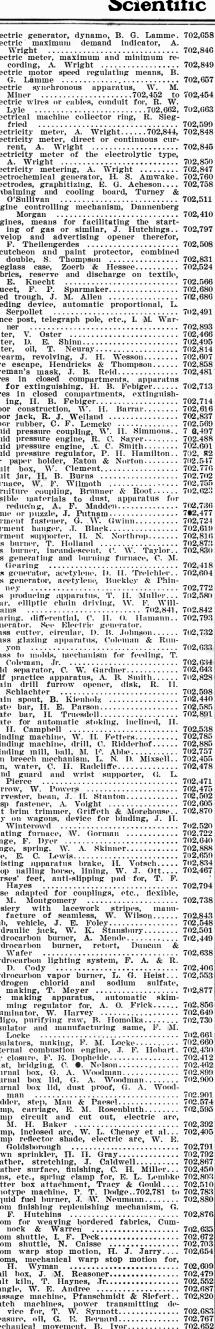
June 17, 1002,

AND EACH BEARING THAT DATE.

Usee note at end of list about copies of these patents.

	atents.	Electricity meter, direct or continuous current, A. Wright	702 845	
Air and hydrocarbon, apparatus for supply- ing, W. N. Best	709 590	Electricity meter of the electrolytic type, A. Wright Electricity metering, A. Wright Electrochemical generator, H. S. Amwake. Electrodes, graphitizing, E. G. Acheson Employing and ecology bound Turney &	702,850	
Air brake testing apparatus, Saum & Mer-	- 1	Electrochemical governor H S Amwaka	702,847	
catoris Animal trap, Polk & Wood		Electrodes, graphitizing, E. G. Acheson	702,758	-
Animal trap, Folk & Wood. Applicator and syringe, combined, L. J. Lohlein Axle attachment, vehicle, J. W. Hafer Badge medallion, J. E. Miller Bag. See Water bag. Bag holder, J. P. Adams Balance or scale, automatic, E. G. Hedman	702,570	Enthalming and cooling board, Turney & O'Sullivan Engine controlling mechanism, Dannenberg Morgan	702,511	1
Badge medallion, J. E. Miller	702,424 702,737	Morgan	702,410	
Bag. See Water bag. Bag holder, J. P. Adams	702,685	Engines, means for facilitating the starting of gas or similar, J. Hutchings	702,797	
man	702,726	F. Theilengerdes	702,508	7
Ball pitcher, mechanical base, C. Edwards	702,626 702,415	double, S. Thompson	702,831	t
Basket or bucket, folding, R. H. Hazen Bearing, J. N. Everett	$702,650 \mid 702,641 \mid$	Envelop and advertising opener therefor, F. Theilengerdes Escutcheon and paint protector, combined double, S. Thompson Eyeglass case, Zoerb & Hessee Fabrics, reserve and discharge on textile, F. Wascht	702,524	8
Balance or scale, automatic, E. G. Hedman Baling press, F. M. Chappell	702,692 7 02,838	E. Knecht Faucet, F. P. Sparmaker. Feed trough, J. M. Allen Feeding device, automatic proportional, L. Serpollet Fence post, telegraph pole, etc., I. M. War-	702,566	
Bed bottom, P. B. Rooney	702,485 702,691	Feed trough, J. M. Allen	702,686	-
Bed pan, E. A. Stockdale	702,603	Serpollet	702,491	
Bed pan, E. A. Stockdale. Beds, reclining chairs, etc., jointed frame for sofa, G. W. Britton Bedstead, C. B. & F. White. Bedstead grate, A. Brecht. Beehive heater, electric, H. Vogeler. Bicycle, G. M. Lilburn. Bicycle construction, J. C. Pratt. Bicycle seat post clamp, J. H. Rast. Bicycle support, E. Moss. Bicycle wheel carrier, C. R. Smith. Blind fastening device, N. O. Bond. Block signal system, P. O. Keilholtz.	702,699 702,839	ner	702,893 702,466	
Bedstead grate, A. Brecht	702,533 702,833	Filter, V. Oster Filter, D. E. Shinn Filter, oil, T. Neuray Firearm, revolving, J. H. Wesson. Fire escape, Hendricks & Thompson. Fireman's mask, J. B. Reid Fires in closed compartments, apparatus for extinguishing, H. B. Febiger Fires in closed compartments extinguishing.	702,495 702,814	
Bicycle, G. M. Lilburn	702,804 702,743	Fire escape, Hendricks & Thompson	702,607 702,858	
Bicycle seat post clamp, J. H. Rast	702,589 702,862	Fireman's mask, J. B. Reid	702,481	
Bicycle wheel carrier, C. R. Smith	702,829	for extinguishing, H. B. Febiger	702,713	
Block signal system, P. O. Keilholtz	702,656	Fires in closed compartments, extinguishing, H. B. Febiger	702,714	
Boat, life, L. Brown.	702,399	Floor jack, R. J. Weiland	702,837	
Boot, C. Schaer. Boat, C. Schaer. Boat, life, L. Brown. Boat, submarine, J. P. Holland 702,728, 7 Boiler, H. Bergfieth. Boiler or other furnace, steam, W. F. Wil- moth	702,694	rling, H. B. Feolger. Floor construction, W. H. Barrar. Floor jack, R. J. Welland Floor rubber, C. F. Lemcke Fluid pressure coupling, W. H. Simmons. Fluid pressure engine, R. C. Sayer. Fluid pressure regulator, P. H. Hamilton. Fluid pressure regulator, P. H. Hamilton.	7 0,497	,
moth	702,756	Fluid pressure engine, A. C. Smith	702,601	Í
Bolster, E. W. Palmquist	702,818	Fluid pressure regulator, P. H. Hamilton. Fly paper holder, Eaton & Norton. Fruit box, W. Clement. Fruit jar, H. B. Burns Furnace, W. F. Wilmoth Furniture coupling, Brunner & Root. Fusible materials to dust, apparatus for reducing, A. F. Madden. Garment fastener, G. W. Gwinn. Garment fastener, G. W. Gwinn. Garment supporter, II. N. Northrop. Gas burner, T. Holland Gas burner, T. Holland Gas burner, T. Holland Gas enerating and burning furnace, C. M.	702,547	6
Bookbinder's press punch, P. A. Bowen. Book holder, E. S. Antistale. Books, making, A. R. Dressel. Boot or shoe, F. W. Slater. Bottle capping machine, J. H. Fox. Bottle, non-refillable, F. J. Braconnier. Bottle, non-refillable, F. J. Daykin. Box fastener, J. H. S. Johnson. Brake mechanism, P. J. McCullough. Brake shoe, A. L. Streeter. Brick molds, safety appliance for sanding and feeding, H. Schoonmaker. Brozzing machine, G. Hare. Brush, J. F. Bowditch.	702,761	Fruit jar, H. B. Burns	702,702	i
Boot or shoe, F. W. Slater	702,600	Furniture coupling, Brunner & Root	702,623	8
Bottle capping machine, J. H. Fox	702,532	reducing, A. F. Madden	702,736	7
Box fastener, J. H. S. Johnson	702,798	Garment fastener, G. W. Gwinn	702,724	-
Brake mechanism, P. J. McCunough	702,812	Gara hypporter, H. N. Northrop	702,816	
and feeding, H. Schoonnaker	702,824	Gas burner, incandescent, C. W. Taylor	702,830	
Brush, J. F. Bowditch		Gearing	702,418	
Brushes, brooms, etc., apparatus for attaching or detaching handles of, J. El-		Gas generator, acetylene, D. H. Treichler Gas generator, acetylene, Buckley & Phin-	702,004	E
stone	702,712	ney Gas producing apparatus, T. H. Muller Gear, elliptic chain driving, W. F. Williams	702,580	ľ
Bucket dumping device for steam shovels, Porter & Beaumont. Bulkhead door, W. W. Ife	702,473 702,651	iams	702,842	
Cake dropping apparatus, cup, W. J. Meik-	702,773	Hams (02,844), Gearing, differential, C. H. O. Hamann., Generator. See Electric generator. Glass cutter, circular, D. B. Johnson	702, 793	1
Camera, photographic, C. F. J. Niss	702,576 702,464	Glass cutter, circular, D. B. Johnson Glass glazing apparatus, Coleman & Run-	702,732	Pard
Camera stand, J. H. Smith	702,749 702,494	Glass to molds, mechanism for feeding, T.	702,633	886
Cane conveyor, sugar, C. H. McNally 7 Car bolster, H. C. Buhoup	702,813 702,701	Glass to molds, mechanism for feeding, T. Coleman, Jr. Gold separator, C. W. Gardner	702,634 702,643	sing
Car door, sliding, J. Player	702,742 702,484			r hin
Car loader, box, D. A. Chappell	702,625 702,819	Schlachter Grain spout, B. Kienholz	702,598 702,440	MON.
Car side bearing, railway, C. H. Williams, Jr	702.896	Goir practice apparatus, A. B. Smith. Grain drill furrow opener, disk, R. II. Schlachter Grain spout, B. Kienholz Grate bar, H. E. Parson. Grate bar, H. Truesdell. Grate for automatic stoking, inclined, II. H. Campball	702,585 702,891	200
Cake dropping apparatus, cup, W. J. Meik- leham Camera, photographic, C. F. J. Niss	702,631 702,644	Grate for automatic stoking, inclined, II. H. Campbell	702,538	Ø.
Carbid cartridge, E. M. Rosenbluth 7 Carbon holder, S. B. Whinery 7	$702,594 \\ 702,514$	Grinding machine, W. H. Fetters	702,785 702,885	(
Carbonator, beverage, J. H. Fox	702,518 702,637	Grinding mill, ball, M. F. Abbe	702,757 702,455	t
Car Wheel, M. F. Geroing	702,469 702,882			7
Case. See Eyeglass case. Cashier, mechanical, Dement & King	702,710	Pierce Harrow, W. Powers	702,471 702,475	ď
Casket handle attachment, II. Riegel 7 Centrifugal separator, P. L. Kimball 7	702,746 702,441	Harvester, bean, J. H. Stanton Hasp fastener, A. Voight	702,502 702,605	i
Centrifugal separator, I. V. Holmes 7 Chain, L. D. Howard	702,795 702,874	Hat brim trimmer, Griffeth & Morehouse Hay on wagons, device for binding, J. H.	702,870	8
Chain protection, driving, E. Catchpool 7 Chain retaining and releasing means, J. J.	702,775	Hand guard and wrist supporter, G. L. Pierce Harrow, W. Powers Harvester, bean, J. H. Stanton Hasp fastener, A. Voight Hat brim trimmer, Griffeth & Morehouse. Hay on wagons, device for binding, J. H. Winterowd Heating furnace, W. Gorman Hinge, F. Dyer Hinge, spring. W. A. Skinner. Hoe, E. C. Lewis. Hoisting apparatus brake, H. Votsch. Hoop nailing horse, lining, W. J. Ott. Horses' feet, anti-slipping pad for, T. F. Hayes	702,520 702,722	f
Galway Chair, H. W. Bolens	702,549 702,768	Hinge, F. Dyer Hinge, spring. W. A. Skinner	702,640	t
Chair attachment, rocking, D. F. Clifford. 7 Chair spider, H. W. Bolens	$702,632 \\ 702,769$	Hoisting apparatus brake, IL Votsch	702,659	ì
Chimney cap, revolving, A. E. & F. J. Cook Cigar lighter, W. F. Kessler	702,779 702,438	Hoop nailing horse, lining, W. J. Ott Horses' feet, anti-slipping pad for, T. F.	702,467	(
Cigar lighter, electric, W. F. Kessler 7	702,437 702,416	Hayes Hose adapted for couplings, etc., flexible, M. Montgomery	702,794	-
Clamp, J. Fellows	702,771	M. Montgomery		
Clamp, J. Fellows. Clasp, C. A. Bryant. Clip, P. H. Yawman.	102,023	Hosiery with lacework stripes, manu-	702,738	1
Clamp, J. Fellows	702,808	Hosiery with lacework stripes, manufacture of seamless, W. Wilson Hub, vehicle, J. E. Foley	702,738 702,843 702,548	l
Chain retaining and releasing means, J. J. Galway Chair, H. W. Bolens	702,682 702,682	Hosiery with lacework stripes, manufacture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende	702,738 702,843 702,548 702,501 702,449	1
Clamp, J. Fellows	702,682 702,666 702,788	Hosiery with lacework stripes, manufacture of sennless, W. Wilson Hub, vehicle, J. E. Foley Hydroaribon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer	702,738 702,843 702,548 702,501 702,449 702,638	1
Clamp, J. Fellows. Clasp, C. A. Bryant. Clip, P. H. Yawman. Clock, electric program, J. O. Lyman. Clock movements for starting or stopping machinery, apparatus actuated by, J. S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal	702,682 702,666 702,788 702,822	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer	702,843 702,548 702,501 702,449 702,638	CRIP.
Clamp, J. Fellows. Clasp, C. A. Bryant. Clip, P. H. Yawman. Clock, electric program, J. O. Lyman. Clock movements for starting or stopping machinery, apparatus actuated by, J. S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel.	702,323 702,888 702,682 702,666 702,788 702,822 702,506 702,889	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer	702,843 702,548 702,501 702,449 702,638	Cape V
Clamp, J. Fellows. Clasp, C. A. Bryant. Clip, P. H. Yawman. Clock, electric program, J. O. Lyman. Clock on the string or stopping machinery, apparatus actuated by, J. S. Sunderland. Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal, crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr.	702,828 702,682 702,666 702,788 702,822 702,506 702,889 702,889	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer	702,843 702,548 702,501 702,449 702,638	ALS ARE
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wison, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford.	702,323 702,808 702,682 702,666 702,788 702,822 702,506 702,889 702,889 702,847 702,487	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer	702,843 702,548 702,501 702,449 702,638	V Fire
S. Sunderland Clock synchronizer, electric, C. F. Mears. 7 Cloth cutter, S. Geczynski	702,682) 702,666 702,788 702,822 702,506 702,889 702,897 702,747 702,487	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrocarbon vapor burner, L. G. Heist Hydrocarbon vapor burner, L. G. Heist Edward of the standard of the standar	702,843 702,548 702,501 702,449 702,638 702,406 702,553 702,877 702,856 702,649 702,730	V Fire af
S. Sunderland Clock synchronizer, electric, C. F. Mears. 7 Cloth cutter, S. Geczynski	702,682) 702,666 702,788 702,822 702,506 702,889 702,897 702,747 702,487	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrocarbon vapor burner, L. G. Heist Hydrocarbon vapor burner, L. G. Heist Edward of the standard of the standar	702,843 702,548 702,501 702,449 702,638 702,406 702,553 702,877 702,856 702,649 702,730	V FT enforce
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis.	702,682 702,686 702,788 702,822 702,506 702,889 702,887 702,747 702,487 702,445 702,678 702,678	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Lydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Lee making apparatus, automatic skimming regulator for, A. O. Frick Huminator, W. Harvey Indigo, purifying raw, B. Homolka. Locke Insulators, making, F. M. Locke Internal combustion engine, J. F. Hobart.	702,843 702,548 702,549 702,649 702,638 702,406 702,553 702,877 702,856 702,649 702,730 702,661 702,660 702,430 702,430	V FT eaf
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster.	702,682) 702,686 702,788 702,822 702,506 702,889 702,887 702,747 702,445 702,678 702,881 702,408	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Lydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Lee making apparatus, automatic skimming regulator for, A. O. Frick Huminator, W. Harvey Indigo, purifying raw, B. Homolka. Locke Insulators, making, F. M. Locke Internal combustion engine, J. F. Hobart.	702,843 702,548 702,549 702,649 702,638 702,406 702,553 702,877 702,856 702,649 702,730 702,661 702,660 702,430 702,430	V FT enfo
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wison, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilevicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus for treating, R. See-	702, 682 702, 788 702, 882 702, 882 702, 889 702, 889 702, 702, 97 702, 747 702, 487 702, 487 702, 678 702, 688 702, 881 702, 881 702, 894 702, 894 702, 894	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, I. G. Heist D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Ice making, T. Meyer Ice making apparatus, automatic skimming regulator for, A. O. Frick Illuminator, W. Harvey Indigo, puritying raw, R. Homolka Locke Internal combustion engine, J. F. Hobart. Jar closure, F. B. Dophelde. Joist, bridging, C. M. Nelson Journal box, G. A. Woodman Journal box lid, G. A. Woodman Journal box lid, G. A. Woodman Journal box lid, G. A. Woodman	702,843 702,548 702,549 702,501 702,449 702,638 702,406 702,553 702,877 702,856 702,640 702,730 702,660 702,412 702,462 702,499 702,900	V FT eaff & c s v Ti C V
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wison, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilevicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus for treating, R. See-	702, 682 702, 788 702, 882 702, 882 702, 889 702, 889 702, 702, 97 702, 747 702, 487 702, 487 702, 678 702, 688 702, 881 702, 881 702, 894 702, 894 702, 894	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Lee making apparatus, automatic skimming regulator for, A. O. Frick Illuminator, W. Harvey Indigo, purifying raw, R. Homolka Locke Insulator and manufacturing same, F. M. Locke. Insulators, making, F. M. Locke. Internal combustion engine, J. F. Hobart. Jar closure, F. 12. Dopheide. Joist, bridging, C. Nelson Journal box, G. A. Woodman. Journal box lid, G. A. Woodman. Journal box lid, G. A. Woodman. Ladder, step, Mau & Paesel	702,843 702,548 702,549 702,501 702,449 702,638 702,406 702,553 702,877 702,856 702,660 702,730 702,412 702,482 702,899 702,900 702,900	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wison, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arner & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus for treating, R. Seelman Corn shocker, J. F. Steward. Cors tetels, etc., socket for, N. F. T.	702, 682 702, 788 702, 686 702, 788 702, 882 702, 887 702, 887 702, 487 702, 487 702, 688 702, 581 702, 688 702, 581 702, 692 702, 692 702, 702, 692 702, 702, 602	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Lee making apparatus, automatic skimming regulator for, A. O. Frick Illuminator, W. Harvey Indigo, purifying raw, R. Homolka Locke Insulator and manufacturing same, F. M. Locke. Insulators, making, F. M. Locke. Internal combustion engine, J. F. Hobart. Jar closure, F. 12. Dopheide. Joist, bridging, C. Nelson Journal box, G. A. Woodman. Journal box lid, G. A. Woodman. Journal box lid, G. A. Woodman. Ladder, step, Mau & Paesel	702,843 702,548 702,549 702,501 702,449 702,638 702,406 702,553 702,877 702,856 702,660 702,730 702,412 702,482 702,899 702,900 702,900	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. R. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus for treating, R. Seeman Corn husking machine, W. II. Gernand. Corn shocker, J. F. Steward. Corns blocker, J. F. Steward. Corn and tent, combined folding, D. I. Kuthr	702, 682 702, 788 702, 788 702, 882 702, 889 702, 889 702, 487 702, 445 702, 678 702, 487 702, 490 702, 720 702, 490 702, 720 702, 659 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Lee making apparatus, automatic skimming regulator for, A. O. Frick Illuminator, W. Harvey Indigo, purifying raw, R. Homolka Locke Insulator and manufacturing same, F. M. Locke. Insulators, making, F. M. Locke. Internal combustion engine, J. F. Hobart. Jar closure, F. 12. Dopheide. Joist, bridging, C. Nelson Journal box, G. A. Woodman. Journal box lid, G. A. Woodman. Journal box lid, G. A. Woodman. Ladder, step, Mau & Paesel	702,843 702,548 702,549 702,501 702,449 702,638 702,406 702,553 702,877 702,856 702,660 702,730 702,412 702,482 702,899 702,900 702,900	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. R. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus for treating, R. Seeman Corn husking machine, W. II. Gernand. Corn shocker, J. F. Steward. Corns blocker, J. F. Steward. Corn and tent, combined folding, D. I. Kuthr	702, 682 702, 788 702, 788 702, 882 702, 889 702, 889 702, 487 702, 445 702, 678 702, 487 702, 490 702, 720 702, 490 702, 720 702, 659 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Lee making apparatus, automatic skimming regulator for, A. O. Frick Illuminator, W. Harvey Indigo, purifying raw, R. Homolka Locke Insulator and manufacturing same, F. M. Locke. Insulators, making, F. M. Locke. Internal combustion engine, J. F. Hobart. Jar closure, F. 12. Dopheide. Joist, bridging, C. Nelson Journal box, G. A. Woodman. Journal box lid, G. A. Woodman. Journal box lid, G. A. Woodman. Ladder, step, Mau & Paesel	702,843 702,548 702,549 702,501 702,449 702,638 702,406 702,553 702,877 702,856 702,660 702,730 702,412 702,482 702,899 702,900 702,900	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. R. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus for treating, R. Seeman Corn husking machine, W. II. Gernand. Corn shocker, J. F. Steward. Corns blocker, J. F. Steward. Corn and tent, combined folding, D. I. Kuthr	702, 682 702, 788 702, 788 702, 882 702, 889 702, 889 702, 487 702, 445 702, 678 702, 487 702, 490 702, 720 702, 490 702, 720 702, 659 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559 702, 559	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Lee making apparatus, automatic skimming regulator for, A. O. Frick Illuminator, W. Harvey Indigo, purifying raw, R. Homolka Locke Insulator and manufacturing same, F. M. Locke. Insulators, making, F. M. Locke. Internal combustion engine, J. F. Hobart. Jar closure, F. 12. Dopheide. Joist, bridging, C. Nelson Journal box, G. A. Woodman. Journal box lid, G. A. Woodman. Journal box lid, G. A. Woodman. Ladder, step, Mau & Paesel	702,843 702,548 702,549 702,501 702,449 702,638 702,406 702,553 702,877 702,856 702,660 702,730 702,412 702,482 702,899 702,900 702,900	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus for treating, R. Seeman Corn husking machine, W. H. Gernand. Corn shocker, J. F. Steward. Corset steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Cranberry assorting apparatus, A. E. Nightingale Crate for poultry, folding, A. F. Dice. Curtain hauger, A. F. Goshorn.	702, 682 702, 788 702, 686 702, 788 702, 589 702, 589 702, 487 702, 445 702, 678 702, 678 702, 881 702, 894 702, 702, 502 702, 702, 502 702, 702, 502 702, 503 702, 411 702, 503 702, 503 703 703 703 703 703 703 703 703 703 7	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Lee making apparatus, automatic skimming regulator for, A. O. Frick Illuminator, W. Harvey Indigo, purifying raw, R. Homolka Locke Insulator and manufacturing same, F. M. Locke. Insulators, making, F. M. Locke. Internal combustion engine, J. F. Hobart. Jar closure, F. 12. Dopheide. Joist, bridging, C. Nelson Journal box, G. A. Woodman. Journal box lid, G. A. Woodman. Journal box lid, G. A. Woodman. Ladder, step, Mau & Paesel	702,843 702,548 702,549 702,501 702,449 702,638 702,406 702,553 702,877 702,856 702,660 702,730 702,412 702,482 702,899 702,900 702,900	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus for treating, R. Seeman Corn husking machine, W. H. Gernand. Corn shocker, J. F. Steward. Corset steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Cranberry assorting apparatus, A. E. Nightingale Crate for poultry, folding, A. F. Dice. Curtain hauger, A. F. Goshorn.	702, 682 702, 788 702, 686 702, 788 702, 589 702, 589 702, 487 702, 445 702, 678 702, 678 702, 881 702, 894 702, 702, 502 702, 702, 502 702, 702, 502 702, 503 702, 411 702, 502 702, 502 702, 503 702, 503 703 703 703 703 703 703 703 703 703 7	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Lee making apparatus, automatic skimming regulator for, A. O. Frick Illuminator, W. Harvey Indigo, purifying raw, R. Homolka Locke Insulator and manufacturing same, F. M. Locke. Insulators, making, F. M. Locke. Internal combustion engine, J. F. Hobart. Jar closure, F. 12. Dopheide. Joist, bridging, C. Nelson Journal box, G. A. Woodman. Journal box lid, G. A. Woodman. Journal box lid, G. A. Woodman. Ladder, step, Mau & Paesel	702,843 702,548 702,549 702,501 702,449 702,638 702,406 702,553 702,877 702,856 702,660 702,730 702,412 702,482 702,899 702,900 702,900	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus for treating, R. Seeman Corn husking machine, W. H. Gernand. Corn shocker, J. F. Steward. Corset steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Crapherry assorting apparatus, A. E. Nightingale Crate for poultry. folding, A. F. Dice Curtain fixture, J. Burley. Curtain faxture, J. Burley. Curtain for Machine, L. Lindas. Dental appliance, H. E. Lindas. Dental appliance, W. E. Lindas. Dental bridgework securing device for. W.	702,682 702,682 702,788 702,882 702,889 702,889 702,887 702,445 702,678 702,445 702,487 702,490 702,597 702,597 702,597 702,587 702,587 702,587 702,587 702,587 702,587 702,682 702,587 702,682 702,720 702,720 702,720 702,720 702,720 702,720 702,720 702,720 702,720 702,720 702,887	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer lee making apparatus, automatic skimming regulator for, A. O. Frick Huminator, W. Harvey Indigo, purifying raw, B. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart Jar closure, F. E. Dophelde Joist, bridging, C. O. Nelson Journal box iid, G. A. Woodman Journal box lid, G. A. Woodman Journal box lid, G. A. Woodman Lamp, carriage, E. M. Rosenbluth Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al. Lamp reflector shade, electric arc, W. E. Goldsborough Lawn sprinkler, H. H. Gray Leather, stretching, J. Caidwell Leather surface, finishing, C. H. Miller Leather surface, finishing, C. H. Miller. Leather surface, finishing, C. H. Miller. Leather surface, finishing, C. H. Miller. Leather bax attachment, Tracy & Gould. Linotype machine, P. T. Dodge. 702,781 to Liquid fuel burner, J. W. Neumann. G.	702,843 702,548 702,549 702,501 702,406 702,553 702,856 702,649 702,730 702,661 702,430 702,430 702,492 702,990 702,593 702,901 702,574 702,593 702,392 702,493 702,901 702,574 702,593 702,392 702,893 702,893 702,893 702,893	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. Seeman Corn blocker, J. F. Steward. Corn shocker, J. F. Steward. Cornet steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Crapherry assorting apparatus, A. E. Nightingale Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain pole, L. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental bridgework, securing device for, W. E. Griswold	702, 682 702, 6882 702, 6882 702, 889 702, 889 702, 887 702, 445 702, 445 702, 445 702, 678 702, 481 702, 688 702, 894 702, 894 702, 597 702, 490 702, 602 702, 567 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 587 702, 490 702, 587 702, 490 702, 587 702, 490 702, 587 702, 587	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic jnck, W. K. Stansbury Hydraulic jnck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, T. G. Heist D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Ice making, T. Meyer Ice making apparatus, automatic skimming regulator for, A. O. Frick Iluminator, W. Harvey Indigo, purifying raw, R. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. Iz. Dophelde Joist, bridging, C. • Nelson Journal box, G. A. Woodman Journal box lid, G. A. Rosenbluth Lamp carriage, E. M. Rosenbluth Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al. Lamp, inclosed arc, W. L. Cheney et al. Lamp reflector shade, electric arc, W. E. Goldsborough Leather, stretching, J. Caldwell. Leether surface, finishing, C. H. Miller Leather surface, finishing, C. H. Miller Lens, etc., spring clamp for, E. L. Lembke Letter box attachment, Tracy & Gould Linotype machine, P. T. Dodge. 702,781 to Liquid fuel burner, J. W. Neumann Goom for weaving bordered fabrics, Cum-	702,843 702,548 702,549 702,501 702,406 702,553 702,877 702,866 702,430 702,462 702,430 702,412 702,462 702,490 702,901 702,574 702,574 702,575 702,392 702,495 702,791 702,792 702,893 702,791 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,793 702,893 702,793 702,893 702,793	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. Seeman Corn blocker, J. F. Steward. Corn shocker, J. F. Steward. Cornet steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Crapherry assorting apparatus, A. E. Nightingale Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain pole, L. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental bridgework, securing device for, W. E. Griswold	702, 682 702, 6882 702, 6882 702, 889 702, 889 702, 887 702, 445 702, 445 702, 445 702, 678 702, 481 702, 688 702, 894 702, 894 702, 597 702, 490 702, 602 702, 567 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 587 702, 490 702, 587 702, 490 702, 587 702, 490 702, 587 702, 587	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic jnck, W. K. Stansbury Hydraulic jnck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, T. G. Heist D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Ice making, T. Meyer Ice making apparatus, automatic skimming regulator for, A. O. Frick Iluminator, W. Harvey Indigo, purifying raw, R. