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american exhibits at the berlin fish show.
The Commission to represent the United States at the International Fish Exhibition, to open in Berln, April 20, sailed from this port March 20. At the head of the Commission is Professor G. Brown Goode, curator of the National Museum. His assistants are Mr. Frederick Matber, in charge of the apparatus used in fish culture; Mr. T. W. True, assistant in natural history; Mr. E G Rockwell, secretary; Captain J. W. Collins, of Gloucester, Mass, expert in sea fisheries; and Mr. J. Palmer, taxidermist.
The exhibits carried out by the Neckar comprised fully 7,500 specimens, having an aggregate bulk of 175 tons. They will be arranged as follows: Section 1 will contain casts, photographs, and alcoholic specimens of North America. Edible and useful fish, oysters, clams, mussels, etc., with
crustaceous turtles, and the algæ. Animals and birds which prey upon fish will be shown in this section; also water snakes, edible frogs, and gulls, and other creatures used for bait.
The second section is devoted to plans, charts, and models of our coast fishing grounds, with relief models of the Atlantic coast to a depth of 200 fathoms, as far north as Newfoundland. These models were made by Mr. C. Lindenkohl. The geographical distribution of our food fishes, oysters, etc., is shown on maps devised by Professor Goode. The whalng interest will be similady represented; also the sealing grounds off the Alaska coast, the latter charts, the work of Mr. H. W. Elliott, being exhibited by the Alaska Commercial Company. In the third section will fall the various apparatus used in fishnng, a number of leading manufacturers being represented by their best work. Fish preserving apparatus will be shown in this section, also models of all the styles of boats used by fishermen, some forty'in number, fully rigged, folding boats, canvas,
etc. Six figures in fishermen's costumes and the various etc. Six figures in fishermen's costumes and the various
articles employed in the fisherman's personal outfit will be articles
shown.
Section 4 shows plans and models of factories which turn out fish products, such as guano, oils, glues, gelatine, and the edible preparations, as shown in oyster packing, canning, drying, and salting.
Section 5 will contain the innumerable substances derived from fish, either used for food or employed in the arts. Boston, New York, Baltimore, and San Francisco have sent assortments of canned goods, and all our leading manufac-
turers will be represented. There are not less than 150 differ turers will be represented. There are not less than 150 differ rieties.
Section 6 contains the apparatus used in the artificial hatching of fish eggs and in rearing young fish. The exhibition made by the United States Fish Commission will probably gain especial distinction in this department. Under the direction of Professor Baird, a map has been constructed showing all the points where fish culture has been introduced throughout the country, with the dates of iptroduction, the amount of money appropriated either by the general or State government-in short, a chart showing at a single glance the wonderful progress and success of American fish culture. There will be comprised in this exhibit models of the new government floating hatchery, the Sea Hawk, and of the Druid Hill Hatching house in Baltimore.
A great variety of American fish eggs will be shown, and when possible, actual fish culture will be carried on. In addition to this, at the particular request of the German Fishery Commission, there will be sent out a complete rivers. This department will be in charge of Mr. F. Mather The Government will exhibit in section 7 the various de vices of the Lighthouse Board, with all the apparatus used at life-saving stations, and the methods of cautionary sig-
naling. The Coast Survey sends charts, and the deep sea naling. The Coast Survey sends charts, and the deep sea sounding machinery of Mr. A Agassiz and Captain Sigsbee. The literature of fish and fishing, with all the journals printed in the United States having special reference to $3 \begin{aligned} & \text { these subjects, find their appropriate place. The fine arts } \\ & \text { will be represented by pictures painted by Mr. S. A. Kil }\end{aligned}$ Dourne and Walter Brackett The Messrs. Scribner send their profusely illustrated "The Game Fish of America," by Mr. Goode and Mr Kilbourne.
A collection of terrapins and live fish were sent in charge of Mr. Mather, by Mr. E. G. Blackford, of this city, who proposes to send every week, during the continuance of the show, an assortment of the leading edible fish to be found in our markets.

## mining in maine.

That gold, silver, copper, lead, and other valuable mine rals occurred sparingly in Maine has been known for years; but until within three or four years no one has believed that Maine could ever rank among the mining States. When the geological survey of the State was authorized by the legis 3 lature, some forty years ago, the prejudice against mining fevers was so strong that the geologist, Prof. Chas. T. JackSon, was especially forbidden to make known any mineral
veins that he might come across. Accordingly, in the official veins that he might come across. Accordingly, in the official
report of the survey, allusion to the precious metals was carefully avoided, though several deposits of promise had been discovered; and since then it has been taken for granted that there were no precious metals in the State, notwithstanding the large number of specimens of silver and cop
shown in the State cabinet of minerals at Augusta.

