The Extent of the Universe.

Prof. Simon Newcomb has delivered an interesting address on the "Problems of Astronomy" at the dedication of the Flower Observatory, University of Pennsylvania. It is printed in full in Science. We take from it the following passage:

I have seldom felt a more delicious sense of repose than when crossing the ocean during the summer months I sought a place where I could lie alone on the deck, look up at the constellations, with Lyra near the zenith, and, while listening to the clank of the engine, try to calculate the hundreds of millions of years which would be required by our ship to reach the star α Lyræ, if she could continue her course in that direction without ever stopping. It is a striking example of how easily we may fail to realize our knowledge when I say that I have thought many a time how deliciously one might pass those hundred millions of years in a journey to the star α Lyræ, without its occurring to me that we are actually making that very journey at a speed compared with which the motion of the steamship is slow indeed. Through every year, every hour, every minute, of human history from the first appearance of man on the earth, from the era of the builders of the Pyramids, through the times of Cæsar and Hannibal, through the period of every event that history records, not merely our earth, but the sun and the whole solar system with it, have been speeding their way toward the star of which I speak on a journey of which we know neither the beginning nor the end. During every clock beat through which humanity has existed it has moved on this journey by an amount which we cannot specify more exactly than to say that it is probably between five and nine miles per second. We are at this moment thousands of miles nearer to α Lyræ than we were a few minutes ago when I began this discourse, and through every future moment for untold thousands of years to come the earth and all there is on it will be nearer to α Lyræ, or nearer to the place where that star now is, by hundreds of miles for every minute of time come and gone. When shall we get there? Probably in less than a million years, perhaps in half a million. We cannot tell exactly, but get there we must, if the laws of nature and the laws of motion continue as they are. To attain to the stars was the seemingly vain wish of the philosopher, but the whole human race is, in a certain sense, realizing this wish as rapidly as a speed of six or eight miles a second can bring it about.

I have called attention to this motion because it may in the not distant future afford the means of approximating to a solution of the problem already mentioned—that of the extent of the universe. Notwithstanding the success of astronomers during the present century in measuring the parallax of a number of stars, the most recent investigations show that there are very few, perhaps hardly more than a score of stars of which the parallax and therefore the distance has been determined with any approach to certainty. Many parallaxes, determined by observers about the middle of the century, have had to disappear before the powerful tests applied by measures with the heliometer; others have been greatly reduced and the distances of the stars increased in proportion. So far as measurement goes, we can only say of the distances of all the stars, except the few whose parallaxes have been determined, that they are immeasurable. The radius of the earth's orbit, a line more than 90,000,000 miles in length, not only vanishes from sight before we reach the distance of the great mass of stars, but becomes such a mere point that, when magnified by the powerful instruments of modern times, the most delicate appliances fail to make it measurable. Here the solar motion comes to our help. This motion, by which, as I have said, we are carried unceasingly through space, is made evident by a motion of most of the stars in the opposite direction, just as, passing through a country on a railway, we see the houses on the right and on the left being left behind us. It is clear enough that the apparent motion will be more rapid the nearer the object. We may, therefore, form some idea of the distance of the stars when we know the amount of the motion. It is found that in the great mass of stars of the sixth magnitude, the smallest visible to the naked eye, the motion is about three seconds per century. As a measure thus stated does not convey an accurate conception of magnitude to one not practiced in the subject, I would say that, in the heavens, to the ordinary eye, a pair of stars will appear single unless they are separated by a distance of 150 or 200 seconds. Let us then imagine ourselves looking at a star of the sixth magnitude, which is at rest while we are carried past it with the motion of six or eight miles per second which I have described. Mark its position in the heavens as we see it to-day; then let its position again be marked 5,000 years hence. A good eye will just be able to perceive that there are two stars marked instead of one. The two would be so close together that no distinct space between them could be perceived by unaided vision. It is due to the magnifying power of the telescope, enlarging such small apparent distances, that the motion has been determined in so small a period as the 150 years during which accurate observations of the stars have been made.

Lord Kelvin on Contact Electricity.