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. Iz. Dophelde Joist, bridging, C. • Nelson Journal box, G. A. Woodman Journal box lid, G. A. Rosenbluth Lamp carriage, E. M. Rosenbluth Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al. Lamp, inclosed arc, W. L. Cheney et al. Lamp reflector shade, electric arc, W. E. Goldsborough Leather, stretching, J. Caldwell. Leether surface, finishing, C. H. Miller Leather surface, finishing, C. H. Miller Lens, etc., spring clamp for, E. L. Lembke Letter box attachment, Tracy & Gould Linotype machine, P. T. Dodge. 702,781 to Liquid fuel burner, J. W. Neumann Goom for weaving bordered fabrics, Cum-	702,843 702,548 702,549 702,501 702,406 702,553 702,877 702,866 702,430 702,462 702,430 702,412 702,462 702,490 702,901 702,574 702,574 702,575 702,392 702,495 702,791 702,792 702,893 702,791 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,793 702,893 702,793 702,893 702,793	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. Seeman Corn blocker, J. F. Steward. Corn shocker, J. F. Steward. Cornet steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Crapherry assorting apparatus, A. E. Nightingale Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain pole, L. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental bridgework, securing device for, W. E. Griswold	702, 682 702, 6882 702, 6882 702, 889 702, 889 702, 887 702, 445 702, 445 702, 445 702, 678 702, 481 702, 688 702, 894 702, 894 702, 597 702, 490 702, 602 702, 567 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 587 702, 490 702, 587 702, 490 702, 587 702, 490 702, 587 702, 587	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic jnck, W. K. Stansbury Hydraulic jnck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, T. G. Heist D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Ice making, T. Meyer Ice making apparatus, automatic skimming regulator for, A. O. Frick Iluminator, W. Harvey Indigo, purifying raw, R. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. Iz. Dophelde Joist, bridging, C. • Nelson Journal box, G. A. Woodman Journal box lid, G. A. Rosenbluth Lamp carriage, E. M. Rosenbluth Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al. Lamp, inclosed arc, W. L. Cheney et al. Lamp reflector shade, electric arc, W. E. Goldsborough Leather, stretching, J. Caldwell. Leether surface, finishing, C. H. Miller Leather surface, finishing, C. H. Miller Lens, etc., spring clamp for, E. L. Lembke Letter box attachment, Tracy & Gould Linotype machine, P. T. Dodge. 702,781 to Liquid fuel burner, J. W. Neumann Goom for weaving bordered fabrics, Cum-	702,843 702,548 702,549 702,501 702,406 702,553 702,877 702,866 702,430 702,462 702,430 702,412 702,462 702,490 702,901 702,574 702,574 702,575 702,392 702,495 702,791 702,792 702,893 702,791 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,793 702,893 702,793 702,893 702,793	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. Seeman Corn blocker, J. F. Steward. Corn shocker, J. F. Steward. Cornet steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Crapherry assorting apparatus, A. E. Nightingale Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain pole, L. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental bridgework, securing device for, W. E. Griswold	702, 682 702, 6882 702, 6882 702, 889 702, 889 702, 887 702, 445 702, 445 702, 445 702, 678 702, 481 702, 688 702, 894 702, 894 702, 597 702, 490 702, 602 702, 567 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 587 702, 490 702, 587 702, 490 702, 587 702, 490 702, 587 702, 587	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic jnck, W. K. Stansbury Hydraulic jnck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, T. G. Heist D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Ice making, T. Meyer Ice making apparatus, automatic skimming regulator for, A. O. Frick Iluminator, W. Harvey Indigo, purifying raw, R. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. Iz. Dophelde Joist, bridging, C. • Nelson Journal box, G. A. Woodman Journal box lid, G. A. Rosenbluth Lamp carriage, E. M. Rosenbluth Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al. Lamp, inclosed arc, W. L. Cheney et al. Lamp reflector shade, electric arc, W. E. Goldsborough Leather, stretching, J. Caldwell. Leether surface, finishing, C. H. Miller Leather surface, finishing, C. H. Miller Lens, etc., spring clamp for, E. L. Lembke Letter box attachment, Tracy & Gould Linotype machine, P. T. Dodge. 702,781 to Liquid fuel burner, J. W. Neumann Goom for weaving bordered fabrics, Cum-	702,843 702,548 702,549 702,501 702,406 702,553 702,877 702,866 702,430 702,462 702,430 702,412 702,462 702,490 702,901 702,574 702,574 702,575 702,392 702,495 702,791 702,792 702,893 702,791 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,793 702,893 702,793 702,893 702,793	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. Seeman Corn blocker, J. F. Steward. Corn shocker, J. F. Steward. Cornet steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Crapherry assorting apparatus, A. E. Nightingale Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain pole, L. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental bridgework, securing device for, W. E. Griswold	702, 682 702, 6882 702, 6882 702, 889 702, 889 702, 887 702, 445 702, 445 702, 445 702, 678 702, 481 702, 688 702, 894 702, 894 702, 597 702, 490 702, 602 702, 567 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 587 702, 490 702, 587 702, 490 702, 587 702, 490 702, 587 702, 587	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic jnck, W. K. Stansbury Hydraulic jnck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, T. G. Heist D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Ice making, T. Meyer Ice making apparatus, automatic skimming regulator for, A. O. Frick Iluminator, W. Harvey Indigo, purifying raw, R. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. Iz. Dophelde Joist, bridging, C. • Nelson Journal box, G. A. Woodman Journal box lid, G. A. Rosenbluth Lamp carriage, E. M. Rosenbluth Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al. Lamp, inclosed arc, W. L. Cheney et al. Lamp reflector shade, electric arc, W. E. Goldsborough Leather, stretching, J. Caldwell. Leether surface, finishing, C. H. Miller Leather surface, finishing, C. H. Miller Lens, etc., spring clamp for, E. L. Lembke Letter box attachment, Tracy & Gould Linotype machine, P. T. Dodge. 702,781 to Liquid fuel burner, J. W. Neumann Goom for weaving bordered fabrics, Cum-	702,843 702,548 702,549 702,501 702,406 702,553 702,877 702,866 702,430 702,462 702,430 702,412 702,462 702,490 702,901 702,574 702,574 702,575 702,392 702,495 702,791 702,792 702,893 702,791 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,792 702,893 702,793 702,893 702,793 702,893 702,793	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. Seeman Corn blocker, J. F. Steward. Corn shocker, J. F. Steward. Cornet steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Crapherry assorting apparatus, A. E. Nightingale Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain pole, L. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental bridgework, securing device for, W. E. Griswold	702, 682 702, 6882 702, 6882 702, 889 702, 889 702, 887 702, 445 702, 445 702, 445 702, 678 702, 481 702, 688 702, 894 702, 894 702, 597 702, 490 702, 602 702, 567 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 587 702, 490 702, 587 702, 490 702, 587 702, 490 702, 587 702, 587	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon vapor burner, I. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Ice making, T. Meyer Ice making apparatus, automatic skimming regulator for, A. O. Frick Illuminator, W. Harvey Indigo, puritying raw, R. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. Iz. Dophelde. Joist, bridging, C. M. Nelson Journal box, G. A. Woodman. Journal box iid, G. A. Woodman. Journal box lid, G. A. Woodman. Journal box lid, dust proof, G. A. Woodman. Journal box lid, dust proof, G. A. Woodman. Lander, step, Mau & Paesel Lamp, inclosed arc, W. L. Cheney et al Lamp reflector shade, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al Lamp reflector shade, electric arc, W. E. Goldsborough Lawn sprinkler, H. H. Gray Leather, stretching, J. Caldwell Leather surface, finishing, C. H. Miller. Lens, etc., spring clamp for, E. L. Lembke Letter box attachment, Tracy & Gould Linotype machine, P. T. Dodge702.781 to Liquid fuel burner, J. W. Neumann Loom finishing replenishing mechanism, G. F. Hutchins Loom for weaving bordered fabrics, Cum- nock & Warren Loom shuttle, N. Caisse Loom warp stop motion, H. J. Jarry Looms, mechanical warp stop motion for, H. Wyman Mail box, J. M. Reasoner Mansage machine, Pfanschmidt & Slefert	702,843 702,548 702,549 702,638 702,406 702,553 702,877 702,856 702,640 702,430 702,430 702,430 702,430 702,430 702,452 702,450 702,450 702,450 702,595 702,392 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,873 702,791 702,792 702,873 702,791 702,792 702,657 702,793 702,654 702,666 702,672 702,672 702,673 702,669 702,672 702,687 702,687 702,887	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. Seeman Corn blocker, J. F. Steward. Corn shocker, J. F. Steward. Cornet steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Crapherry assorting apparatus, A. E. Nightingale Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain pole, L. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental bridgework, securing device for, W. E. Griswold	702, 682 702, 6882 702, 6882 702, 889 702, 889 702, 887 702, 445 702, 445 702, 445 702, 678 702, 481 702, 688 702, 894 702, 894 702, 597 702, 490 702, 602 702, 567 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 587 702, 490 702, 587 702, 490 702, 587 702, 490 702, 587 702, 587	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon burner, retort, Duncau & Wafer Hydrocarbon vapor burner, I. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Ice making, T. Meyer Ice making apparatus, automatic skimming regulator for, A. O. Frick Illuminator, W. Harvey Indigo, puritying raw, R. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. Iz. Dophelde. Joist, bridging, C. M. Nelson Journal box, G. A. Woodman. Journal box iid, G. A. Woodman. Journal box lid, G. A. Woodman. Journal box lid, dust proof, G. A. Woodman. Journal box lid, dust proof, G. A. Woodman. Lander, step, Mau & Paesel Lamp, inclosed arc, W. L. Cheney et al Lamp reflector shade, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al Lamp reflector shade, electric arc, W. E. Goldsborough Lawn sprinkler, H. H. Gray Leather, stretching, J. Caldwell Leather surface, finishing, C. H. Miller. Lens, etc., spring clamp for, E. L. Lembke Letter box attachment, Tracy & Gould Linotype machine, P. T. Dodge702.781 to Liquid fuel burner, J. W. Neumann Loom finishing replenishing mechanism, G. F. Hutchins Loom for weaving bordered fabrics, Cum- nock & Warren Loom shuttle, N. Caisse Loom warp stop motion, H. J. Jarry Looms, mechanical warp stop motion for, H. Wyman Mail box, J. M. Reasoner Mansage machine, Pfanschmidt & Slefert	702,843 702,548 702,549 702,638 702,406 702,553 702,877 702,856 702,640 702,430 702,430 702,430 702,430 702,430 702,452 702,450 702,450 702,450 702,595 702,392 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,873 702,791 702,792 702,873 702,791 702,792 702,657 702,793 702,654 702,666 702,672 702,672 702,673 702,669 702,672 702,687 702,687 702,887	-
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arnér & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. Seeman Corn blocker, J. F. Steward. Corn shocker, J. F. Steward. Cornet steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Crapherry assorting apparatus, A. E. Nightingale Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain pole, L. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental bridgework, securing device for, W. E. Griswold	702, 682 702, 6882 702, 6882 702, 889 702, 889 702, 887 702, 445 702, 445 702, 445 702, 678 702, 481 702, 688 702, 894 702, 894 702, 597 702, 490 702, 602 702, 567 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 490 702, 527 702, 587 702, 490 702, 587 702, 490 702, 587 702, 490 702, 587 702, 587	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer lee making apparatus, automatic skimming regulator for, A. O. Frick Hluminator, W. Harvey Indigo, purifying raw, B. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. E. Dopheide Journal box, G. A. Woodman Journal box ild, G. A. Woodman Journal box ild, G. A. Woodman Journal box ild, G. A. Woodman Lamp, carriage, E. M. Rosenbluth. Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al Lamp reflector shade, electric arc, W. E. Goldsborough Lawn sprinkler, H. H. Gray. Leather surface, finishing, C. H. Miller. Leather surface, finishing, C. H. Miller. Leather stretching, J. Caidwell. Leather stretching, J. Caidwell. Leather stretching, J. Caidwell. Leather stretching, J. Caidwell. Leather surface, finishing, C. H. Miller. Leather stretching, J. Caidwell. Leather surface, finishing mechanism, G. F. Hutchins Loom finishing replenishing mechanism, G. F. Hutchins Loom for weaving bordered fabries, Cumnock & Warren Loom shuttle, N. Caisse Loom shuttle, N. Caisse Loom smechanical warp stop motion for, H. Wyman Mail box, J. M. Reasoner. Mail kiln, T. Haynes, Jr. Mangle, W. E. Andree Massage machine, Pfanschmildt & Siefert. Match machines, power transmitting device for, T. W. Synnott. Measure, oil, G. E. Bernard.	702,843 702,548 702,549 702,638 702,406 702,553 702,856 702,649 702,730 702,661 702,632 702,412 702,462 702,493 702,493 702,901 702,593 702,901 702,593 702,902 702,902 702,876 702,889 702,889 702,889 702,889 702,889 702,890 702,893 702,654 702,654 702,635 702,654 702,654 702,683 702,654 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683	1110011
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arner & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. See-man Corn busking machine, W. H. Gernand. Corn shocker, J. F. Stoward. Corn shocker, J. F. Stoward. Corn steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Cranberry assorting apparatus, A. E. Night- ingale Crate for poultry. folding, A. F. Dice. Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain nole, I. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental appliance, H. E. Lindas. Dental fastening and bridgework, W. E. Griswold Dental fastening and bridgework, W. E. Griswold Dental fastening and bridgework, W. E. Griswold Dental innression cup, W. E. Griswold. Dental innression cup, W. E. Griswold Dental innression cup, W. E. Griswold Dental fastening and bridgework, W. E. Dock, land reclaiming, E. Chaquette Dogging machine, steam, A. S. Hill Dock, land reclaiming, E. Chaquette Dogging machine, steam, A. S. Hill Door strike, E. Bommer Drafter, Clam, G. C. Griswold, J. F. Murphy. Dress supporter, R. F. Montgomery. Dress supporter, R. F. Montgomery.	702, 682 702, 682 702, 683 702, 683 702, 589 702, 589 702, 889 702, 887 702, 445 702, 445 702, 445 702, 678 702, 487 702, 487 702, 487 702, 480 702, 597 702, 490 702, 567 702, 490 702, 567 702, 490 702, 567 702, 490 702, 587 702, 411 702, 537 702, 411 702, 537 702, 420 702, 887 702, 420 702, 887 702, 645 702, 645 702, 645 702, 683 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Ilydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Lee making apparatus, automatic skimming regulator for, A. O. Frick Hluminator, W. Harvey Indigo, purifying raw, R. Homolka Insulators and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. E. Dopheide Journal box, G. A. Woodman Journal box ild, G. A. Woodman Journal box ild, G. A. Woodman Journal box ild, G. A. Woodman Lamp, carriage, E. M. Rosenbluth. Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al Lamp reflector shade, electric arc, W. E. Goldsborough Lawn sprinkler, H. H. Gray. Leather surface, finishing, C. H. Miller. Leather surface, finishing, C. H. Miller. Leather stretching, J. Caldwell. Leather surface, finishing, C. H. Miller. Lens, etc., spring clamp for, E. L. Lembke Letter box attachment, Tracy & Gould. Linotype machine, P. T. Dodge. 702.781 to Liquid fuel burner, J. W. Neumann. Loom finishing replenishing mechanism, G. F. Hutchins. Loom shuttle, N. Caisse Loom swattle, N. Caisse Loom smuttle, N. Caisse Loom shuttle, N. Caisse Loom smechanical warp stop motion for, H. Wyman Mail box, J. M. Reasoner. Mail kiln, T. Haynes, Jr. Mangle, W. E. Andree Massage machine, Pfanschmildt & Slefert. Match machines, power transmitting device for, T. W. Synnott. Measure, oil, G. E. Bernard. Metal surfaces, producing designs or de-	702,843 702,548 702,549 702,501 702,406 702,553 702,856 702,649 702,730 702,661 702,632 702,412 702,462 702,493 702,493 702,901 702,595 702,392 702,493 702,857 702,291 702,903 702,901 702,593 702,903 702,901 702,791 702,593 702,876 702,877 702,887 702,887 702,887 702,654 702,635 702,654 702,693 702,654 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683 702,683	11010
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arner & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. See-man Corn busking machine, W. H. Gernand. Corn shocker, J. F. Stoward. Corn shocker, J. F. Stoward. Corn steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Cranberry assorting apparatus, A. E. Night- ingale Crate for poultry. folding, A. F. Dice. Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain nole, I. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental appliance, H. E. Lindas. Dental fastening and bridgework, W. E. Griswold Dental fastening and bridgework, W. E. Griswold Dental fastening and bridgework, W. E. Griswold Dental innression cup, W. E. Griswold. Dental innression cup, W. E. Griswold Dental innression cup, W. E. Griswold Dental fastening and bridgework, W. E. Dock, land reclaiming, E. Chaquette Dogging machine, steam, A. S. Hill Dock, land reclaiming, E. Chaquette Dogging machine, steam, A. S. Hill Door strike, E. Bommer Drafter, Clam, G. C. Griswold, J. F. Murphy. Dress supporter, R. F. Montgomery. Dress supporter, R. F. Montgomery.	702, 682 702, 682 702, 683 702, 683 702, 589 702, 589 702, 889 702, 887 702, 445 702, 445 702, 445 702, 678 702, 487 702, 487 702, 487 702, 480 702, 597 702, 490 702, 567 702, 490 702, 567 702, 490 702, 567 702, 490 702, 587 702, 411 702, 537 702, 411 702, 537 702, 420 702, 887 702, 420 702, 887 702, 645 702, 645 702, 645 702, 683 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685 702, 685	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncau & Wafer Itydrocarbon burner, retort, Duncau & Wafer D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Ice making apparatus, automatic skimming regulator for, A. O. Frick Iluminator, W. Harvey Indigo, purifying raw, R. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. Iz. Dophelde. Joist, bridging, C. • Nelson Journal box, G. A. Woodman Journal box lid, G. A. Woodman Journal box lid, G. A. Woodman Journal box lid, dust proof, G. A. Woodman. Ladder, step, Mau & Paesel Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al. Lamp reflector shade, electric arc, W. E. Goldsborough Leather, stretching, J. Caldwell Leather surface, finishing, C. H. Miller Leather surface, finishing, C. H. Miller Leather, stretching, J. Caldwell. Leter box attachment, Tracy & Gould Linotype machine, P. T. Dodge. 702,781 to Liquid fuel burner, J. W. Neumann Loom finishing replenishing mechanism, G. F. Hutchins Loom shuttle, N. Caisse Loom warp stop motion, H. J. Jarry Looms muttle, N. Caisse Loom smuttle, N. Caisse Loom smuttle, W. E. Andree Massage machine, Pfanschmidt & Siefert Mangle, W. E. Andree Massage machine, Pfanschmidt & Siefert Match machines, power transmitting de- vice for, T. W. Synnott. Measure, oil, G. E. Bernard. Mechanical movement, B. Ivor. Metal spinder	702,843 702,548 702,549 702,501 702,406 702,553 702,877 702,661 702,6640 702,430 702,412 702,462 702,490 702,490 702,901 702,574 702,574 702,575 702,392 702,495 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,693 702,693 702,693 702,693 702,693	
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Cog wheel, F. Saxon Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arner & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus for treating, R. Seeman Corn husking machine, W. H. Gernand. Corn shocker, J. F. Steward. Corn shocker, J. F. Steward. Corns steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Cranberry assorting apparatus, A. E. Night- ingale Crate for poultry, folding, A. F. Dice. Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain pole, L. J. Graff. Curtain rod, M. P. Creahan Dental bridgework, securing device for, W. E. Griswold Dental inbression cup, W. E. Griswold. Dental inbression cup, W. E. Griswold Dental tool, W. E. Griswold Dental inbression cup, W. E. Griswold Dental tool, W. E. Griswold	702, 682 702, 682 702, 682 702, 683 702, 683 702, 889 702, 889 702, 887 702, 445 702, 678 702, 678 702, 557 702, 557 702, 557 702, 557 702, 557 702, 557 702, 557 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 687 702, 686 702, 703 702, 686 702, 703 702, 686 702, 703 702, 687 702, 686 702, 703 702, 686 702, 703 702, 687 702, 703 702, 687 702, 703	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncau & Wafer Itydrocarbon burner, retort, Duncau & Wafer D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer Ice making apparatus, automatic skimming regulator for, A. O. Frick Iluminator, W. Harvey Indigo, purifying raw, R. Homolka Insulator and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. Iz. Dophelde. Joist, bridging, C. • Nelson Journal box, G. A. Woodman Journal box lid, G. A. Woodman Journal box lid, G. A. Woodman Journal box lid, dust proof, G. A. Woodman. Ladder, step, Mau & Paesel Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al. Lamp reflector shade, electric arc, W. E. Goldsborough Leather, stretching, J. Caldwell Leather surface, finishing, C. H. Miller Leather surface, finishing, C. H. Miller Leather, stretching, J. Caldwell. Leter box attachment, Tracy & Gould Linotype machine, P. T. Dodge. 702,781 to Liquid fuel burner, J. W. Neumann Loom finishing replenishing mechanism, G. F. Hutchins Loom shuttle, N. Caisse Loom warp stop motion, H. J. Jarry Looms muttle, N. Caisse Loom smuttle, N. Caisse Loom smuttle, W. E. Andree Massage machine, Pfanschmidt & Siefert Mangle, W. E. Andree Massage machine, Pfanschmidt & Siefert Match machines, power transmitting de- vice for, T. W. Synnott. Measure, oil, G. E. Bernard. Mechanical movement, B. Ivor. Metal spinder	702,843 702,548 702,549 702,501 702,406 702,553 702,877 702,661 702,6640 702,430 702,412 702,462 702,490 702,490 702,901 702,574 702,574 702,575 702,392 702,495 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,693 702,693 702,693 702,693 702,693	
S. Sunderland Clock synchronizer, electric, C. F. Mears. Cloth cutter, S. Geczynski. Cloth, etc., device for unrolling, H. L. Rosenthal Clothes pounder, S. B. Tadlock. Coal crusher, A. W. F. Steckel. Coal, etc., machine for washing, F. R. Wilson, Jr. Collection form, A. F. Sanford. Colors, making mordant, Lange & Emilewicz Composition of matter and preparation of same, W. Prampolini Concrete mixing machine, C. Otis. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, J. H. Cook. Conveyer, A. J. Webster. Cooker and turner, cake, Arner & Goodwin Cooking apparatus, steam, W. C. Salmon. Copper ores, apparatus, steam, W. C. Salmon. Copper ores, apparatus, for treating, R. See-man Corn busking machine, W. H. Gernand. Corn shocker, J. F. Stoward. Corn shocker, J. F. Stoward. Corn steels, etc., socket for, N. F. T. Hunt Cot and tent, combined folding, D. I. Kuhn Cranberry assorting apparatus, A. E. Night- ingale Crate for poultry. folding, A. F. Dice. Curtain fixture, J. Burley. Curtain fixture, J. Burley. Curtain nole, I. J. Graff. Curtain rod, M. P. Creahan Dental appliance, H. E. Lindas. Dental appliance, H. E. Lindas. Dental fastening and bridgework, W. E. Griswold Dental fastening and bridgework, W. E. Griswold Dental fastening and bridgework, W. E. Griswold Dental innression cup, W. E. Griswold. Dental innression cup, W. E. Griswold Dental innression cup, W. E. Griswold Dental fastening and bridgework, W. E. Dock, land reclaiming, E. Chaquette Dogging machine, steam, A. S. Hill Dock, land reclaiming, E. Chaquette Dogging machine, steam, A. S. Hill Door strike, E. Bommer Drafter, Clam, G. C. Griswold, J. F. Murphy. Dress supporter, R. F. Montgomery. Dress supporter, R. F. Montgomery.	702, 682 702, 682 702, 682 702, 683 702, 683 702, 889 702, 889 702, 887 702, 702, 702, 702 702, 702 702, 702 702, 678 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 687 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 686 702, 702 702, 687 702, 702 702, 686 702, 702 702, 686 702, 702 702, 702 702, 703 702, 703 702, 703 702, 703 702, 703 702, 703 702, 703 702, 703	facture of seamless, W. Wilson Hub, vehicle, J. E. Foley. Hydraulic juck, W. K. Stansbury Hydraulic juck, W. K. Stansbury Hydrocarbon burner, A. Mende Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon burner, retort, Duncan & Wafer Hydrocarbon lighting system, F. A. & R. D. Cody Hydrocarbon vapor burner, L. G. Heist Hydrogen chlorid and sodium sulfate, making, T. Meyer lee making apparatus, automatic skimming regulator for, A. O. Frick Hluminator, W. Harvey Indigo, purifying raw, B. Homolka Insulators and manufacturing same, F. M. Locke Internal combustion engine, J. F. Hobart. Jar closure, F. E. Dophelde Journal box, G. A. Woodman Journal box lid, G. A. Woodman Journal box lid, G. A. Woodman Lamp, carriage, E. M. Rosenbluth Lamp circuit and cut out, electric arc, M. H. Baker Lamp, inclosed arc, W. L. Cheney et al Lamp reflector shade, electric arc, W. E. Goldsborough Lawn sprinkler, H. H. Gray Leather surface, finishing, C. H. Miller Leather surface, finishing, C. H. Miller Leather surface, finishing mechanism, G. F. Hutchins Loom finishing replenishing mechanism, G. F. Hutchins Loom for weaving bordered fabrics, Cumnock & Warren Looms shuttle, N. Caisse Loom warp stop motion, H. J. Jarry Looms, J. M. Reasoner Mail kiln, T. Haynes, Jr. Mangle, W. E. Andree Massage machine, Pfanschmidt & Siefert Match machines, power transmitting device for, T. W. Synnott. Measure, oil, G. E. Bernard Metals from ores, recovering, Neill & Bur- Metals from ores, recovering, Neill & Bur-	702,843 702,548 702,549 702,501 702,406 702,553 702,877 702,661 702,6640 702,430 702,412 702,462 702,490 702,490 702,901 702,574 702,574 702,575 702,392 702,495 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,791 702,792 702,893 702,693 702,693 702,693 702,693 702,693	

