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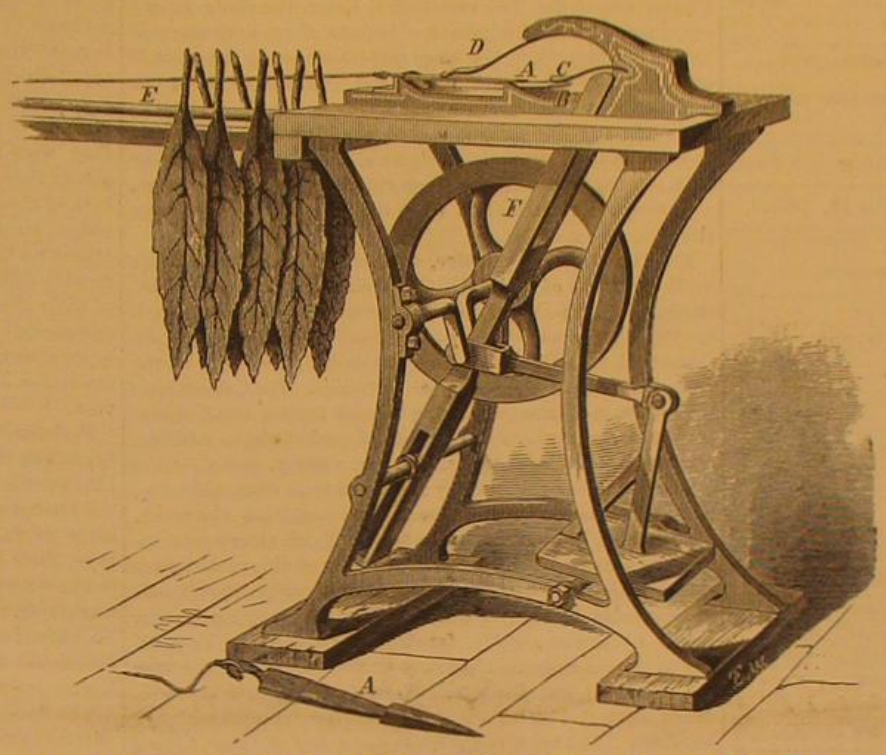
IMPROVED MACHINE FOR STRINGING TOBACCO LEAVES.

We illustrate herewith a new foot power apparatus by which tobacco leaves can be rapidly pushed upon a string, and also along a rod or wire to which the cord serves to secure them. The arrangement is such that the leaves can be strung as rapidly as two persons can present them from opposite sides in front of the needle.

The needle, A, which is shown detached in the foreground, rests in notches on inclined projections above the table, with its point projecting over a cavity, B, in the bed. It is confined against being pushed back by the shoulders formed upon it as shown. A spring, C, bears on the point, and a spring, D, on the body, of the needle between the inclined projections. The string is attached to the head and also to the rod, E, the further end of the latter being secured in a standard not exhibited in the engraving. F is a fork, pushed between which and the point of the needle the leaves are placed. By means of the treadle and crank mechanism beneath the table, the pusher is caused to move forward, thus forcing the leaves upon the needle, which is lifted by the leaves as they pass out of the notches in which it rests. The springs then force the needle back into the notches; and the pusher, continuing its motion, carries the leaves upon the string, then descends, passes back under the table, and resumes its original position, ready to push forward a new supply of leaves. By presenting the leaves to the pusher, alternately from opposite sides, they are made to hang on each side of the rod until the string is full. The end of the cord is then fastened to the rod, the latter with its load is removed, and a new rod and string are adjusted.

The device is simple and labor-saving, and will doubtless greatly facilitate work where extensive crops of tobacco are to be prepared for drying, etc.

Patented through the Scientific American Patent Agency, August 29, 1876. For further information relative to sale of patent or regarding royalties, address the inventor, Mr. Louis Strasser, 317 South Washington avenue, Columbus, O.



STRASSER'S MACHINE FOR STRINGING TOBACCO LEAVES.

IMPROVED MILLING ATTACHMENT FOR LATHES.

We illustrate herewith an ingenious invention, the object of which is to increase the capabilities of the lathe in order that that tool may be adapted to the work of a milling machine. There are many shops where the last named implement would be of much assistance, but yet is not so frequently required as to warrant its purchase. In such cases the present device offers both an economical and a convenient mode of supplying the need; and as it includes an adjustable bed plate, it besides furnishes an effective adjunct to the lathe itself.

The apparatus consists of a swinging frame, A, having rectangular sides, which is applied to the lathe centers and adjusted by means of a slotted arc-shaped standard, B. The latter is secured to the lathe shears by a base part fitted to the lathe and a clamping arrangement. It is removed from the machine with the milling attachment when not required for use. The extension of one arm of the swinging frame is clamped to the stand by a set screw, and is secured at the desired angle by the tangent screw, C, that turns in a socket held by a clamp screw in the slot of the standard. The tangent screw admits of nice adjustment of the frame, and defines the position of the latter and that of the milling cutter at the exact hight required.

The frame carries the arbor, D, to which the cutter is applied, the arbor being retained at one end in a bearing in the frame, and at the other by a pointed screw center rigidly held in position by a jam nut. It is revolved by a gear wheel at its end, engaging with a gear wheel of the lathe mandrel.

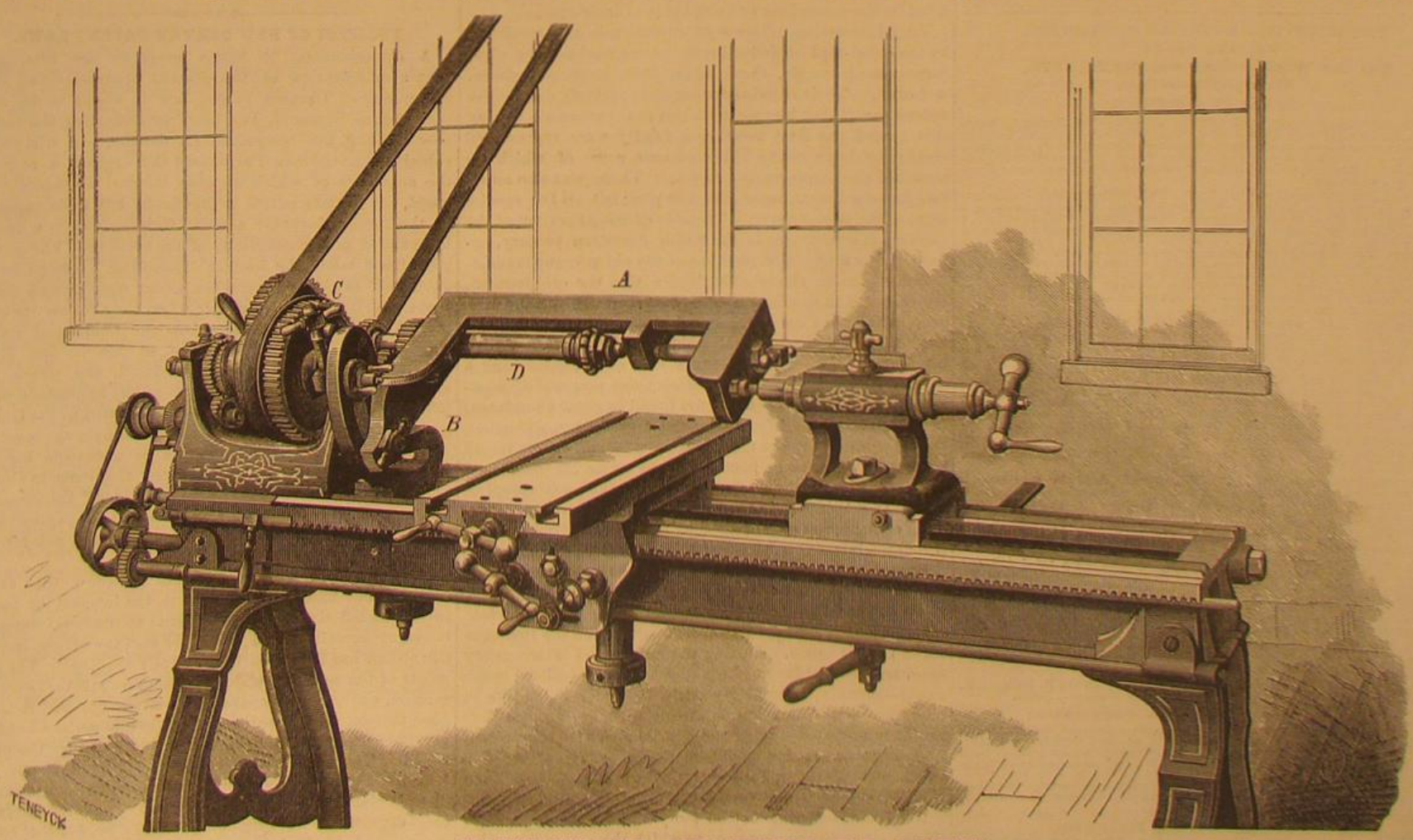
Work is fed to the cutter by means of the solid bed plate and feed screw shown. The plate moves on a guide plate clamped to the lathe carriage, and is adjustable to any angle up to 45°.

The automatic feed of the lathe and the range afforded in the direction of the lathe bed facilitate the milling-off of plane surfaces, and enable the lathe to do the work of a small planer. Instead of using the bed plate for small work, a suitable vise or work holder may be clamped to the tool post. Several devices for this purpose are known to mechanics; but when this attachment is used, they may be made more simple and substantial, as the hight of the cutter is varied and not that of the work.

By withdrawing the back center of the lathe, and relaxing the clamping nut beneath the bed, the whole milling arrangement may be removed at once. The device is now operation at the Centennial Exposition, in Machinery Hall, section B 4, column 28.

Patented through the Scientific American Patent Agency, August 29, 1876. For further particulars relative to sale of rights or of patent, address the inventor, Mr. Wm. Main, Jr., Columbia, S. C.

INVENTIVE HONORS.—A medal of the value of $100 has been founded by Mr. Benjamin Shaw, of which the Society of Arts, London, has accepted the trusteeship. It is to be awarded every fifth year "for any discovery, invention, or newly devised method for obviating or materially diminishing any risk to life, limb, or health, incidental to any industrial occupation, and not previously capable of being so obviated or diminished by any known and available means." The first award will be in May, 1877.



MAIN'S MILLING ATTACHMENT FOR LATHES.

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Contents.

(Illustrated articles are marked with an asterisk.)

THE SCIENTIFIC AMERICAN SUPPLEMENT.
Vol. II., No. 44.
For the Week ending October 28, 1876.
With 49 Illustrations.
TABLE OF CONTENTS.

SOME EXTINCT AMERICAN ANIMALS.

When the theory of evolution began to displace the old theory of specific creation, its opponents were wont to ask triumphantly for missing links. If species are the result of gradual development by progressive variation, they said, we ought to find an abundance of intermediate forms: where are they?

The advocates of evolution could only reply: They will appear when sought for. Darwin even ventured the prophecy that in course of time links would be found connecting the extremely specialized one-toed horse with the normal four and five toed mammals. The readers of the SCIENTIFIC AMERICAN know how completely the prophecy has been fulfilled in the numerous and increasingly specialized horse-like creatures which roamed over our Western plains during the tertiary period of geology. At the beginning of the period the four-toed orohippus was most like the horse that was to be, though it exhibited many unhorselike characteristics. From that time down to the present the chain of development is complete, the precursors of the horse steadily growing more and more horselike in head, and foot, and general structure of body and limb. In the middle tertiary, the mesohippus had but three toes, a slender splint of bone being the only vestige of the lost toe; and in the miohippus the splint had vanished. Later the three nearly equal toes of the miohippus had become three very unequal toes in the hipparion, the large middle toe being the main if not the entire support of the animal. At the close of the period, the prevailing form was a true horse, in which the dwindled and useless side toes of the hipparion had ceased to exist as toes, appearing only as slender splints under the skin. In the modern horse these splints are sometimes seen, attesting its relationship with the horses of prehistoric times.

Similar, if not as positive, evidence of evolution is borne by the remains of tapirs, rhinoceroses, and other hoofed animals. In eocene times the most prominent of the unequal-toed ungulates were the hyrachyus and the palæosyops, the former allied to the lophiodons and tapirs, the latter to the palæotheriums of the European tertiaries. Both these families embraced animals varying in size from a small rhinoceros to a peccary. In the miocene period, these families attained a great development in form, variety, and size: the group became more distinctly separated from each other, and some of them possessed remarkably specialized character. There were, however, no true tapirs, which afterwards became so numerous. The ascendant forms of this period were rhinocerotic, represented by the diceratherum, with its pair of horns side by side on the nose, and the very interesting genus hyracodon, which furnishes a connecting link between the palæotheroid animals of the eocene and the true rhinoceros of the pliocene. The miocene period also produced several species of a more perfect rhinoceros, still hornless. But more remarkable than any of these, indeed in some respects the most remarkable of all the animals brought to light in the strata of the West, were a number of species of grotesque appearance and gigantic size, resembling the existing rhinoceros in general appearance, but larger, some of them approaching nearer to the elephant in size and length of limb. They have been named titanotheriums, brontotheriums, and symborodons, and appear to have died out during the miocene epoch. While they lived they must have played the part of the then extinct uintatherium of the eocene (of which more directly), and that afterwards filled by the mastodons and elephants of later ages.

Very interesting evidence of evolution is also furnished by the equal-toed hoofed animals, represented now by pigs, hippopotami, camels, chevrotains, deer, antelopes, sheep, and oxen. Their remains appear but sparingly during the eocene period, but become abundant in the miocene. During this period the first mentioned family were represented chiefly by huge swine-like creatures, some of which approached the hippopotamus in size. There was also an allied four-toed form, more like true pigs; but all the species were of the peccary type. The sole existing survivor of the form on this continent is the South American peccary, apparently an unmodified remnant of the old miocene fauna.

A much more remarkable family was the oreodantidæ, which began in the later eocene, extended through the miocene, when they swarmed enormously, dying out in the early pliocene. In nearly all points of structure, they were intermediate between ruminants and swine, furnishing a complete line of transition between those now widely separated groups. Their remains are found in great abundance, both in species and individuals; and a gradual modification, corresponding with the chronological position, can be traced from the earlier, more generalized forms to the latest and most specialized: thus affording one of the most complete chains of evidence yet found in favor of a progressive alteration of form, not only of specific but of generic importance, through advancing ages.

Exceedingly suggestive, too, is the history of the camelidæ as exhibited in our tertiary strata. Here was apparently the original home of this singular group, now represented only by the llamas of South America, and the two camels of the old world. During the middle and later tertiary ages, transitional forms from the more generalized ruminants—animals increasingly camel-like and llama-like in character—were abundant in North America, whence they probably migrated during the glacial epoch to the present homes of the existing members of the family, along with the horses, tapirs, and peccaries, which disappeared from this country about that time.

Not less interesting is the story told by the remains of those unique eocene monsters to which the names titanotherium, uintatherium, dinocera, loxolophodon, and eobasileus have been given: huge creatures intermediate between the orders represented by the rhinoceros and the elephant. Professor Flower compares them to broken piers of the bridge by which the gulf, that now so completely divides the orders of the perissodactyle ungulates and the proboscidea, may have been passed over. They were all elephant-like in bulk and general appearance, yet presented a combination of characters which made them unlike anything elsewhere known. Their feet were five-toed, their legs straight and massive; their necks longer than the elephant's, and their small-brained, narrow heads much more like the rhinoceros's than the elephant's. But their distinguished peculiarity was their frontal armament of three pairs of horns, which, with their enormous size and strength, must have made them formidable indeed. Their end is yet a mystery. It has been suggested that at the close of the eocene period they may have migrated to Asia to lay the foundation of that family which first appears in the old world under the more familiar forms of the typical proboscideans—the elephants, mastodons, and mammoths. None of these appear in America earlier than the pleiocene period, a long time after they had become abundant in the old world.

Among the carnivora which preyed upon the abundant herbivorous fauna of the great plains, forests, and lake regions of the tertiary ages, not a few furnish extremely cogent evidence of specific evolution. There were among them fierce creatures, larger than wolves (synaplotherum and mesonyx) which presented such a combination of characters that it is impossible to rank them with either of the existing families of the order to which they belong. In some respects they were like dogs, in others they were bear-like; in still others they were more generalized than any existing members of the order. Then there were several species of hyænodon, some larger than any of the European forms, and others no larger than a fox: "the last survivors of a group notably differing from any now known." In the character of their skulls they stand intermediate between wolves and opossums. In the earlier periods, still more generalized types abounded, some of them combining the generic characteristics of half a dozen of our specialized modern carnivora.

Perhaps the most remarkable of these comprehensive types was the tillodontia, which seem to have combined the characteristics of several distinct groups, the carnivors, the hoofed animals, and the rodents. Some of them were as large as the tapir. Their molar teeth were of the ungulate type, their canines small, their incisors rodent-like. Their heads were bear-like, their general structure like that of the ungulates, their feet plantigrade. Two distinct forms abounded: one in which the incisors grew from persistent pulps, like the beaver's, the other having all the teeth rootless.

The dominant types of tertiary flesh eaters, however, were various modifications of felidæ, fierce cats, some of them surpassing our modern lions and tigers in size and strength. Chief among them in the miocene age were the saber-toothed tigers, which seem to have overrun the whole world about that time, and to have lingered in some parts until the human period. It is one of the puzzles of palæontology to account for the extinction of this highly specialized type, apparently the fittest of all the cat family to win in the struggle for existence. Happily for man they did not survive in force, to contest his progress toward the mastery of the earth.

PROSPECT OF NEW GERMAN PATENT LAWS.

A correspondent in Berlin sends us the intelligence that a modification of the present oppressive and illiberal system of German patent law is about to be made: that Prince Bismarck has been investigating the code as now existing, has recognized its defects, and will shortly submit to the German Parliament the draft of a new law, the substance of which we give below. As matters now stand, the German patent is practically but little safeguard to the foreign inventor against German piracy, a fact we have stated in a multiplicity of connections. The government itself takes the lead in "adopting" foreign devices submitted to its examination under applications for patents, and it protects its people when they follow its example. We need go no further than the Centennial Exposition to find a striking instance of this in the Krupp guns, wherein is used the Broadwell gas check ring, an American invention, and a necessary appendage to all breech-loading cannon. This was submitted to the German government for trial, and was unblushingly appropriated, and the inventor virtually told to go about his business The invention is styled the Broadwell ring even in German official reports. Krupp likewise "adopted" the invention, and has used it on thousands of guns without paying the inventor a cent. The same has been the case notably with other American military inventions.

Of course it needs no argument to show that such a course is not merely detrimental to the interest of foreign inventors, but also highly prejudicial to the best interests of Germany herself; and of this latter fact the astute Imperial Chancellor has doubtless become fully apprised. The main points of the new law which he suggests are that every invention, excepting, of course, such as are opposed to law or good morals, may be patented. Inventors are not bound to give licences except where such are demanded for the public benefit. The specification must be definite, must be published at a certain time after application, and must embody distinct claims. The first applicant is considered the inventor, disputes as to originality are to be settled by the courts, and, in obtaining patents, foreigners are placed on the same footing as Germans, with the exception, however

that the former must appoint an attorney or representative in Germany. Patents may be declared void if insufficiently worked in the German Empire. It is considered a proof of such insufficiency if the articles patented are imported into Germany after a qualified person has offered to work the patent within the Empire. All such patents are to be forfeited if the proprietors allow importation without interfering, provided the laws of the respective patentee's native country contain similar ordinances (France, etc.). In all other respects, there is no special proof of working necessary. Patents are to last fifteen years, and in certain cases extensions may be had. Progressive taxes are to be levied. Prior publication prevents the grant of a patent, the patent right is transferable by deed or will, divided or undivided. A special court is to be provided for patent suits. Patent objects are to be marked, as under the American law. Patents may be declared void if the invention is insufficiently specified, if the foreign patentee maintains no German representative, if taxes are not paid, or if the patent can be proved to have been void from the beginning. There are some other, minor provisions, but the above sufficiently indicate the scope and character of the law, which, so far as Americans are concerned, is but little mprovement on the present system. Of course the complete text is necessary before a just opinion of the provisions as a whole can reached, and we should prefer some experience in its working before hazarding judgment as to its fairness and efficacy as regards foreign inventors. The clauses which require inventors to "give licenses when demanded for the public benefit," those relating to working in the Empire, and the offer by "a qualified person" to do so in the event of the non-compliance of the inventor, seem to open the way to wide constructions adverse to foreigners, and virtually to a continuance of the present injustice. The letter of the law may, it is true, change; but when such constructions are possible, and not only this, but, as past experience shows, have been the rule in Germany, it is not unreasonable to believe that those who interpret the law will be guided therein by the light of precedents.

PROGRESS OF THE MISSISSIPPI RIVER JETTIES.

We have held so firm an opinion that a triumphant success awaited the carrying out of Captain Eads' plans, for opening the Mississippi river to the commerce of the world, that to read the engineer's reports of the splendid progress of the work is but to learn of the fulfilment of confident expectations. The latter report, dated August 18, is now before us, and the results noted must certainly be gratifying to the whole country. The channel between the jetties, we are told, is constantly increasing, and the jetties themselves are built up above mean low tide, and for a great length above average high tide. The last survey, made July 27, shows a channel extending down 11,800 feet from the upper end of the jetties, and within only 250 feet of the deep waters of the Gulf, having an average width of about 350 feet, in which all soundings are 20 feet or more in depth. The line of deepest soundings through the length of 2¼ miles averaged over 26 feet, and many single soundings showed over 40 feet. Some idea of the progress of the erosion going on between the jetties may be inferred from the fact that the 20 feet channel, existing on June 17, had increased in average width nearly 100 feet throughout its entire length in the forty days between that date and the last survey.