At the Royal Institution Lord Kelvin recently gave a most important lecture. He began by showing an experiment which conclusively proved Volta's theory that, when a zinc plate and a copper plate were put in contact, one became charged with positive electricity and the other with negative. Although he had shown this experiment fifty years ago at Glasgow University, says the Builder, yet an immense amount of ingenuity had been wasted recently in trying to explain away this phenomenon. He considered that Volta was absolutely right and made an appeal to physicists to study Volta's work seriously. A very interesting and novel experiment was shown. A plate of uranium was connected to one terminal of an electrometer, and was then touched by a plate of aluminum. It was seen by the deflection of the spot of light that the uranium plate became at first positively electrified; it then gradually lost its charge and became negatively electrified. Lord Kelvin could suggest no explanation of this very mysterious experiment. Another interesting topic touched upon was Becquerel's discovery of the radiation given off by uranium. This radiation is very feeble, but photographs of coins, etc. taken by its means were thrown on a screen. He stated that it had been conclusively proved that this radiation was not due to phosphorescence, or the slow radiation of light previously absorbed, and he could give no explanation of it. Lord Kelvin was slightly discursive, but he was listened to most eagerly, and his points were rapidly taken up by an appreciative audience.

Big Pension Roll.

The pension roll of the United States has almost reached the million mark. Commissioner Evans has just issued a statement showing that at the beginning of the fiscal year the pensioners numbered just 983,528, an increase of 12,850 for last year. During that year 50,101 new pensions were granted and 3,971 persons were restored to the rolls. Old age and disease, however, are working great inroads into the lists, for there were 31,960 deaths during the year. Other sources of loss were 1,074 from remarriage of widows, 1,845 orphans attained majority, 2,683 failures to claim pensions, and 3,560 losses from unrecorded causes.

RECENTLY PATENTED INVENTIONS.

Mechanical.

ROLLER MILL BELT FEED.—Evelyn E. Protheroe, Brodhead, Ky. According to this improvement the adjusting devices are at the outside of the machine, away from the rusting influence of the hot, moist air of the internal parts. The invention also provides a regulating gate to so control the stock that it will accumulate in proper quantities the full width of the belt at its delivery end, finally overcoming the resistance of the gate and dropping in an even sheet to the grinding rolls, there being no liability of the feed choking, and stock that may escape from the belt feed being automatically returned.

WELL PUMPING POWER.—George W. Grimes, Bluffton, Ind. This invention relates to devices to be placed at a central station to operate a series of surrounding pumps for oil or water wells, providing a power of large capacity for operating a great number of wells. A master shaft is supported vertically in a metal frame on a base sill, auxiliary shafts supported by the frame having gear connection with the master shaft, there being pump rod actuating devices on the master shaft and on the auxiliary shafts, and driving mechanism having connection with the master shaft. The actuating mechanism is firmly attached to the shaft to rotate with it and also to prevent a vertical movement of the actuating devices relatively to the shaft.

TOOL FOR SCREWING TREENAILS.—Albert Collet, Paris, France. A brake strap, according to this improvement, has vertical teeth adapted to engage and bite into the head of the treenail, on the inner face of its first convolution, and the strap also has horizontal openings adapted to be engaged by the ends of a lever or cross piece having at its middle an upwardly projecting square boss on which fits an operating key, a central vertical rod descending into the treenail, and centering the screwing tool on its head. The strap is locked on the nail by its teeth, when turned in one direction, thus carrying the treenail forward and screwing it in, and when turned in the opposite direction the strap opens out and turns freely without engaging the nail.

Railway Appliances.

SWITCH.—Michael F. Finnerty, Brooklyn, N. Y. A switch more especially designed for use on street railways is provided by this invention, its construction being such as to permit the motorman or gripman to readily set the switch as desired while the car is approaching it. The switch point is connected with a bar adapted to be shifted transversely, a lever is connected with the bar, and cam levers adapted to be actuated from the approaching car control the movement of the bar to shift the switch point to open or closed position. The device is simple and strong, and not liable to get out of order.

Miscellaneous.

SEWING MACHINE RIPPER.—Charles H. Stuart, Newark, N. Y. A simple and inexpensive ripping attachment is provided by this invention, readily applicable to any sewing machine, the knife of the attachment being secured to the needle bar and taking the place of the needle. A needle plate is also arranged to cover the feed device of the machine without interfering with its movements, the plate serving both as a guide for the ripping knife and a guide for the seam being operated upon. The shank of the knife is adapted to be secured in the needle receiving socket, and its blade is preferably razor-shaped, with either a straight or serrated cutting edge.

STAMP AFFIXING MACHINE.—Sinclair Tousey and Ella De Long, New York City. To facilitate putting stamps on envelopes or packages, this machine provides for moistening the place where the stamp is to be affixed, has a reservoir for the stamps, and an automatic mechanism drawing one stamp at a time from the reservoir to a plunger, one movement of the hand placing the stamp on the moistened envelope or package and operating the plunger to fix the stamp in position. Stamp-receiving receptacles may be introduced at will in the machine, providing for a supply of stamps of different denominations, to be used as desired.