| Tour | Lyle
Electrical machine collector ring, R. Siegfried
Fried
F Glass cutter, circular, D. B. Johnson.
Glass glazing apparatus, Coleman & Runyon
Glass to molds, mechanism for feeding, T.
Coleman, Jr.
Gold separator, C. W. Gardner...
Golf practice apparatus, A. R. Smith.
Grain spout, B. Kienholz
Grate bar, H. E. Parson.
Grate bar, H. E. Parson.
Grate bar, H. Truesdell.
Grate for automatic stoking, inclined, H.
H. Campbell
Grinding machine, W. H. Fetters...
Grinding machine, W. H. Fetters...
Grinding machine, drill, C. Ridderhof.
Grinding mill, ball, M. P. Abbe...
Gun, water, C. H. Radelliffe.
Hand guard and wrist supporter, G. L.
Pierce
Harrow, W. Powers
Harvester, bean, J. H. Stanton
Hasp fastener, A. Voight
Hat brim trimmer, Griffeth & Morehouse.
Hay on wagons, device for binding, J. H.
Winterowd
Heating furnace, W. Gorman
Hinge, F. Dyer
Hoop nailing apparatus brake, H. Votsch...
Hosting apparatus brake, H. Votsch...
Horses' feet, anti-slipping pad for, T. F.
Hayes
Hose adapted for couplings, etc., flexible,
M. Montgomery Hayes reet, anti-slipping pad for, T. F. Hayes dapited for couplings, etc., flexible, M. Montgomery 702,738
Hosiery with lacework stripes, manufacture of seamless, W. Wilson 702,843
Hub, vehicle, J. E. Foley 702,548
Hydraulic juck, W. K. Stansbury 702,541
Hydrocarbon burner, A. Mende 702,449
Hydrocarbon burner, retort, Duncan & Wafer 702,638 Wafer Hydrocarbon lighting system, F. A. & R. Hydrocarbon lighting system, F. A. & R.
D. Cody
D. Co man
Ladder, step, Man & Paesel....
Lamp, carriage, E. M. Rosenbluth.
Lamp circuit and cut out, electric arc,
M. H. Baker