During recent years, however, a great many natives of the State have returned from the mining regions of the far the State have returned from the mining regions of the far
West, where they had gained a practical knowledge of mines and minerals; and looking with educated eyes upon the rocks of their native hills they could not mistake the numerousinducations of mineral deposits, similar to those they had become acquainted with in California. As soon as one or two mines had given proof of actual bodies of valuable ore within the State the search for paying leads became general. In 1878 nine or ten mining companies were organized and incorporated; during the next twelve months the number was increased to fifty. The Maine mining directory now contains the names of sixty-tbree incorporated companies and thirtyfour private companes, chiefly devoted to silver mining. If a tenth part of these are based on deposits of real value, and some of them certainly are, the future of Mine as a great mining State is assured. The more promising mineral discoveries have been principa'ly along the coast, in seven belts, which are described at considerable length in the little handbook of the mines of Maine, published last fall by the State Assayer, Mr. Frank L. Bartlett.
The most easterly mining district, the Lubec belt, extends through Campobello Island, Lubec, and Trescott, and probably also to St. George, New Brunswick, where similar deposits have been opened up. The ore consists of silver-bearing galena, zinc, and copper, the proportion of lead and silver increasing downward. Fine specimens of copper pyrites have been found at Campobello Island. Though the oldest mining in the State, the Lubec belt has been but imperfectly prospected.
Further west the Gouldsboro and Sullivan mining belt has been extensively prospected, resulting in the opening of a number of promising mines. It extends from Gouldsboro through the towns of Sullivan and Hancock to Franklin, a distance of twenty miles or more. Similar veins appear in the towns of Cherryfield and Harrington, the ore being a high grade argentiferous galena with zinc blende. At Goulds boro are several prosperous mines, the ores being abundant and rich. The Sullivan lode is regarded by Mr. Bartlett as one of the most remarkable silver-bearing veins ever discovered. At the surface it showed eight or ten inches of quartz containing silver sulphuret, galena, and iron pyrites. Native silver, in threads and flakes, was obtained at a depth of eight or ten feet. Deeper the predominating ore is a black sulphuret of silver, with specimens of native silver, and a great variety of other silver ores. The proportion of lead is small; there is considerable iron, some arsenic, and a little zinc. A large number of discoveries of ores have been made in the neighborhood of Sullivan and across the river on the Hancock side, and several important mines are being developed. Among the more promising localities are Mount Desert, Hancock Neck, Iron Bound Island, Little Duck Island, and Petit Manan Point.
West of the Sullivan belt, twenty-two miles, is the Blue Hill copper belt, at the head of Blue Hill Bay, in Hancock County. This copper belt is about four miles long by half a mile wide. It resembles the copper belts of Falun, Sweden, the Carpathian belts, and the Chilian deposits. There are six regularly organized companies at work here. A silver mine has been opened at one end of the belt, and ores of manganese and antimony are found in several localities.
Further south, at Byard's Point, in the town of Sedgwick, several silver-bearing veins, one quite large, are being worked. In one place, at a depth of sixty-five feet, native silver was found, the ore possessing many characteristics of the Sullivan ore. On Deer Isle, opposite Byard's Point, a number of promising silver veins are being worked; and other neighboring islands appear to be rich in ores. A large deposit of nickel ore has been found at Vinal Haven.
In the great metalliferous slate belt of Penobscot and Piscataquis counties - 70 miles wide by 120 miles long-several mines of copper are being worked, and large bowlders of silver-bearing galena have been found in various places. Several galena mines are in operation in Dexter, Corinna, and St. Albans.
Another narrow but very promising mineral belt is being developed in Acton and Lebanon, York County. The ores consist mainly of argentiferous galenas, with zinc, arsenical iron, and copper. In some places are oxides and carbonates of lead rich in silver. This region has been but little explored.
The Wakefield and Parsonsfield belt crosses into New Hampshire. It is eminently a quartz and gneissic belt, carrying gold and argentiferous galenas. Recent reports tell of an immense vein of auriferous quartz near the State line, in an immense vein of auriferous quartz near the state line, in
the town of Wakefield. Gold, in quartz and in river sands, the town of Wakefield. Gold, in quartz and in river sands,
has been found in many other parts of the State, but whether in quantities sufficient to pay for mining remains to be seen. Tin has been found in many localities, and may occur in profitable quantities. Zinc ores are abundant, associated with lead, and will probably be profitable as a by-product. There are immense deposits of arsenical iron in the State, which may be made to yield arsenic in abundance. There is a large deposit of antimony at Vanceboro, which has been worked to some extent. Iron, nickel, and cobalt are also said to be abundant.
Altogether the prospect is fair that, after a period of feverish activity, during which much capital is likely to be sunk in ill-cons: dered ventures, the mining interests of Maine will settle down to permanent and profitable work in a sufficient number of localities to give the State an honorable rank a mong the great mining districts of the world.