Captain Eads reviews, in some detail, various objections which the opponents of his project have urged, and devotes himself more especially to the assertion that the earth washed out of the channel would merely form a new bar outside the jetties, and thus render access as difficult as ever. To settle this matter, he had soundings made in radial lines from the end of the jetties; and comparing the results thus obtained with those gained from a like series of soundings made in 1875, he finds that, instead of a bar being formed, there has been actually excavated, out of an area 1,100 feet square immediately in front of the jetties (which area must first be covered with deposit before a re-formation of a bar can occur) a mass of earth equal to 68,400 wagon loads. And this aggregate deepening has occurred while nearly 3,000,000 cubic yards of earth have been taken up, from the bar between the jetties, by the river current, in excess of the ordinary burden of sediment, and transported over this area out into the Gulf of Mexico. If the mass had been deposited over the area mentioned, it would have covered the space to the depth of about 18 feet. In fine, it is conclusively proved that a general deepening has occurred in 490,000 square yards of the area in front of the jetties, comprising the outer slope of the bar and the track of the river discharge, and thus the report of bar advance and shoaling in front of the jetties is shown to be without any real foundation. Captian Eads admits that this favorable phenomenon of deepening immediately in front of the jetties was unexpected to all the advocates of his system, and he ascribes it to the sea current which is induced by the prevailing winds, which blow almost constantly from between the northeast and southeast. The current resulting is driven westwardly beneath the river discharge, and excavates more room for itself as the volume from the jetties becomes gradually stronger. Captain Eads reports in conclusion

"In seventeen months after the passage of the act, and within fourteen months from the commencement of the work, the jetties have solved the problem presented at the mouth of the river. In their unfinished condition, they have withstood with but trifling injury two very severe storms, one surpassing in violence any known in the locality for many years; they have demonstrated the entire ability of the delta formation safely to sustain the works necessary to control the river discharge; they have not been overturned by mud lumps, nor swallowed up in quicksands, nor undermined by the river current: and although largely over 3,000,000 cubic yards of earth have been swept out from between them into the Gulf, and the channel across the bar has been deepened from eight or nine to twenty-one feet, no evidences of a re-formation of the bar have yet to justify the belief that any extension of them will be necessary."

STEAM ENGINE SLIDE VALVES.

Some of our correspondents seem to have a difficulty in deciding as to the comparative merits of engines with single slide valves, and engines with separate cut-off valves. Take the following letter as a specimen:

"Can you explain clearly and definitely the difference in action between an engine with a single slide valve and one having two slide valves, one being a cut-off valve, there being a throttle in the steam pipe? And what are the advantages of the more modern cut-off engines, in which the governor acts upon the cut-off valve directly? I cannot find the information in any book, and none of the men in our shop seem to have precise information upon it."

If, with a single slide valve, sufficient steam lap is given to the valve to enable it to cut off the steam earlier than when the piston has traveled about three quarters of its stroke, the exhaust becames cramped at the cylinder exhaust port, as explained in volume XXXII, page 101. Hence, to economize fuel by using the steam expansively during a greater portion of the stroke, the cut-off valves were added; and at the same time, to avoid the loss of steam due to long steam passages, the latter were placed at the ends instead of in the middle of the steam chest. This necessitated the employment of two steam valves and two cut-off valves, it being considered that the power required to operate the valves was more than compensated for by the steam saved by reason of the short ports.

The placing of the throttle valve in the steam pipe had the following defects: In the first place, the action of a governor takes place after the error which it is intended to remedy has actually occurred: or, in other words, the speed of the engine must be greater than it is intended to be before the governor balls will rise and correct the evil. So that there is an element of time between the acceleration of the speed of the engine and the diminution of the steam supply by the action of the governor and throttle valve. Now in order that the initial pressure of the steam supplied to the cylinder shall be as near that of the boiler as possible, a supply of steam is provided close to the cylinder, that is to say, in the steam chest; and when the engine is running at her proper speed, the pressure of this steam approximates to that in the boiler; and if the engine speed increases and the governor closes to a corresponding degree the throttle valve, there is nevertheless a supply of steam at full pressure which has passed the throttle, and is already in the steam chest; and its action is, to a great extent, to offset the effort of the governor.

Secondly, the throttle valve, by reducing, at the necessary times, the pressure of the steam in the steam chest, correspondingly reduces its temperature, inducing in the steam chest a certain amount of condensation of the re-entering full pressure steam, admitted when the throttle valve reopens wide. When, however, the governor is attached to the cut-off valve direct, the pressure (and temperature) of the steam in the steam chest is not affected by the governor, and continues, therefore, to be nearly that of the boiler. The advantage due to this will perhaps be more readily perceived if we suppose that the throttle valve is the steam pipe, and that, the engine load having suddenly lightened, the throttle partly closes, thus reducing the pressure of the steam in the steam chest and cylinder. If, then, the engine load suddenly augments, and the throttle opens wide, the inflowing steam is required to restore the pressure in the chest before it can restore it in the cylinder. In other words, the space requiring its steam pressure to be increased is the contents of the steam chest as well as of that part of the cylinder in open communication with the steam chest.

The action of a governor attached directly to the cut-off valve is that, so soon as the engine load lightens, the supply of steam to the engine cylinder is lessened by cutting it off earlier in the stroke: and there is hence a direct relation existing, at all times, between the engine duty and the consumption of steam, the engine speed being reduced by the extra degree of expansion employed, instead of by wire-drawing the steam. In addition to these advantages, most of the modern cut-off devices are given a motion which opens and closes the steam ports very suddenly, inducing a greater initial pressure of steam in the cylinder and obtaining a more sharply defined point of cut-off.

MORE CENTENNIAL AWARDS.

Another lengthy list of Centennial awards has been published, and the New York *Times* has still better ground for its witty suggestion that people will before long begin to seek for exhibitors who did not receive honors, under the idea that the true mark of distinction lies in failing to obtain any judicial notice whatever. Meanwhile it is amusing to notice the efforts which many of the successful exhibitors, and most especially the sewing machine and piano men, are making to convince the public that each and every one of them obtained the first and best and highest premium. Four piano firms are lavishly advertising the fact, and reinforcing their assertions with extracts from the judges' reports, which quotations, when considered together, show that the judges avoided an obvious dilemma by characterizing all the pianos as excellent, as doubtless they were, and leaving the rival makers to wrangle over their grammars and dictionaries in determining the exact comparative signification of the high sounding adjectives employed. Of course (and every one who has taken the trouble to comprehend intelligently the system of awards knows it) there are no "first premiums," and it is only uselessly to infer ignorance on the part of the public to blazon forth any claim to such. The regulations of the Centennial Commission on the subject are as follows: "Fourth: Reports and awards shall be based upon inherent and comparative merit. The elements of merit shall be held to include considerations relating to originality, invention, discovery, utility, quality, skill, workmanship, fitness for the purpose intended, adaptation to public wants, economy, and cost. Fifth: Each report will be delivered to the Centennial Commission as soon as completed for final award and publication. Sixth: Awards will finally be decreed by the United States Centennial Commission, and will consist of a diploma with a uniform bronze medal and a special report of the judges on the subject of the award."

The cardinal object of the system is to avoid gradation. The judges simply write reports on exhibits which they deem commendable, and the Centennial Commission thereupon decides which out of the exhibits so reported upon are entitled to the medal and diploma. From the length of the lists, it is safe to believe that few if any of the objects commended by the judges were denied the distinction: and inquiry among several exhibitors in this vicinity reveals the further fact that, in most cases, those who did not receive judicial notice and a report owe it to their own neglect and misapprehension in not entering for competition, or in failing to send in the required description to the judges, or in some other wise not complying with the regulations of the Exposition.

We do not think that any one will regard the medals and diplomas as of any especial importance. Some system of the kind had to be devised, else exhibitors would be dissatisfied at being denied their usual stimulus. The defects of the old anonymous jury system, with its multifarious gold and silver medals, are well known, and the present plan was adopted as a better substitute. It gives everybody a premium, and that is excellent, and likely to cause universal gratification. The real distinction, however, lies in the reports; and when an exhibitor receives a document signed by such experts as Dr. John Anderson, or Professor Reuleaux, or Dr. Nordenskjold, or Captain Eads, all of whom are judges besides many other eminent gentlemen, pointing out the merits of his device, showing wherein it excels, and thus lending the weight of their high authority in his support, then he has something worth any number of meaningless medals; and if he fails to publish that report, and to advertise the fact that he has received it, and the object he received it for, over the whole land, he simply neglects his best interests and throws away the greatest benefit which the Centennial Exposition can secure to him. And this we strongly advise our readers to do: Do not claim "first premiums," for that is nonsense; but procure a copy of the report (and every exhibitor is legally entitled to that), and publish it along with such a description of the invention that the public may see what has been accomplished, and what the accomplishment has earned.

We give below some further names of manufacturers and inventors well known to our readers, who have received favorable reports and awards: H. W. Johns, for asbestos and its adaptations to roofing, paint making, engine packing, boiler covering, cement, etc.; Dixon Crucible Company for graphitic crucibles; Morris, Tasker & Co., gas works machinery; Charles Pratt & Co., petroleum products; General M. C. Meigs, for hydrodioptric light; Odorless Excavating Company, for cesspool cleaning machine; W. D. Andrews & Brother, for centrifugal pumps; Lathrop Anti-Friction Company, for lubricant; Jerome Wheelock for automatic cut-off engine; George B. Brayton, for hydrocarbon engine; and Professor R. H. Thurston, for metal-testing machine.

A Remarkable Fish Dinner.

The fish culturists who have recently been in session at the Centennial Exposition treated themselves, during their stay in Philadelphia, to a fish dinner, which is certainly extraordinary and unique in its way. The bill of fare embraced fifty-eight different kinds of fish, and in its entirety is much too long for publication here. Some of the delicacies, however, are remarkable. Under the head of *hors d'œuvres froids*, (the *menu*, by the way, is organized with the utmost elaboration) we find Norwegian pluck fish, Portuguese conger eel, and Spanish conger eel with tomatoes, Turkish botargoes or mullet roes, Japanese shake or dried salmon, crayfish from the Cape of Good Hope, French tunny fish, Chinese white and black shark fins, Alaskan oolachans, Portuguese sword fish and squid, Russian caviar, Chinese dried fish maws, and, most astonishing of all, "desiccated octopus eggs." Noted scientists are honored by having their names applied to the various sauces. Thus we have *filet* of English soles *à la* Buckland, sheepsheads, Agassiz sauce, aspic of eels *à la* Huxley, and *bisque* of lobster, Seth Green style. It was a memorable feast, and taxed the culinary skill of the cooks at the Centennial to the utmost. One particular dish seems to have puzzled even the most ingenious *chefs*, and that was kanten (Japanese seaweed) *à la* Sekizawa Akekio. The aid of the Japanese cook in the employ of the Japanese Commission was at last invoked, and he proved equal to its toothsome preparation.

AN agricultural society in Massachusetts, desiring to encourage tree planting and the re-foresting of poor lands in that State, have offered prizes for the best plantations of larch, pine, ash, and other trees suited to different localities and soils. The prizes range in amount from $400 to $1000, and special instructions are published to guide competitors.

MUSICAL BUILDING BLOCKS.

An ingenious method for teaching music in a graphic manner has been patented by Mr. Herman Eckhardt, of Columbus, Ohio, through the Scientific American Patent Agency, September 5, 1876. It is a toy or game, by which almost any piece of music of a certain number of bars may be set up to be played.

In the engraving, A, Fig. 1, represents a clef block, that is equal in length to the hight of the staff and the added spaces above and below the staff. The clef block, A, contains the G clef, with the lines and spaces numbered, together with the names of the notes upon the lines and spaces, and other information, on one side, and the bass clef, etc., on the other side. The clef block, A, also forms the rest or support, against which the other blocks are placed. The different musical notes, rests, characters, and signs are placed on blocks of varying sizes, proportioned to the duration of the same—the cubical blocks, B, containing whole and half notes, and whole and half rests, on lines and spaces; the semi-cubical blocks, C, quarter notes and rests on lines and spaces; and the quarter blocks, D, eighth and sixteenth notes and rests on lines and spaces, and all the other musical characters, as sharps, flats, naturals, dots, etc. The blocks, B C D, are provided with black edge lines, *a*, that form the lines of the staff in setting up the music, some of the sides remaining without signs or edge lines, to serve to fill up the spaces above and below the staff. The measures are indicated by means of thin strips, D', Fig. 2, of black or other colored wood, that are interposed between the blocks to form the division of the bars. A number of measure strips, B, are provided, in proportion to the number of blocks and bars that may be set up with the same. Any piece of music may be readily set up by selecting the required notes, rests, and sign blocks, and filling up with the remaining blocks, separating the blocks by the measure strips, in the manner indicated.

Fig. 1

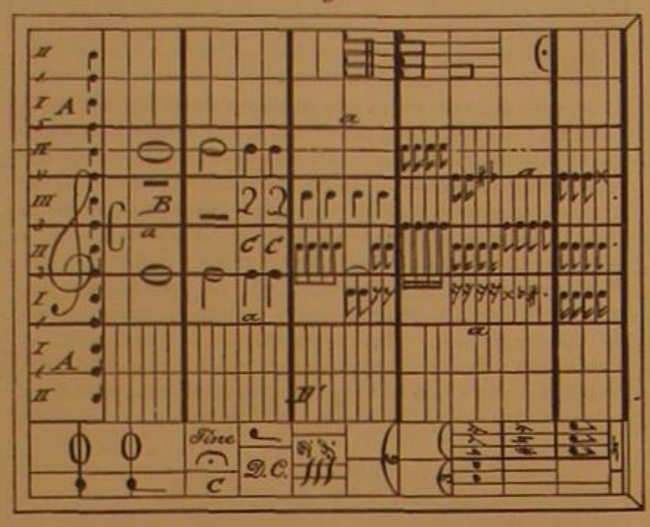
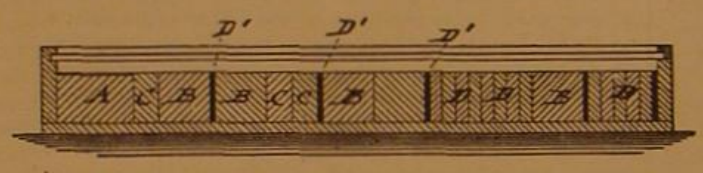


Fig. 2.



ECKHARDT'S MUSICAL BUILDING BLOCKS.

A New Safety Explosive Composition.

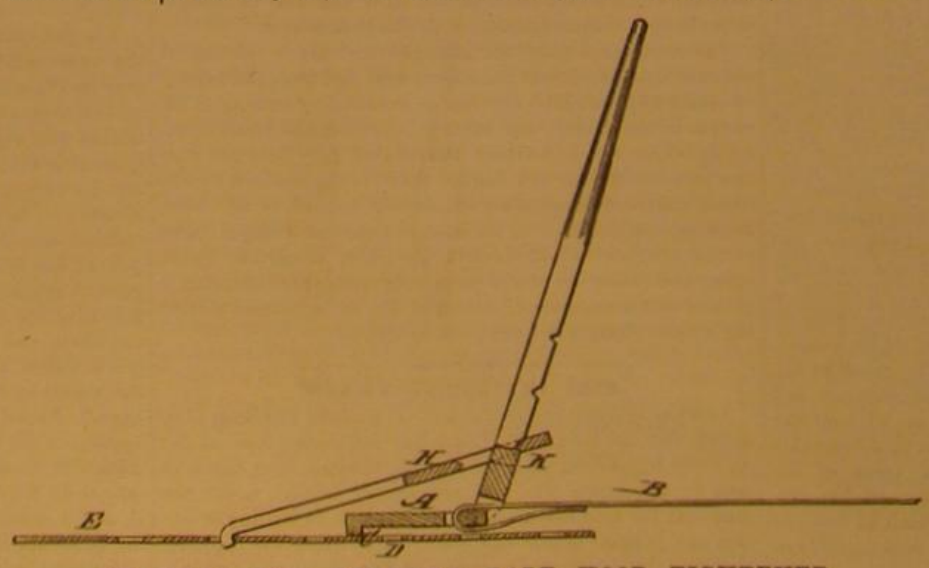
Messrs. L. de Soulages and R. Cahuc, of Toulouse, France, have patented through the Scientific American Patent Agency, September 19, 1876, a new blasting powder, which is claimed to produce a dynamical effect superior to the common mining powders and to dynamite, while it combines the advantages of cheapness and non-explosibility in the open air, with a reduced production of smoke and injurious gases in its explosion, leaving hardly any trace or residue of solid deposit of ashes in the bore hole. It consists of nitrate of potash or equivalent salts, sulphur, and soot or lampblack, combined with tanner's bark, sawdust, or similar separating ingredients, ground and mixed in suitable proportions. The compound is then mingled with a solution of sulphate of iron, and boiled until the mass becomes entirely liquid, with the parts so combined as to form a uniform black paste. This, when dried, produces a powder of a blackish color, and of a density of about 0·6. It may be stored for a considerable length of time without undergoing the least alteration or deterioration.

In the atmospheric air the powder takes fire and burns like any other inflammable body brought in contact with an ignited body or a flame of sufficient intensity, producing no shock or explosion whatever. Neither atmospheric electricity, nor shocks of any kind, have any action on the powder, which explodes only when firmly tamped or compressed in the bore hole, and ignited, like the ordinary mining powder, by means of a mining fuse.

IMPROVED BALE HOOP TIGHTENER.

We have had several letters *from* cotton press owners and others, asking for an invention which will pull together the ends of cotton bale bands while the bale is in the press, so that when the pressure is removed the bale will not expand. The object sought, of course, is to save room and consequently the cost of storage and freight. The present invention is apparently in response to this demand. In order to strain the hook around the bale, the inventors employ a lever with a forked claw and a hook, H, the former to engage the hook, A, behind its shoulders, and the latter to engage in one of the holes of the part, E, and draw them together in the manner indicated in the engraving. The hook is connected to the lever, so that it can be shifted toward and from the claw end as the resistance varies. This connection is preferably made by a yoked end of the hook, in which the lever is slipped, so that it drops into the notches, K, to be held the required distance from the end.

This device was patented through the Scientific American Patent Agency, September 5, 1876, by Messrs. Thomas C. Knowles and James P. Derden, of Vienna, La.



KNOWLES AND DERDEN'S BALE HOOP TIGHTENER.

Spontaneous Combustion of Charcoal.

The late Mr. Braidwood, superintendent of the London Fire Brigade, England, remarks that lampblack and charcoal, when the smallest quantity of oil gains access to them, are more inflammable than sawdust and the vegetable and animal textiles, and should not be admitted among ships' stores.

The kinds of wood generally used for the manufacture of charcoal for gunpowder are the black dogwood, the willow, and the alder. These varieties are all well adapted for the purpose, though for the best brands of sporting powder the dogwood is said to be preferable. The wood is converted into charcoal by heating it in iron cylinders. After the charcoal is removed from these vessels, it is placed in iron coolers provided with tightly fitting lids, and allowed to stand for some hours until quite cool. It is then sent to the mill to be ground, and is afterwards mixed with the other ingredients for gunpowder. With reference now to this process, Professor F. Hargreaves vouches that there are many instances recorded where the charcoal has taken fire the second day after grinding. With the process of this occurrence we are by this time quite familiar. The same observer, it appears, is also aware of the fact that the pulverization of the charcoal is not absolutely indispensable for such ignition to ensue, for he adds, at the conclusion of his remarks: "The absorption (namely, of oxygen) with sticks of charcoal is not so quick as with ground charcoal, and hence the spontaneous combustion of stick charcoal does not occur so often." Mr. Hatfield, in a paper containing "Observations on the Circumstances producing Ignition in Charcoal at Atmospheric Temperatures," published in the *Philosophical Magazine*, states the following: "If twenty or thirty hundred of charcoal, in a state of minute division, be put together in a heap, and left undisturbed, spontaneous combustion generally occurs." He records, in verification of this statement, the following instance: "A quantity of small charcoal was thrown into a heap that covered about ten feet square and four feet deep. In three days the temperature had increased to 90° Fah., although it was at first only 57°, that of the surrounding air. On the sixth day, it had risen to 150°; and on the seventh, combustion had commenced in several places."

Dr. C. T. Jackson, in a communication to the American Academy, gives the following piece of testimony corroborative of what has just preceded: "Three times," he remarks, "I have set fire to charcoal at temperatures below that of boiling water. My first experiment of observation was accidental. I was preparing, while at Bangor, Me., for a lecture, in which I had occasion to show an artificial volcano. I took a tray filled with gunpowder and laid it on the stove to dry. I then took a paper of pulverized charcoal, such as is sold by apothecaries for tooth powder, the charcoal being wrapped in white paper, and placed it on top of the gunpowder that was being dried upon the top of the stove. Having occasion to go out, I took off the paper of charcoal and laid it on the table. When I came back, in about twenty minutes, I observed the paper smoking. The charcoal was completely consumed. During all this time the gunpowder remained on the stove unexploded.

"My next observation was this: While at work in my laboratory, I had occasion to use a piece of charcoal for blowpipe experiments. I went down into my cellar, and brought up a piece of light, fine, round charcoal suited for that purpose. It was damp. I laid it upon the top of a column stove to dry, directly beside a tin pan containing water, which was not boiling and never did boil there. I took the charcoal off the stove and laid it on the table. A short time afterwards, I discovered that it was on fire all through its mass. I laid it aside and it burned entirely to ashes . . . I repeated the experiment again intentionally, watching it carefully, and with the same result." The explanation of the cases first quoted is not difficult to find. The charcoal possesses wonderful porosity and great power for occluding gases. This absorptive quality is supplemented by a species of selective power: in virtue of which, it absorbs oxygen with much more avidity and in much greater quantity than nitrogen. The enormous condensation which gas suffers by absorption into the pores of the charcoal is attended with the liberation of a quantity of sensible heat that is the equivalent of the work the atoms have accomplished: while simultaneously, the eminent non-conducting property of the charcoal hastens the period of active combustion by preventing the dissipation of the heat thus evolved, and concentrating it upon the porous mass.—*Polytechnic Review.*

Mineral and Vegetable Waxes.

Mineral waxes are hydrocarbons, often crystallizable, and differing from each other in their temperature of fusion. They are frequently derived from resinous trees buried in peat beds, and rarely from lignites or coal formations. The principal variety used industrially is ozokerit, sometimes called natural paraffin. It is less dense than water, of a waxy luster, and in one direction presents a conchoidal fracture, breaking into thin translucent scales. Its color is a brownish green by reflected light or yellowish brown or red by transmitted light. Powdered, it is a yellowish white. It is soft, flexible, cuts like wax, and softens at a low temperature. The odor is aromatic, and becomes more bituminous when the wax is rubbed. Friction also electrifies it negatively. It is fusible into a clear oily liquid, and burns with a bright flame. It is soluble entirely in turpentine and naphtha, more or less in ether, and slightly so in boiling alcohol, when the material separates in crystalline state on cooling. It is unattackable by sulphuric acid.