FRICTION DISK DRILL FOR LIGHT WORK. Has These Great Advantages:

The speed can be instantly changed from 0 to 1600 without stopping or shifting belts. Power applied can be graduated to drive, with equal safety, the smallest or largest drills within its range—a wonderful economy it time and great saving in drill breakage.

W. F. & JNO. BARNES CO., Established 1872. 1999 Ruby Street, - Rockford, III.



THE FRANKLIN DYNAMO 50 Watts, 10 Volts, 5 Amperes

3.000 to 4.000 revolutions. Sets of materials, finished parts, complete machines. For amateur construction - very efficient. Will drive a dental engine, sewing machine or small latie; run as a generator, will furnish current for six 6-candle lamps. Parts, \$3.50, \$6.00, \$8.50. Complete, \$12.50. Write for circular 3. Model Shop

Will samps. Parts, 10.00, plete, \$12.50. Write for circular 5.

Parsell & Weed. 129-131 W. 31st St., N.Y.

There are many unique features in our Hand and Power Pipe Threading and Cutting Machine It has our Standard Adjusted to 702,601 It has our standard Adjustable Quick 702, 82 Opening and Closins Die Head with 702,517 Convenient. cam' movement. Five 702,776 Chasers, set by graduation to any size 702,705 pipe beine cut and closed instantly 702,023 pipe beine cut and closed instantly 810 positively. Send for Catalegue.

THE MERRELL MANUFAC-TURING CO., 501 Curtiss St., Toledo, Ohio





GAS ENGINE DETAILS.-A VALUAble and fully illustrated article on this subject is contained in SUPPLEMENT No. 1292. Price 10 cents. For sale by Munn & Co. and all newsdealers.

The "Wolverine" Three Cylinder Gasoline Marine Engine.

The only reversing and self-starting gasoline engine on the market. Lightest engine for the power built. Practically no vibration. Absolutely safe. Single, double and triple marine and stationary motors from \$\frac{1}{2}\times 0 M. P. triple marine and stationary motors from % to 30 H. P. WOLVERINE MOTOR WORKS, Grand Rapids, Mich.

YAN NORMAN **Universal Bench Lathes**



havea full line of the most improved attachments for Screw Cutting, Milling, Grinding, Etc.

THE

WALTHAM WATCH TOOL COMPANY, Springfield, Mass.





B. F. BARNES COMPANY, Rockford III. THE NEW BRISTOL COUNTER

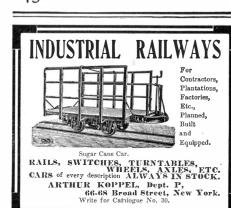


Registers an accurate account of work done on print-ing presses, grain tallies, weighing, measuring and other automatic machines. Counts up to 1,000 000 and repeats automatically. Simple, accurate, durable. Spe-cial counters to order. 187 Send for circular. cial counters to order. Fraction. C. J. ROOT, Bristol, Conn., U. S. A.



rower Hilling and rolding machine, F. A. Rollisson and wrapping machine, F. A. 702,591
Power for car axles, means for transmitting, E. H. Johnson. 702,685
Prillard and embossing press, plate, W. 702,591
Printing press, A. E. Dowell. 702,691
Printing press, A. E. Dowell. 702,695
Pully asshing apparatus, A. Hilizke. 702,695
Pully and baller, sand, W. E. Johnston. 702,499
Pump and baller, sand, W. E. Johnston. 702,499
Pump and baller, sand, W. E. Johnston. 702,499
Pump and baller, sand, W. S. Sharpneck, respectively. 702,491
Pump apparatus, J. W. Simmons. 702,492
Pump apparatus, J. W. Simmons. 702,492
Puzzle, G. F. Bardene. 702,573
Rall, compound truss, E. T. Morian. 702,573
Rall, compound truss, E. T. Morian. 702,493
Rall joint, C. D. Jones. 702,493
Ralliway, electric, J. C. Henry. 702,493
Ralliway, electric, J. C. Henry. 702,593
Ralliway, electric, J. C. Henry. 702,593
Ralliway replacing frog. A. Pursley. 702,593
Ralliway replacing frog. A. Pursley. 702,594
Rallway switch, W. G. R. Rolliway witch, W. G. R. Rolliway witch, W. L. R. Rallway and the metal of the sand and the s

(Continued on page 456)



MINERAL



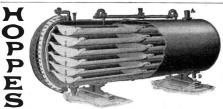
For Students, Experts and Collectors. Single specimens, all prices. Standard Collec-tions in cabinets, \$1 to \$1,800. Scientific and accurate label-ing. Illustrated catalog free. Crystals and ores purchased.