AUTOMATIC DUMP FOR HOISTING BUCKETS.—Matthew Liston and Luther Wilson, Ward, Col. This improvement comprises an inclined and pivoted frame on which slides an attached cage shaped to receive the buckets and having at its upper end inwardly projecting hooks which engage the upper end of the bucket, the latter sliding the cage up the frame until the bucket overbalances the frame and its contents are discharged. Supporting slide bars are attached to the frame and extend therewith inside the cage, supporting the bucket above the cage, so the bucket will not engage the cage to slide it upward until the bucket is entirely within the cage and engages the hooks upon the upper end.

FOUR-WHEELED VEHICLE.—John W. Windle, Ormstown, Canada. According to the construction provided for by this improvement, the bottom of the vehicle body is below the top plane of the wheels, owing to the upward curve of the bolsters. The bolsters have their ends turned upward and then downward, truss bars connecting the downwardly turned portions, and the wheels having axle bearings in the downwardly turned portions. Bifurcated ends of a bolster embrace each pair of wheels.

COAT HOLDER.—Robert J. Stuart, New Hamburg, N. Y. To assist people who, from rheumatism or other cause, find it difficult to put on a coat or similar garment, this invention provides a holder having two horizontal bars with forwardly extending clamping fingers, a spring acting on an arm to clamp the fingers together to support a coat, the device being connected with a standard or support, there being also a foot lever and connections by which the clamping fingers may be operated.

LOCK.—Giuseppe Piccioni, Montefiore, Italy. According to this invention, the wards of the lock are pivoted to yield on the insertion of a tool, preventing the obtaining of a duplicate of the key by making an impression of the wards, and the key has a central socket with grooves and shoulders to act on the wards of the lock after the fashion of bits, but the socket is so formed that no impression can be taken of its shape from which to make a duplicate of the key.

BUCKLE.—Charles F. Francisco, San Diego, Cal. This invention is for an improvement on a formerly patented invention of the same inventor, the buckle frame having a tongue bar to which is hinged a keeper, the tongue having a shoulder engaged with the keeper, and the latter having an end cross bar and an intermediate fulcrum bar which serves in rocking the keeper to lift the point of the tongue.

CURTAIN FIXTURE BRACKET.—Edward W. Farnham, Chicago, Ill. This device is stamped out of sheet steel, its main plate comprising a base wing with a screw hole for the fastening screw, and a flange or bearing wing, and both wings having slots in which fit lugs on a rib plate adapted to act as a screw driver in putting up the device and remaining secured to the bracket.

STAIR CARPET FASTENER.—Harry C. Adams, New York City. According to this improvement, plates extending nearly the width of the stairs are permanently attached at the angle of the riser and tread, such plates being bent toward each other and having serrated or toothed edges, the carpet as it is stretched in place being forced into the space between the opposing toothed edges of the fastener. The fastener may be made entirely of one piece of thin sheet metal, bent to right angle, with flanged toothed edges.

DUST PAN.—Lloyd P. Ray, Seattle, Washington. This pan is made to lie close to the floor from which the dust is to be taken, and has a thin strong plate along its receiving edge. It has a removable and adjustable handle, and a spring fastening device adapted to hold the handle at an angle to the pan when the latter is in use, or permitting the handle to be carried to a position parallel with the pan, the handle also serving as a means for suspending the pan.

BLACKING BRUSH AND DAUBER.—Louis Barberie, Brooklyn, N. Y. This device is adapted for either shoe or stove blacking, the main brush having in the sides of its back, near the front end, pivot arms adapted to carry a dauber socket which may be swung up, with the dauber, over the back of the brush, or turned down in position for use, the dauber being moved and held in proper position by a finger piece. The device is very simple and can be cheaply manufactured.

Designs.

SLATE.—Belle McConnellogue, New York City. According to this improvement, a narrow box adapted to receive pencils, etc., is fitted to and extends across one end of the slate and its frame, the box having a hinged lid and a catch to hold it closed.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS, ETC.

ROMAN AND MEDIEVAL ART. By W. H. Goodyear. 1897. Meadville, Pa.: Flood & Vincent. The Chautauqua-Century Press. Pp. 307. Price $1

This is a revised and enlarged edition of a work which was published in 1893. It contains much additional information and a large number of new illustrations. Those who are acquainted with the work of Professor Goodyear will expect that the present volume will be up to his "Renaissance and Modern Art," and his "History of Art," and in this they will not be disappointed, for it would be hard to find in any language a clearer or more concise history of Roman and medieval art, and all reduced to the smallest compass. There is a continuity of thought running through the book from the first to the last page which shows that the author is a perfect master of his subject. It will be readily seen that Professor Goodyear is a believer in the "picture book," and in this he is entirely correct. Art works should always be illustrated freely by photo-engravings from the monuments, eschewing perhaps the more artistic wood cut. The 196 illustrations in the present book, though many of them are of small size, are admirably selected and are very well reproduced. We can cordially commend this book to our readers as a safe guide, which, unfortunately, many so-called art works are not.