Ozokerit is found in the Caucasus, in England, and in Austria. In Moldavia, it is directly employed for illumination, being used in gas making, and in the manufacture of candles. A factory in Frankfort on the Oder prepares the material under the name of ceresine, and produces over 100,000 lbs. yearly. Ozokerit, in purified form, is largely used by perfumers and in pharmacy in place of beeswax, as it hinders medicaments from becoming rancid.

A similar substance, now but little employed, is hatchetin or mineral adipocere. This is of a yellowish white color, has a mother-of-pearl luster, is very soft and is of about the consistence of spermaceti. It is found in Belgium, Moravia, Bohemia, Wales, and England. It is scarcely attacked by nitric acid, but is completely carbonized by sulphuric acid. It is slightly soluble in boiling alcohol and in ether, leaving a viscous and inodorous residue.

Other mineral waxes are *neft-gil*, found in the island of Tschelekan in the Caspian Sea, near naphtha sources, and baikerite, from the vicinity of Lake Baikal. These are fossil waxes, or more probably bitumens, as are also kir and elaterite. The latter, often termed elastic bitumen or mineral caoutchouc, is of less density than water, of a blackish color, and is elastic like rubber. It has been found in this country, near Woodbury, Conn., and in many parts of Great Britain.

There is a large number of vegetable waxes but slightly known. Some are secreted by insects, which absorb the sap of various plants. Others are derived from the exudations of palm trees. The *Copernicia cerifera*, a Brazilian tree, bears leaves from the glands of which carnauba wax is obtained. The commerce in this material exceeds 2,000,000 lbs. yearly. In the Andes there exists the *ceroxylon andicola*, which also yields a material known as palm wax.—*La Nature.*

ON a high bluff near the Iowa river are some wonderful Indian mounds, with the remains of circular floors made of baked clay and the trunks of trees, covered with earth. Underneath the earth are human bones, copper axes with handles of polished horn and petrified wood, stone hammers, flint knives, and images of animals accurately carved and polished, made of a hard reddish stone.

IMPROVED YARN REEL AND TESTER.

The necessity for close attention to the details of cost of manufacturing, both in the matter of stock and labor, has recently received much consideration. This is especially the case in the cotton and woolen manufacture. The two engravings published herewith exhibit very important means towards greater economy in the spinning of cotton and wool, beside keeping the manufacturer informed of the actual quality of the work produced.

Fig. 1

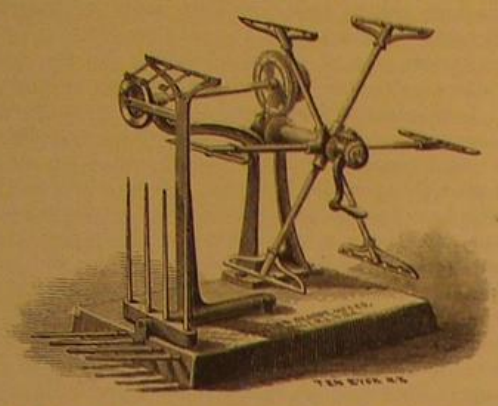


Fig. 1 shows an improved yarn reel of new design, particularly adapted for use in reeling fine cotton, linen, woolen, or worsted yarns. The reel is one and a half yards in circumference, and connects with a disk graduated into 120 parts, indicating the number of yards reeled from each spindle. An automatic feed motion lays the yarn flat upon the reel, securing accurate and uniform measurement, and consequently correct results as to stretch, strength, and numbering.

Fig. 2.

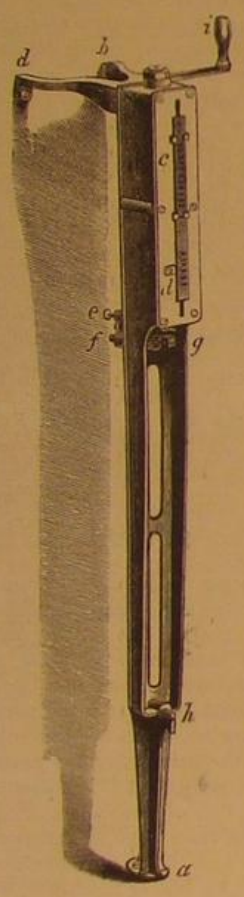


Fig. 2 exhibits a yarn tester, which is designed to test both the strength and stretch of yarns. A knot, or one seventh of a hank or skein, of yarn is first reeled and then removed from the reel and placed upon the pins, *g* and *h*. The crank, *i*, is then turned to the right until the yarn breaks. The index point, *d*, will then show the amount of stretch in inches and eighths, and the upper index, *c*, will give also the exact breaking weight in lbs. avoirdupois. The machine is adapted for a breaking weight of 100 lbs. or less, which generally includes any number of yarn above 20. If any number should exceed 100 lbs. in strength, it would be necessary to reel off only half of the amount mentioned above, which would equal 60 yards, and then multiply the weight by 2. The advantages resulting from the use of such a reel and tester will be at once appreciated by those familiar with this branch of production.

Further information can be obtained from the Brown & Sharpe Manufacturing Company, Providence, R. I., who are the inventors and makers.

SAMPLE-WEIGHING SCALE.

The sample-weighing scale illustrated herewith is designed to meet a want often felt where a large number of small articles or parts are to be computed, or large quantities are to be estimated from the weight of samples. One pound can be weighed by ten thousandths. Screws, samples

of paper, drugs, colors, etc., can be accurately weighed. It also answers for a postal scale. The finished parts are nickel plated, and the stand and base are neatly japanned and ornamented. The scoop is detached for convenience in use. Further particulars will be furnished by the Brown & Sharpe Manufacturing Company, Providence, R. I.

A SYSTEM of weather observations is now applied to the whole coast of Australia. All the stations are connected by telegraph

PATENT GAS HEATER.

The simple contrivance illustrated herewith at once explains and commends itself to those who require a ready means of heating and tempering small tools. It is intended to take the place of a forge in heating and tempering machinery and jewelers' small tools, beside being capable of use for domestic purposes, such as a nurse lamp, etc. A

piece of steel half an inch in diameter can be heated sufficiently to harden in about six minutes. It does not heat to a degree that will injure the quality of the steel, and tools heated by it will be tougher than when heated in a forge in the usual way. Darling, Brown, & Sharpe, Providence, R. I., are the makers of this article.

FISHHOOKS, JETTIES, AND MISCELLANEOUS DEVICES.

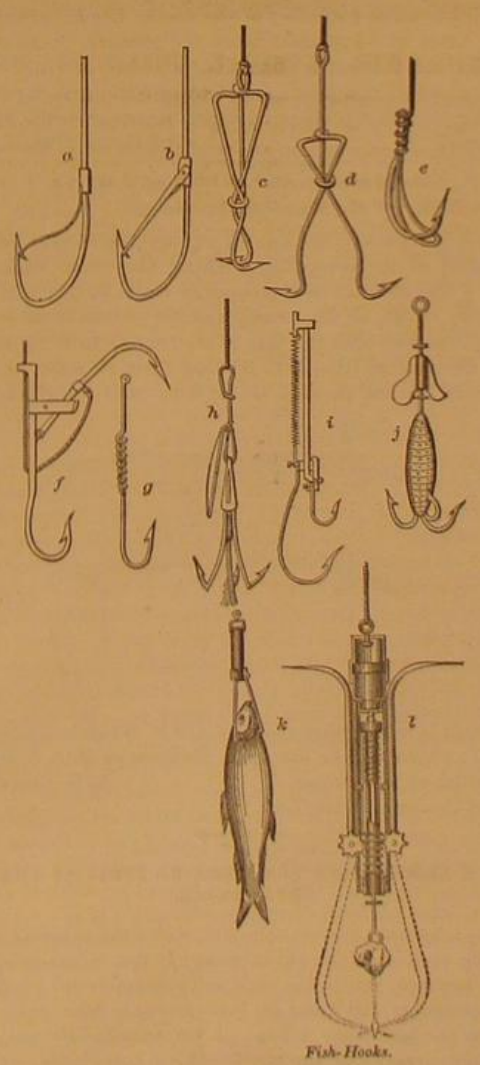
We select this week from Knight's "Mechanical Dictionary"* a number of interesting engravings relating to subjects which it is scarcely possible to classify under any one general heading. In Fig. 1 is represented a number of ingenious

FISH HOOKS.

a and *b* are two forms of spring hook in which a mousing piece engages the barb. *c* and *d* are two positions of the same hook, one set and the other sprung. *e* is intended to give the hook a square presentation, and prevent glancing of the hook in striking. *f* has a tripping hook which strikes from above, and supplements the primary hook. *g* has a spiral spring shank. *h* has a spring hook attached to the snood, which affords the means of attaching a bait or other hook. *i* has an additional hook, which is sprung, and thus supplements the primary hook. *j* has spiral vanes, so as to revolve it when drawn through the water in trolling. *k l* shows two forms—on different scales—of a spring hook whose claws are thrown down upon the fish which tampers with the bait.

In making the hooks, straight wires of the proper size and length are flattened at one end, and the barb formed by a single blow with a chisel. The point having been sharpened, the proper curve or twist is given to the hook; the soft iron is then case-hardened, to give it the stiffness and elasticity of steel, by immersion in hot animal charcoal. The hooks

Fig. 1.



Fish-Hooks.

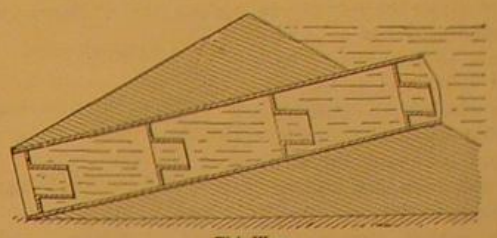
are subsequently brightened by friction, and tempered. In the hook-making machine, the wire is run from a reel into the machine, and on the other side the fish hook drops out completed, with the exception that it must be tempered and colored. After the wire reaches a certain point, the requisite length is clipped off. The next operation barbs it; the other end is flattened. It passes around the revolving dies, whose teeth, formed like the notched spikes of a wheel, catch it, and bear it from one operation to the next until it is smoothed and filed, when it passes between rollers that give it the prescribed twist and turn, and it drops into the receiver awaiting it.

*Published in numbers by Messrs. Hurd & Houghton, New York city.

THE FISH WAY,

shown in Fig. 2, is a device to enable fish to ascend a fall.

Fig. 2.



Fish-Way.

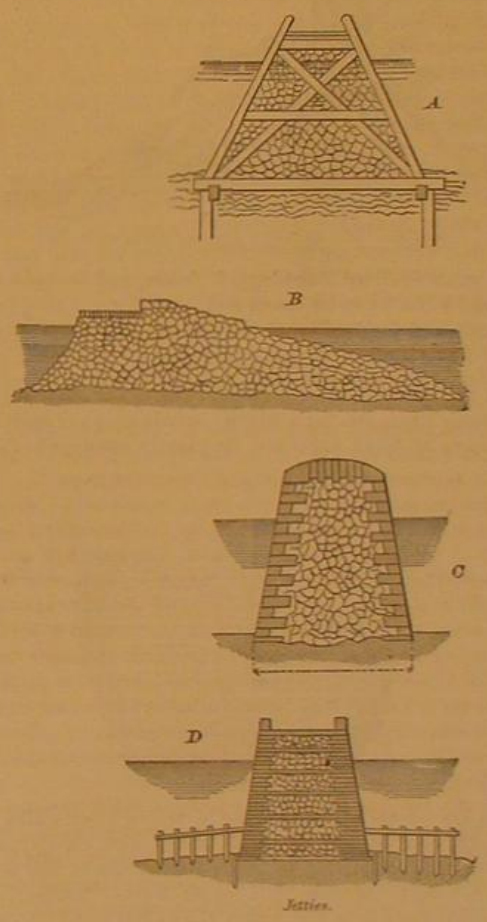
It may consist of a series of steps over which the water descends, turning a fall into a cascade, and sometimes known as a fish ladder; or it may consist of a chute with a sinuous track for diminishing the velocity and assisting the passage of the fish to the level above the dam. In the example, it is an inclined chute having a series of chambers containing comparatively still water, the current being confined to a relatively smaller space.

The success with which Captain Eads is meeting with his construction of willow jetties, at the delta of the Mississippi river, will render interesting the various other forms of

JETTIES

presented in Fig. 3. Although limited to no particular form, a very common construction of jetty is a timber framing, A,

Fig 3.



Jetties.

secured by piles or loaded with rubble. It is often built in the manner of a sea wall having a double row of sheeting piles, the interval filled in with rubble or *béton*. The latter is excellent. The term jetty is also applied to expensive and solid erections of masonry, and to hards or landing places for boats.

Telford's jetty, B, at the eastern arm of Kingstown harbor, Ireland, is an example of a jetty made of rubble, with a track and parapet of coursed masonry. The foreshore, in most works of this kind, is faced with patched stones, that is, an outer layer in which the undressed stones are not laid at random, but deposited end on, beginning at the lower edge, and so caused to bind and become mutually sustaining

Jetties of masonry, C, have usually ashlar facings and heartings of rubble or concrete. The walls filled in with *béton* will be nearly equal to a solid mass; in fact, *béton* it self makes a wall of such tenacity that its strength is equal to a homogeneous block. When the ashlar masonry is filled in with earth, it requires a bond; when this is masonry, the counterforts take the form of division walls, which thus reduce the jetty to a series of compartments. The stones of these horizontal bonding courses should be cramped and joggled together, and the top carefully paved to prevent infiltration.

The southern jetty, D, of the port of Havre is exposed to violent storms and a powerful littoral current. It exemplifies the ashlar facing, horizontal bonding walls, rubble filling, paving, parapets, aprons of piles and *pierre-perdue* to protect the foundations from the repercussion of the waves, all executed in a style which has provoked the admiration of those who have understandingly examined it.

FELTING.

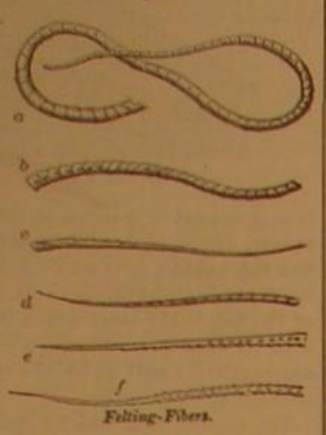
The mechanical features of the operation of felting are derived from the jagged character of the edges of some animal fibers which enables them to pass in one direction, that is, root first, but opposes their withdrawal. When the fibers are pressed together by suitable means, the projections interlock, and a compact fabric is produced.

In Fig. 4 are represented several

FELTING FIBERS

as seen under the microscope. *a* is a fiber of Saxony wool, somewhat less than $\frac{1}{1000}$ of an inch in diameter. *f* is rabbit hair, and *b* beaver down, which has a diameter of about $\frac{1}{2000}$ of an inch. *c*, *d*, and *e* are muskrat, nutria, and hare fur. They all show the jagged edges which confer upon them the characteristic felting quality.

Fig. 4.



Felting-Fibers.

M. Du Chaillu, the well known African explorer, describes a

PRIMITIVE EASY CHAIR,

devised by Obindji, a chieftain of a tribe living in the Gaboon country. This dusky potentate is represented, enjoying a *siesta* in the offspring of his inventive genius, in Fig. 5. The chair is nothing more than a slab of wood which

Fig 5.


Obindji in his Easy-Chair; Gaboon, Africa, A. D. 1875.

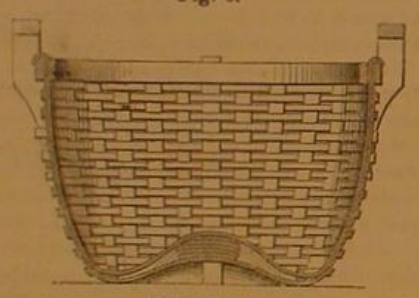
rests on an inclined four-legged frame, and is held from sliding by blocks at its lower end.

Figs. 6 and 7 relate to

BASKET MAKING.

For the finer kinds of baskets, osier is the material most commonly used, but for a coarser article strips of split hickory, oak, or black ash, are frequently employed (Fig. 6.)

Fig. 6.


Split Basket.

Osiers are prepared by soaking in water, after which they are split, cleaned, and bleached in the sun. A number of rows are laid crosswise to begin the bottom of the basket, and are woven together by a spiral weft of wands, which pass alternately over and under the radial wands, to which others are added as the size increases. The wands are bent up to form the sides, and other rods are woven in and out between them, until the basket is made of the required

Fig. 7.


Basket-Maker.

hight. The edge or brim is finished by turning down the projecting ends of the ribs, whereby the whole is firmly and compactly united. Handles are formed by forcing two or three osiers, sharpened at the ends and cut to the proper length, down the weaving of the sides and close together. They are pinned fast near the edge and afterwards bound or plaited.

Hydrophobia and Intemperance.

Mr. L. N. Noyes, of Boston, Mass., sends us the following, from the Brooklyn *Argus*:

"Hydrophobia, in the dog, I am satisfied, is the result of the animal having been inoculated by biting some person suffering from the disease of intoxication. Startling as this theory may appear, there is not the least question but that the facts will bear it out. First, hydrophobia and *mania a potu* are identical in most physical conditions—subjects dead of either disease presenting nearly the same autopsy. Second, the saliva of a man dying of delirium tremens, and that of a dog suffering from rabies, bear the same chemical analysis. Third, the entire system of the patient suffering from alcoholic madness is so poisoned that rapid inoculation will follow any contact with the virus of the blood. Fourth, the bite of a man in an alcoholic fit has been known to result in hydrophobia. As to the application of these facts: First, with the canine race, hydrophobia is never spontaneous; with man, the disease is known to be. Second, there is not a case on record of a dog having died of hydrophobia that will not admit of proof—if the facts can be ascertained—that the dog had previously bitten an intoxicated person, or had been attacked by some other animal suffering from a like inoculation.

GEORGE WILL. JOHNSTON, Superintendent Brooklyn Society for Prevention of Cruelty to Animals."

We think the statements here made are without foundation: In regard to the first assertion, that hydrophobia and *mania a potu* are identical, by which we presume the writer means that similar symptoms are developed in both, we would refer him to the works of the best authorities, in which he will find that they differ in the most important respects. That the autopsy in both cases is similar is quite natural, since there are no well marked anatomical lesions in either; nor are there in hydrocyanic acid poisoning, *tetanus*, etc. Secondly, as to the saliva of a man dying of *delirium tremens*, etc.: we do not fully understand what the writer means. If it is that the same abnormal principles are found in the saliva of both cases, such as would produce hydrophobia if introduced into the healthy circulation, we can only reply that this could only be proved by a number of experiments, which have not, as far as we are aware, ever been made. We almost daily hear of cases where a nose, an ear, a cheek, or a finger is bitten off in a drunken broil, without hydrophobia resulting. Thirdly, there is no virus of the blood in alcoholism. According to Flint, Sr., Minuyer, Watson, Reynolds, Dunglison, and many others, the etiology of hydrophobia is not known; while it never appears in the human subject without inoculation in the correct sense of the word, and not as Mr. Johnston uses it. The last deduction is too absurd to demand attention.

Correspondence.

The Centennial Trial of Steam Fire Engines.

To the Editor of the Scientific American:

Will you please correct an error in your otherwise admirable account of the trial of steam fire engines at the Centennial?

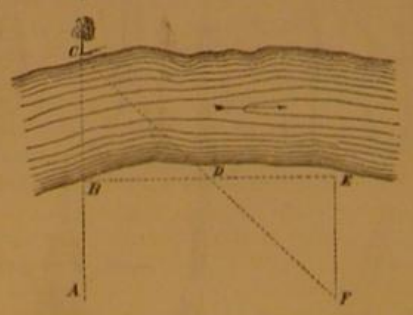
The judges were assisted by Mr. Wellington Lee, as expert, not by a Mr. Wellington as you printed it. Mr. Lee is well known as a member of the firm of Lee & Larned, who, after Latta of Cincinnati, were the pioneers in steam fire engines, and first made them an established success. He is on all accounts the most competent man living to fill the exceedingly difficult position of expert assistant to the judges.

Newark, N. J. CHARLES T. PORTER.

To Measure the Width of a River.

To the Editor of the Scientific American:

Let A B represent the line of survey (the course being at any point of the compass), striking the river bank at B. Mark a tree or bush on the opposite bank, in line with A B. Then lay off 25, 40, 50, or any number of feet from B to D, at right angles with the line A B; from D to E lay off the same distance as from B to D; then from E, walk, at right angles to B E and parallel to line A B, until you reach point



F, which is in line with points C and D. Then measure from E to F, which will be the same distance as from B to C, or the width of the stream. A. S. LEHMAN.

Fort Cameron, Utah Ter.

(For the Scientific American.)

A LESSON FROM THE MACHINE TOOLS AT THE CENTENNIAL.