FOOTE
MINERAL CO, Dept. A
1317 Arch St., Philadelphia
Estab. 1876. Piila, and Paris.

New Microscope for Nature Study and for use in the Examination of Ores, Metals, Wools, Fibre, etc.

Queen Acme No. 61 in, objective giving power of about 100 diameters, 1 set of 12 prepared slides of insect parts and other interesting specimens, all in case, \$16.00 ask your nearest Optician for it.

OUEEN & CO., INC.
Optical and Scientific Instrument Works.
1010 Chestnut St., Phila. Pa.
39 Fifth Ave., New York.



Live Steam Feed-Water PURIFIERS are guaranteed to keep boilers

Purifier, Heater and Separator Catalogue Free.

HOPPES MFG. Co., 25 Larch St., Springfield, Ohio.



ARTESIAN

Wells, Oil and Gas Wells drilled by contract to any depth from 50 to 3000 feet. We also manufacture and furnish everything required to d.ill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 1200 feet. Write us stating exactly what is lequired and send for illustrated catalogue. Address PIERCE WELL ENGINEERING AND SUPPLY CO. 136 LIBERTY STREET, NEW YOUK, U. S. A.

MATCH FACTORY.—DESCRIPTION of an English factory. SCIENTIFIC AMERICAN SUP-PLEMENT 1113. Price 10 cents. For sale by Munn & Co. and all newsdealers.

THE MIETZ & WEISS KEROSENE



and GAS ENGINE
burns KEROSENE cheaper and
safer than gasolme. Automatic,
simple, reliable. No electric hattery or flame used. Perfect regulation. Belted or directly coupled to
dynamo for electric lighting, charging storage batteries, pumping and
all power purposes.

128-138 MORT ST., NEW YORK.
ADDEPTED RY

ADOPTED BY
U. S. GOVERNMENT. U. S. GOVERNMENT.
Highest Award for direct
coupled Generator Set, Paris ExposiGold Medal, Pan-American Exposition, 1901

GASOLINE ENGINES are remarkable for SIMPLICITY and ECONOMY
write for Prices.
Olds Motor Works,
1328 Jeff. Ave..
Detroit, - Mich.

ACETYLENE GAS AND CARBIDE OF ACETYLEINE GAS AND CARBIDE OF Calcium.—All about the new illuminant, its qualities, chemistry, pressure of liquefaction, its probable future, experiments performed with it. A most valuable series of articles, giving in complete form the particulars of this subject. Details of furnaces for making the carbide gas generators, gasometers, burners, etc. Contained in SCIENTIFIC AMERICAN SUPPLEMENT Nos. 998, 1004, 1007, 1012, 1014, 1015, 1016, 1022, 1035, 1038, 1057, 1064, 1071, 1072, 1082, 1083, 1084, 1085, 1086, 1104, 1124, 1132, 1149,1150, 1203, 1204, 1206 and 1209. Price 10 cents each, by mail, from this office, and all newsdealers.



(OPEN OR CABIN)

Marine Gasolene Engines



Row Boats and dealer in Boat Fittings.
I have on hand boats built and ready for delivery, guaranteed in every way to give perfect satisfaction. If you would have the best of boat construction at reasonable prices write or call on.

AUGUST J. FRITZ, 180 Main St., West.

Surgical forceps, L. M. Pignolet. 702,432
Surgical instrument, L. R. Kratzunueller. 702,443
Surgical instrument, L. R. Kratzunueller. 702,443
Surgical instrument, L. R. Kratzunueller. 702,443
Surgical instrument, electro, R. H. Wappeler. 702,503
Suspenders, E. G. Mellem. 702,902
Switch throwing device, automatic, J. N. Quinn 702,745
Tanning, preparing skins for, W. L. Albee 702,861
Tape reel, W. Keuffel. 702,433
Telegraphy, electric, S. G. Brown. 702,622
Telephone stations, sound strengthening appliance for, F. Oprendek. 702,637
Thread dressing machine, G. A. Fredenburgh 702,669
Tire and the sing machine, G. A. Fredenburgh 702,669
Tire, vehicle, W. S. Huffman 702,432
Tire, vehicle, W. S. Huffman 702,432
Tire, vehicle, W. S. Huffman 702,432
Tosting bread, etc., gas range utensil for, I. M. Scherer 702,671
Top roll saddle, J. Bilsborough 702,618
Toy, W. P. Lyle. 702,861
Toy, mechanical, O. C. Wiesner 702,555
Trace fastener, T. A. Bakken 702,555
Trace fastener, T. A. Bakken 702,555
Track fastener, T. A. Bakken 702,555
Track fastener, T. A. Bakken 702,555
Tubing, etc., apparatus for rotating, S. W. Titus 702,564
Truck, ilifting, B. Colseth 702,461
Type distributing apparatus, J. Breakey 702,621
Type distributing machine, J. Hinklein 702,555
Type distributing machine, McClintock 702,459
Type distributing machine, McClintock 702,459
Type distributing machine, McClintock 702,459
Type writer escapement mechanism, F. McClintock 702,459
Type writing machine, G. W. Coffman 702,766
Type writing machine, G. W. Coffman 702,563
Type writing machine, G. W. Coffman 702,766
Type writing machine, G. W. Coffman 702,766
Type writing machine, G. W. Coffman 702,766
Type writing machine, G. W. Coffman 702,767
Type writing machine, G. W. Coffman 702,766
Type writing machine, G. W. Coffman 702,767
Type writing machine, G. W. Coffman 702,766
Type writing machine, G. W. Coffman 702,767
Type writing machine, G. W. Coffman 702,766
Type writing machine, G. W. Coffman 702,766
Type writing machine inking device, P. F. McClintock 702,461
Type w

DESIGNS.

 Buckle, belt, L. B. Prahar
 35,957

 Cabinet, dressing, J. C. Taylor
 35,956

 Casket trimming, E. R. Sargent
 35,959

 Cushion cover, portrait, E. Solomon
 35,958

 Die or similar article, H. D. Call
 35,952

 Fabric, woven, J. W. Landenberger
 35,953

 Receptacle, E. Goetze
 35,953

 Stove, W. V. Robinson
 35,954

 Stove or range, cooking, F. J. Frey
 35,955

TRADE MARKS.

& Bro. 38,475

Harmonicas, mouth, Firm of M. Hohner, 38,456 to 38,460

Heating apparatus and thermal appliances, certain named, Nash Regulating Valve Co. 38,494

Match safes, C. C. Pitts. 38,461

Meal and flour of corn, wheat oats, and other cereals, Andersen & Darrow. 38,497

Medicinal herb compound, W. H. Eldred. 38,466

Medicinal preparations, certain named, Chelf Chemical Co. 38,467

Medicinal preparations for the cure of certain named diseases, Dr. Foote Chemical Co. 38,471

(Continued on page 459)

"Sure Signal" AIR PUMP WHISTLE

An independent, ever-ready Whistle for boats and launches operated by other than steam power. No air tank, ne fuss or bother; simply pull the handle and produce a clear musical tone reaching a half mile. Not a toy, but a practical, powerful, perfectly made Chime Whistle. Brass or nickel. 30 in. high. An ornament to any boat. Not expensive. Send for Price List. BOWEN MFG. CO., South Street, Auburn, N. Y.



Apple Economical Gas Engine Igniters.

Are positively the best built for Stationary, Automobile and Marine Gus Engines, either touch or jump spark system. We are the leaders in the manufacture of lignifing Dynamos, Alagnetos, Governors, Colis, Plugs, etc. Write for printed matter. The Dayton XX of So State St. Clair St., Dayton, Ohio, U. S. A.



The Conrad Motor Carriage Company, 1417 Niagara St. BUFFALO, N. Y

75 Miles & Return--5th qts. Gasoline That is the record of the **KENSINGTON** in a trip from Paris to Maulau and back. Best in build and cer-

anny the most economical in fuel. Made on the latest French Darracq Model, artillery wheels with 3½ in. tires, speed from 2½ to 35 miles an hour, as you choose. 3½ qts. of Gasoline will carry you 150 miles. A safe, speedy and elegant vehicle. We are also bulders elec Kensington Automobil

elegant vehicle. We are also builders of moderate priced steam and electric vehicles. Kensington Automobile Mfg. Co., - - Buffalo, N.Y.



 $oldsymbol{B}$ icycles $oldsymbol{B}$ elow $oldsymbol{G}$ ost 000 Bicycles, overstock. For 30 days have will sacrifice at less than actual factory New 1902 Models.



500 good 2nd-hand wheels \$3 to \$8.

Do not buy a bicycle until you have written for our free catalogues with large photographic engravings and full descriptions. MEAD CYCLE CO. Dept. 59W, Chicago.

For making joints in gas pipes, steam pipes, water pipes, compressed air pipes, and putting around gaskets and flanges, caps, headers, bolts and nuts, nothing excels

DIXON'S PIPE-JOINT COMPOUND.

Joints can be easily taken apart after years of use even when the pipes are rusted. Manufacturers, machinists, engineers, contractors and gas companies freely use and endorse it.

Booklet free.

JOSEPH DIXON CRUCIBLE CO. Jersey City, N. J.

4.4.4.4.4.4.4.4.4.4.4.4.4

D L HOLDEN REAL ESTATE TRUST BLOG PHILA, PA REGEALED ICE MACHINES

Have more practical features, fewer parts and require less attention in operation than any machine in their class.

C. L. BARKER, NORWALK, CONN.

GERE GASOLINE ENGINES CABINAMOPEN BOATS GEO.H.GERE YACH LAUNCH WKS GRAND RAPIDS MICHIGAN.

Howard Two and Four Cycle



MARINE **AUTOMOBILE MOTORS** Write for Cat. Grant Ferris Co. Troy, N. Y

TRUSGOTT BOAT

Simple, Safe, Reliable, Speedy.



Built either cabined or open in sizes from 16 to 100 feet in length. For catalog giving full information write

Truscott Boat Mfg. Co., ST. JOSEPH, MICE.



Each telephone its own Central, one Each telephone its own Central, one movement to call, nothing to turn back. Saves half your time without using unre-liable automatic attachments. Only one movable part, nothing to get out of order. The only Central Battery and Central Coil System in use. Especially desirable for business plants of five to twelve stations, radius of 1,000 feet. Efficiency guaranteed.

Office of SCIENTIFIC AMERICAN equipped.

SPENCER ELECTRICAL CO., 163 Greenwich St.,

10 PER CENT. TO 50 PER CENT. SAVED



Dept. 14E, N. Y. Camera Exchange, 114 Fulton St., N. Y.

30



The STANDARD blue print paper of the world—not the ordinary kind, but a perfect paper for photographic work, perfectly made and perfectly packed in sealed tubes. The delight of the professional and amateur PHOTOGKAPHERS, There is no better, it is the best. A postal card will bring full information of French Satin Jr. and our other photographic specialties.

THE J. C. MILLEN, M. D., 5 Denver, PHOTOGRAPHIC CHEMICAL CO., 5 Colo.

SIXTEENTH REVISED AND ENLARGED EDITION OF 1901.

The Scientific American Cyclopedia of Receipts, Notes and

Price, \$5.00 in Cloth. \$6.00 in Sheep. \$6.50 in Half Morocco. Post Free.

This work has been revised and enlarged,

900 NEW FORMULAS.

The work is so arranged as to be of use not only to the specialist, but to the general reader. It should have a place in every home and workshop. A circular containing full TABLE OF CONTENTS will be sent on application. Those who already have the Cyclopedia may obtain the

1901 APPENDIX

Price, bound in cloth, \$1.00, postpaid.