## THE OLD EIVER BEDS OF CALIFORNIA

 In the current number of the American Journal of Science and Arts, Professor Joseph Le Conte discusses the subject of the old river beds of California, which, in several respects, present features that are entirely unique. In most countries, as, for example, in Europe and the Eastern United States, the new or present river beds occupy the same position as the old; while in Middle California the rivers have been displaced by lava flows from their former position and compelled to cut entirely new channels.Again, in certain portions of Europe and the Eastern United States, the old river beds are broad, deep troughs, filled sometimes several hundred feet deep with detritus, into the upper parts of which the present much-shrunken streams are cutting their narrower channels on a higher level; while in California the displaced rivers have cut their new channels 2,000 to 3,000 feet deep in solid slate, leaving the old detritus-filled channels far up on the dividing ridges. In the Northeastern United States the drainage system has remained substantially unchanged since early tertiary, or even earlier times; while in Middle California the tertiary drainage system seems to have been obliterated, and the streams have been compelled to carve out new and indedependent drainage systems, to a much deeper level and having the same general direction, but often cutting across the former. Furthermore, in Californa, the detritus which fills the old river beds is nearly always capped with lava, clearly indicating the cause of the displacement. Finally, the contrast is further marked in the fact that the detritus filling of the old California river beds usually consists of large pebbles and bowlders; while the old channels of the Eastern coast are filled with fine silt.
This peculiar relation of the old to the new river beds does not characterize the whole Pacific slope, but only the auriferous slate belt of Middle California. It is not found in the coast range, nor in the region of the granite axis of the Sierra range. Neither is it found in any marked degree in extreme Northern California, nor in Oregon, nor in Southern California. It seems to be confined mainly to the slate belt of the western slope of the Sierra from Plumas county on the north to Tuolumne county on the south, inclusive, a distance of about 250 miles, and from the San Joaquin and Sacramento plains on the west to about 4,000 feet elevation on the Sierra slope on the east, a breadth of about 35 miles. There are many difficult and important questions suggested by these phenomena. How were the old river beds
filled with detritus? How were the streams displaced? Why have the new channels been cut so much deeper than the old? When did these events occur?
In answer to the first question, Professor Le Conte first points out the fact that rivers either erode or build up by deposit. Every current has a certain amount of energy, and can do a certain amount of work, increasing with the velocity. This energy is divided between the work of transport ation and that of erosion. If the load of transported matter be moderate, a large amount of energy is left for erosion; but if it be very great, the whole energy may be expended
in transportation and none left for erosion-the limit is in transportation and none left for erosion-the limit is that is necessary, therefore, to cause any stream to deposit, is to increase its load beyond the limits of its energy. If rivers build, they almost always do so very rapidly. Now, the phenomena of the old river gravels are precisely those of deposits made by the turbulent action of very swift, shifting, overloaded currents, which must have been far swifter and more heavily loaded than any existing ones. Therefore the process of filling must have been exceptionally rapid. It may have occupied years, or even centuries; but, geologically, it must have been a very speedy process. And these conditions must have been fulfilled by the rapid melting of extensive fields of ice or snow. The reason the detritus was not carried away again was because immediately after the filling the detritus was protected and the rivers displaced by the lava flood. This brings us to the cause of the displacement of the rivers.
Middle California lies on the southern skirt of the great lava flood of the Northwest. The center of the great outflow (which came from fissures and not from craters) was the Cascade and the Blue Mountains. In Oregon the lava is 3,000 feet thick; in extreme Northern California it is still several hundred feet thick, and the old river beds are hopelessly concealed. In Middle California it is reduced by erosion to ridges and patches. Immediately after the obliteration of the previous drainage system, the rivers began cutting a new system having the same general trend (determined, of course, by the mountain slope), but independ ent of, and therefore often cutting across the older system. From all the facts of the case the conclusion seems inevi. table, that the subterranean heat of the impending lava flow was the cause of the rapid melting of the snow and ice, and the consequent rush of the overloaded waters, which filled the channels with detritus. Before the melting was completed the ash eruptions had already commenced, and mud streams, follo
It is almost certain that, coincident with the outflow of lava in California, there was an increase in the elevation of the Sierra range. The inevitable effect of this would be the cutting of new channels below the level of the old, and thus, finally, the singular relation between the old and the new channels which now exist. Professor Le Conte believes that these general phenomena of the gravels and their accumulaion are wholly those of the Quaternary period. They can
hardly be explained except by the existence of glacial conditions. Also the gentle movement of elevation which he supposes to have preceded and attended the lava flow is characteristic of the Quaternary everywhere. On the other hand, it is certain that the Pliocene passed insensibly into the glacial epoch, and therefore that glacial conditions commenced in the Pliocene. Furthermore, it is certain that here in California, glacial conditions continued and reached their acme after the lava flow; for glaciers occupied all the present cañons, and swept awoay all the lavas from the granite axial region, exposing their roots in the form of dikes. In conclusion, therefore, it seems best to make both the accumulation of the gravels and the lava flow which protected hem the dividing line between the Pliocene and Quaternary, although it is probable that glacial conditions had already commenced when these events occurred.