It is somewhat remarkable that, while the exhibits in Machinery Hall show the advancement in special manufactures and processes, yet, in the tools and appliances for producing the machinery, but little progress seems to have been made during the last thirty years. If we examine the loom, the printing press, and the woodworking machinery, our advance is marked by complete and successful applications of new and original principles. But if we turn to the lathe and the planing, drilling and slotting machines, in fact to any of the tools used in the construction of machines, we shall find that we have reach a platform where we may "rest and be thankful," but beyond which we have apparently but a small prospect of further progress. If we examine the lathe, and ask ourselves in what broad particular we have improved upon the old Smith, Beacock, and Tannett lathe of thirty or forty years ago, we shall not readily find an answer. We have the same bed, the same cone mandril, the same gear, screw-cutting, and independent feeds, the same cross feed, the same compound rest, the same tail stock, in fact, the same design and general arrangement all through; and with the exception of the introduction of the universal chuck, our chucking devices are identical. If we turn to the lathe cutting tools, we shall find that our practice has been stationary. In planing machines, we have adhered to a like general arrangement of parts; and the departures from old practice are not worth mention. The slight modifications consist in arrangements for a quick return motion by means of an extra pulley and belt instead of differential gearing, and in the application of an independent rest attached to the uprights for planing vertical faces. In planing machine cutting tools, we have made no innovation; and the only departure from the old time practice has been in the modern plan of taking a finishing cut on cast iron with a broad, flat-nosed tool with a very coarse lateral tool feed. In shaping machines, we have made some departures in the entire design, giving to one machine capacity for a much wider range of work. The sliding head has been made movable upon the bed, and various attachments for the table have been introduced. But the machines built by Maclear and March, a generation since, had a quick return motion, cone mandrils for circular work, and a vise chuck (as good as any we remember to have seen, except that lately introduced by Thomas & Co., of this city); whereas we do not know of a modern shaping machine equal in capacity to the Nasmyth "puff and dart" machine of thirty years ago. That machine, which is still extensively used in England upon the edges of armor plates, had a stroke of five inches and made 160 cutting strokes per minute. Referring again to the various attachments for the table, but very few of them are used for general work. In cutting tools for shaping machines, we have no modern innovations whatever. In drilling machines, our progress has been confined to the introduction of multiple machines, adapted to special work, and in various forms of radial drilling machines, constituting a more marked improvement than in the machines above mentioned; but in the drilling machine pure and simple we have made no substantial progress, except it be in the introduction of the twist drill, which is decidedly a step forward in drilling fine work. The Maclear and March drilling machines above mentioned were as substantial in their framing, and were provided with self-acting change feed as well as hand feed; for light work a treadle feed was employed, leaving both hands free to manipulate the work. In screwing machines, we may justly lay claim to advancement in the introduction of solid dies, and in the use now common of segmental dies fitted to adjustable chucks; so that, while the dies cut the whole thread at one cut, they thus avoid the strain on the sides of the thread, which is inherent in those dies which are adjustable and require to take more than one cut to make a full thread. Another modern improvement is in the dies, which are made to throw open when the thread to be cut is finished, so that the dies do not require to travel back over the thread, a movement which abrades the cutting edges of the die teeth, and also entails a loss of time. We have also added pumps for supplying a more copious stream of oil to the dies; so that, taken altogether, we have made satisfactory progress, notwithstanding that the tap has maintained its original form, except it be in our having adopted a standard angle and pitch.

Our greatest degree of progress has been in the milling machine, which has been given a very wide range of useful application during the last thirty years. But milling machines and milling cutters, of the same shape as those at present used, and with self-acting feeds, were employed years ago; but their field of employment was then comparatively limited. In the slotting machine, we know of no substantial improvement made during the last twenty-five years, and but little indeed in a much longer period. The slotter introduced by Sharp, Stewart, and Co., of Manchester, England, about the year 1855, had a box frame, and as complete an arrangement of change speeds and table movements as any exhibited at the Centennial. In boring machines, we have made considerable improvement, especially in the introduction of those of the horizontal type.

In none of these machines, however, have we succeeded in attaining higher rates of cutting speed and feed than were formerly used. It is only when we turn to special machines that the march of modern progress becomes visible. The Monitor lathe, for example, will produce infinitely more small work than was formerly attainable by any machine worked by one operative. It is, however, scarcely just to term it a lathe, since it is more properly a special machine having definite limits of useful application. The introduction of solid emery wheels is another modern improvement, greatly facilitating our operations upon hard metals requiring to be very true, but in no way advancing us in the practice of polishing, for which purpose the wooden wheel, covered with leather and coated with emery, still holds its own. So likewise for many purposes the quick running grindstone has not been displaced by the emery wheel. In polishing processes our progress has been but little, the greatest innovation being in the employment of rag wheels.

In many of our special machines, we have merely enabled the ordinary mechanic to produce as much and as good work as the most expert workman did formerly: and we have lowered the standard of capability of our mechanics in a proportionate degree. This, however, is not in the main to be regretted, since, having the improved machines, we do not as a rule require the expert workmen. The only attendant evil lies in that, though we have greatly enhanced our ability to produce new machines, we have in a partial degree produced a less skillful class of workmen to repair them. It is true that worn ou tparts may be duplicated, but that is not sufficient, for the reason that the new part is of the original size, whereas the repaired part requires in a majority of cases to be made sufficiently larger to compensate for the wear in the part to which it is attached. Thus, if a hole is

worn larger and the bolt smaller, a new bolt of the original size will not fit the enlarged hole. There are, furthermore, many classes of work which a skillful workman can fit together more quickly or economically with the hammer, chisel, and file than can be done by the aid of machine work; but to be sufficiently expert to do this, the mechanic requires to be vastly more skillful than our modern practice enables him to become.

The United States has undoubtedly taken the lead in the application of special machinery for special purposes, and hence possesses the largest proportion of special workmen, that is to say, men having more knowledge as to how a piece of work should be done than they have manual or manipulative skill to do it; and it is mainly from this class of men that our inventors are drawn. The workman who does not find it difficult to handle and manipulate his work becomes satisfied with and wedded to the process or means by which it is made or manufactured; while he who finds the existing means of production difficult and tedious begins at once to think out some better means of producing the same result. And though the difficulties to be overcome may preclude his entire success, he generally attains it in some degree; while others, taking up that part in which his object was attained and profiting by his failures, search in a new direction to overcome the obstacles which proved to him almost insuperable. It is from these causes that our triumphs in mechanics have been almost invariably practical. It is a common idea that it is the cost of labor to which we owe the greater part of our inventive progress; but there can be no doubt but that, to the causes here pointed out, we are much more large indebted.

Had it been the undue cost of labor, we should have undoubtedly expected to look to theoretical men and capitalists for the innovations; whereas our inventions have been the productions of practical men, with only a partial manipulative and mechanical education: of those men, in fact, who, experiencing the practical difficulties, set about to avoid them by machine manipulation, leaving it to the theorists to follow, and so cover the principles governing the action of the machine. With the diagrams, formulas, and laws that they produce, the inventor is very frequently lost in astonishment at beholding the cloud of theoretical considerations enveloping his successful productions, and innocently, though naturally, wonders how he came to devise so simple a machine involving such learned considerations, of which he had not the slightest knowledge. The American mechanic, in fact, not satisfied with the capacity of the ordinary machine tool, and not having had sufficient experience to wed him to a precise method of operation, sets about to first make those tools as perfect as possible, and next to supplant them, whenever practicable, by taking the processes in detail and designing new tools, bringing the appliances for planing, turning, grinding, polishing, and screw cutting together in one machine, if necessary; and steadily pursuing his end, adopting new ideas wherever he could find them, profiting by others' failures, and substituting for them his own ideas, which might be successful or otherwise, the latter case merely showing the necessity for further experiment. Thus every failure becomes a success, inasmuch as it is a sign post to a road that was not to be taken, besides being a notice to search in other directions. How far we have profited by this practical process will be shown on a future occasion. J. R.

PRACTICAL MECHANISM.

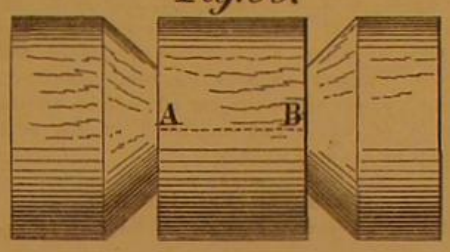
BY JOSHUA ROSE.

SECOND SERIES—Number XIII.

To resume, then, having sawn out our piece of wood for the flange, we plane up one side, and set a pair of compasses to the radius of the required flange, and mark a circle upon the piece of wood, and then saw off the corners nearly to the circle. We then true up a facing chuck in the lathe, and fix the flange to it by screws passing through the chuck from the back, placing them far enough from the center to avoid their coming into contact with the hole which we shall require to bore in the flange. We then dress off the face of the flange to nearly the required thickness, using the gouge to rough it out with, and the scraping chisel to finish. It is not necessary to finish right down to the center, but merely down to a diameter somewhat smaller than the hole in the flange will be. Our next procedure is to mark the size of the hole, which is done by setting the compasses to the required diameter, and then holding them with one leg resting upon the hand rest; and by bringing the point into contact with the face of the work, we may describe upon the latter a true circle, somewhat smaller in diameter than that required. This circle will serve as a guide to us while we hold both compass points against the work to describe a circle of the correct diameter, which will be done by keeping the compass points at equal distances, one on each side of the circle first described. We must, in the last operation, hold the compass points lightly against the work until we can see that the line described by one point falls in the same line as that described by the other, and then we may make a deep mark. This method is quite as easy an operation as setting the compasses to the radius of the hole, and, putting one leg in the center of the work, describing a circle with the other; and this process is also more exact when the wood is rough. We next take a chisel of about $\frac{1}{2}$ inch wide, and cut out the hole at one cut by forcing the chisel lightly through the thickness of the flange, taking care to cut the hole nearly $\frac{1}{32}$ inch too small, so as to allow of finishing with the diamond point or side tool. The hole being finished, we may turn the outside diameter of the flange with a very sharp gouge, leaving about $\frac{1}{32}$ inch for finishing, which may be done with the scraper. When the scraping chisel, as indeed all scraping tools, is in proper order, a slight burr can be felt on the top face of the tool, which is caused by oilstoning the beveled face of the chisel last.

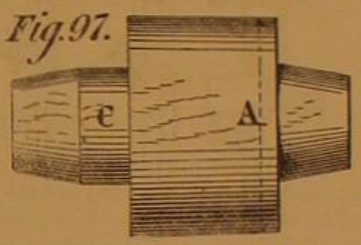
To form the body of the pattern, we take a piece of timber of sufficient size to make the hub and core prints in one piece; and with an ax, we hack off the corners so as to save lathe work. We then place it in the lathe between the centers, using the fork shown in Fig. 48 as the running center and to drive the piece of wood, and screwing up the back center sufficiently firmly to hold the wood tightly. The large diameter is turned to its size with the gouge and scraper, using the latter to finish with, and bearing in mind that the wood is apt to become loose between the lathe centers by reason of the latter becoming imbedded in the wood; and it is necessary therefore, during the earlier portion of the turning, to try the back center and screw it up into the work, if necessary. Then, with the skew chisel, we cut two recesses, as shown in Fig. 96, the distance from

Fig. 96.



A to B being the length of the body or hub of the pattern, and the small diameter of the recess being a little above the required diameter of the core prints. We next turn down the core prints to the required sizes, and turn the part shown at C, in Fig. 97, to fit the hole tight to the flange;

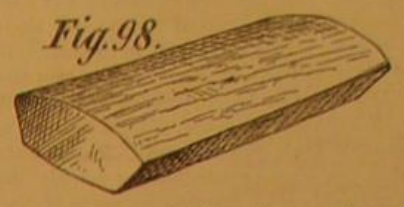
Fig. 97.



and it will be perceived that, by leaving a longer end outside of the recess or nick at one end than at the other, we have left room for the flange, and so kept the core prints of equal length at each end, as shown in Fig. 97. The part that protrudes through the flange will in this case be for the top print, and it is therefore given an excess of taper, for reasons before explained. The hub or body of the pattern is also made taper, being a little the smallest at the end farthest from the flange (A, in Figs. 87 and 96), because this hub, being cast endwise, requires draft to permit it to be extracted easily from the mould.

Having brought our pattern, as nearly as possible, to the requisite size and form with the cutting tools, it is necessary to consider those final processes which so much add to the appearance and smoothness of pattern work. The first of these processes is termed sand-papering or glass-papering. Sand paper is a sort of Will o'-the-wisp to the beginner, luring him on to scamp his work, under the impression that sand paper will hide the defects and bring it all right, while the fact is nearer the reverse; for let a pattern be never so truly shaped and turned, if the sand-papering be be injudiciously performed, the sharpness of its outline will be destroyed, and very likely its size and shape be seriously interfered with. It is true that it is scarcely possible to do much damage to large surfaces; but that is merely because of the great disproportion that would exist between an error engendered by sand-papering and the whole size of the pattern itself. If we have an inch cube to sand-paper, and should take $\frac{1}{64}$ inch more off one side than off another, our error would amount to the $\frac{1}{64}$ of the length of the pattern; but had the same thing been done upon a 12 inch cube, the error arising therefrom would only amount to the $\frac{1}{768}$ of the length of the pattern. Again, to remove $\frac{1}{64}$ inch from one side of each of these respective cubes, we should have 144 times as much wood to abrade away in the one case as in the other; so that it will be readily perceived that the difficulties attending the sandpapering of a pattern, so as to preserve its true form and size, increase in a twofold ratio as the size of pattern diminishes, until at last it becomes impracticable. Exactly where this point is reached it is not possible to state; it will, however, vary with the capabilities of the workman, the steadiness of his eye and hand, and the nature and material of the work. It must have happened to many that they have made patterns so small that they dared not attempt to sand-paper them, and that they have turned intricate details upon a piece of work which could not be preserved in their sharpness under the abrasion of sand paper. While therefore we respect sand-paper, let us respect our tools more, and let the pattern or core box, as the case may be, be brought as nearly to the form required as practicable with the cutting instrument, and then let the sand paper be applied, not by folding it together and rubbing it upon the work, but by considering the shape we intend to finish, and preparing a piece of wood to correspond to the shape. Such a piece of wood is called a rubber. A flat surface requires a flat rubber, a convex surface a concave rubber, and *vice versâ*. Rubbers are made of a size suitable to hold in the hand, and in length range up to 12 inches. Longer than this would be useless for one sheet of sand paper, and that is all that is generally used at a time. Turned cylinders make good rubbers, for core boxes that are semi-circular, up to about 3 inches in diameter; above that size, the turned rubber becomes clumsy, and a piece flat on one side and planed to suit the curve is used. Such a piece is shown in Fig. 98. To use it, place one fold

Fig. 98.



of sand paper only around the rubber; and applying it to the work, move it over the surface of the work, and across the grain of the timber, if it is possible. If the size of the work is smaller than the rubber, we must take short strokes so as to be able to move the latter steadily, and not round off the work at and towards the edges. A very good plan, where extra care is required, is to either glue the sand-paper to the rubber, or else fasten it with a few tacks. Sand-paper glued to a flat board is very useful for small surfaces; but in this case, we rub the work upon the paper, and not the paper upon the work. The grades of sand paper used upon pattern work range from No. $\frac{1}{2}$ up to No. 2, Nos. 1 and $1\frac{1}{2}$ being most commonly employed.

The surfaces of the hub or body of our gland pattern being straight in their outline, we sand paper them in the lathe with the paper wrapped once around a flat rubber, applying the paper lightly to the work, and moving it very slowly over the work in the manner in which a file is used. We next fasten the flange to the body by gluing it by using finishing nails, or by both. If finishing nails are used, care must be taken to use a bradawl before inserting the nails, for fear of splitting the work.

To make the pattern in the manner shown in Fig. 90, the method of procedure is the same as the above, with the exception that the tapering of the core prints must be *vice versâ*, as in this case the core print the farthest from the flange will be the top one in the mold, and must therefore be given the most taper. And since the body of the pattern will lift with the cope, while the flange will remain in the nowel of the flask, when the mold is taken apart (as shown in Fig. 91), the flange of the pattern must be made an easy fit to its place on the body or hub, and must not be left of a tight fit, as in the former case. A pattern of the form shown in Fig. 92 may be turned, flange and all, out of a solid piece of wood; or if too large for this, we may plane up a piece for the flange and glue a hub to it; and when the glue is dry, turn up the whole patttern at one chucking in the lathe.

Protection of Buildings from Lightning.

Professor Clerk Maxwell read an abstract of a paper before the Mathematical and Physical Science Section of the British Association at the recent meeting at Glasgow, in which he stated that those who erected lightning conductors had paid great attention to the upper and lower extremities of the conductor—having a sharp point above the building and the lower extremity carried into the earth as far as possible. The effect was to tap, or, as it were, to gather the charge by facilitating the discharge between the atmospheric accumulation and the earth. That would cause a greater number of discharges than would have otherwise occurred; but each of them would be smaller than those which would have occurred without a conductor. That arrangement was therefore more for benefit of the surrounding country, and for the relief of the clouds laboring under an accumulation of electricity, than for the protection of the building on which the conductor was erected. What was really wanted was to prevent the possibility of an electric discharge taking place within a certain region. An electrical discharge could not occur between two bodies unless the difference of their potentials was sufficiently great compared with the distance between them. If, therefore, they could keep the potentials of all bodies within a certain region equal or nearly equal, no discharge could take place between them. That might be secured by connecting all these bodies by means of good conductors, such as copper wire ropes. It would, therefore, be sufficient to surround a powder mill with a conducting material, to sheath its roof, walls, and ground floor with a thick sheet of copper, and then no electrical effect could occur within it on account of any thunderstorm outside. There would be no need of any earth connection. They might even place a layer of asphalt between the copper floor and the ground so as to insulate the building. If the mill were struck, it would remain charged for some time, and a person standing on the ground outside or touching the wall might receive a shock, but no electrical effect would be perceived inside even by the most delicate electrometer. A sheathing of copper was by no means necessary in order to prevent any electrical effect taking place. Supposing a building was struck by lightning, it was quite sufficient to enclose it with a network of a good conducting substance. For instance, if a copper wire were carried round the foundation of a house, up each of the corners and gables, and along the ridges, that would be a sufficient protection for an ordinary building against any thunderstorm in England; but it might be well, to prevent theft, to have it built in the wall, and then it would be necessary to have it connected with some metal, such as lead or zinc, on the roof. It need scarcely be added, said the Professor, that it is not advisable during a thunderstorm to stand on the roof of a house so protected, or to stand on the ground outside, to lean against the walls.

IMPROVED ENGINE INDICATOR.

Every engineer who has had occasion to apply the indicator to engines running at a high speed has, doubtless, been made unpleasantly aware of the disturbing effect of the weight of the parts which move with the marking points; for notwithstanding the great improvements which have been effected over the first instruments in the way of reducing the disturbing momentum of these parts, there still remains much room for improvement in the same direction.

Some of the conditions necessary to the best steam economy are a high boiler pressure, prompt and free induction, a quick cut-off, reduced clearance, a high ratio of expansion, and a reasonably high piston speed. But it unfortunately happens that the above conditions are exactly those under which the momentum of the moving parts of the indicator produces its maximum of disturbance. Hence, since the introduction of improvements in automatic cut-off engines, through which engines of that class, owing to their not being subjected to the limitations of speed imposed by "releasing gear" cut-off mechanism, can now be made of any size, however small, and run at any speed, the need of a corresponding improvement in the indicator has become apparent; and to a desire to meet this requirement, the instrument illustrated herewith owes its origin.

Fig. 1 is a perspective view, from which it will be seen that the pencil is inserted directly in the end of the lever, A, the other end of which is pivoted to the vibrating bracket, B, which, being pivoted at C with freedom of movement, allows the path of the pencil to be controlled by the light link or radius bar, D, which is pivoted at one end to the standard, E, and at the other to the lever, A. These parts are so arranged with reference to each other that the curvature of the path of the end of the bar, D, exactly neutralizes the tendency of the pencil end of the lever, A, to move in a curve, and so that the latter is thus constrained to move in a straight line. The lever, A, having only the pencil to carry, is made only of sufficient strength to give the necessary pressure of the pencil to the paper; and the bar, D, having but a slight duty to perform, is also made extremely light. In fact the weight of the parts is claimed to be, by actual test, less than one third of that of the lightest system, hitherto produced, having a parallel movement.

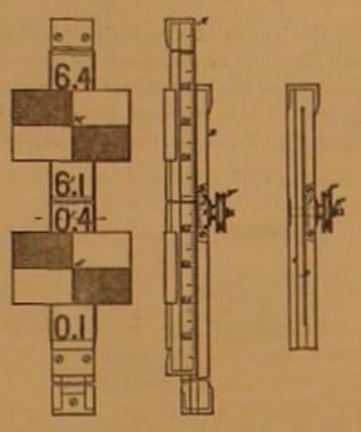
Fig. 2 is a vertical section of the cylinder, piston, and its connections. F is the piston, the stem, *f*, of which is short, but is supplemented by a hollow trunk, G, which is screwed on its end, and which, passing through the cap, H, steadies and guides it. The connection, I, which connects the piston with the lever, A, passes down the inside of the trunk and has a head or collar, *i*, the upper and lower surfaces of which are respectively convex and concave, and are concentric with each other. The concave surface rests on and fits the hemispherical end of an adjustable stud, which is screwed into the end of the piston stem, *f*, and the upper or convex surface fits and is secured by an internal collar in the trunk, G, the whole forming a universal compensating joint which allows both the lateral play required by the parallel movement, and the axial movement of the head, K (which carries the lever system), by which the pencil is brought in contact with and removed from the paper. The connection, I, is pivoted to the lever by a taper steel pin. The head, I′, which embraces the lever, is separate from the rod, which is screwed into it and secured by a lock nut, *i*′, which allows the length of the connection to be varied to suit variations in the length of the springs. It will be observed that this arrangement involves but two joints between the piston and the pencil, and these are of a substantial and durable character. The pivots at the ends of the brackets, B, are also taper steel pins.

Fig. 2 also shows a minor improvement in the arrangement of the spring in the paper barrel. The drum, L, which contains it, is covered by a milled edge cover, M, to a hub on which the inner end of the spring is attached, so that, by turning this cover, the tension of the spring may be adjusted as desired and secured by the thumb nut, N, the thread of which is cut right or left, according to the corresponding character of the instrument, so that the force of the spring will always tighten the nut.

A patent was granted through the Scientific American Patent Agency to J. W Thompson, August 31, 1875, and assigned to himself and the Buckeye Engine Company, of Salem, Ohio, to whom all inquiries should be addressed. The above company are also the sole manufacturers of Thompson's patent automatic cut-off engines, an illustrated description of which was published in the SCIENTIFIC AMERICAN of January 9, 1875.

IMPROVED LEVELING ROD.

We illustrate herewith an improved leveling rod, patented



through the Scientific American Patent Agency by Mr. G. L. Whitehouse, of Farmington, N. H. A represents one part of the rod, and B the other. A has a dovetail or undercut groove in the back, and B has a tongue C, corresponding to the groove in form, and being fitted into it. Between the tongue, C, and the main part of B, is a long slit, D; and a screw stud, E, extends from the tongue out through the back part, and has a clamp nut, F, fitted on it to spring the parts together, and thus clamp them to the part of A between the tongue and the main parts, A and B, of the rod together at any point, making a simpler and better contrivance than the outside clamp commonly used. G and H represent two targets, which are applied to the part, A, of the rod, the same being in practice six feet apart from center to center, so that, by using the upper one for extra hights, and adding six feet to the reading of the scale, these hights are obtained without reversing the rod and shifting the target, as with the common rod. I is a vernier, together with a scale on the side of the rod, for the rodman to read. The scale, I, on the face of the rod is large, to allow it to be easily read by the leveler.