MUNN & CO., Publishers, 361 BROADWAY, NEW YORK CITY



ILLUSTRATIONS.	D D	Locomotive, hardware 20	Speed changing gear 243 Speed gear for pumps 120	Alcohol as motive power 55	son252
<u> </u>	"Decatur," launch of 254 Dinosaur, Jurassic, geat	Locomotive, oil-burning 220 Locomotive, powerful 35 Locomotive, wrecked 35 Locomotives, American .391, 396	Sprinkler, lawn	Alcohol motor, improvement 191	Books, text, Amer., abroad 201 Bore, tidal, picture of a 103
Accum ulators, automobile . 351 Actelyene gas explosions 203 Acid, carbonic, solid 303	Dough divider 270	Loop, N. Y. Central 58 Lord Kelvin 307	Stanhope, Grout 139 Station indicator 243 Stations of Langen railway 53 Steam carriage, White 136 Steam chest, locomotive 396	Alcohol motors, the	Bottle, journey of a
Air currents, study of 75	Drive-gate, auto 315	Mail van, automobile 104 Marconi, experiments of 4	Steam racer, Serpollet's 350 Steamships, Atlantic, growth of	Alloy, nickel steel	Braking tests, comparative 352
Air pump, automatic. 227 Airship, British 308 Airship 'Pax' 362 Airship, Santos-Dumont No. 77	Dust collector	Match how bievelo 490	Storooption light new 332	l Aluminium saw handles 279	Bridge at Zanesville*398 Bridge, Atbara River*184
Airship, Severo	Dynamo, ignition 202	Monitor, "Scorpion" 416 Motor, Balzer 140 Motor car 168	Street cleaner, sanitary 327 Street gas analyzer 93 St. Pierre, ruins of 427, 433 Sundew, the 431 Switch, automatic 202 Switch plug 227		the
Alcohol automóbile 37 Ambulannee, electric 225 Analyzer, gas 93 Antenna, Guavani 169	Electrometer, Lippmann's 400	Motor, gasoline, novel. 291 Motor, Knox 140 Motor, rotary, new. 27 Motor starter, Crest. 152	Switch, plug	Anthracite in China 353	Bridge, East River, caissons of*381 Bridge East River No. 3 234
Antenna, Guavani 169 Apiculture 416, 417 Armaturing machine 87 Ash sifter, dustless 328 "Asie," capsizing of 258	Engine, Duryea 147 Engine, rotary, new 27 Engine, steam, Lane 138 Engine, steam, oscillating 384	Motor, steam, Lane 138 Motor, steam, oscillating 384 Motor, steam, White 136	Telegraphy, wireless, apparat. 10	"Argonant," the, in court 94 Armature winding, feat in. 155 Armor plate for Russia 218 Armor plate tests 330	Bridge over the Tyne 394
Aspen tunnel	Engine, steam, White 136 Engines of Edison power sta. 199 Engines, hoisting412	Motor, wave and tide	Telegraphy, wireless, Marconi 4, 74, 169	1 *107. *188	Bridge, Redheugh, new 122 Bridge, stone, Petrasse River 52 Bridge tunnel, Penn. R *72 Bridge, Wheatstone, novel
Automobile cell, Gould 351 Automobile coupe	Erie Canal improvements 290 Etchograph, the	Missions, old Spanish 56	Telescope, new, Oxford 189 Tollwign Craddock	Ash sifter, new *328 ''Aste,'' capsizing of *258 Aspen tunnel *86 Asphalt case, the 210	Briquettes of garbage 257
Automobile, marine	F Falls, Shawenegan, power	Nail puller, Salo	Thill coupling, new	Atbara River Bridge	Bronze, tensile strength 254 Bug trap*209
Automobile, Overman 139 Automobile race, Nice 384 Automobile, racing, Baker. 419	plant 41, 42 Farm card, census 275 Feedbag, new 420 Fire alarm, automatic 60	O	Tire-repairing tool 59 Tires, automobile 150 Tonneau electric 225	Automobile clubs, English 2/4 Automobile coupe	Bureau and trunk*436 Burglar alarm, new*63 Burner, the Lane *138
Automobile seat, new	Fire alarm whistle	Oil can and pump 93 Oil fields, submarine 36 Oil wells submarine 26	Tonneau, gasoffie 142 Tool grinder, new 362 Tool receptacle, bicycle 420	234, 325, 385 Automobile endurance test 428 Automobile frame, flexible*225 Automobile fuel storage 187	Burner, gasoline, Welshach. *52 Burner, hydrocarbon *208 Butter industry of Australia. 167 Butter preservation 239
Aviators	Fly, feeding, on honey dew 241 Flying machine, Villard 173 Forum, Roman, discoveries 297	Omnibus, gasoline 142 Orange peeler 209 Ordnance, heavy 258 Ore conveyor, progressive. 378	Tractor in lumbering	Automobile house, portable. 145 Automobile in Porto Rico. 293 Automobile industry, 1901. 2 Automobile launch*143	Buttes, formation of*349
Barges, tractor, canal	Fountain of Juturna 297 Freight, handling, New York 418 Friction clutch, Phillips' 291	Oven, bread, new	Transway, bridge, electric 172 Transformer, continuous-al- ternating current 452 Transmission, speed 273	l Automobilo moil wan *104	Canal, Erie, improvements*290 Cables, submarine, mfr*87 Cable, submarine, new155
Battery, international 351 Battery plates 351 Battleship "Gaulois" 378 Battleship "Mikasa" 326 Battleship "Missouri,"	Friction clutch pulley 385 Furnace, blast, modern165, 172	Paddle wheel, Horton 71	Triangle, computing 202 Triceratops, model of 43 Trench diggers 434, 435 Tree growth, curious 368	Automobile, marine	Canai Doat, tractor
Bicycle attachments 420	Gages, tide	Palace, glass, Drury Lane Lane Theater 233 Pampas grass 400 Passengers, unloading 6 "Pax," airship 362	Tree stand	Automobile passenger service 137 Automobile principle, applic. 135 Automobile race, Nice. 350, *384 Automobile racing	Canal. Darien. route 118
Bicycle on runners 145 Bicycle, walking 369 Block, spring, new 208 Boller, locomotive 251 Boller, locomotive, Regan 243	Gate, drive, new	Pelicans 261	Tunnels, bridges, construct-	Automobile, racing, Baker. *419 Automobile, rise and growth. 134 Automobile seat, reversible. *152 Automobile show, Chicago 134	Canal, Isthmian 34
Boiler, locomotive, Regan 243 Boat, fishing, motor 452 Boat on wheels, a 276 Boat, submarine, Armorl 40	Gasoline motor, novel	Photography of fluids. 75 Photography by trains 272 Photography, headlight 120	Turbine and dynamo, steam 52 Turbine, Rateau348, 349 Turbines, 8,000 horse power. 41 Typewriter book436	Automobile shows, Amer 271 Automobile sled*145 Automobile speed bill. Cocks 257	Canal. Nivernais. barges*394
Book typewriter 436 Bees, construction by 241 Bee culture 416, 417 Braiding mechine 87	Gear, speed changing	Penstocks, large 41 Phonograph recorder 93 Photography of fluids 75 Photography by trains 272 Photography, headlight 120 Photography, headlight 120 Photography, headlight 120 Photography, 111 Pile driver, electric 331 Pistol, sword 221 Plants refley action 421	Typewriter, Hanson-Lee 279 Typewriter, Simplex 255	Automobile speed measurer. 187 Automobile, stables	Canal, Sault Ste. Marie 429 Canal scheme, Austria's 295 Canals, German 223
Breadmaking, mechanical 1	Glassware, manufact. process 323 Gnats and midgets in winter 295	Planter, a handy 420 Plow, hilling up 208	Valve for pumps 397	Automobile tire, new135, 187 Automobile tires*150 Automobile, three-wheel*226 Automobile towning outfit	
Bridge, East River, caisson. 375 Bridge, railway, moving a 412	Grass, pampas	Plow, snow	Venus' flytrap 431	Automobile, world touring 381	Car, New Haven, wrecked 50 Car shortage, our 110 Car, tipple, mine railway *27
Bridge, Redheugh	Gulls, tame 333 Gun shops at Essen. 296 Gun-sight, telescopic 209 Guns, cast iron, breaking 295 Gutta percha press. 87	way Press, hydraulic, 5,000 ton 277 Press, printing, electric 409 Printing, electricity in 409	W Wagon, steam, Stearns 137	Automobiles in the army 6 Automobiles, military test	Car, touring "Peerless"*142 Carbureter, alcohol*37
Bug trap, a 209 Bureau and trunk 436 Burglar alarm, automatic 60 Burner, gasoline, Welsbach 52	н	Projector, photographic184 Pulley, friction clutch385 Pump, air, automatic227	War car, Simms	Automobiles, wear of roads by	Cars, mail, automobile*104 Cars, mail, fireproof376
Butter, formation of 349	Harrow, Schaffer 37	Pump, mixing 432 Pump valve 397 Pumps, speed gear for 120	Wave motor, Santa Cruz 8	Axle bearing, automobile*152 B	Cars, self-dumping*399 Cars, street sanitary condit 306
Butterine, wrapping 450 C	Heater, a new	Punch, population card 269 Python, feeding a 57 R	West Indies, disaster in 359 Whirl, cycle	Babylon, ancient	Carriage, gasoline, Duryea*147 Carriage, gasoline, Knox*140
Cables, 'submarine, mfr	Horn growth, curious 105	Race, Nice-Turbie	Whistle, fire alarm 10	Baggage handling, Paris 205 Baldwin relief party 433 Baldwin, searching for 332 Balloon, dirigible, new 167	Carriage, Steam, Lane*138
Canal, Erie, improvements 290 Canal excavator for Java 294			Yacht "Vixen"	Balloon outfit, Sultan's 86 Balloon "Pax," end of 395 Balloon projects for the Sa-	Catamaran, cycle-driven*145 Cats, accidents caused by 106
Car, mail, automobile 104	Hut, Fiji	287, 341	Z Zuni, ancient city of 313	Balloon, Santos-Dumont 88 Balloon, Zeppelin's, end of 19 Banks of New York city 414	Celluloid phonograph records 191 Cement, Portland, domestic 122 Census machine*275
Car, motor 168 Car, polyphase 91 Car, repair 311 Car, 'saddle'' 6	Ignition dynamo 202	Railway, elevated, power station	PETGODE T A NY	hara 256 Balloon, Santos-Dumont 88 Balloon, Zeppelin's, end of 19 Banks of New York city 414 Barges, tractor *394 Barlum, preparation 76 "Barry" launching of 297 Basket machinery *185 Batelon horse *191	Central Park, maintenance, cost
Car, tipple 27 Car, touring, Packard 146 Car, touring, Peerless 142 Car, war, Simm's 350 Cars, jack to lift 70 Cars, self-dumping 399 Carbureter, alcohol 37 Carbureter, Packard 146	Indicator, horse power. 60 Indicators, tide 259 Indicators, railway station. 243 Insect, geometrician, an. 278	Railway station indicator. 243 Railway, suspended, Langen, 49, 53, 54 Railways, underground 305		Bataclan, horse	Chamonix electric line 204 Charleston Exposition 54 Chemistry school of Berlin 261 Chicago clearing yard *70
Cars, jack to lift	Insects in winter	Ramblersville 345 Redheugh bridge 117 Reflector, two-foot, a 109	refer to illustrated articles.	Battacian, photo., new 20 Battery, the storage 148 Batteries, storage, charging 202 Battleship "Gaulois" 378 Battleship "Mikasa" 226 Battleship "Missouri," launch 20	Claims, construing 61 Clamp, carpenters' *242 Claw-bar, adjustable *315 Clinker, furnace, utilizing 292
Card puncher, Hollerith 269 Carriage, Duryea 147 Carriage, ether-motor 9 Carriage, steam 136	Jack, lifting, for cars 10	Revolver and dark lantern. 315 Rice threshing in Texas. 236 Road making, mechanical. 24 Road scraper. 24 Rock pillar at Acoma. 349	Abydos, operations at 85	Bee culture*416 Bell, submerged, signaling belleisle," defence ship 190 Belt mounters, competition 432	Club, Indian, illuminated*369 Clutch, friction, Phillips*291
Carriage, steam, Lane 138 Carriage, the Knox 140	Kava, drinking, Fiji	"Rollo," launch 143	Acetylene, carbureted*368	Bergama, archaeolog. finds at 223	Coal or oil early sugges-
Catamarin, Fiji	King, Clarence 19	Sampson, Admiral 343	Acetylene gas explosions*203 Acetylene gas, increasing use of	Bicycle, a snow	Columns of Hall of Records. *395 Comet, Brooks', of 1902 414 Coal-loading machine *105
Census taking, mechanical 269	L Lard pails, filling 450 Lamp, electric, Armorl 40	Sand drifting, Cape Cod 127	berries 154	Bicycle novelties 332 Bicycle whirl *144 Bicycles, gear changes for 243 Bicycling problem 364 Bird mummles at Lyons 111	tion 72
Claw bar, adjustable	Lamp hanger, new 93	Searchlight, electric 272 Shale column of 349	Aeronautics, experiments in.*125 Aeronautics in 1901	Bird tragedy, a	Coin detector, electric 2339
Coal loading machine	Lamp, Nernst 25 Lamp, night, simple 105 Langen suspended railway 49, 53, 54 Lantern, dark 315 Lantern slide clamp 174	Shell practice, city armory,	Aerostatics, motors in 200	Block, spring, he will block, circulation of the 22	Collision, rear-end*453
Computing triangle 202 Conveyor, ore, progressive 378 Cop, V-wound, a 220 Copper refining, electrolytic 181 Coral strand, Fiji 443	Lathe attachment	Shovel, muck	Air, compressed, in glass mfr*329	Boat, submarine, new40, 410	Consequentian bognital glagg 110
Counling shaft Davis 279	Levuka, Fiji Islands 443 Level and plumb 174 Lever device Smyth's 38	Silk, reeling	Air. permeability of 328	Boats, motor, exhibition of. 278	Conveyor, ore, progressive*378 Cooling machine, new 435
Crab, the largest	Light, stereopticon, new 332 Lighting above and under water 239 Lions, sea. tame 332	Skate, ice, spring 269 Sled, automobile 145 Sled motor 227 Smoke deposits 320	Airship, and aeroplane306 Airship, English, new*308 Airship, new, Santos-Dumont 103 Airship races, St. Louis329	Boiler, explosions in England 171 Boiler, locomotive*243 Boiler, locomo., oil-burning*220 Boiler, locomo., water tube,	Copper, electrolytic refining.*187 Copper, extraction, Hoepfner proc
Crane, traveling, electric 435 Crusher, ore 453 Curie experiment 328 Cycle whir!	Locks, canal, at Cohoes 290 Locks, chalar 281 Locks, canal, at Cohoes 290 Locomotive boller 281	Snow plow	Air, vitiated, purifying 280 Airship and aeroplane 306 Airship, English, new *308 Airship, new, Santos-Dumont 103 Airship races, St. Louis 329 Airship, Severo *224 Airship, Severo, end of 355 Airship, Severo, trials of 346 Airship, Severo, wreck of 362 Airship, the 270	Roiler, steam, inspection 119 Boiler, water-tube, German. 106 Boiler, water tube, on loco-	Copper removed from mercury 171 Copyright infringement 210 Cordite, explosive qualities 257 Cork stopper, passing of 174
Cynips polycera 382	Locomotive boiler, Regan 243	Spectrum of water vapor 239	Airship, the 270	motives 242	Coupe, automobile*226