## ARIZONA SHELLAC.

At a recent meeting of the California Academy of Sciences Professor Stillman read a paper on the gum and coloring matter found on the Acacia Greggii and the Larrea Mexicana r creosote plant. The gum which exudes from these plants is very abundant, and is the product known to commerce as shellac. The same plants produce lac dye. Professor Stillman suggested that California might compete with British India in supplying this valuable product. Mr. B. B. Redding said that these lac-yielding plants were as plentiful as sage-brush from Southern Utah to New Mexico, and from he Colorado Desert to Western Texas.
The lac is most abundant around stations on the Mojave and Colorado deserts, and exudes as the result of an insect's sting. Calcutta exports a mıllion pounds sterling in value annually of shellac, selling at 25 to 35 cents a pound, and almost as much more of lac dye, selling at 30 to 40 cents a pound. In 1876 the United States imported 700,000 pounds of shellac alone. To collect this is simple work for boys, and will prove an important industry. It will require little r no capital. The twigs are boiled in hot water, and the gum rises to the top, is skimmed off, strained and dried on mooth stones, and hand pressed into flakes, ready to make sealing wax or varnish. The residue, when allowed to settle, makes lac dye. The plants live on a rainfall of three nches a year.
In vol. vi. (Botany) of the Reports of the U. S. Geographi. cal Surveys west of the 100th meridian we find the follow. ing information relative to these two plants, which would seem to be worthy the attention of commercial men and Panufacturers:
P. 108-Acacia Greggir, Gray.-A small tree, 10 to 20 feet high, pubescent or glabrous, unarmed or with scattered stout recuryed prickles; pinnæ 2 or 3 pairs, on a slender petiole; leaflets 4 or 5 pairs, oblong or oblong-ovate, 2 or 3 ines long, rounded or truncate above, narrower at base, rather thick, and with 2 or 3 straight nerves; flowers in cylindrical spikes an inch or two long, the peduncles equaling or exceeding the leaves; pods thin, coriaceous, flat, 3 or or 4 inches long by 5 to 7 lines broad, shortly stipulate, acute, curved, glabrous, and reticulated, more or less constricted between the seeds; seeds half an inch long.-From Western Texas to Southern California; collected in Western Arizona, 1872.
P. 41-Larrea Mexicana, Moricand, Creosote bush.Common from Western Texas to Kern County, California,
and southward to Mexico. Dr. Loew's examination proves that the reddish-brown exudate on the branches, caused by an insect, will yield a red coloring matter showing all the reactions of cochineal. "The alcoholic extract of the leaves, on evaporation, yields a greenish-brown residue of a specific and somewhat disagreeable odor, more strongly perceptible on boiling the extract with water. This residue is only to a small extent soluble in water, and the solution has an acid eaction. It yields a light yellow precipitate with acetate of lead. The part of the alcoholic extract that is insoluble n water is easily soluble in alkalies. It also dissolves in nitric acid at a moderate heat, whereby oxidation takes place. On addition of water a yellow brittle mass is precipitated.' The Mexicans are said to use an infusion of the leaves for bathing in with good effect in rheumatic affections. (Also vol. iii., Wheeler's Reports.)
P. 80-Larrea Mexicana, Moric (L. glutinosa, Engel mann), Valley of the Gila, Arizona.-This shrub is especially common on the hills bordering the Gila, also on the sandy wastes adjacent to Tucson and Camp Lowell, in Arizona ven imparting its strong odor to the air
In the third volume of these reports this plant is also called stinkweed and etiontio.

The Non-examination of Engineers in Chicago.
Chicago is waking up to the necessity of regulating the employment of engineers and the establishment of a system of official boiler inspection. The Inter-Ocean says:
' There seems to be an impression that any one, after a few hours' instruction, can run a stationary engine and will work cheapest gets the place. Most of the engines in the business and office blocks in the city are in charge of old feeble men or mere boys, and there are actually cases where women do the work. Many of the large factories,
rolling mills, blast furnaces, foundries, grain elevators, pleme mills, blast furnaces, foundries, grain elevators, im engines, and machine shops have men in charge of the is no means of learning and boy engineers are to be found even in some of these great establishments. In some places
too, the engineer does not put in his whole time about the engine and boiler, but is called out by the foreman every now and then to do other work, and engine and boiler have to take care of themselves for long periods."
The natural consequence of this sort of carelessness is a frequency of explosions, with loss of life and limb, that is positively alarming. Chicago has no city inspectors of boil ers, the only inspections being by the insurance companies where they have risks.

## ANOTHER SIX WEEKS OF SUSPENSE.

Five drops of water for the sawing of ten cords of wood s a liberal allowance compared with the originally promised propulsion of steamships across the Atlantic with a pint or ; still it will be an achievement worth recording when it comes off "'about six weeks from now." That is the way with Mr. Keely; his marvelous motor is always on the point of being completed, but the finishıng touch is always delayed. It is gratifying, however, to know just how the matter stands, and for this information the world is indebted o a correspondent of the New York Times who has ately been favored with a "private exhibition" at Mr. Keely's workshop in Philadelphia. The correspondent says of the new engine:

All the machinery is contained in a cylinder which reembles an ordinary drum. Through this runs a double shaft, one revolving in a sleeve. It is upon this shaft that the difficulty at present exists. The negative and positive motions are nearly equal, and Mr. Keely is engaged in the graduation of these so as to cause them to harmonize. When he accomplishes this, which he says is a tedious operation, then the Keeley motor will be completed."
-The Times correspondent has seen the machine turn an 18 nch wheel with force enough to break a rope, but he does not say what fraction of a drop of water sufficed to generate the exhibited power. The new generator is pronounced a curiosity. It occupies a space about six feet by ten feet, with a height of five feet.