Velocity of Electric Waves.

A new method for measuring the speed of waves, and at the same time their exact contours, has lately been invented by Mr. Robert Sabine, and tried with excellent results upon lengths of the Red Sea cable at present in course of manufacture at Enderby's wharf, Greenwich, England. Mr. Sabine's method consists in sending currents into one end of the cable (the other end being to earth), and at regular intervals testing the potential of some given point in the conductor. This is done by means of a mica condenser, which is kept in connexion with the point in question until the right interval has elapsed, when it is discharged through a galvanometer. A rotating time apparatus is arranged to close the circuit of the battery at the end, and after a given interval to separate the conductor and discharge it. The interval may be varied from 0·001 to 2 seconds. A similar reading is taken for each interval from 0·001 second upwards until the maximum of the potential due to the position of the point tested is attained. This gives a curve of the exact contour of the wave. The speed is measured by sending two waves of opposite size into the cable, and noticing the intervals at which their neutral point passes two given points in the cable. The difference of the intervals and the distance between the points give the speed.

Acid-Proof Paint.

The following recipe may be of value to some of our readers: The application of water glass or soluble silicate of soda to wood or metal utensils, to protect them from the action of corrosive bodies, is sometimes desirable, and this material, a correspondent in the *Polytechnisches Journal* tells us, may be used with little difficulty if you go the proper way to work. The wood or metal must be perfectly dry to begin with, and free from rust or any kind of fatty matter. Any of the pure mineral colors may be used for mixing with the silicate. Powdered lime, amounting to twenty or twenty-five per cent by volume, is mixed with the pigment, and double as much water glass is then added. The mixture is then applied in the same way as ordinary paint.

A SWISS inventor envelopes the driving axle of locomotives in coils of insulated copper wire, and by the passage of an electric current converts the wheels into powerful magnets, with increased adhesion to the rails.

Fig. 1.

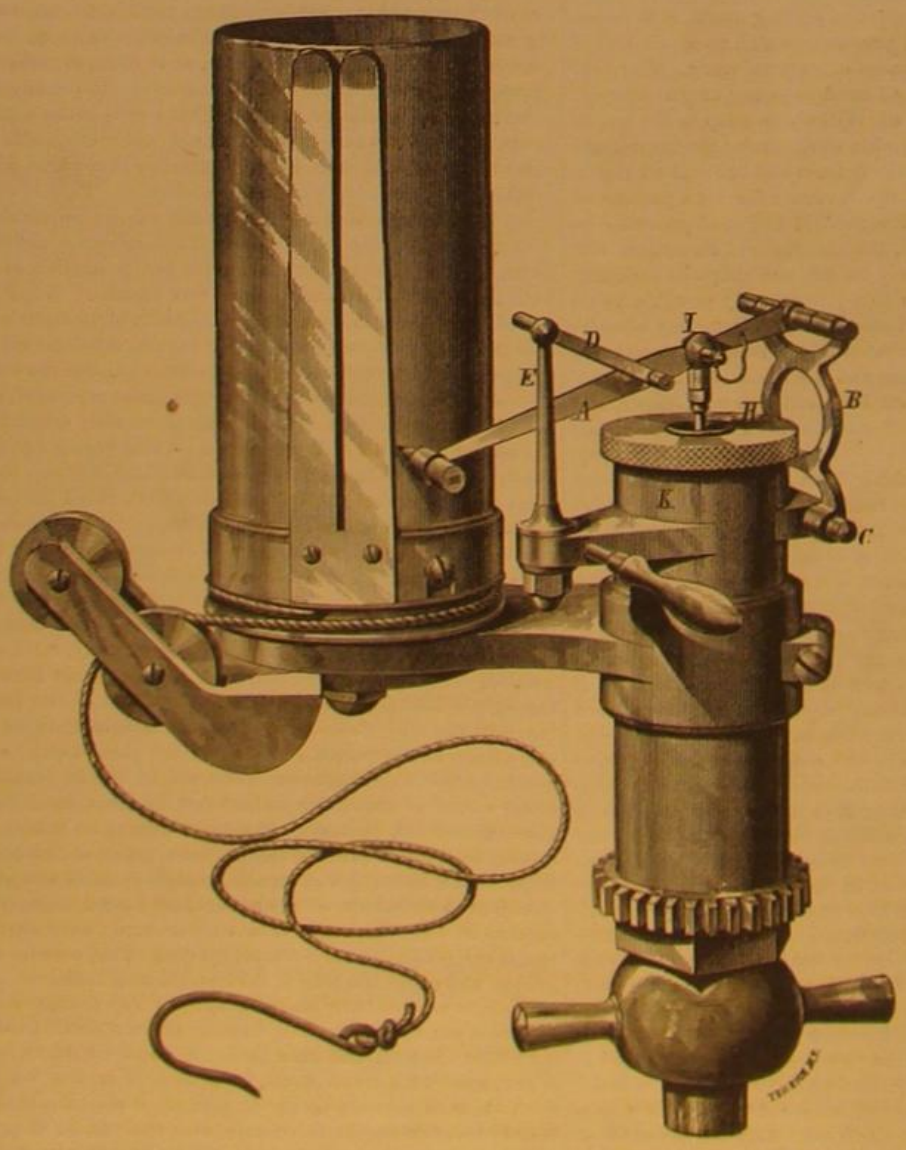
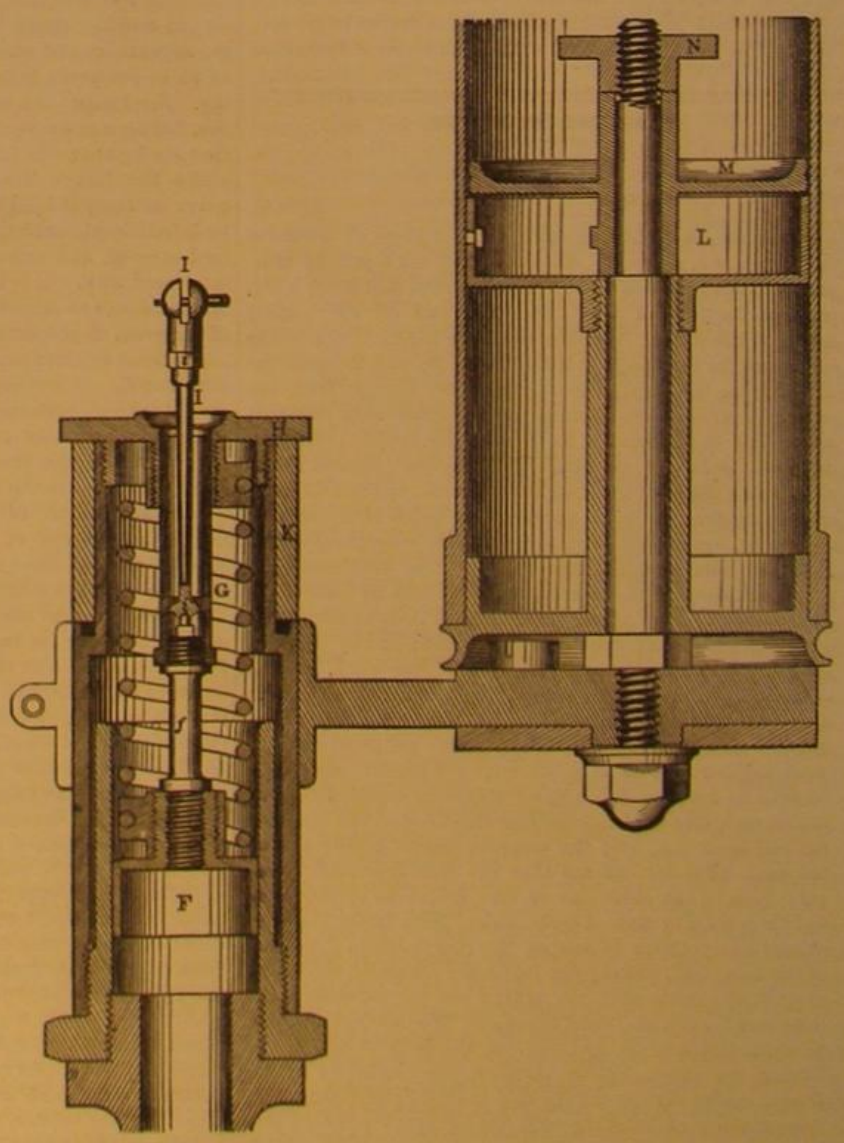


Fig. 2.



THOMPSON'S IMPROVED ENGINE INDICATOR.

A WHITE-FLOWERED BRAMBLE.

Though rarely seen in gardens, this is one of the most striking of all early flowering shrubs; it was originally discovered in 1822 by Dr. James, who found it on the Rocky Mountains, where it grows at considerable elevations. The plant was brought into cultivation, says a correspondent of the English *Garden*, in Great Britain, by Mr. Anderson-Henry, of Hay Lodge, Edinburgh, who raised it from North American seeds, the produce of which first bloomed in May, 1870. Our illustration was prepared from a bush of it 4 feet high, in the Royal Botanic Gardens, Regent's Park, London, where we saw it bearing numerous large white flowers among serrated trilobate leaves. Its single roselike blossoms are succeeded by reddish purple blackberry-looking fruits, which have an agreeable flavor. The plant is perfectly hardy, and is well worth a place in every choice collection of flowering shrubs; its proper position, however, is unquestionably on the outskirts of plantations or in the wild garden. Like nearly all other species of *rubus*, it may be readily increased by means of root cuttings.

RUBUS DELICIOSUS.

True Economy of Life.

The true economy of human life looks at ends rather than incidents, and adjusts expenditures to a moral scale of values. De Quincey pictures a woman sailing over the water, awakening out of sleep to find her necklace untied and one end hanging over the stream, while pearl after pearl drops from the string beyond her reach; while she clutches at one just falling, another drops beyond recovery. Our days drop one after another by our carelessness, like pearls from a string, as we sail the sea of life. Prudence requires a wise husbanding of time to see that none of these golden coins are spent for nothing. The waste of time is a more serious loss than the extravagances against which there is such loud acclaim.

There are thousands who do nothing but lounge and carouse from morning till midnight—drones in the human hive, who consume and waste the honey that honest workers wear themselves out in making, and insult the day by their dissipation and debauch. There are ten thousand idle, frivolous creatures who do nothing but consume, and waste, and wear what honest hands accumulate, and entice others to live as useless and worthless lives as they do. Were every man and woman honest toilers, all would have an abundance of everything, and half of every day for recreation and culture. The expenditure of a few dollars in matters of taste is a small matter in comparison with the wasting of months and years by thousands who have every advantage society can offer, and exact every privilege it affords as a right.—*Philadelphia Commercial List.*

THE COCA PLANT.

The habit of chewing the leaves of the coca plant, common among the natives of many parts of South America, has recently been commented on by many medical authorities; and we present herewith an engraving of a branch of the plant, taken from a specimen in flower of the Royal Botanical Gardens, Kew, England. The use of the leaves of this plant as a masticatory is of great antiquity in Peru; indeed, it is said to have originated with the Incas, and at the present time is common through New Grenada, Quito, and Peru, and also on the banks of the Rio Negro. The South American Indians always carry with them a little bag of the dried leaves, and a gourd containing finely powdered lime, which is mixed with the leaf before chewing. Used in moderation, coca is said to pleasingly excite the imagination, and it also powerfully stimulates the nervous system. In illustration of this, Dr. Spruce remarks that an Indian, with a supply of his favorite coca leaf, will travel two or three days without food and without showing any desire for sleep. Among recent contributions to the history and effects of this plant, we may allude to a paper read before the April meeting of the Edinburgh Botanical Society, from which it appears that without doubt the leaves of the coca, when rightly prepared and used discreetly, possess the effects ascribed to them by all travelers in Peru since Pöppig was there in 1827, but that their effects are not always precisely the same on different individuals. From experiments conducted by Sir R. Christison, the author of the paper above cited, and those of fourteen other gentlemen who undertook to try the plant at his request, the following conclusions have been arrived at: (1) That, taken in quantities of two drachms by healthy persons, it has no injurious, unpleasant, or suspicious effect whatever; (2) that in a very few cases this dose, of an inferior sample, had no effect at all; (3) that in by much the greater number of instances, and with a fine sample in every case, extreme fatigue was removed and prevented from returning, and that no doubt can exist that, in such persons, its restorative and preventive powers will render protracted exercise easy, without any subsequent harm, so far as the restorative is concerned; (4) that it does not in the end impair the appetite or digestion, although hunger, even after long fasting, is taken away for an hour or two; (5) that the use of it probably does not agree with more than a very moderate use of alcoholic stimulants. At the same time the paper avoided all reference to the possible medicinal uses of this plant. Similar conclusions have also been arrived at by Professor Bouchardat, of Paris, who considers that its services in therapeutics have been most valuable, almost equal to those of cinchona, and that as a nervous and muscular stimulant it ranks with tea and coffee. On the other hand, evidence is not wanting to show that its effects (like those of tobacco, opium, hemp resin, gunjah or bhang, alcohol, and other vegetable stimulants) are certainly highly injurious when used habitually or in excess. A confirmed *conquero*, as an habitual chewer is termed, is said to be invariably known by his haggard look, gloomy and solitary habit, listless inability, and disinclination for any active employment. Its use is regarded by Europeans as befitting only the Indians; nevertheless, many whites are addicted to it. Dr. Weddell, who inquired very carefully into its effects on the constitution, states, as the result of his observation, the opinion that its habitual use acts on Europeans more prejudicially than on the Indians accustomed to it from early years; and in some cases is attributed to its abuse a peculiar aberration of intellect, characterized by hallucinations.

Dr. Mantegazza, says the English *Garden*, fully confirms the statements of Pöppig, and carefully describes its effects, stating the result of intemperance in its use to be frequently confirmed idiocy. The principle to which the effects of the coca leaf is due has been named cocaine; but much remains yet to be done before we can speak with any precision as to the properties and uses of this comparatively modern introduction to the pharmacopœia. The plant is easily cultivated in an ordinary plant stove in a compost of fresh fibrous loam, leaf mold, and sand; when growing it requires copious supplies of water at the root, and frequent syringings with tepid water keep down insect pests. Cuttings of both stem and root may be employed for purposes of propagation. There are about seventy other species of *erythroxylon*, some of which have stimulating qualities, while others furnish a tonic bark somewhat resembling that of cinchona. The bark of one species—*e. tuberosum*—supplies a reddish dye. The majority of the species are natives of South America and the West Indies, but others are found in Madagascar and the Mauritius. In nearly all the species a distinct pale band runs up the center of the back of the leaf, as shown in our engraving; indeed, in some descriptions of the leaf of the coca plant, we find it stated that two veins, in addition to the mid-rib, run parallel to the margin.

The leaves of this plant are used to make an infusion, as few as four or five leaves making drink enough for six persons. The coca is not to be confounded with the *cacao*, of the genus *theobroma*, which furnishes the nuts from which cocoa, chocolate, and the shells used for infusion are made.

ERYTHROXYLON COCA.

Leaf (natural size), single flower, and ovary enlarged.

Curiosities of the British Patent System.

A writer in *Chambers' Journal* has been examining into the history of the British Patent Office; and he describes many curious grants in the early history of the office. Among other facts, the writer states that there are four thousand applications for patents every year; and that the office receives the snug sum of $750,000 a year in fees and stamps.

The first patents, issued in the time of James I, were more in the nature of monopolies or privileges, for which a consideration was paid to shrewd Jamie himself. The very first patent of all was an exclusive privilege for drawing, engraving, and publishing maps of London, Westminster, Windsor, Bristol, Norwich, Canterbury, Bath, Oxford, and Cambridge. The next was for the privilege of publishing portraits of His Sacred Majesty. The third was for an unexplained group of wonderful inventions, for plowing land without horses or oxen, making barren land fertile, raising water, and constructing boats for swift movement on water.

Many of the patents relating to clothing are singular either for their immediate objects or for the language in which they are couched. One patent for breeches, at a date when trousers had not yet come much into use, described a mode of cutting out and making "to do away with all the inconveniences hitherto complained of"—by the aid of elastic springs, morocco elastic supporters, straps, buckles, etc. Another "protects trousers from mud," by means of a shield attached to the hinder part of the boot heel, which shield receives the splashed mud. Martha Gibbons, early in the present century, patented "a certain new stay for women and others, called the '*Je ne sçais quoi*' stay which may be padded in any part when required for persons to whom Nature had not been favorable"—probably a euphuism for "flat figures." George Holland patented a mode of "making false or dummy calves in stockings." A famous *modiste* has an improvement in ladies' dresses, "rendering the same body capable of adapting itself to fit different figures." For those "who cannot bear a ligature round the leg," a patentee has a garter made of steel springs, connected with a silver plate placed in the waistband of the dress. One patent tells of a machine for brushing trousers: a frame work supports a spindle which carries a set of concave brushes; a cylinder of wicker or cane is placed inside the trousers to keep them distended; and the spindle is set rotating by an endless band acting on a beveled pulley.

The searchers after a machine for producing perpetual motion—that dreamy fallacy of the middle ages—have not failed to make their appearance in the patent world. In 1859 two Germans, Krause and Rotman, residing at Milwaukee in the United States, sent a letter to "Her Majesty the Queen Victoria, Patent Office, London." Her Majesty most likely did not read it, but the Patent Office folks did. It ran thus: "Your Majesty, we humbly advertise that we find out the perpetual motion, a machine very singular in its construction, but the same time very important by the power it gives. We intend to secure ourselves the patent right for the United States; and as we are informed your Majesty has secured a reward for the invention, we respectfully ask your Majesty if we may come to show our invention? To prevent mistake, we humbly beg not to believe any person without having the original patent of the United States, and the copy of this letter."

From the cradle to the grave, says the writer, patentees take care of us in some way or other. Even Dolly is attended to. One patent among many tells us that "dolls hitherto made have never been so constructed as to allow of their being placed in a sitting posture, with the legs bending at and hanging down from the knees", and announces that this important desideratum has now at length been secured. Another inventor "gives a rocking motion to dolls' cradles" by an elaborate array of clockwork, eccentric wheel, winch, and connecting rod. One of the early patentees had "a hydraulike, which being placed by a bed-side, causeth sweete sleepe to those which either by hott feavers or otherwise cannot take rest." A patent medicinal powder, compounded of tobacco and herbs, was so meritorious that "if one teaspoonful be struck for a dose up the nose as snuff, will cure various disorders of the hypochondriac and melancholy kind." Eighty years ago many persons believed in a patented mode of curing numberless aches and pains "by drawing over the parts affected various pointed metals, which from the affinity they have with the offending matters, or for some other cause,

extract or draw out the same, and thus cure the patient." One patentee has a thief-proof coffin, in which the corpse is secured by chaining or hooping it to a false bottom; and another a coffin made impregnable by some special application of "tapped and case-hardened screws."

If we cut short our budget of curious patents, it is only because space fails us. Two of the Lillywhites, the celebrated cricketers, have at different times patented bowling machines; in one instance for the adoption of machine bowling in actual play; in the other only for practice at batting, when a trained bowler is not at hand. If the reader will imagine something of the catapult or cross-bow kind, he may form some idea of these cricketing oddities. One patentee has a balloon for catching fish; a balloon, inflated with air and ballasted with water, is supposed to drag or trawl the fishing lines or nets. Before the Manchester and Liverpool Railway was constructed, a bright genius conceived the idea of using balloons to draw a ship overland between those towns, on a tramway of twenty feet gage! A balloon has been patented for preventing sea sickness: a platform, resting on a huge ball and socket, supports the seats for the passengers; the platform is connected by cords with a circle of small balloons; and the balloons are expected to keep the platform always horizontal—of course to the great satisfaction of the passengers. Balloons are also intended, by another patentee, to keep in motion the swings which are such a source of delight at country fairs. One of the very earliest patents was for "a fish call, very usefull for the fishermen to call all kinde of fishes to their netts, speares, or hookes; and for fowlers to call severall kindes of fowles or birds to their neets or snares." In one part the inventor speaks of his fish call as a "looking glass"—rather a puzzle to interpret. Acrobats are invited to use a patent shoe soled with iron, which will enable the wearer, with the aid of a powerful electromagnet to walk head downwards along a metallic ceiling. There are patents for milking cows, for preserving the hands from chapping, and for curing the croup in fowls. Snuff-taking is made easy by "two snuff boxes, one with a slider and the other with a sweep, out of which snuff may be taken without pulling it (the box?) out of the pocket, and without spilling."

CENTENNIAL NOTES.

We continue below our notes on the various objects of interest.

THE SANDWICH ISLANDS EXHIBIT

contains a large number of very curious articles; but owing to the lack of necessary descriptive labels, the visitor is unapprised of their remarkable features. For instance, spread out in a glass case is a cape or tippet, which on close inspection seems to be made of bright yellow feathers. As few birds wear such intensely yellow plumage, it would naturally be supposed that the feathers are dyed. The reverse, however, is the case. The cloak is termed the kehela, and the plumes are obtained from the mamo or royal bird, under each of the wings of which a single yellow feather grows. Now in the cloak there are perhaps thousands of the feathers, and hence the number of birds which must have been killed to secure the requisite quantity must have been enormous. Add to this the fact that the birds themselves are becoming very rare, and the difficulty of producing the garment accounts for the circumstance that it is seldom found out of the possession of kings. The cape exhibited belongs to Queen Emma, and was loaned by her for display. It is about ten inches in breadth, and quite short, yet its value is about $600. A relic of the days when human flesh was considered wholesome food is shown in a spittoon inlaid with human bones. Articles connected with the reign of the founder of the line of Kamehameha are religiously preserved, and Kamehameha the First's war clubs form a part of the exhibit. There is also a cane made of a lancewood spear which also belonged to the same doughty warrior. A fiber, little known here, called *olona*, may prove to be worthy of further experiment as a rival of hemp or even of flax. It is the inner bark of a shrub, which at the age of three years is of the right size for stripping. It can be shred into very fine threads, which are remarkably strong A bird's nest is peculiar from the fact that it contains no vegetable or animal matter. It appears to be made of horse hair. but is made of what is called pele's hair, a form assumed sometimes by hot lava.