Cranberry industry*206 Crane, traveling, electric*435 Crematory for light refuse 328	"Gaulois," battleship *278 Gear changer, bicycle *243 Gear, speed, for pumps *120 Geological Society of Amer 51 Generator, ether vapor *9 Generator, pyromagnetic 219	Lightning, ball, at sea 36 Lightning conductors 239 Lightning above and under	Panama Canal bill, Senate. 444 Panama Canal treaty 306 Panama route the	Runabout, Ajax	Central *58 Test paper, new 154 Theater *cience in *238
Cruiser "Spartiate" 186 Crusher, ore 453 Custaceans, monster 353 Cunard liners, new 182 Curie, experiments of 328 Current transformer, simple 209 Currents, alternating, fre-	Generator, steam, White. 136 Genoa electric incline. 326 Germany, export trade of. 102 Glass decoration, simple method	water 2339 Lightning effects 414 Lignite, note on 328 Lime, how to slake 27 Linen, to soften 27 Liner, Atlantic, value of 364 Loop, underground, Central *58	Park Ave. Hotel life	S Safes, new designs in	Thill coupling, new. *93 Therius, bronze head of. *401 Tides, predicting the. *312 Tides, indicating the. *259 Timber, insect-proof. 204 Time-signals, electric 414 Tipple, car, mine railway. *27
quency 208 Currents, high voltage. 347 Currency, peculiar 296 Cyanide patents, New Zea- land 61 Cycle trade, employes. 19 Cycle whirl, the 144	Glassware, manufacture of *329	tube	Patent laws, British 314	Screen, expansible *60	Tire, automobile 187 Tire-repairing tool *59 Tire, automobile, new 293 Tire, solid, decision 190 Tire, pneumatic, new 135 Tire, the pneumo-cushion 135 Tires, automobile *150
Daguerreotype, the*262 Damages, personal injury 104 Darien tunnel canal route 118	Gramophone, home-made 204 Granite as an insulator 196 Grape-nut trade mark 61 Grass, Pampas, uses of 400 Gun, electro-magnetic, new 223 Gun sight, telescopic 209 Gun, the Gathmann 324	Locomotive industry, Austria 380 Locomotive, oil-burning *220 Locomotive, powerful *308 Locomotives, Amer. in India 89 Locomotives, electric, in towing 55	Patents, construction of	School, apparat., patent	Tool-grinding attachment*362 Torpedo boat destroyer84, 204 Torpedo boat flasco, the 102 Torpedo suit, Whitehead 94 Torpedo steering, Armorl system 40
"Decatur," launch of. *254 Detonator, dynamite 55 Diet, electric 59 Dinosaur, Jurassic, great *5 Divers, apparatus for 191 Dock at Avonmouth 415 Dock, dry, new, Algiers *169 Dock, floating, Bermuda *337	Gun trade, Birmingham. 89 Guns, breaking up of. *295 Guns, rapid-fire, heavy. 222 Guncotton, inexplosive 271 Gutta percha substitute. 59	Lord Kelvin	Periodicals at Brit. Museum. 255 Pelee, eruption, witness of . 392 Pelicans, notes on	Screws, twin, steering	Traction, electric, danger. 69 Traction, electric, England 296 Traction system, novel 6 Traction, three-phase, American 444 Tractor barges
Drills, centering, tool for 2242 Drive gate, automatic *315 Drydock, large 185 Drydock, new, Algiers *169 Dune grass for sand drifts *127 Dust collector, a *22 Dustfall in Europe . 1901 271	Hair brush, coin-in-clot	Maddox, Richard L	Petroleum substitute, new 364 Pets as pests 296 Pharmacists, liability of 210 Philippines, gov. contract in 411 Phonograph, Edison, new *93 Phonograph, improvements in 93 Phonograph records, celluloid 191	Severn bore, picture of	tions
Dustpan and sprinkler*60 Dynamite explosion, New York	Haze, autumn, cause of 201 Healthy decadence 234 Heater, a new *347 Heating cars, odd method 449 Heating, novel method 328 Heating system, hot water 174 Heavens in February 73	Mall van, automobile. 104 Malaria, prevention of 38 Mammoth, discovery of a 253 Mammoth, the frozen 329 Man trap, ingenious 460 Manacles, new buoy at 435 Manle bird's eye 415	right 175 Photographing by a headlight*120 Photography, future of *262 Photographs, prizes for 449 Photographs, the first 442 Photographs taken by train *272	Shield, safety, for markers. 393 Shipbuilding in England. 205 Ship, defense, "Belleisle". 190 Ship subsidy bill	Trade mark infringement.94, 210 Trade mark registry 190 Trade mark, transferability. 280 Trade route to Persia, new 50 Trades in Spanish missions *56 Train signaling, automatic 10 Train, the fastest 166
Education, scientific, Wurtemberg	Heavens in April	Marconi, latest feat of 186 Marine, mercantile, subsidized 166 Martinique, disaster in 346, *365 Masonry St Paul's Cath	Pipes, gas, freezing of398 Pistol, sword*242 Plant 70 000 h n 166	Signal, night, for trolley lines	ternating current
Egypt, archaeology of	Horse, jumping, Bataclan. *191 Horse power indicator *60 Horses, American, export. 451 Hose, a metallic *398 Hospital, glass, consumption 119 Houseboat, Lorillard *149 Houseboat "Rancocas" . *148 Hudson River tunnel, revival 118	Match-box, nandle bar 420 Match, lucifer, inventor 209 McClellan, Oscar, death of. 432 Measuring vessel *209 Merchant marine in 1901 2 Merchant marine subsidies 204	Plants for Botanical Garden. 223 Plants, odoriferous	Sled, motor, a *227 Smoke, consumer, novel . 42 Smoke deposits, London . *330 Snake, electrocuting a . 204 Snake-bite mortality . 412 Snow melted by steam . 186	Trees and forests of California
Electricity, uses, novel 92	Hydrant output, measuring. 94 Hydraulic plant at Vizzola. 262 Hydrocarbon burner, new*332 Hydrogen app., electrolytic. 107 Hydrogen, infu. upon iron 43	"Meter gystem, Kelvin on high temp. 323 "Motor III.," yacht "141 Meteorology, popular invasion 272 Meter, telephone 60 Meters, gas, inspection of 377 Metric system, Kelvin on 314 Metric system in U. S 343	Plow, snow, rotary	Soldiering Iron, new	Tripoli, desert, exploration. 154 Trolley, current, novel use. *330 Truck, rail, new
Engine, gasoline, advantages 144 Engine, marine, units	I	"Mikasa," battleship "326 Milk flour 59 Milk flour in Sweden 121 Minerals, valuable 393 Mines, iron, Michipicoten *22 "Missour!," launch of the *20 Monitors, British, early *416	Postage stamps, danger from 223 Portland cement, domestic. 122 Potential discharger patent. 421 Power from rivers		dent*221 Tunnel accident. New York. 50
Englines, high speed, testing. *327 Englines, kerosene, market for	Improvements, Marconi's 451 Indexing, chemical 411 India, letter from 257 "Indiana," launch of *254	Monster, fossil, constructing *43 Mont Pelee, eruption oi	Projection in photography*184 Pulley, friction clutch*385 Pump, air, automatic*227	Squirrels and telephone cables	Tunnel, Park Avenue 182 Tunnel railway, Mersey, electric
Engineering notes. 26, 55, 89, 106, 123, 154, 171, 205, 223, 242, 257, 292, 311, 328, 347, 364, 380 Engraving glass with sand. *270 Etching, simple method of. *121 Etchograph, the	Instinct, where it falls	Motor, alcohol, the	Pump valve, new	Steamship, British, centen- ary 295 Steamship combination, great 306 Steamship combination 392	Turbine plant, steam
Ether-vapor generator *9 Erie Canal improvements. *290 Excavator for Java, an *294 Expedition, Jesup, return of. 109 Expedition, polar, a new 103 Exhibition, Glasgow 19	Invention, change by assignee	Motor, gasoline, Balzer		Steamships, transatlantic, growth "309 Steel and Iron, German 380 Steel articles, hardening 27 Steel, Glebeler 208 Steel industry, vast 342 Steel paine, possibilities of 102	Turf for heating 332 Turin, archeolog., finds at 271 Typesetting, Chinese 203 Typewriter, book 436 Typewriter, Hanson-Lee 279 Typewriter, simplex *255
Explosives, safe	Inventions, profit in	Motor sled	R Race, automobile, Paris-Vi- enna	Steel plate exhauster *243 Steel rails, manufacture *346 Steering with twin screws 306 Streopticon light, new *332 Strawberries, the acid of 154 Street accidents in fogs 434 Street car fenders 94 Street cleaner sanitary *326	v
Falls, Shawenegan, power *42 Fan, electric, winter use 294 Farming, winter, expansion of	Inventions, some simple242 Inventor, qualities of242 Inventors, incomes of201	Motors, alcohol, tests of. 23	Radium rays, experiments on \$28 Radium rays, experiments on \$328 Rail, joint, improved	Street gas analyzer	Vegetable cutter, new
rauna, cave, Maiayan. 271 Feedbag, new	Iron, laurence of hydrogen. 45 Iron, large shipment of 106 Iron, manufact., Stassano 331 Iron mines, Michipicoten 22 Iron ore in Porto Rico 381	Mummies, bird, at Lyons 111	Railroad bridge, Tyne. 394 Railroad, Brooklyn, congeston 106 Railroad charter, first. 380 Railroad curves, speed on. 218 Railroad, Mt. Etna. 365 Railroad run, fastest 324 Railroad run, longest 433 Railroad, Southern Pacific. *256 Railroad speed device. 88	Cubmarine, Goubet's 100	Ventilation 167
Fire alarm whistle	Iroquois rite, ancient*401	Nail puller, mechanical. *6 Names, scientific, combining 244 Nature, study of. 394 Navigation Congress 432 Navigation, submarine 324 Navy, appropriation bill. 324 Navy bill, House. 392 Navy, development, future. 118		Switch, crossover, electric. 296	Volcanoes, active and extinct 393 Volcanoes and Isth. canal, 392, 397
Flames, musical 257 Fleet, British, reorganization 153 Fleets of the world	Journalism, yellow, sci. and. 203 Jugs, how made	Nicaragua Canal 34 Nicaragua Canal	Railroads of 1901 3 Railroads, Spain 364 Railroads, Unbular 392 Railroading, winter, Alaska *124 Railway accidents, prevention 155	Tagalog dictionary, a 235 Tantalum, preparation of 236 Target, electric, Chevallier *446 Target practice in navy 50 Teak timber industry 8 Telescone. Oxford. new *189	Volcanoes, eruptions of 414 Volcanoes, sun and moon 433 Voltmeters, Eldridge *227 "Vulcan," the 18 W Wagon, steam, the Stearns*137
Flywheels, power lost in 353 Flying machine, Villart *173 Fog lights in London 434 Fog signaling 205 Food experiments in children 223 Forestry in the Philippines 126 Forum, Roman, excavations. *297 Fossil monster, mounting *43	Kelvin, Lord, greeting to 310 Kelvin, Lord, Honors for 347 Keyboard, typewriter *453 King, Clarence *19 King Edward as automobil- ist 147	Novelties, patented, recent*420 Nefs, a collection of*126 Nelumbo structure of 277	Railway, electric, Chamonix. 204 Railway, electric, Italy 22 Railway, electric, Milan 127 Railway, electric, Switzer*413 Railway, elevated, pass. station	Telegraphy, wireless, and promoter	on
Frame, automob., flexible*225 Freight handling, New York*418 Friction clutch, Phillips*291 Friction clutch pulley*385 Fuel, liquid for steamships. 360 Fuel, liquid, long voyage with	"Kroonland," launch of 171 Krupp works at Essen*276 L Laboratory, physical, national 394 Lace machine, new 280	Officers, Amer, for Amer,	work 19 Railway, Grosslichterfelde *207 Railway, high-speed, German *91 Railway, Manchurian 42 Railway, monorail. Scotch 223	Telegraphy, inventions in 26 Telegraphy wireless Mar-	Water, artesian, Australia. 43 Water-level regulator
Fuel, oil, foreign use of	Lake, new, Switzerland	ships	Railway, monorail, Scotch 223 Railway, run, fast, New York-Chicago 444 Railway station indicator *243 Railway, suspended, Langen *53 Railway, underground, Paris, Railway workmen, wages 84	Telegraphy, wireless, new appliances	Wealthy, the, as inventors. 270 Weather Bureau, work of 234 Welding, electric*380 Welding, Goldschmidt, method
Gages, tide*259 Garbage consuming plant 124 Garbage, incineration of328 Garments, Siberian*368 Gas, acetylene, explosions*203 Gas, acetylene, increasing use	Lamp, night, electric, simple*105 Lamps, Nermst, pract. value. 85 Langen suspended railway. *53 Language, universal7, 22, 72 Lantern, dark and revolver. *315 Lantern slide clamp. *174 Lathe attachment *369 Launch, automobile . *143 Launches, gasoline, artillery. 274 Launching, broadside . *254 Lawn **inkler** 242 Lead **ing, Wisconsin. 201 Lead. removed from mercury 171 Lead. removed from mercury 171	Ore handling	Railway, underground, ventilation 256 Rain, artificial production 106 Railways, electr. or steam for 342 Railways, French, Abyssinia 252 Railways, tube, air in 76	Bureau 314 Telegraph, printing, Murray 76 Telegraphy, wireless, at sea 186 Telegraphy, wireless, rivalry 274 Telegraphy, wireless, work in 170 Telegraphy, wireless, Zug- spitz 89	West Indies, disaster in *365
Gas, changing use of. 110 Gas, coal mine, for Paris. 107 Gas meters, inspection of 377 Gas pipes, freezing of 399 Gas, street, history of 230 Gas whistle, fire alarm *70 Gasmobile. Stanhone *141	Launches, gasoline, artillery. 274 Launching, broadside *254 Lawn inkler 242 Lead ai. 'ng, Wisconsin 201 Leather as a filter 201 Lead, removed from mercury 171 Legal notes 61, 94, 175, 190 210 244 280 352 420	lytic 107 Okapi, protection of the 86 Omnibus, gasoline-electric *141 Omnibus service, motor, new 293 Oil can, pump *93 Oil drilling in California 123 Oil fuel, foreign use of 326 Oil wells drilling	Railways, underground, elec *311 Rangefinder, new 280 Rays, Roentgen, burn 342 Rays, X, substitute for 368 Redheugh Bridge, new *122 Reflector, Yerkes Observatory*109 Regulator, water-level *227 Rainworting gene of *220	Telephone, appar., new	Workmen, English, American, method
Gasoline automobiles*140 Gasoline burner, Welsbach*52 Gasoline carriage, Duryea*147 Gasoline motor, advantages	Lead, removed from mercury 171 Legal notes61, 94, 175, 19C, 210, 244, 280, 352, 420 Letter, garbled, used to deceive 94 Letters mailed, number English	Oil wells, Texas, subsidence, 363 Ozone for sterilizing water, 452 P Packing industry, Chicago*450 Paddle wheel, Horton *71	Reflector, Yerkes Observatory*109 Regulator, water-level *227 Re-invention, case of *220 Reservoit, Jerome Park 68 Retrospect of 1901 2 Revolver and dark lantern *315 Rivers, power from 54 Rochambeau statue 378 "Rollo," launch 143 Roman remains, discovery 436 Runabout, a light 187	Telephone meter	nacnt, turpine, steam
Gasoline vehicles, starting 135 Gate, drive, automatic*315	Light, search, in photog*184 Light, stereopticon, new*332	Paint, machinery, heat-detect 279	Roman remains, discovery 436 Runabout, a light 187	in *363 Temperature, subterranean 84	Zeppelin, ruin of

ELECTRICAL ENGINEERING; TAUGHT BY MAIL. Write for our Free Illustrated Book.

"CAN I BECOME AN ELECTRICAL ENGINEER?"

We task Planticular We teach Electrical Engineering, Electric Lighting, Electric Railways, Mechanical Engineering, Steam Engineering, Mechanical Drawing, at your home by mail Institute indorsed by Thos. A. Edison and others.

ELECTRICAL ENGINEER INSTITUTE, Dept. A, 240-242 W. 28d St. New York.

EARN MORE We teach you what you need to in your own business or another. Engineering, Prafting, Art, Architecture, Mining, Metallurgy, Business, Stenography, Journalism, Bookkeeping, etc.

Write for free catalogue 6, with full particulars.

F Special Discounts Now.

THE CONSOLIDATED SCHOOLS, 156 Fifth Ave., N. Y



BECOME AN ENGINEER

Imagine feeling a monster locomotive throb under your control! Wouldn't you like to be the man at the lever? You can be if you try. Through our correspondence courses thousands of young men are fitting for splendid positions. Steam, Mechanical, Electric Engineering. Heating, Ventilating, Plumbing, Mechanical Brawing. Our instructors are professors in the best technical schools in Boston. Write for prospectus and particulars about Free Scholarships.

AMERICAN SCHOOL OF CORRESPONDENCE Chartered by the Commonwealth of Massachusetts, BOSTON, MASS.

LEARN PROOFREADING. If you pos iucation, why not utilize it at a genteel and uncrowder of ession paying \$15 to \$35 weekly? Situations alway tainable. We are the original instructors by mail. HOME CORRESPONDENCE SCHOOL, Philadelphia.





Difficult Parts or Finished Articles UNION MFG, & SPECIALTY CO., UNION Mru, α STEUMET. CC., 506-508 Genesee Street, BUFFALO, N. Y.