THE PROSPECTOR'S FIELD BOOK AND GUIDE IN THE SEARCH FOR AND THE EASY DETERMINATION OF ORES AND OTHER USEFUL MINERALS. By Prof. H. S. Osborn, LL D. Illustrated by fifty-eight engravings. Third edition. Revised and enlarged. Philadelphia: Henry Carey Baird & Company. 1897. Pp. xxii, 274. Price $1.50.

This is the third revised and enlarged edition of a work which has already demonstrated its value. It treats of crystallography, surveying, the analysis of ores by the wet and dry methods, and each of the metals is taken up in turn and a great deal of information is given about each with special reference to what is usually required by the prospector. Petroleum, asphalt, gems, and precious stones are not neglected. This is probably the most practical work which can be put in the hands of the inexperienced prospector.

THE PRINCIPLES OF FRUIT GROWING. By L. H. Bailey. New York: The Macmillan Company. Pp. 508. Price $1 25.

One who is just starting out to grow fruit, for pleasure or profit, may obtain in this book a most excellent guide and teacher, and there are few whose experience has been so extended that they may not learn from it much of value. It treats very completely and specifically of location and climate and the tillage and fertilizing of fruit lands as prime factors in attaining high success; and with much detail of the planting and secondary and incidental care of the fruit plantation, including diseases, insects and spraying, and closes with a highly valuable chapter on the picking and packing of fruit, its

storage and shipment to market. It would be well if every one who has it in mind to start, or has the opportunity to care for, an orchard, or a less number of valuable trees, would first master the subject as it is set forth in this book.

THE CIVIL SERVICE GUIDE. By L. M. Bryan. New York: Dick & Fitzgerald. Pp. 112. Price $1.

A manual for applicants for government positions under the United States civil service examinations is here presented in revised form. It contains rules, specimen examination questions, requirements of applicants, salaries, etc., with full instructions for applicants for positions in all branches of the classified civil service of the United States, including the government printing department, the post office, custom house, and internal revenue service, as well as the departmental business and the non-classified consular service. It cannot fail to be useful to intending applicants for positions.

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AUGUST, 1897.—(No. 142.)

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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.

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(7187) G. T. M. writes: I would like to have information on melting gold. I melted some in a crucible, and all the gold went through the bottom and left a hard ball that looked like iron. When I went to look for the gold, I could find none. Will you inform me how to prevent the same? A. Mr. C. A. B. says: We advise your correspondent to start with sound crucible. Use saltpeter and borax with gold in melting and have a strong fire.

(7188) G. R. B. writes: As I intend to make the small eight light dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 600, but wish to use it as a regular shunt wound machine, could you kindly let me know what gage wire I should use on the fields and armature, and about how much? I should like to get the same voltage and amperage; perhaps greater amperage, if possible. I should like to put one length of wire on the fields, instead of in sections. A. Use No. 16 American wire gage in the armature, with 10 turns in each coil, making a total of 480 conductors in the armature. Same sized frame as original. Use No. 20 A. W. gage in the field. On each field wind 1,200 turns, making a total of 2,400 turns. This gives about one ampere more than the original design. A field regulator or outside resistance should be used containing about 10 ohms.

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Electrochemical treatment of fibrous material, method of and apparatus for, G. H. Pond 588,065
Electrochemical treatment of straw or other fibrous materials, process of and apparatus for, G. H. Pond 588,094
Electrodepositing device, J. Bossard 587,782
Electrodes, treating alloys for manufacturing, L. P. Hulin 587,829
Electrolysis, apparatus for, A. E. W. Boucher 587,686
Electrolysis of underground pipes and locating transmission losses, apparatus for detecting, H. P. Brown 587,698
Electrolytic apparatus, W. Thum 588,035
Electropneumatic alarm, G. W. MacKenzie 587,998
Elevator. See Water elevator.
Elevator bucket, A. W. Brash 587,697
Elevator controller lock, W. C. Fahy 588,106
Engine. See Carding engine. Gas engine. Rotary engine. Steam engine.
Engine igniter, explosive, P. Mueller 587,747
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Fencing device, C. M. Graham 587,810
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Fertilizer distributer, hand, E. F. Anderson 588,045
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File cutting machine, J. Turner 587,885
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Filter cleaning apparatus, I. H. Jewell 587,969
Filtering cane juice, machine for, J. A. Lombas 588,074

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