The highest point reached by vegetation is 12,000 feet, and at that elevation the silver sword plant grows, the flower of which is on exhibition. One large case contains the birds found on the islands. They are not named. One red bird, as large as an oriole and with a brilliant red plumage, is the bird that constructs the nests from pele's hair. Castor oil and candle nut oil is also exhibited; the latter is made from a nut bearing the above name.

The Oahu College sends a collection of land shells, containing between 800 and 900 varieties. They are all found on the island of Oahu and nowhere else in the world. Their habitat is under the mosses and lichens attached to the bark of trees. Many varieties are not found alive, and are believed to be extinct.

But few industrial products are exhibited, and native manufacturers appear to be of a very primitive nature. Cloth is made from the inner bark of the bread fruit tree by a kind of felting process; the fiber is steamed and then pounded with wooden mallets, on whose surface grooves are cut. A cloak made in this manner on the island of Tahiti, and ornamented with shells, is shown, and also several larger pieces of cloth or felt, quite thin and tough, and ornamented with floral designs.

From the Micronesian Islands there is an exhibit of beautiful pink corals which are unsurpassed in beauty by anything of the kind ever seen here. They attract great attention and the majority of them have been already sold. This variety of coral is said to be found nowhere else than on the reefs about these islands, where the natives, who are expert watermen, dive for them.

The full dress of a Caroline Island belle is shown, and consists simply of a cape about a foot broad, made of strips of cocoa bark and worn about the shoulders. A waterproof cloak of novel construction is also shown. At each knot of an ordinary fish net is tied a bunch of seaweed. This being spread over the shoulders, net side under, forms a perfect protection against wet.

The display of firewood is quite large, and includes many curious varieties. Of these the wood called *kou* is said to be the most valuable. It is similar in appearance and character to black walnut, but has a finer grain and is not so heavy. It can be turned into all shapes, and never cracks or checks, as is the case with most woods. A large number of jars are shown made from this wood and the black koa. These are used by the natives as receptacles for the food called poa, the staff of life among them, a farinaceous food made from a root called taro, something like a turnip. This is baked and made into a porridge. The natives do not like it until it begins to ferment.

It is said that the Exposition is not very rich in antiquities, save, perhaps, in the Chinese pottery and old Japan bronzes. To inspect some portions of

THE TUNIS DISPLAY

is to go back to the time of Abraham, at least so far as progress is concerned, for agricultural implements that were used by the patriarchs are but copied in the tools which the Tunisians still employ to till their ground. A plow is shown made of two strips of wood; one, the beam, is crossed by the other at a sharp angle, the lower portion of the latter serving for the plowshare. Its point is shod with iron. Such an implement might be used to stir up the ground, but neither lifts nor turns it. Hand rakes are shown heavy enough for horse rakes. The thresher consists of what an American farmer would call a stone boat or sled, the bottom of which is stuck full of sharp stones. This implement is dragged over the grain as it lies on the floor. With all these discouragements very fine crops of grain are raised; and samples of different cereals are shown, put up in bags. Among them are corn, an inferior yellow variety; barley, which is quite plump and bright; wheat, a quality which would rank as No. 3 in this country; three kinds of beans, white, flat brown, and a small black-eyed variety; caraway, fennel, coriander, and other similar seeds; oats are said to be raised abundantly, but none are exhibited.

An object which is a genuine antique is the mosaic representing a lion and its prey. This was found by Davis' party during his explorations of the site of ancient Carthage. It was found within the precincts of the Byrsa of Carthage, and in close proximity to the site of the Temple of Astarte, the Juno of the Phœnicians. In this vicinity there appears to have been a temple dedicated to Diana, and this lion seemed a part of the pavement of that temple. Every other representation on this vast pavement had relation either to the chase or to wild beasts. Through the ignorance of native workmen of how to handle such easily broken objects, every one was hopelessly destroyed, in the attempt at removal, but the lion, which remains in possession of the Bey. The boldness of the design and exquisite execution of the work assign it to the most flourishing period of Carthage, say 2,500 years ago. The mosaic is about eight by ten feet square, and represents a lion who has seized his prey, a horse or other animal with hoofs, from whose wound the blood is trickling. The stones of which it is composed are about half an inch square and are set in cement.

The principal Tunisian exhibits are of silk, and these are profusely ornamented with gold and silver embroidery. It is a custom among the wealthy to ornament the walls of dwellings with silk hangings above the wainscoting, which is usually of tiles. One of these silk hangings is shown, which is about thirty feet long and six feet broad. It is a pink silk, and is covered with ornaments in various colors sewn on. One case of Moorish costumes contains loose white silk garments called bournouses. The silk is of pearly whiteness, and is ornamented with gold embroidery. Bournouses of striped silk, in which gold bands are woven, are also shown.

One case shows the trousseau of a Moorish bride. The garments, which are numerous, are all of pure white silk, and are so thickly embroidered with pure gold and silver that they are oppressively heavy. These costumes are all offered for sale. There are also goods manufactured expressly for the Exhibition, scarves, opera cloaks, and shawls. One is made of silk, through which runs a stripe of rough cotton, the effect of which is quite odd.

SOME NEW COTTON AND WOOL MACHINERY

on exhibition in Machinery Hall is attracting considerable attention among manufacturers. A new English gin separates the seed without cutting the fibers of the cotton, by means of a vibrating knife, a roller, and a combined action of fixed and moving grids. At each elevation of the moving knife, the grid which is attached to the same lifts the cotton to the level of the fixed knife edge and to the exposed surface of the roller; and on the descent of the moving knife, the seeds which have become separated from the fibers are disentangled by the prongs of the moving grid passing between those of the fixed grid. The machine on exhibition is about the size of a common 60-saw gin which would require at least 5 horse power to run it; while this takes but little over 1 horse power. The machines being automatic, one man can feed two of them, whereas on the saw gin he could feed but one. The out-turn of cotton is from 120 to 200 lbs. per hour, and the seeds are much more thoroughly cleaned. There can be no danger from fire, as it would be impossible for it to communicate with the ginned cotton, and it would be effectively quenched by the action of the machine. Regarding safety, it is impossible to get the fingers cut or jammed, as the grids push them aside and prevent accident.

There is also a double cylinder burr picker for the cleaning of wool. The wool is placed upon a feed apron, and, passing between two feed rollers, is carried by the main cylinders on to two burr cylinders acting independently of each other; passing over these, the wool (which is now evenly spread with the burrs on top) comes in contact with a fluted roll, termed a beater or clipper, which removes the burrs and deposits them in a receptacle below. The wool, which is now freed from burrs, is carried by a brush to a beater, which removes all fine dirt. The wool is then blown into a wool room perfectly cool. The inventor of this machine claims that he can clean 500 lbs. of fine or 1,000 lbs of carpet wool per hour. This picker is manufactured by the Atlas Manufacturing Company, Newark, N. J.

CARRIAGE WHEELS AT THE CENTENNIAL EXHIBITION.

MATERIALS USED FOR MAKING WHEELS.

For making light wheels, hickory is, in America, employed almost universally for the spokes and felloes, and elm or gum wood for the hubs; for heavy wheels, oak is used for the spokes, oak or ash for felloes, and elm, gum wood, or locust for the hubs. Hickory is an indigenous American tree, and is found in all States east of the Mississippi river; but the supply has mainly been drawn from Indiana, Ohio, New England (where it is now very scarce), the Middle States, and also, more recently, from Virginia and Kentucky. The term second growth, as applied to this timber, has from improper use grown to be a misnomer; it really means a growth of timber that springs up, more or less sparsely, on ground that has once been cleared from the forest; but, to justly rate the true value of hickory, each individual tree must be judged on its own merits. It rarely happens that a first growth tree has any value for carriage work, and then simply because it has stood alone. What are known as hedgerow trees generally give the best quality of wood, and they are in their prime when from forty to sixty years old. Hickory is cut at all seasons of the year, but from early fall into the winter is the time generally preferred; and it is claimed that timber cut during this period is less liable to the attack of worms. The butt only of the tree should be used for best work, and for a distance of from six to sixteen feet from the ground, according to the quality of the tree and the place of its growth. The butt is generally cut into lengths suitable for spokes or felloes, and, if intended for spokes, it is then sawn or riven into proper sizes, from center outwardly, and around by the annular growths; while for felloes it is simply sawn into strips of suitable length. The heart of the tree generally contains what are known as the pin knots, or marks of the small twigs which grew from the trunk when very small, and this portion in most trees has a brownish color, which features make the heart wood less salable, although sometimes equal to the whiter wood in all other respects. Four grades of hickory may generally be found in the market, which embrace varieties from the very best down to that which is so poor that it is only adapted for very common classes of work In countries where this timber is comparatively unknown, the impression prevails that "hickory is hickory," always possessing the same qualities and characteristics; but a more intimate acquaintance shows that there is as much difference between the different grades of hickory as between totally different kinds of timber, some resembling ivory or whalebone for hardness and elasticity, while other pieces possess no more value for wheelmaking than common pine or deal. Prices vary very materially in accordance with the quality, the best grade being worth in the market from three to five times as much as the fourth grade—a point which foreign customers are beginning to learn through costly experience. The best proves the cheapest in the end. The seasoning of hickory for spokes is an important matter, concerning which there exists a diversity of opinions. The method employed by some of our best wheel manufacturers is as follows: After cutting the timber into spoke sizes, it is usually allowed to season in the open air about six months, after which it is placed in the dry room, with a temperature of about 90° Fah., which should not, under any circumstances, be allowed to exceed 100°; and it is kept in this dry room for from ten days to two weeks, according to the size of the pieces. It is then ready to turn and finish, after which it should again be placed in the dry room for a few weeks, before making up into wheels. It is customary with some wheel makers to subject their spoke stuff, after it is cut into spoke sizes, to a process of steaming without pressure, which occupies from one to two hours, the object being to fix the albumen in the wood, render it stiffer, hasten the seasoning, and prevent checking or splitting.

American oak is fully equal in all respects to the best English oak Take, for example, the dog cart wheel exhibited by Messrs. Hoopes, Brother, & Darlington, and no oak from any country could be better. Oak grows in nearly all parts of the United States, the present supply being received mainly from the Atlantic seaboard, and from Ohio add Indiana. It is commonly cut in the same season as hickory—namely from September to February—from eight to sixteen feet of the trunk being employed, which is cut up in the same manner as hickory. A tree growing in a heavy

clay soil, with exposure to plenty of air and sunshine, is preferable, and the tree is in its maturity when from fifty to one hundred years old.

Elm is found in all the States east of the Mississippi, and the present supply is drawn very largely from Ohio. It is cut in the same season as hickory, but the method of seasoning differs in some respects. When required for hubs, it is usually cut in the required lengths, and a hole bored through the heart; the bark is then removed, and each block reduced to a true cylinder, with the hole for its center. From this point the practice differs in different works, but generally the blocks are then steamed for a short time, to assist in seasoning them without splitting or checking; and after this the ends are dipped, to the depth of about half an inch, in a mixture of hot linseed oil and tallow (or resin), as a further preventive of checking. They are then stored in open sheds, where they remain from two to four years to season thoroughly.

Locust is sometimes used for hubs, and possesses special value on account of its durability; but it splits easily, to prevent which it requires to be carefully banded close beside the spokes. The mode of cutting and preparing it is similar to that employed for elm.

Gum wood, known in some sections as pepperidge, is found mainly in the States along the Atlantic seaboard, growing but sparingly in the West; and south of New York State it is used considerably by carriage builders for hubs. In its qualities it is very similar to elm, being very difficult to split; but it has not the lateral strength of elm, and in driving spokes it is more liable to break between the mortises. The method of preparing it is very similar to that employed for elm, the only difference being that the blocks are not usually dipped, although this treatment would doubtless be beneficial; and its market value is about the same as that of the latter.

WHAT CONSTITUTES A GOOD WHEEL.

The excellence of a wheel depends, first, upon the quality of the material employed; second, upon the proper preparation of this material; third, upon the proper proportioning of the different parts, and fourth, upon exact and skillful workmanship in combining these parts into a perfect whole. Mr. William Thompson Casson lays down a similar standard in his article which appeared in a recent number of London *Saddlers'*, *Harness Makers'*, *and Carriage Builders' Gazette*, wherein he says:

"The gem of the wall exhibits at the Centennial is an English dog cart wheel, shown by Hoopes, Brother, & Darlington; and from whatever point of view we take it, whether regarding its appearance, workmanship, or material, it is a source of admiration; the spokes and rims are oak, but it requires an experienced eye to detect whether the oak is English or American. They also show landau, brougham, and other wheels of the English pattern, as specimens of their ordinary manufacture, leaving nothing to be desired. Those of the old school of wheel makers, who yet dispute whether any steam wheels can equal those of hand make, would be convinced of the superiority of the former by a close inspection of the wheels shown by this firm; every joint and shoulder is up and close, without having one part squeezed into another, simply because every tenon, shoulder, and surface is made with mathematical precision. From personal experience learned at the bench, this really seems to be the whole secret of wheel making—to have everything tight, true, and fair."

SHAFTS, WHIPPLETREES, AND SIDE BARS.

For shafts, hickory is commonly used by American carriage builders, and answers the purpose admirably. Lancewood, however, from the West Indies, would, without doubt, be preferable; but it is difficult to obtain, and very expensive. It is much to be regretted that not a specimen of lancewood in the rough is exhibited at the Centennial; and although it is used in connection with several of the carriages exhibited, it is so disguised by paint or varnish as to give, to those unacquainted with it, little or no idea of what the timber really is. The valuable qualities by which lancewood is distinguished are great stiffness and elasticity, and remarkable strength. Some builders claim, however, that lancewood is not so safe as hickory for shaft purposes, for the reason that, when it breaks, it is liable to break off short; and to obviate this danger, some foreign builders fasten strips of whalebone under lancewood shafts, by means of round-headed screws. For whippletrees, hickory is used almost universally by American carriage builders.

Wooden side bars, now so popular in connection with light road wagons, are made of various materials, hickory being preferred by the majority of the best builders, while locust ranks next in favor; and experiments have also been made with *bois d'arc*, Chinese chopstick wood (name unknown to us), and lancewood. Lancewood would doubtless prove the best for this purpose, and come into general use, were it not for its expense, and the difficulty of obtaining it in sufficient quantities; for it possesses those qualities particularly demanded for side bars—namely, stiffness, toughness, and elasticity.—*The Hub.*

NOTES ON THE AMERICAN INSTITUTE FAIR.

ENVELOPE MACHINERY.

There is a remarkably ingenious machine at the Fair of the American Institute, which is said to make 3,000 envelopes per hour. A similar apparatus is in operation in the Government building at the Centennial, but there it is not among the machinery, and is thus out of the route usually followed by those who make mechanism an especial study. It is one of those devices which even the practised eye can not appreciate at a glance, and when at work it goes through its multitudinous manipulating performances so quickly and yet so deftly that the observer instinctively find himself watching the envelopes come in and the envelopes go out as if a natural phenomenon were taking place, the internal operation of which it were useless to try to fathom. The motion of the apparatus is mainly obtained through cams, and these act on rubber rollers on the extremity of the rods moved. The envelope blanks, previously cut out, are placed on a table. Beside and above the latter is a paste slab whence mucilage runs to distributing rollers, and these in turn cover movable rollers, which are thrust forward to apply the gum to the under surface of a stamp or plunger. The plunger now descends and takes against the parts of the envelope to which paste is to be applied, and then rising carries the envelope up with it. Now a carrier shoots under the envelope, takes it away from the stamp, and conducts it rearward under a square plunger which, descending, pushes the paper through a square hole, thus bending up its edges preparatory to folding. No sooner is the envelope through the orifice than four little doors or shutters clap over it and neatly fold the edges. Next it falls between arms on a long endless chain which moves very slowly rearward, the envelopes going down one way and coming up the other. This travel is long enough to enable the paste to become dry, a process facilitated by a little rotary fan under the chain, which keeps up a draft of air. Lastly, as each envelope returns to the table of the machine, fingers rise on each side, remove it from the chain, and place it on a small platform which, turning, deposits the envelope neatly on edge beside its predecessors. Then the young lady who presides over this wonderful machine quickly runs her finger over the requisite number of envelopes to form a pack, surrounds them with the usual ornamental strip of paper, and the process is ended.

There is one good feature about the American Institute Fair which occurs to us here, and that is that it offers excellent facilities for the undisturbed study of its contents. It is useless to attempt to examine intricate machinery at the Centennial, owing to the now almost constant crowd; and to post oneself in front of an object with a note book, and to ask questions of the exhibitor, or, worse yet, to try to sketch, is, especially in the latter case, to constitute oneself the center of a throng whose curiosity impels each individual member to ask questions on his own account, or else to constitute himself a critic on the efforts of the amateur pencil. Nothing delights us more, however, than to see the interest manifested by the people in machinery and invention, and in that view we can forgive the annoyance. It would not be a bad idea, though, for enterprising exhibitors to hire artists to sit and sketch their exhibits by the week, by way of advertisement. But this is wandering from the American Institute Fair, where—and here is a contrast to the Centennial—an exhibitor the other day set an engine racing for our inspection, at a most remarkable pace, and no one manifested the slightest interest in the proceeding. People passed, instinctively wagged their heads, as they always do, in time with the machine, and proceeded onwards. The engine in question, we found, presented some features not wholly new, but well worth examining.

THE BALANCE ENGINE.

It has two pistons in its single cylinder. From the front piston and through boxes near the edges of the cylinder cover extend two piston rods, each connected to a crank on the driven shaft. From the rear piston a single main piston rod passes directly through the front piston, then through the middle of the cylinder cover, and connects to a crank formed by making the inner sides, of the two cranks already mentioned, twice as long as the outer sides. That is, imagine a W with the middle angle twice as high as the side strokes, and consider a crank at each angle. The main piston rod would then be attached to the angle at the apex, and the two smaller rods to the angles at the base. The cranks, it will be observed, are set in the same plane, and not quartering, as is usually the case. The steam ports enter the cylinder at the middle and at the ends, and the stroke of each piston of course equals half the length of the cylinder. The steam enters between them and forces them apart, and then enters at the ends and carries the pistons together. Now the sum total of all is that the power is applied to the shaft just as the two hands are to the handle of an auger, and the reciprocating parts are balanced; while the engine—despite the very indifferent workmanship—runs at high speed with little vibration.

THE HARRIS STEAM PUMP

is quite new, and has a positive action. The main piston, on arriving near the end of its stroke, raises a poppet which admits steam to the valve piston and at the same time closes its communication with the exhaust. This throws the steam valve, which admits steam, to the other side of the main piston, causing it to make the return stroke. The instant the piston moves from under the poppet it drops to its seat, closing the steam and opening the exhaust on that side of the valve piston, which, together with the steam valve, remains at rest until the other poppet is raised to admit steam to the opposite side. There are no outside connecting valves, etc., and the water end is of the double acting plunger pump pattern.

AN INGENIOUS MECHANICAL MOVEMENT

will be found embodied in the Vanhorn & Cranston paper-cutting machine in the main hall. The arm which draws down the clamp to hold the paper, prior to the knife rising from beneath, is pivoted to a long hand lever, near the lower end but above the fulcrum. Hence, when the lever is pulled down, the clamp is carried downward until its further motion is prevented by the paper under it. The lever then changes to one of the first order, having its fulcrum on the clamp rod pivot, while the former fulcrum now is the pivoting point of the lever end to the carriage which supports the knife. Consequently, further forcing down of the lever lifts the carriage with great force, and the knife is caused to cut the paper. The device is very simple, and so constructed that the greatest power is applied just where it is needed.

As a whole, the fair is interesting, and visitors to the Centennial, sojourning in this city, will do well to visit it. It is especially rich in household articles, and in new designs in furniture, etc. The machinery department is not so well filled as usual; but there are many novelties which will repay careful examination. The attendance is constantly large; and on Saturday and Wednesday nights which seem to be especially favored, the building is generally crowded.

Opening of the New York Aquarium.

The New York Aquarium, located on the corner of 35th street and Broadway, this city, was recently opened to the public. The tanks contain a large number of fish, including a white whale from Labrador, several shark, a huge sting ray, and terrapin, besides an interesting collection of zoöphytes. A laboratory for naturalists, with the necessary appliances for investigation, is provided; and in the pisciculturral apparatus, the process of hatching and rearing salmon may be witnessed. On the opening night, President R. B. Roosevelt, of the New York Fish Commission, made an address on the objects of pisciculture.

A Disastrous Boiler Explosion.

A terrible boiler explosion recently occurred at Zug & Co.'s mills at Pittsburgh, Pa. The boilers in the nail mill blew up, demolishing that building and half the adjacent rolling mill. Some twenty men were killed and as many wounded. No cause is as yet assigned for the casualty. The boilers were in charge of a careful engineer, and it is stated that they were inspected some five weeks ago and were then in good condition.

NEW BOOKS AND PUBLICATIONS.

THE AMERICAN LIBRARY JOURNAL. Edited by Melvil Dewey, 13 Tremont Place, Boston, Mass. New York city: F. Leypoldt, 37 Park Row.

As its name indicates, this Journal is devoted to the interchange of thought and experience among librarians, and with this aim it enters a field hitherto wholly unoccupied. We have a great many large and excellent libraries in this country; and there is a constant increase going on both in the numbers of these repositories of learning as well as in their contents. To render the vast mass of information thus accumulated accessible to the reading public, to keep his own particular charge up to the latest dates in constantly adding new works, and, perhaps above all, to constitute in himself a living index of what the book makers have done, is but a rough statement of the librarian's duty; and that these ends can be accomplished better by the union of librarians, which the present journal seeks to bring about, than by individuals, it is hardly necessary to suggest. The first number of the periodical, which is issued monthly, contains a number of interesting communications and papers, among which we note some sensible practical hints to starters of libraries, and a good many ideas for the care, indexing, etc., of books. There is, beside, a useful record of new publications, not merely in this country, but throughout the world. The journal is elegantly printed, the margins are luxuriously wide, and the present number has an illustration of the new Ridgway library building in Philadelphia. The subscription price is $5.00 per year, or 50 cents per number.

THE COMPLETE AMERICAN TRAPPER. By William H. Gibson. Illustrated by the Author. Price $1.75. New York city: James Miller.