- There are numerous small pipes, of mysterious appearance, of the thickness of telegraph wire, bored to the fine ness of a cambric needle. One of these leads from the generator to the engine, and it is claimed that all the power is secured through this medium, and the regularity of motion secured by the vibratory apparatus contained nside the drum cylinder. People who expect to learn all about the engine, generator, and the secrets of the thing, will probably be discouraged when they take hing, will probably be discouraged when they take
into their mind what Mr. Keely says. "After I have secured my letters patent, it will require at least a y ear of ecturing to demonstrate the secret of this generator and engine," remarked Mr. Keely. "The apparatus will be in use some twenty yearsbefore the thing is fully understood.' The public exhibition of wood-sawing is promised "some where about July 1," year not stated. The Times correpondent does not say whether he or his friends have any tock to dispose of, or what ground there is for believing that the tedious harmonizing process above mentioned will ever be accomplished. Mr. Keely's facility in the invention of plausible excuses and catch phrases for the gulling of the simple is scarcely less remarkable than the capacity of some people to be gulled.


## The East River Bridge.

The New York approach to the East River Bridge is finished with the exception of about four blocks, and the property through to Chatham street has been appraised by the bridge authorities. Should this not be accepted by the owners, a commission, acting under the railroad law, will be appointed to value the land. Upon this portion of the work 90,000 bricks are being laid daily. But one block of the Brooklyn approach remains unfinished. The cities still hold about $\$ 1,000,000$ of interest accruing from the sale of bonds. The first one hundred tons of the recently awarded contract for steel have been sent from the Cambria Iron Company at Midvale to be rolled; from there they will be aken to the Edgemoor Iron Company, who do the drilling, fitting, etc. The bill for the final appropriation- $\$ 2,250,000$ -now pending in the Legislature, has passed the Senate, with an amendment, and is in the House, where it is favorably received.-Engineering News.

## International Exhibition of Steam Thrashing Machines.

The Italian Minister of Agriculture, Industry, and Commerce has arranged to hold an international exhibition of steam thrashing machinery at Perugia, in Umbria, Italy, to begin July 1, 1880. Only machines from one to four-horse power will be admitted. Four prizes of gold, silver, and bronze will be bestowed by the government. Public tests of the competing machines will be made under the direction of a ommission. Applications must be made before May 31st next, to Signor Alessandro Raspi, Secretary of the Agrarian Committee, Perugia, who will furnish any desired information with reference to the competition.

The enormous advance in the cost of paper may be in part attributed to its extensive use in the various arts and manu factures not connected with printing. The last application of paper is the construction of an astronomical tower twentyN. Y.

## A Prevalent Popular Error.

By the burning of a Chinese wash house in San Francisco a short time since, eleven of the occupants who were asleep in bed lost their lives. The account published in the newspapers described them as exhibiting, by the positions in which their bodies were found, the agony they suffered from the fire. As editors and reporters are considered to possess more than an average amount of intelligence and information, it appears singular that they should propagate or perpetuate such an error. It may be safely asserted as a general rule that persons who lose their lives while sleeping in burning buildings, are suffocated and die painlessly without waking, and before the flames had reached their bodies. The merest tyro knows what would be the effect of going to bed with a pan of burning charcoal in the room, or the effect of blowing out the gas instead of turning it off. An individual going to sleep under such circumstances inhales the impure air, which acts as an anæsthetic and rapidly converts the natural sleep into stupor and coma, from which there is no waking. Persons sleeping in a house which takes fire are smothered in this way by the carboniferous gas long before the fire reaches them. Their bodies or remains are found-not in the halls or stairways where they would have been had they awakened and attempted to escape-but in bed, or in the spot which the bed had occupied, and in the very position in which they had been lying asleep. The ex: ceptions are mostly noticeable, as when persons are seen to make attempts to escape. There is something so horrible in the idea of being burned to death that it were well for the community not to suffer needlessly from sympathy for the victims. To the relatives of persons who lose their lives in burning houses, particularly to parents whose children may die in this way, it may save a lifetime of grief to know that death entered the chamber quietly and performed his task without so much as disturbing the slumbers of his victim.-Pacific Med. and Surg. Journal.