The World's Playground

Colorado, Michigan, Canada, The Adirondacks,

St. Lawrence River, White Mountain's, or the

Sea Coast of New England

Best reached by the

Write for Rates and Folders.

Warren J. Lynch, W. P. Depp Gen'l Pass.&Tkt.Agt. Asst.Gen'l P.&T.A. CINCINNATI, OHIO.



Anyone sending a sketch and description may nuickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. Handbook on Patents sent free. Oldest agency for securing patents. Patents taken through Munn & Co. receive special notice, without charge, in the

Scientific American.

ndsomely illustrated weekly. Largest cir-on of any scientific journal. Terms, \$3 a four months, \$1. Sold by all newsdealers. MUNN & Co.361 Broadway, New York anch Office, 625 F St. Washington, D. C.

LABELS.

"Big 4 External inodyne Liniment," for medicine, J. C. Banta ... 9,234
"Brandine," for medicine, C. O. Rano ... 9,237
"Crescent Stock Food Co., Knoxville, Ill."
for stock food, Funk & Varner ... 9,243
"Dr. Price's Soda Quinine Laxative Powders," for medicine, S. C. Frice ... 9,235
"Effervescent Kidney Salts Tablets," for medicine, J. E. Kelly ... 9,236
"Hughes' Crescent Cottage Paints," for paints, A. M. Hughes Paint & Glass Co. 9,233
"Malt Vigor," for extract of malt, Siegel-Cooper Co. 9,239
"Miladi," for shoes, W. Richardson Co. 9,228
"Perfection Comforts," for comforts, W. H. 9,229
"Sportsman's Club," for whiskey, H. E. Ehrman ... 9,240

PRINTS.

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

given. Address saum Co., York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.



HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question. Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buvers wishing to purchase any article not adver-

his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying

addresses of houses manufacturing the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of

Minerals sent for examination should be distinctly marked or labeled

(8626) A. E. L. asks: With our 12 horse gasoline engine we frequently have power to spare. Would it be practicable to run a small dynamo for charging battery like the new Edison storage, to be used for mobile, lighting warehouse and furnishing spark for engine, and if so, what kind of outfit would be best adapted to our wants? A. It is quite practicable to use the excess of power from your gas engine in running a dynamo for lighting or charging storage battery or any other electrical work. We have no special dynamo to recommend. Any one giving the voltage and current suited to your battery will be all right. The company from which you buy the battery will put you in the way of getting a suitable

(8627) C. E. B. asks how to rewind the following 50-volt, 30-ampere incandescent dynamo so as to deliver 115 volts and 30 amperes. The armature is of the slotted drum type, 4 inches diameter, 5 inches long, and contains 20 slots, each slot containing eighteen No. 14 B. & S. double cotton-covered wires: speed of armature 1500 R. P. M. A. To double the voltage of your dynamo, you must double the number of coils on the armature, the number of turns remaining the same. The field coils should be rewound with twice the present number of turns, using wire of onehalf the size of the wire now upon them. By double the size is meant twice the sectional area. You can then increase the speed to about 1800 R. P. M. and bring the voltage up to 115 or thereabouts. We do not think you can then get 30 amperes at the higher voltage. This is about 2 1-3 times the present output: and if the field is now anywhere nearly saturated, it cannot be made to give so much more than it now gives.



Che Cypewriter Exchange



136 Barclay St., NEW YORK 124 La Salle St., CHICAGO 38 Bromfield St., BOSTON 817 Wyandoite St., KANSAS CITY, MO.



6he

Remington **Typewriter**

lasts longest-so does the Remington operator.

The Remington does not overwork the operator. The operator cannot overwork the Remington.

WYCKOFF, SEAMANS & BENEDICT (Remington Typewriter Company)

327 Broadway, New York

The New Sun Typewriter



A REVELATION. A Type-Bar Machine.

Highest Speed. Lightest Touch.
Visible Writing. Universal Keyboard.

Beautiful Work. PRICE, No. 2.—\$40. Beautiful wo THE SUN TYPEWRITER CO.

A NEW RESULT from the EDISON PHONOGRAPH Accomplished. Shomas a Edison

MR. EDISON'S LATEST INVENTIONS. THE Moulded Record & the New Reproducer

duplicate the human woke in volume and clearness. Absolutely free from scritching, perfectly smooth and natural. The Moulded Records are "high speed," made of hard wax, freely and safely handled, New Reproducers on all Phonographs. Ask your dealer for exchange proposition ("Gen" excepted), Phonographs in Nine Styles, \$10,00 to \$100,00. Records, 50c.; \$5 per dozen.

NATIONAL PHONOGRAPH COMPANY, Orange, N. J. New York, 83 Chambers St. Chicago, 144 Wabash Ave.

NIAGARA

FALLS

One of the natural wonders of the world. A charming place at any season of the year, reached from every direction by the

NEW YORK CENTRAL LINES

A visit to the Falls is an object lesson in geography; an exhibition of landscapes that no painter can equal, and a glimpse of the latest developments of the industrial world.

A copy of Four-Track Series No 9, "Two Days at Niagara Falls," will be sent free, postpaid, to any address on receipt of a two-cent postage stamp, by George H. Daniels, General Passen-ger Agent, New York Central & Hudson River Railroad, Grand Central Station, New York.

OIL--SMELTER--MINES

Dividend-Paying Mining, Oil and Smelter Stocks, Listed and Unlisted, our Specialty.

DOUGLAS, LACEY & CO.
Bankers & Brokers, Fiscal Agents,
Members N. Y. Consolidated Stock Exchange.

66 BROADWAY & 17 NEW ST., NEW YORK. Booklets giving our successful plan for realizing the large interest and profits of legitimate mining, oil and smelter investments, sub. blanks, full particulars, etc., sent free on application.

CONTROL OF FIRE.—VALUABLE PA-per on fire extinguishment. SCIENTIFIC AMERICAN SUPPLEMENT 1134. Price 10 cents. For sale by Munn & Co. and all newsdealers.

Risk a postal. Send us your name for prospectus of the Rayo Mining and Developing Co. of California. Every dollar invested in these shares will return you regular, handsome, dividends. MILLIONS of ore values ready to mine; Electric Water-Power Plant in connection. Not the ordinary mining proposition. Shares now selling at ground-floor price. Bank References. ROANOKE INVESTMENT CO. 525 Marquette Building. Chicag

Hutchinson, Goldsmith & Company, Exclusive Eastern Financial Agents, 53 State St., Boston, Mass.

PROPOSALS.

SEALED PROPOSALS WILL BE RECEIVED AT the office of the Light House Engineer, Tompkinswille, N. Y., until one Oclock P. M., June 27, 1902, and then opened, for the metal work and erection of Fort Wadsworth Light House, New York Harbor, N. Y. Information furnished on application to Wm. T. ROSSELL, Major, Corps of Engineers, U. S. A., Engineer, 3d Dist.

FREE Catalogue of Architectural, Scientific and Technical Books.
Prospectusfor 1902, for "Architects' and Bullders' Magazine," monthly \$2 a year.
Bullders' Magazine, "Magazine," wonthly \$2 a year.
Pub., 23 Warren St., New York.

MATCH Factory Machinery. W. E. WI LIAMS, Mfr., 217 South Clinton St., Chicago, U. S. A.

NEW YORK SHOPPING by a responsible and experienced lady. Send for circular. MRS. LORD, 41 West 24th Street, New York City.

MACHINES, Corliss Engines, Brewerk' and Bottlers' Machinery, THE VILTER MFG. CO., 899 Clinton Street, Milwaukee Wis.

MODELS & EXPERIMENTAL WORK.
Inventions developed. Special Machinery.
E. V. BAILLARD, Fox Bidg.. Franklin Square. New York.

MODELS OUNION MODEL WORKS

NOW READY.

ompressed

ITS PRODUCTION, USES AND APPLICATIONS.

By GARDNER D. HISCOX, M. E.

AUTHOR OF "MECHANICAL MOVEMENTS."

820 PAGES.

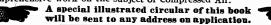
547 ILLUSTRATIONS.

PRICE, bound in Cloth, \$5.00.

Half Morocco, \$6.50.

A complete treatise on the subject of Compressed Air, comprising its physical and operative properties from a vacuum to its liquid form. Its thermodynamics, compression, transmission, expansion, and its uses for power purposes in mining and engineering work; pneumatic motors, shop tools, air blasts for cleaning and painting. The Sand Blast, air lifts, pumping of water, acids and oils; aeration and purification of water supply; railway propulsion, pneumatic tube transmission, refrigeration. The Air Brake, and numerous appliances in which compressed air is a most convenient and economical vehicle for work—with air tables of compression, expansion and physical properties.

A most comprehensive work on the subject of Compressed Air.





Publishers of the Scientific American,

LARGE 8VO.

361 Broadway, New York.



BEST IN THE LAND



Winton Touring Car-Tonneau Detachable. Price Complete, \$2,000. Wen the mile speed record (Class 1,000 to 2,000 pounds) in 1:17 3 5 the official hill climbing championship, and evolved a blue

The Winton Motor Carriage Co., Cleveland, O., U.S.A.

Automobile Gearing



BRECHT AUTOMOBILE CO., - ST. LOUIS, MO.

CHARTER ENGINE

ANY PLACE
BY ANY ONE
FOR ANY PURPOSE
Hoisters, Engines and Pumps.
FUEL—Gasoline, Gas, Distillate.
Send for Illustrated Catalogue and Testimonials, and State Your Power Needs.

CHARTER GAS ENGINE CO., Box 148, STERLING. ILL

\$750 HYDRO-CARBON. 20-Mile Speed.

20-mile Speed.
20 per cent. Grades.
100-Mile Gasoline Tank.
800-Mile Water Tank.
900 lbs. 6 H. P. Actual.
Write for Catalogue.

FRIEDMAN AUTOMOBILE CO., 8 E. Van Buren Street, Chicago, Ill.

If it isn't an Eastman, it isn't a Kodak



A new folding

for the pocket—almost for the vest pocket, at six dollars. Makes pictures 1% x 2½ inches, loads in daylight, has a fine meniscus lens, brilliant finder, automatic shutter-in fact, has the "Kodak quality" all the way through.

No. 0 Folding Pocket Kodak, for pictures 1% x 2½ inches, • • \$6.00 Transparent Film Cartridge, 12 exposures, 1% x 2½,
Do., 6 exposures, .25 .15

EASTMAN KODAK CO.

Catalogue free at the dealers or by mail.

Rochester, N. Y.

SEATS.

\$4,000.00 in prizes for Kodak and Brownie Pictures.

DICKERMAN'S DURABLE AMERICAN DESK & STOOL CO., 33 Howard St., just East of 424 B way.
New York City.



STEWARD'S WONDER

ACETYLENE BURNERS Sample 25c.in stamps Ask for catalogue C. STATE LINE MFG. CO., Chattanooga, Tenn., U. S. A. 107 Chambers St., New York.

COOD INCOMES MADE 25% to 30% Commission. BEST AND MOST 33C. 1-lb. trade-mark red bags. Good Coffees, 12c. and 15c. Good Teas, 30c. and 35c.

The Great American Tea Co. 31 & 33 Vesey St., New York. P. O. Box 289.

WANTED

"KEYLESS CLOCK,"

Just being introduced to the public. Clocks are self-winding and run a year without attention; no one will buy key wound clocks when they see and have an opportunity to buy the latest thing; full line of samples now ready; parties having \$500 and upward to invest and ability to manage can secure agency for cities not already taken; parties making arrangements now will have name appear in our advertisements. Address The United States Clock Co., executive offices, No. 405 Broome Street, New York.

These Cigars are manufactured under the most favorable climatic conditions and from the mildest blends of Havana tobacco. If we had to pay the imported cigar tax our brands would cost double the money. Send for booklet and particulars.

CORTEZ CIGAR CO., KEY WEST.

Orient Motor Cycle.



Fitted with the New Orient 3 H. P. Motor.

Speed over 40 Miles per hour.

The Most Powerful Motor Bicycle in the World. Write for Particulars.

WALTHAM MFG. CO., Waltham, Mass.



BRISTOL'S
RECORDING INSTRUMENTS.
Pressure Gauges, Vacuum Gauges, Voltmeters, Amperemeters, Wattmeters, and Ihermometers, make continuous records
Day and Night. Will pay for themselves.
Form instrument fully guaranteed and Every instrument fully guaranteed and sent on 30 days' trial. We send for Carculars and Specimen Chart.

The Bristol Company Waterbury Conn SILVER MEDAL PARIS EXPOSITION.

The most satisfactory cement Mill made."



purpose will produce 50,000 barrels of Portland cement a day, or over 15,000,000 barrels a year. No other mill approaches such a record, because no other mills begin to work as cheaply or as satisfactorily. Write for our illustrated descriptive catalogue.

BRADLEY PULVERIZER CO. BOSTON, NEW YORK, CHICAGO.

have a world-wide reputation gained by results as accurate timekeepers. We make all sizes and styles. We sell only complete watches. Catalogs sent on request.

THE NEW ENGLAND WATCH CO.

131 Wabash Ave., Chicago. 37 & 39 Maiden Lane New York Claus Spreckels Building, San Francisco.

GARDNER ACCURATE RAPID DATES TO SERVICE OF THE SERV

FREDERICK PEARCE

216 WILLIAM STREET

N. Y. CITY

Manufacturer of ELECTRICAL, MECHANICAL and SCIENTIFIC APPARATUS. Our factory is equipped with the best up-to-date machinery and tool We make a specialty of model work for inventors, wh have the benefit of assistance from our engineerin dept. Further information on application.

All varieties at lowest prices. Best Railroad Track and Wagon or Stock Scales made. Also 1000 useful articles, including Safes, Sewing Machines, Bicycles, Tools, etc. Save. CHICAGO SCALE CO., Chicago, Ill.

NEW YANKEE DRILL GRINDERS

Used in all Government Shops. Has no equal for simplicity. All adjustments done away with. After using two months one firm wrote, "It has already paid for itself." Send for catalog E showing 15 styles. WILMARTH & MORMAN CO. 158 Canal Street, - Grand Rapids, Mich.

RESTFUL SLEEP In Camp, on the Yacht and at Home. "Perfection" Air Mattresses CUSHIONS and PILLOWS.



Style 61. Camp Mattress with Pillow attached. Also showing Mattress deflated.

Clean and Odorless, will not absorb moisture. Can be packed in small space when not in use, Send for Illustrated Catalogue.

MECHANICAL FABRIC CO., PROVIDENCE, R. I.

FOOT-POWER LAUNCH with **ADJUSTABLE**

Sometimes when a man starts a Gasoline Launch he says something. Our Foot-Power Launches go without saying. We also manufacture Gasoline Launches, Canoes (Canadian Model), St. Lawrence Skiffs. We build to any model specified. The Launches we carry in stock are the most suitable for our boat motors.

DURAND MFG. CO., 219 South Avenue, Rochester, N. Y.



ELECTRIC Envelope Sealer Capacity, 150 per minute. Not only a time and labor saving device, but does its work accurately and neatly. Endors-



Thexton Electric Envelope Sealer Co.,







AMERICAN TUBULAR WHEEL CO. Dept. C. Pittsburg, Pa.