We are inclined to think that the author's claim that "this is the most comprehensive work on the subject ever published" is a fair one, judging from the almost endless variety of traps and other devices to effect the capture of animals and birds which he illustrates and describes. He even tells us how to trap the hippopotamus, the lion, and the tiger: and from these great beasts he descends through the scale until he reaches a daintily delicate way of catching humming birds by a few drops of birdlime on the leaves of a lily. Trap making—or, to speak generally, the pitting of human reason against brute instinct and cunning—requires a special kind of ingenuity, which not many possess; and in gathering together all the curious devices described in his volume, the author has done excellent service in helping very many people to ideas which doubtless would never occur to them. The book contains 143 engravings—mainly representative of the apparatus explained—and is written clearly and well. It will be useful not merely to hunters and trappers, but will also serve to exhibit to inventors what has already been accomplished in this particular line.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED METHOD OF CONVERTING MOTION.

Hiram L. Joslin, Mankato, Minn., assignor to himself and Henry K. Lee, same place.—This consists of a reciprocating head working backward and forward among belts, and having clutches or pawls contrived to take hold of one side of the belt going one way, and the other side going the other way, so as to apply the power continuously in one direction.

IMPROVED BRICK MACHINE.

Ferdinand Michel, Dallas, Texas.—The table to receive the tempered clay is attached to the top of the frame from which it is fed into the molds. Followers enter the molds from below, and serve as bottoms to the mold when being filled. A weighted block withdraws the followers when the pressure is removed. By operating a lever, the followers may be forced up to press the brick, and to raise them out of the mold after being pressed. There are other ingenious improvements in the mechanical construction.

FEEDING APPARATUS FOR CARD-PRINTING PRESSES.

William M. Clark, Philadelphia, Pa.—As the card passes down beneath a shelf, its ends pass beneath the flanges of guide bars, projecting downward along the platen to guide the card to the place where it is to be printed. As the card reaches the place where it is to be printed, it is stopped by inwardly projecting curved points, which receive its lower edge. As the platen is drawn back, these curved points raise the card slightly as its lower edge slips from them, so as to release it, should it stick to the platen, and allow it to drop from the press. The arms which carry the points slide upon gripers so that they may be adjusted as the width of the card may require.

IMPROVED APPARATUS FOR REMOVING COKE FROM RETORTS.

Joel F. Rice, Louisiana, Mo.—This consists of a sliding scoop placed on a swiveled support, that is carried by a truck, the scoop being forced into the retort under the coke by a winch, and withdrawn by the same means.

IMPROVED WINDMILL.

Edward Williams, Potosi, Wis.—This consists of a solid wheel of sheet metal, the vanes of which are of concave form in cross section. There is a secondary set of curved vanes outside of the rims to increase the capacity of the wheel. The power is transmitted to the pump rod by a pair of eccentric wheels and a lever, giving increased leverage on the upstroke, with quicker motion on the downstroke, and enabling the wheel to lift from a greater depth. The tail vane is double, and diverges each way, so that the wind has greater power to hold it steady. The connecting rod works upward from the crank to a level, having the pump rod connected to it in such manner that the pump rod has but little vibration in the hollow axis of the turntable, and thus does not require so much space as when the crank works over hollow axes. The main stem is set in the adjustable step, for plumbing the turntable readily when the tower settles.

IMPROVED TOOL HOLDER.

Christian C. Bergh, St. Paul, Minn.—This consists of a vibrating holder for holding engraving and other tools in applying them to the oil or grinding stone, so as to insure the proper angle of the bevel, and thus make the points true. The said holder is an extension rod fixed on a vertical pin at one end, and having at the other end a chuck in which the tool to be sharpened is fastened. The oilstone is placed at such inclination that the bevel of the tool bears fair on the face of the stone.

IMPROVED RAILWAY SIGNAL.

John H. Williams, Albion, N. Y.—This consists of an arrangement of levers and connecting rods, which are combined with a danger signal or flag in such a manner that the same is displayed by the action of a passing train upon levers and rods.

IMPROVED SAND PUMP.

William H. Birge, Franklin, Pa.—This consists of an inner and outer tube, forming together the lower end of a sand pump, arranged to slide one within the other. The inner tube is provided with a rotating valve having a segment of teeth on its outer end, which engages with a rack formed on the edge of a slot in the outer tube. A spring assists the parts to regain their nominal position. The object of the invention is to provide a valve which shall have a positive motion, not depending upon the action of the water or sand to open or close it.

IMPROVED PAPER PULP SEPARATOR.

Joseph S. Smart, Troy, N. Y.—The object is to utilize the coarse and heavy stock that is collected at the bottom of the settling vats in the manufacture of paper, so as to draw the same off to regrind, and conduct it back to the vat for use. To this end, a settling vat is provided with revolving bottom arms, that convey the heavy particles of pulp to an outlet, and, by a connecting pipe, to a grinding engine, that forces the ground particles through a goose-neck pipe back into the vat.

IMPROVED CONDENSER FOR STEAM ENGINES.

Robert Hardesty, Shepherdsville, Ky.—This invention comprises a condensing cylinder surrounded by an iron casing, with a space between condenser and casing. At the top, the casing extends above the condenser far enough to form an air chest. The condensing water is forced in between the casing and condensing cylinder at the bottom by a pump, ascends to the air chest, and enters therein in a shower. By suitable pipes, a portion of the steam is conducted past the condenser into the heater. The general construction is such that, when the engine stops, all the water above the condensing cylinder will soon pass through it, thus cutting off the supply of water to the valves. When the engine starts, the water will rise in the air chest until the air becomes sufficiently compressed to force the water through as fast as the pump supplies it. This will again supply the valves with water. This invention is claimed to suit both the high pressure and low pressure engine. If there is any exhausted steam above the pressure of the atmosphere, it will exhaust part of it into the air and condense the remainder. If the steam is below the pressure of the atmosphere, it will exhaust it by condensation.

IMPROVED BLOW-OFF COCK FOR STEAM BOILERS.

Samuel Myers, Pittsburgh, Pa.—The valve for controlling the discharge of water is made to fit loosely in its case or socket, so as to permit the passage of a small quantity of water around the valve and over the seat while the valve is closing, for the purpose of washing off from its seat any scale or other solid matter that may have lodged thereon. The valve is, however, designed to fit sufficiently tight in its casing to prevent scale, etc., passing along with the water, which thus washes the seat, at the instant of closing.

IMPROVED MIDDLINGS SEPARATOR.

Edward T. Archibald, Dundas, Minn.—This invention consists in troughs arranged in one or more series above the reciprocating bolt, and in inclined gather boards arranged above the troughs and on each side of holes in the dome of the bolt, that lead into the fan chamber to guide the air and dust.

IMPROVED FLOUR BOLT.

William H. Woolard, Windsor, Ill.—This consists in providing a stationary auxiliary head, carrying a packing of sheep's pelt having the wool on, which is forced against the rotating head of the bolt reel by means of springs, and retained in place by leather straps. The object is to prevent the accumulation of dust on the bolt head, and to prevent the escape of specks and flour dust from from the bolt, and also to do away with the device used in flour bolt chests commonly known as speck boxes.

NEW AGRICULTURAL INVENTIONS.

IMPROVED CULTIVATOR.

Edward Nauman, Bridgeport, O.—In this cultivator, by moving one of the side standards forward and the central standard back, the machine is adjusted as a side wipe. By moving the center standard forward and attaching a larger shovel to it, and moving the side standards back, and attaching half shovels to them, the machine becomes a potato plow. By detaching the center standard and moving one of the side standards forward, the machine becomes a double shovel. By detaching the side standards, the machine becomes a single shovel; and by detaching the center standard, and attaching half shovels to the side standards, the machine becomes a corn coverer. The farmer is thus provided with a number of useful implements arranged in compact form.

IMPROVED CULTIVATOR.

Horace C. Briggs, West Auburn, Me.—Novel devices are provided whereby the ends of the beams may be moved wider apart or closer together, as may be desired. The points of draft attachment may also be raised and lowered as circumstances may require. The depth to which the plows enter the ground may be regulated and the machine may be easily guided around short turns in crooked rows.

IMPROVED RIDGE-FORMING MACHINE.

Andrew D. Martin, Abbeville, La.—This invention is a machine for forming ridges for planting sweet potatoes; and it consists in the combination of two plows and two rollers inclined with each other, so as to throw the soil toward each other to form a ridge. The upper ends of the two rollers incline toward each other; and as soon as the dirt has been heaped by the plows, the rollers press it together to form a steep ridge. The plows may also be used without the rollers, for ordinary ridges, such as for cotton, corn, or cane.

IMPROVED CULTIVATOR.

Edwin W. Joy, Iowa City, Iowa, assignor to himself, Marcus F. Dunlap, and Samuel J. Faust, of same place.—This relates to cultivators in which short independent axles are hinged to a yoke connecting the two axles, to allow horizontal oscillation of wheels relatively to the beams, and which are used without a tongue; and it consists of the application of another yoke in a manner to regulate the oscillation of the wheels and prevent them from cramping too much and binding against the beams.

IMPROVED CORN PLANTER.

Burton Hakes and Ellis Hakes, Marengo, Iowa.—The general construction is such as to drop the seed automatically and at uniform distances as the machine is drawn forward to enable the hills to be planted in accurate check row, and to throw the dropping mechanism out of gear when the opening runners are raised from the ground.

IMPROVED STALK PULLER.

Robert D. Brown, Austin, Tex.—This consists of jaws which grasp the stalks, and which are actuated by hand levers to lift the latter from the ground. The whole is mounted on a suitable carriage. The device was described and illustrated on page 358, volume XXXIV.

IMPROVED WHEEL CULTIVATOR.

Thomas R. Wallis, Egg's Point, Miss.—This consists of a novel contrivance of frames for coupling the body frame of a wheel cultivator to the short independent axles employed in machines for cultivating high plants. The frames are composed of elliptic plates and connecting bolts, the plates being fitted at the middle on the axles, so that they can be readily taken off and shifted higher or lower, for which a number of holes are made in the plates for the axle.

IMPROVED BEE HIVE.

Noah D. Hayden, Dallas, Tex., assignor to himself and Amasa O. Clapp, of same place.—The brood chamber has its top and front open; and the back is securely attached to the back of the hive, so that, by swinging one side of the hive open, the brood chamber may be swung out, giving convenient access to its open side. The inner side of the brood chamber is made detachable, so that it may be removed to give convenient access to the said brood chamber, and enable the comb frames to be easily separated and removed.

IMPROVED SEED PLANTER.

John H. Lee, Livingston, Ala.—This invention relates to an improved construction of a seed planter, designed to plant corn, peas, beans, rice, turnip seed, and cotton seed, either in hills or rows, as may be desired. The invention consists in the particular construction and arrangement of parts, in which an ordinary plow is fitted up with detachable seeding devices, and is adapted to independent use as a plow or a combined use as a seed planter, thus forming an efficient and economical implement for farmers who are possessed only of a single horse.

IMPROVED DRAIN FENCE.

Dr. William A. J. Pollock, Kinston, N. C.—The object of the invention is to provide a means for preventing live stock from crossing over from one field to another, in which there may be growing crops, when such fields are bounded by canals, creeks, or large ditches. The invention consists in a very strong, peculiarly constructed frame work, which is designed to be placed in the canal of the dividing lines of the fields, whether such division line be a fence or a second ditch at right angles to the canal.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED FLUME.

Samuel C. Dike and Sidney M. Brawn, You Bet, Cal.—This invention relates to that class of flumes or chutes which are used for conveying lumber, wood, etc.; and it consists of a sheet metal trough, made up of semi-cylindrical sections, supported on trestle-work or other suitable support, and provided at its upper end with a grating for separating the wood, lumber, etc., from the water.

IMPROVED HARNESS LOOP.

Duncan McMillan, Dodge Center, Minn.—This consists of a double metal loop fastener, adapted to fasten two loops in hame, breast, holdback, breeching, and other straps to rings and buckles, without sewing the strap loops, as they are commonly done.

IMPROVED BALANCE LINE FOR MAST HOOPS.

William E. Leighton, West Pembroke, Me.—This invention is intended to make the hoops run up easily with the sail, and consists in the lacing together of the hoops by lines equidistant to the sail rope, and attaching the lines by sheaves running along the mast to the jaw of the gaff.

IMPROVED GAS BURNER.

Charles Royle, New York city.—This burner is so constructed that it may be adjusted to regulate the flow of the gas, and consequently the light from the outside, without its being necessary to remove any part of the burner for this purpose. The invention consists in a cap spun in to fit upon the neck and top of the base, having holes formed in its upper part corresponding in number and position with the holes through the said base, and having its lower part spun outward to receive the cover and the ring plate, and to serve as a handle for adjusting it.

IMPROVED WATCH BALANCE.

August F. Curpen, Plymouth, O.—This invention consists of a mode of connecting the balance wheel to the staff, so that in case the watch falls the wheel will move on the staff by the shock, and be stopped by the plates of the watch, if the watch falls flat on its side, or by other plates provided for the purpose in case the watch falls on the edge. This protects the jewels from breaking, and saves considerable expense for repairs.

IMPROVED PLUG TOBACCO.

George H. Lyford, Brooklyn, N. Y.—The object of this invention is to furnish plugs of tobacco so formed that the brand, trade mark, name of manufacturer, etc, or other desired information may be readily applied to them. Tags of wood are imbedded in the body of the plug beneath the wrapper, the said wrapper being cut away over the middle part of said wrapper.

IMPROVED HOLDBACK FOR THILLS.

George Seil, East Randolph, N. Y.—A short tube is slipped upon each of the thills from its forward end. Another short tube fits loosely upon the first tube, so as to be easily slipped on and off the end of the thill. The rear end of the second tube rests against a flange of the first tube, and to said second tube is attached a keeper, for securing the holdback strap to it. With this construction, should the drawing device become detached, the outer tubes will readily slip off the forward ends of the thills, and the horse will be entirely disengaged from the vehicle.

IMPROVED OPEN SIDE THILL.

Conrad H. Matthiessen, Odell, Ill.—The object of this invention is to improve the construction of the open side thill for which letters were issued to the same inventor November 30, 1875, to prevent the harness being drawn to one side by the springing of the thill, and to enable the holdback straps to be more easily connected with the thill. To this end the thill is now made hook-shaped in front, and in the rear has a bifurcation reinforced with an intermediate brace, all in one piece.

IMPROVED ATOMIZER.

Frank E. Stanley, Auburn, Me.—This relates to such improvements in atomizers that they may be employed for finishing photographs in water colors, india ink, and crayon, and also for all kinds of shading in which color can be used in a liquid state. The invention consists in inserting an adjustable wire with pointed end into the liquid tube, to regulate the amount of liquid issued. A cap or hood with detachable nozzles, having varying orifices, admits the confining of the spray to a certain surface.

IMPROVED WATCH CASE SPRING.

Numa J. Felix, New York city.—The object is to provide for an improved spring, that may be fitted with but little trouble into any case, so as to facilitate the repairing of broken springs by any watchmaker in a short time. The invention consists of a bearing or bridge piece, with downward bent end posts that bear in perforations the steel spring, the posts being readily recessed to fit any case.

IMPROVED SPARK ARRESTER FOR STOVE PIPES

Horace W. King, Richmond, Mo.—Holes through the pipe, above the water level, in a boiler attachment which surrounds its lower section, allow the steam to escape from the boiler into the pipe and extinguish the sparks. An air jacket surrounds the pipe above the boiler, with holes in the bottom to allow the air to enter. Vessels extend down into the boiler from the head, for holding the medicating or other substance to be discharged into the air by the heat of the boiler. Holes in the top of the boiler are provided for the escape of the vapor of the water, and receive ball covers when they are to be closed.

IMPROVED CORDER FOR SEWING MACHINES

John J. Donahoe, New Orleans, La.—A trumpet-mouthed tubular guide is constructed in two parts, and joined together for keeping the tube closed. A double spring gage guides the cloth both above and below the holding plate of the tube, and there is a contrivance of the attaching plate for regulating the hight of the cord guide. All are arranged with special reference to fastening a cord wrapped in a strip of cloth between two pieces of cloth, by sewing the edges of the cord-inclosing strip and the edges of the cloth together at the same time.

IMPROVED TAX AND INTEREST CALCULATOR.

Niels Larsen, West Point, Neb.—The invention consists in the combination of three concentric cylinders, which are movable independent of each other, and the two outer ones provided with openings, allowing portions of each cylinder to be seen. The cylinders bear numbers or figures, the inner cylinder representing hundreds, the middle one tens, and the outer one units. By properly moving the cylinders the tax or interest upon a given sum or amount will be exhibited through a stationary shield.

APPARATUS FOR THE GENERATION AND HYDRATION OF SULPHUROUS ACID GAS.

William Maynard, New York city.—This invention relates to apparatus for generating and hydrating sulphurous acid gas, and it consists mainly in the following features: First, constructing the pan for burning the sulphur with a conical bottom, whereby a large amount of heat is conserved and the sulphur burnt without subliming, as is the case in ordinary furnaces; secondly, in the peculiar construction of the furnace door, designed to secure ease of manipulation, safety, and other incidental advantages; and thirdly, in the arrangement of a water tank upon the top of the condenser, which both operates as a reservoir for the water fed to the condenser, and is a receiver for the waste gas and azotized air.

IMPROVED RIDING SADDLE.

John T. Gathright and James C. Watson.—The object of the invention is to form a more perfect seat for the rider without adding either weight or expense to the saddle, by making the cantle of the tree and the thigh puffs on the skirts form a continuous concave or hollow seat extending well down on the leg of the rider.

NEW HOUSEHOLD INVENTIONS.

IMPROVED IRONING APPARATUS.

Henry J. Nott, St. Mary's, Texas.—This machine embodies nine novel contrivances, which cover nearly the entire mechanical construction. The iron is attached to a carriage above the table, and is supported in rails so that it may be drawn forward and back by cords communicating with a crank. The table is pressed up against the iron by levers. Devices for fluting and other operations are provided.

IMPROVED FOLDING TABLE.

James M. Kimball, Woodstock, Ill.—This consists of an under frame pivoted to one of the middle boards, so as to swing around in line with it for folding, and crosswise of it for setting up the table, in which latter position it stands on two legs which support one end, and locks with the legs of the other end, so as to hold the table upright. There is a weighted hook for hooking the two sections of the table together.

IMPROVED KNOB ATTACHMENT.

William H. Gonne, Chatham, Ontario, Canada.—This invention consists of a spindle that connects the knobs and shanks, and binds the same tightly by a head at one end and screw nut, turning into the shank, and on the spindle at the opposite end. The roses are provided with spurred sockets to be attached securely to the doors. This admits the ready adjustment of the knobs to any thickness of door.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED VEHICLE SPRING.

William Hunt, Oskaloosa, Iowa.—To the upper part of the forward spring is bolted a circular block, which fits into a recess in a wheel, which is bolted to the middle part of the spring bar. The upper part of the forward spring and its disk are pivoted to the bar, and the flanged block by a bolt, which passes through the said parts, the blocks thus forming the fifth wheel of the vehicle. A spring brace bar, the rear end of which is secured to the center of the rear axle, holds the springs perpendicular. By this construction, when the vehicle is loaded so as to compress the springs and bring the brace into horizontal position, the parts of the spring will be nearly vertical, and thus in the most favorable position to resist a strain.

Notes & Queries

G. D. T. will find a recipe for waterproof glue on p. 43, vol. 32.—A. C. G. should use Indian ink for architectural drawings.—C. A. W. can French polish beechwood. See p. 11, vol. 32. To mend a rubber band, put a piece in with the cement described on p. 263, vol. 30.—F. S. will find directions for making baking powder on p. 123, vol. 31.—F. E. H. will find directions for transferring engravings to glass on p. 298, vol. 31.—G. S. should consult a dentist.—W. T. B. will find directions for making hard soap on pp. 331, 379, vol. 31.—W. O. G. will find directions for cleaning shells on p. 122, vol. 27.—S. N. C. will find directions for browning gun barrels on p. 11, vol. 32.—C. P. can blue steel work by the process described on p. 123, vol. 31.—W. M. will find directions for silvering mirrors on p. 267, vol. 31.—W. P. will find directions for making a weather glass on p. 75, vol. 30.—P. K. D. will find that the pretended plated diamond is an imposition.—F. H. M. will find directions for softening iron for electro-magnets on p. 123, vol. 31.—H. S. B. will find directions for making Babbitt metal on p. 364, vol. 29.—C. A. H. will find a recipe for a hair restorer on p. 363, vol. 31.—D. A. H. will find complete instruction in the art of mechanical drawing in the SCIENTIFIC AMERICAN SUPPLEMENT.—E. R. G.'s plan for striking the curve of a segment of circle, the chord and altitude being given, is very old.—E. S., W. L. B. J. H., H. C. S., and others who ask us to recommend books on industrial and scientific subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) A. W. says: 1. I have an achromatic object glass of 30 inches focus and 1½ inches aperture. I wish to know what eyepiece to use. A. You can use the one described on p. 315, vol. 34, or the one described on p. 203, vol. 35. 2. What advantage has an eyepiece with four glasses over one with only three? A. An eyepiece with four glasses can be better corrected.

(2) A. G. C. asks: 1. What power is necessary to drive two circular saws (1 cross cut and 1 rip) of 12 inches in diameter, in 2 inch pine lumps? A. About 4 or 5 horse power. 2. What size of boiler would be necessary to furnish steam for an engine 3x6 inches, running at 250 revolutions per minute, cutting off at about ⅜ stroke. A. One with about 75 feet, superficial measure, of heating surface.—J. E. E., of Pa.

(3) A. E. R. says: What would be the dimensions of an air pump to work from an eccentric to give 80 lbs. pressure to the square inch in the shortest time? A. If you have plenty of power to drive the pump, you can get 80 lbs. pressure with a large pump as quickly as with a small one, if the action is direct. And in proportioning the size, you need only look to the total pressure which you wish to exert.

(4) E. D. G. asks: 1. If a balloon has, when filled with gas, a lifting capacity of 100 lbs., would it not have double that lifting capacity if twice the volume of gas could be compressed within its sphere? A. It would have less. 2. A balloon will ascend until it reaches equilibrium, or, in other words, until it reaches an elevation at which the gas and atmosphere are of the same weight. If by a safe process the gas could be heated, would not the balloon attain a greater elevation? A. Yes, if the balloon could expand.