## NEW USES FOR OLD TIN CANS.

I give below the result of an extended experience in the uitilization of tin cans, such as are used by the million by


Fig. 1.-Bird-houses made from old Cans.
packers of fruits and other articles. These cans, after serving their original purpose, are usually thrown into obscure corners, battered and rusty, a nuisance to every one.
By the method given below these troublesome articles are made useful and e'ven ornamental, such articles as flowerpots, hanging baskets, bird-houses, etc., being produced from them with little trouble or expense.
The cans were prepared in the following manner: Procuring a large dishpan, as much asphalt was melted in it as it would hold with safety. Into the boiling asphalt the cans were dipped; as each can was taken out it was rolled in dry sand, to give it a natural ground color; without the sand the effect of the black asphalt coating would be somber and out of keeping with the color of the surroundings. To give some of these bird-houses a still more picturesque effect they were rolled in the ordinary dry packing moss used by florists and wood mosses; also short dry twigs, smail cones, and burrs were fastened on the cans. In this way very nice effects of color were produced. It is a well known fact that birds avoid brilliant or artificial colors; for this reason greens, grays, browns, and neutral tints are best for bird-houses. Where cans had been opened so that the top piece was still attached by a small piece of metal, it was bent down so as to form a rest for the birds when feeding their young, or a porch or rain screen over the entrance. All these little points when carried out gave character, variety of form, and completeness. The different ways of fastening and suspending the bird-houses are shown in Fig. 1. I sometimes fastened branches of vines over the birdhouses to more thoroughly obscure them.
A glue-pot, a grater, a fruit gatherer, and a bailer, shown respectively in Figs. 2, 3, 4, and 5. The glue-pot, Fig. 2, was made in the following manner: Selecting an empty two pound can, enough tin was cut away to admit of an empty one pound can. This inver can projected one inch above
the top of the one pound can, and was held in position by
four wooden pegs, which were slightly tapering, so as to bind. Holes were made in the shoulders of the cans, through which wire bails were fastened.
Fig. 3, a bread grater, is so simple that it hardly needs


Fig. 2.-Ghe Pot.


Fig 4.--Fruit Gatherer.
box more pots were placed, so that but little of the cheese boxes could be seen. All the pots were ornamented with
burrs, cones, lichens, or barks. The spaces left between the boxes were filled in with wood mosses. Around the rim of the table was nailed hooping from a flower barrel. The inner angle formed by the hooping and the top of the table was patched with putty. Over the entire top of the table, the hooping, and the putty, hot as. phalt was applied with a brush. This rendered the top phalt was applied with a brush. This rendered the top
of the table watertight, so that when watering the plants water could not run on to the floor. A hole bored through the top of the table afforded an escape for surplus water. The cheese boxes were coated inside and outside with asphalt, to prevent them from warping. The open space between the first circle of pots and the rim of the table was filled in with earth, on top of which moss was built up to the first circle of pots. The plants used were tradescantia, German ivy, English ivy, vincas, saxifraga, hyacinths, and calla lily.
Fig. 10 shows the complete plant standard. In hanging baskets, pots, and standards, where the plants are planted closely together and in a comparatively small bulk of soil, they require frequent watering and occasional applications of liquid manure. Our fowls provide us with a very fair article of "domestic guano," from which we make good liquid manure of sufficient strength by mixing one shovelful to a barrel of water. Still there is danger in a too generous use of liquid manure; if ton strong or too frequently used the tender roots of the plants are injured and the leaves begin to fall.
Fig. 11 is a fern rockery for table or Wardian case. For the rockwork the most picturesque of rocks in form and color were selected. The rocks were fastened together with plaster of Paris, which was mixed with dry colors, grays and browns predominating. As fast as the plaster was applied sand was thrown on it. The effect of the coloring and sanding of the plaster was to destroy its whity glaring look, and to harmonize it with the general colors of the rock work. The cans used for the flower-pots were first wrapped in wet paper, to increase them in size, before applying the


## Fig. 7.-Hanging Flower-pot

plaster against them when building up the rock work. In a few hours the paper wrappings had so dried that the pots were easily withdrawn, after which the paper was removed and the pots put back in their places.
Fig. 12 is a vase for dried grasses and autumn leaves, which was constructed as follows: To the top of a brokenoff lamp standard of glass was fastened a fruit can that had been previously dipped in asphalt. The outside of the can was then carefully covered with selected lichens and tufts of "sealing wax moss." Shells and parts of pine cones were used for ornamentation.

## Weighing an Elephant without Scales

An Indian writer relates an interesting anecdote concerning Shajee, the father of the first ruling prince of the Mahrattas of Hindostan, who lived at about the beginning of the seventeenth century. On one occasion a certain high official made a vow that he would distribute to the poor the weight of his own elephant in silver money; but the great difficulty tbat at first presented itself was the mode of ascertaining what this weight really was; and all the learned and clever men of the court seem to have endeavored in vain to construct a machine of sufficient power to weigh the elephant. At length, continues Little Folks, it is said that Shajee came forward, and suggested a plan, which was simple, and yet ingenious in the highest degree. He caused the unwieldy animal to be conducted along a stage, specially made for the purpose by the water-side, into a flat-bottomed boat; and then, having marked on the boat the height to which the water reached after the elephant had weighed it down, the latter was taken out, and stones substituted in sufficient quantity to load the boat to the same line. The stones were then taken to the scales, and thus, to the amazement of the court, was ascertained the true weight of the elephant.