(5) O. J. B. says: Please give me a method of producing the logarithmic spiral, and also state its use in mechanics. A. Draw a circle, divide its circumference into any number of equal parts, and draw radii from these points to the center of the circle. Then divide one of the radii into the same number of parts, increasing the length of the successive divisions, from the center, in geometrical progression. Transfer the points so determined to the successive radii, thus determining points of the spiral.

(6) R. M. B. says: Can a ladle or suitable vessel be made for melting 2 lbs. of iron in a common blacksmith's forge? If so, of what and how shall it be made? A. There are small plumbago crucibles made for this purpose. Metal ladles would not serve your purpose.

(7) J. N. W. asks: 1. Who first applied steam power to the propulsion of boats, and is the inventor of steam navigation? A. The Marquis de Jouffroy, of France, used a steam engine in a vessel some years before Fulton. 2. Who first applied steam power to a locomotive on an experimental track, and is entitled to the credit of the invention of railroading? A. It is generally supposed that the first locomotive was built by Cugnot, in France, in 1769. 3. Who made the first rifled cannon? A. Rifled cannon were first brought into use in 1857. Doubtless many had been invented, and numerous experiments had been made, before that time. We cannot, however, state definitely who was the first inventor. Possibly some of our readers can answer the question. 4. Was not the Merrimac the first ironclad vessel ever used or invented? A. Ironclads were used by the French in the Russian war. In this country Captain Eads constructed several, which were in use before the Merrimac appeared.

(8) H. S. G. says: Suppose I sour a piece of cloth with 1 lb. sulphuric acid to 40 gallons water for the space of 3 minutes: if I use 80 gallons of water with 2 lbs. sulphuric acid, would the cloth absorb any more of the acid in the same time? A. If we understand you, no.

(9) J. T. P. says: I visited the Girard College, Philadelphia. An attendant told me that the spiral stone steps were almost self-supporting, or brace themselves about the same as an arch of a bridge. I have spoken about them to a number of friends; they say that the steps run in the wall about 3 feet, while the attendant said that they rested in the wall only about 2 or 3 inches? Was he right? A. The steps are supported essentially on the principle of the arch. They have, in addition, a direct support upon the front edge and on one end of each step; a single step cannot fall without turning over backwards, but this is prevented by the weight of the wall upon one end of it. A very little compressive strain, therefore, upon the arch joints, which are at right angles to the under side or soffit, is sufficient to hold it firmly. See Nicholson's "New Director," edition of 1854, plate XIV, for a similar stairs. The steps are also doweled together with iron dowels, which bind the whole together.

(10) B. F. T. says: Are principles established which show the exact or geometric trisection of any angle (except a right angle) to be impossible? A. The construction can be made for any angle, but the strictly geometrical solution is said to be impossible, because the construction cannot be made by the aid of straight lines and circular arcs alone.

(11) L. C. asks: How can I secure dry walls in the basement of my house? The plastering does not dry. A. It is caused probably by the plastering having been put upon the brick or stone wall without the intervention of furring. It is usual and necessary in such cases to plaster upon lathing nailed to wooden strips placed vertically upon the face of the wall at every 12 inches. This secures the plastering, both from any dampness that may come out of the brick or stone wall, and (by preventing the brick from reducing its temperature) from the condensation of water out of the air of the room upon its surface, either of which is sufficient to destroy it. We cannot suggest any remedy short of the replastering upon lath as here described.

(12) C. F. S. asks: How large a boiler will it require to run a 3½ inch stroke boat engine? How large a wheel and how long a boat will be required? How fast would the boat go? A. It is impossible to answer this question definitely, as you do not state the diameter of cylinder. This answer applies to several other queries.

(13) H. & B. say: In our cooling room, temperature is 42°; when the door is open, it will rise to 50° and fall again. We complain of wet walls, dripping of ceiling, cold damp air, and melting of ice. How can we obtain a cold dry air? A. The dampness arises from the precipitation of water from the air in cooling, and there may be some leakage from the ice melting above. A more free circulation of air would reduce the dampness, but at the same time increase the temperature. The ice would keep better in a compact body; but we must allow that the air can be cooled only by a sacrifice of the ice. A good cooling room is made under the mass of ice and with an air passage around the sides; in this case the doors are not opposite one another, but open upon the passage at different points. When the ice is used also for other purposes, 12 feet cube is a good size for the body of ice. In this case it will keep for two years.

(14) W. T. says: The length of a pendulum which vibrates once an hour is very nearly the diameter of the earth. Does a similar relation exist on other planets? A. No.

(15) G. W. B. says: We wish to build a house 30 x 34 feet, of 3 stories, 26 feet high in all. How shall we construct hollow walls so as to make them damp-proof, and what thickness shall we make the walls? A. Make the wall 14 inches thick, that is to say, the inside wall upon which the door joists rest 8 inches thick, the outside wall 4 inches thick, and the vacant space between them 2 inches wide. These two divisions of the wall should be tied together with anchors made of hoop iron or other light iron, or with cross ties of the brick itself, at about every 4 feet in hight of the wall, and say 5 feet apart, set in rows and alternating one above the other.

(16) W. E. S. asks: Can I construct a horseshoe or U-shaped electro-magnet, by tempering so that it will keep its magnetism after the circuit has been broken for about a half or a minute, more or less, as desired? A. If you make your magnet so that it will retain magnetism for half a minute after the circuit is broken, it will retain the magnetism permanently. There is no halfway work about it. It either holds its magnetism permanently, or gives it up immediately the circuit is broken.

(17) E. P. S. asks: How can I make a cheap telescope, which will show the rings of Saturn? A. Take a plano-convex lens of 1½ inches aperture and about 5 feet focus: place the flat side against the end of a tube a little less than 5 feet in length, into which slides another tube. To the end of the small tube fasten the eyepiece, which may be either a double convex or double concave lens of about 1 inch focus. The double convex lens gives the largest field, with the image inverted; the other shows the object erect and gives better definition.

(18) W. G. W. says: 1. A body weighs more at the poles than at the equator. Is any part of the increase in weight due to its being nearer the center of the earth? A. Yes. 2. I think that a person starting at the north pole, and going in any direction, must go south. Is this so? A. If it were a true pole, and his course were limited to the surface, we think your proposition would hold.

(19) H. H. M. says: 1. I wish to ask some questions as to the ice house described on p. 251, vol. 31. "Provide a good drain in your icehouse to carry off the water." If I build my icehouse on level clay ground, will a dry well suffice for drainage, and if so, how large and deep should it be? A. Yes, if located outside of the building. Make it 6 feet in diameter and 6 feet deep, conical, with base at bottom. Provide an opening at top, covered with a stone, so that you can empty it when necessary. 2. "Put a high-pitched roof over the ceiling." Are the ceiling and roof to extend over the exterior wall, and is the roof to join said wall so as to exclude the air from the space between the interior and exterior walls? A. Yes; the roof is to cover every part of the building, and should project well over the eaves. 3. "Make doors lined with canvas." Do you mean that canvas is to be substituted for boards on inside and outside of doors, and why? A. The doors are to be made as thick as the walls in which they are placed by being padded out upon the inside with canvas filled with sawdust; this is to make them lighter for use than boarding would be. 4. In a space 6 feet square and 8¼ feet high, how can you have "a cube of ice of 7 feet?" A. This was an error of the types; you will find it corrected in No. 41, p. 188, vol. 35.

(20) H. D. T. says: A friend of mine, in attempting to alight from a moving train, stumbled, fell, and received some bruises about the face; the latter healed up, but left dark spots caused by coal dust. He was advised to blister, and did so, keeping the blisters open for a week. All this did not improve the appearance perceptibly. Can anything further be done in this case? A. Probably nothing short of a surgical operation will remove the spots.

(21) J. O'B. asks: How can I keep oroide of gold from being discolored? A. The so-called oroide gold is a variety of brass. If kept well lacquered, it will not discolor.

(22) O. R. asks: If a piece of Babbitt metal, weighing 25 or 30 lbs. and containing antimony, be placed in a well, would it hurt the water for house use and drinking purposes? A. Under certain circumstances, it would prove injurious.

(23) F. W. W. asks: Why, when alcohol and aqua ammonia are mixed in about equal parts, does the liquid turn a light red? A. If the reagents are pure, this change does not occur.

(24) M. V. W. asks: How can I clear sirup of sorghum and molasses? A. The sirup is neutralized with a little lime water and filtered while hot through bone black, which clarifies it perfectly.

(25) W. C. B. asks: How can I remove verdigris from apple butter? A. You cannot remove it without injury to the butter.

(26) W. asks: How is benzine, such as is sold for cleaning clothes, prepared? A. It is one of the direct products of the distillation of petroleum (specific gravity 60° to 70° B.) It is an intermediate between naphtha and kerosene.

(27) O. J. C. says: A case of poisoning by Paris green happened a few days ago, and there is some controversy among the physicians as regards the proper antidotes which should have been applied. A. Give recently precipitated moist ferric hydrate, best administered in the form of a solution of perchloride of iron with magnesia. Emetics should also be given, and the stomach pump applied. Carbonate of soda is sometimes made to replace the magnesia wholly or in part. 2. What is Paris green made of? What are its proportionate ingredients? A. Paris green (Schweinfurt green) is the aceto-arsenite of copper: $\begin{matrix}(C_2H_3O)_2\\Cu\end{matrix}\Big\}O_2+3(CuO,As_2O_3)$. In 100 parts oxide of copper = 31·29; arsenious acid = 58·65 acetic acid = 10·06. 3. In what respect does Paris green differ from Scheele's green? A. Scheele's green is the arsenite of copper, CuO,As_2O_3.

(28) W. H. asks: At what speed ought I to run my water wheel, which is an overshot of 18 feet diameter and 5 feet face, economy of water being the desired object? A. At between 6 and 7 revolutions per minute.

(29) E. L. G. asks: 1. Can copper be nickel plated? A. Yes. 2. How can I plate a rim about the size of a pail hoop? A. Use nickel salts and insert the rim to be plated in the bath and proceed as in plating with other metals.

(30) J. B. asks: 1. Will electricity, passing through a magnet, change its poles? A. It can be made to do so. 2. Take 100 magnetic needles, fasten each to a piece of small wire, say 2 feet long, and these with the magnets attached to a single wire 5 feet long; now will a strong current of electricity, passing through this wire, change the poles of all these magnets? A. No.

(31) J. C. W. says: We have had a discussion on the merits and demerits of upright and horizontal engines and boilers. Is there much difference as to the durability and efficiency of either when the same care is taken of them? A. Not much, but it is a little in favor of the horizontal engine. 2. What kind, upright or horizontal, would you advise for six horse power? A. A horizontal one.

(32) H. A. P. asks: Are cast iron turnings as good for a ground connection for a lightning rod as wrought or scrap iron? A. Yes. You cannot err by having too much surface exposed to the wet ground; and the more iron turnings you use, the better.

(33) E. M. asks: 1. What size and how much of silk-covered wire do I need to make an electro-magnet capable of lifting a weight of 1 oz.? The cores are ¼ inch in diameter and ⅝ inch long. A. Cover your core with No. 20 cotton-covered copper wire to the thickness of ¾ of an inch. 2. What kind of a battery, and how large, must it be? A. Use two cells of Lockwood's battery.

(34) E. S. asks: Can you give me a formula for reducing the area of a pipe in feet to its diameter in inches and decimals of inches: that is to say, if the area of the pipe is 0·063 feet, then what is its diameter in inches? A. Divide the area in square feet by 0·7854, extract the square root of the quotient, and multiply the result by 12.

(35) C. asks: What pressure per square inch will first class steel pipes stand, ⅝ inch outside diameter, ⅛ inch thick, making ⅜ inch inside diameter? A. The bursting strain per square inch would be about two fifths of the tensile strength of the material.

(36) A. D. S. asks: If the ancients believed that the world was flat, why is Atlas always represented as carrying a globular world? A. According to some legends, Atlas was a great philosopher who was the first to teach that heaven was in the form of a globe.

(37) T. J. S. says: Please give us a recipe for a cement that will resist the action of alcohol. A. Melt together equal parts of pitch and gutta percha. Apply hot.

(38) J. A. C. asks: Please name a substitute for lime in a washing compound of sal soda and lime, as the lime will not keep. A. We do not see that the introduction of lime, or any substitute similar in properties, is requisite. A solution of subcarbonate of soda (sal soda) in water is all that is required. The following recipe has lately been introduced in large laundries; it is of German origin: The clothes are simply boiled for about half an hour, with occasional stirring, in water containing about half a pound of common hard soap, ground fine, and 2 ozs. spirits of turpentine to the gallon. The clothes, after rinsing as usual in clean water, and drying in the air, do not retain the slightest odor of the turpentine.

(39) A. R. L. asks: Is there any acid used in the manufacture of sirup? Is it injurious, and how can I detect the presence of it? A. If you mean grape sugar sirup, yes, sulphuric acid; but it is all removed by lime. Test a small portion of the sirup with a solution of chloride of barium; the clouding of the solution indicates the presence of sulphuric acid.

(40) R. L. C. says: I have made an ink by mixing 5 gallons water, ½ lb. logwood, ½ oz. bichromate of potassa, and ½ oz. prussiate of potash, but this ink will not mix with other inks. Why if this? A. Ordinary ink contains gallate of iron, which is precipitated as Prussian blue on the addition of any mixture containing an alkaline ferrocyanide. At the same time a portion of the chromate suffers decomposition.

(41) P. J. B. asks: What substance will remove the gloss from a black coat, so that it will not immediately reappear? The shiny appearance is probably caused by its rubbing against the back of a wooden seat in a horse car. A. Sponge it regularly with a soap containing considerable alkali. If this does not succeed well, use benzole.

(42) W. W. A. asks: Is there anything injurious in paraffin wax, if mixed with bread? A. There is not, but paraffin is not desirable as food.

(43) T. L. M. says, in reply to M. H. C., who asks if a point on a connecting rod between the centers of the crank pin and crosshead journal describes a perfect ellipse, or if the figure it describes its slightly larger at one end than at the other: It describes a perfect ellipse.

(44) F. M. P. says, in reply to G. S. P., who asks about artificial egg hatching: Last spring, there were hundreds of chickens hatched in a box 2 feet square by 6 feet long, set on end. The upper half was full of frames like sieves, frames covered with canvas; these were 4 inches apart, on slides. They were filled full of eggs, and at the bottom of the box was a coal oil lamp burning: directly over it was a pan with water in to keep the air damp. The operation was watched, and the eggs were turned every day.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. D. B.—It is red jasper.—F. D. B.—All four are flint, containing different percentages of iron. —J. B. H.—It contains about 20 per cent of iron. —H. C. B.—They are crystals of sulphate of lime. —O. H. J.—No. 1 is spiegeleisen. No. 2 is flint. No. 3 is decomposed mica.—J.B.—It is compact quartz rock. The small percentage of iron contained in it may hurt it for the purpose proposed.—J. H.P. —No. 1 is fibrous selenite. No. 2 is iron pyrites. No. 3 is hornstone. No. 4 is milky quartz. No. 5 is ferruginous quartz. No. 5 is quartzite. No. 7 is shale. No. 8 is gypsum. No. 9 is iron sandstone. No, 11 is crystalized selenite.—W. M. B.—It contains sulphuric acid, chloride of sodium, carbonate of lime, and a great amount of organic matter. Add lime water, boil, and filter through gravel, sand, and charcoal.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Analogy of Light, Heat, etc. By S. A. C.
On a Lusus Naturæ. By J. H. P.
On Spiritualism, etc. By C. A. W.
On Railroad Rails. By P. M. A. and others.
On Flying Machines. By C. C. M.

Also inquiries and answers from the following:

J.—T. L. B.—H. S.—H. W. C. T.—C. A. S.—B.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes japanned tin novelties and toys? Who makes watchmen's time detectors? Who makes spring balances? Who manufactures india rubber?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

September 26, 1876,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Agricultural boiler, L. & C. Fuller	182,520
Arithmetic case, W. F. Basda	182,515
Artificial marble, L. De Planque	182,647
Axle lubricator, F. A. Bruns	182,555
Axle set and gage, W. C. Carleton	182,556
Bag holder, Green & Finney	182,659
Bag-turning machine, Judson & Van Houten	182,581
Balanced valve, B. T. Babbitt	182,628
Barb for wire fences, F. Armstrong	182,626
Barber's chair, etc., M. Leidecker (r)	7,320
Basin faucet, E. S. Rich	182,603
Bee hive, E. P. Worrall	182,723
Bevel, G. H. Bradshaw	182,551
Bill file, C. S. Whitman	182,726
Bird cage, J. H. Chappel	182,558
Blowpipe, Dodge & Gushurst	182,649
Boats, detaching, W. A. Brice	182,553
Boats, detaching, Otterson & Reeves	182,593
Bolt cutter, W. A. Laurence	182,524
Book case, W. Homes	182,669
Boot and shoe, H. Brossel	182,554
Boot counter support, G. W. Powers	182,704
Boot soles, shaping, J. B. Johnson (r)	7,325
Boots, making, J. W. De Castro	182,565
Bosom-ironing board, L. A. Van Kuren	182,619
Boxes, making, W. H. Allen	182,543
Bracket, C. B. Pettengill	182,532
Breech-loading fire arm, H. A. Castle	182,557
Brick and tile machine, F. J. Kennedy	182,676
Burial casket, E. Allen	182,514
Burner for coal, J. M. Hicks	182,579
Can, metallic, G. W. Bell (r)	7,324
Canceling postage stamps, etc., Palmer *et al*	182,698
Candlestick, Z. I. Pratt (r)	7,326
Car axle, J. D. Imboden	182,673
Car axle bearing, S. Clark	182,641
Car axle box and oiler, J. N. Smith	182,609
Car coupling, G. W. Putnam	182,707
Carbureter, J. A. Pierce	182,598
Carpet stretcher, G.C. Miller	182,528
Carriage hound, J. Fishbaugh (r)	7,317
Carriage top, landau, R. Dunn	182,567
Casting composition boilers, M. F. Bingham	182,547
Casting medals, W. B. Moore	182,589
Chair and cradle, S. C. Megill	182,687
Chimney, M. C. Halsted	182,575
Chimney, G. F. Knight	182,681
Cigar cutter, P. A. La France (r)	7,318
Clasp for corsets, M. E. Mansfield	182,526
Coffee roaster, F. Priewe	182,600
Cooking range, T. J. March	182,587
Corn planter, H. Beitzell	182,630
Corn planter, L. B. Rowland	182,606
Corrugating sheet metal, S. S. Lapham	182,585
Cotton press, L. Lewis	182,683
Coupling vehicles, W. Goodwin	182,656
Cream from milk, separating, D. Pettengill	182,700
Curtain tassel, H. D. Osgood	182,696
Cut-off branch pipe, G. W. Howell	182,672
Cutting nippers, H. B. Todd	182,615
Dental plugger, C. M. Richmond	182,534
Diamond millstone dresser, A. C. Pry	182,706
Diamond millstone dresser, W. P. Uhlinger	182,538
Die, pipe elbow, S. G. Warner	182,728
Die, horseshoe, J. R. Williams	182,731
Drum screen for minerals, M. Neuerburg	182,693
Egg beater, J. G. Brothwell	182,629
Emery grinder, G. Fowler	182,519
Envelope, G. H. Booth	182,550
Eraser holder and pencil protector, W.H. Bennett	182,632
Evaporating pan, J. S. Blymyer	182,549
Feather-curling machine, J. Hawlowetz	182,578
Fence, G. W. Young	182,734
Fence post, M. H. Knight	182,680
Fence post, W. W. Plank	182,702
Fire and burglar proof safe, I. J. Gray	182,574
Fire escape ladder, J. A. Groshon	182,660
Fireproof building, J. J. Schillinger	182,717
Fire wood sawing machine, L. Ruel	182,712
Floating gin, C. Mann	182,686
Flood fence, W. Davis	182,645
Flue stopper, J. R. Higgins	182,667
Foil condenser, Hood & Reynolds	182,670
Folding bedstead, D. Arnaud	182,544
Fringe-twisting machine, S. Mortimer	182,590
Fruit gatherer, S. R. Ruckel	182,607
Furrow gage for plows, B. B. Hawse	182,665
Game apparatus, B. B. Townsend	182,616
Garment stand, F. A. Hatch	182,577
Gas condenser, surface, C. W. Isbell	182,580
Gas regulator, A. Parsons	182,595
Grain binder, J. Garrard	182,655
Grain, thrashing and separating, B. Carpenter	182,516
Grave filler, Parsil & Van Houten	187,594
Hair crimper, G. E. Hart	182,522
Hair-curling iron, M. E. Garnham	182,521
Hair pin, W. R. Clough	182,559
Handles, fastening hammer, etc., A.A. Goubert	182,573
Harmonica, E. D. Tuttle	182,617
Harrow, E. D. & O. B. Reynolds	182,736
Harrow teeth, S. Emery	182,652
Hay rake and cocker, M. Manlove	182,586
Head rest, G. A. Shaw	182,718
Heating stove, etc., C. D. Moody	182,529
Heel evener, Dilley *et al*	182,648
Hides, handling, etc., J. R. Teass	182,614
Hitching post, C. F. Roth	182,711
Hoof expander, C. H. Shepard	182,608
Horse power, J. E. Muldrow	182,691
Horse rake, revolving, W. H. Hall	182,662
Horseshoe blank bar, A. B. Seymour	182,535
Horseshoe blanks, bending, J. Wike	182,541
Horseshoe blanks, making, J. R. Williams	182,732
Hose coupling, Tyler & Severson	182,725
Iron boats construction of, J. T. Smith	182,719
Irrigating apparatus, F. Taylor	182,613
Journal box, W. H. Lungren	182,525
Lace leather, making, H. Loescher	182,684
Lamp burner, E. Bolleau	182,635
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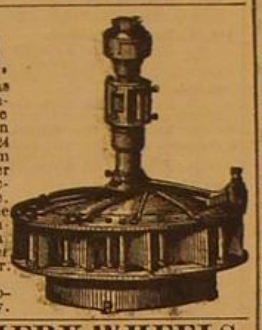

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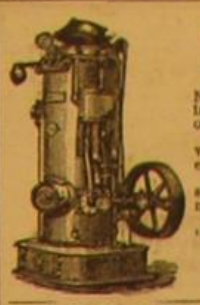

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