# The Use of Asphalt and Mineral Bitumen in 

## Engineering Works.*

Adopting the nomenclature of M. Léon Malo, which had received general sanction, the author considered asphalt as

a combination of carbonate of lime and mineral bitumen produced by natural agency. Asphaltic mastic was the rock ground to powder, and mixed with a certain proportion of bitumen. Gritted asphalt mastic was asphalt mastic to which clean sharp sand had been added. Asphaltic or bituminous concrete was gritted asphalt mastic mixed when hot with dry flint or other stone. Boussingault's analysis of bitumen gave $\mathrm{C}_{85} \mathrm{H}_{12} \mathrm{O}_{3}$. It was, therefore, an oxygenated hydrocarburet, and quite distinct from the preparations of gas tar and pitch which were sometimes erroneously styled bitumens and asphalts. It was important that these distinctions should be borne in mind when specifying asdistinctions should be borne in mind when specifying as-
phalte, as their disregard might lead to the employment of a material having few of the properties of the natural rock, although bearing to the uninitiated a strong resemblance thereto. Messrs. Hervé Mangon and Durand-Claye, of the Ecole des Ponts et Chaussées, Paris, had supplied the author with detailed analyses of different kinds of natural asphalts, which were given in the paper, and specimens were exhibited. But beyond knowing the numerical value of the proportionate constituents, it was highly necessary that the engineer should be acquainted with their quality.

Asphalts which gave almost identical analyses might in practice yield widely different results, if the nature of the individual components was dissimilar. Powdered limestone should be white, and soft to the touch; if rough, it probably contained iron pyrites, silicates, crystals, etc. The presence of these substances was prejudicial, and if suspected the limestone should be subjected to a secondary analysis, directions for which were given. The proportion of bitumen to limestone in the natural asphalt should not exceed 10 per cent for carriage ways; indeed, less than that was preferable. For this latter purpose no asphalt should be specified which had not stood the test of at least three hot summers and three cold winters. These precautions being taken, the author was of opinion that a well laid surface of compressed asphalt, 2 inches to $25 \%$ inches thick, on a foundation of


Fig. 9.-Plant Standard, empty.
Portland cement concrete, 6 inches to 9 inches thick, was superior to all other carriage ways. It was noiseless; hygienic, being impervious to urine and the liquids from dung; absorbed vibration; produced neither dust nor mud;
*From a paper by Mr. W. H. Delano, lately read before the Institution of Civil Engineers,
was cheap, durable, and easily repaired, and the old materials could be used again. The charge of slipperiness which had been made against asphalt roadways in London was not due to the material, but to the absence of provisions for proper scavenging. In Paris, where the asphalt was regularly scraped, washed, and swept, the complaint did not arise. In support of the assertion that climate did not affect the asphalt in London, a table of humidity was given, showing the means of six years' (1873-8) observations to be: for Paris, $80 \cdot 2$; for London, 81.5 . The cost of washing the roadways, when done systematically and on a large scale, was much less than was generally supposed, and the advantages far more than counterbalanced the expense. The author submitted a design for a portable washing and sweeping machine for use in London. Reference was made to the cost of compressed asphalt carriage ways. In Paris this amounted on the average to about $13 s$. per square yard on lime concrete 4 inches thick, but a thickness of 6 inches to 9 inches of Portland cement concrete was much preferable. The cost of transport of the material also exercised an important influence on the ultimate expense. Details were given of various works of asphalt paving carried out by the author, with particulars of the cost of maintenance.
The quality of absorbing vibration, which was a marked characteristic of asphalt roadways, had been taken advantage of in the application of the material for the foundations of machinery running at high speeds. This was instanced in the case of a Carr's disintegrator, which, being mounted in a pit lined with bituminous concrete, was worked at 500


Fig. 10.--Plant Standard, filled.
revolutions per minute, without sensible tremor, whereas with the former wooden mountings on an ordinary concrete base, the vibration was excessive, and extended over a radius of 25 yards. In the Paris Exhibition of 1878 there was shown a block of bituminous concrete, weighing 45 tons, forming the foundation of a Carr's disintegrator used as a flour mill, and making 1,400 revolutions a minute, a speed which would have been impracticable on an ordinary foundation. Extensive applications of the material for this purpose obtained in France, especially in connection with steam engines and steam hammers
Another use of asphalt was for the flooring of powder magazines, where its non-spark emitting character made it particularly valuable. It was also largely applied in France, in the form of gritted mastic, for the flooring of casemates in fortifications, and in its pure liquid form for the coating of vaults and arches, where it protected the masonry from damp, and the subsequent disintegration caused by infiltra tion and by frost.
In conclusion, the author referred to the imitation asphalt occasionally brought forward, and by some regarded with favor on the score of cheapness. The best of these, if properly made, was as dear as the natural material, without in any degree possessing its special qualities of appearance and durability; and in no case were any of them suited as paving materials to resist heavy traffic. In Paris the tricks of irresponsible paving contractors were many, and necessitated constant vigilance. Inferior cement was put into casks bearing established brands, and the concrete made with such cement was put down in thinner layers than was paid for. The author had even known cases where the concrete was
omitted altogetber, a layer of common mortar taking its place. Such foundations would insure the failure of the best asphalt, which ought to be considered only as a wearing surface or armor to the concrete. But the mode most difficult of detection was the ostentatious display, at the site
of the works, of cakes of the particular asphalt specified, while an inferior material was in the boilers. Once laid, wear alone would reveal what had taken place. From these


Fig. 11.-Rockery.
malpractices asphalt had occasionally suffered unmerited condemnation, but the author claimed that with bona fide materials and workmanship satisfactory results could always be obtained.

## mitating Watermarks in Paper.

The following method for imitating watermarks is published in a number of the Obsor Graphitscheski Iskustvo, which is particularly suitable for designs, etc., in half tones. A plate glass plate, with the edges previously ground, is polished with talc, and the ground edges covered with weak albumen, then coated with collodion; afterward a solution of gelatine, lump sugar, and bichromate is poured on, so as to cover it equally to the thickness of one and one-half mills. When dry, detach, and expose under a negative in the sun. In the meantime cover a polished zinc plate sparingly with a solution of gelatine in acetic acid containing a grain or two of chrome alum; after drying well, wash in hot water and stand up to drain. Now take the exposed gelatine, dip it into alcohol, and, while wet, squeegee it on to the moist surface of the zinc plate; in a quarter of an hour it is ready to develop and harden, the same as for pigment work. When the relief is thoroughly dry, it is only necessary to lay a sheet of fine paper over it, and pass it through a rolling press, to obtain an exact facsimile of the negative. Our Berlin contemporary for October last contains an example of a similar method to the above executed by Messrs. Werner \& Schuman, who have patented the process in Germany under the name of photo-diaphanie.
Herr Meyer has hit upon a plan for producing such watermarks, which is novel in the extreme, and at the same time very simple. A print of the required design, either from a typo-block or an India-rubber stamp, is pulled in a very sticky ink on a sheet of glazed wave paper; over this strew some fine silver sand, and let it dry for a short time, then brush off the superfluous sand, and place a damp sheet of evenly gummed paper carefully over it, and place between the leaves of a letter copying book to dry under pressure. The matrix so obtained can be used on either side, so that if it is placed between two sheets of paper, and the whole run through a rolling press, it will give two very good imitation watermarks. This, of course, has the drawback that

it is only suited for line work, but, as Herr Meyer justly remarks, it can be used for a variety of purposes, such as drafts, checks, etc.; or any one furnished with a facsimile done in the above manner could use it for indorsing bills, etc., by merely passing the same, together with the facsimile, through a lithographic or rolling press.

## MISCELLANEOUS INVENTIONS.

Veneers made of paper have been used in place of wood veneers to a limited extent. That they have not come into general use is due chiefly to the fact that the oil applied to their grained face prevents the due adhesion of the glue or cement by which they are attached to any wood surface to be ornamented. Mr. Isaiah M. Clark, of Coldwater, Mich., has patented a new, simple, and economical process, pro ducing a paper veneer having an oil grained surface, and which will adhere to any object as firmly as wood veneers.
Mr. D. W. Clark, of Tidioute, Pa, has recently taken a Mr. D. W. Clark, of Tidioute, Pa, has recently taken a
patent for an improvement in window sashes, which all housekeepers will regard with satisfaction. It consists of a very simple arrangement of the sash, by which it may be quickly removed for cleaning, glass setting, or other pur poses, and as quickly restored. A dwelling house furnished with these sashes has a positively increased value, for the glass work may be kept in handsome condition with much less labor than heretofore. This is an invention that is needed in almost every household. Considering that it is applicable to every window in every house, it will be seen that the uses of the invention, even in a small town, are quite extensive.
Mr. Allen Cox, of Boston, Mass., has patented a sheet metal pan, made without rivets, wire, or solder, and having its ring secured to it without the use of rivet or solder. It has edges as strong and as durable as the ordinary wire edged pan, is of somewhat less weight, is more convenient, as its broad, flat edges afford a good hold in putting it in or out of an oven. It can be manufactured at a greatly reduced cost of material, time, and labor.

An improvement in library lamp fixtures, patented by Mr. Joseph Kintz, of West Meriden, Conn., consists in a novel construction of clamping rings for holding the shade, and in the manner of fitting the stops that arrest the movement of the lamp in raising it
Mr. Henry B. Winslow, of Marblehead, Mass., has pat ented an improvement in apparatus for the manufacture of lampblack. It consists in a certain novel construction, whereby the use of water is dispensed with and the character of the production improved.
A self-locking hook, so constructed that the weight of traces or other tension strain will hold the hooks locked to prevent them from becoming accidentally unhooked, has been patented by Mr. Joel R. Haines, Mount Laurel, N. J. The invention consists in forming upon the shank of the -rook a toothed head, a toothed collar placed upon the rounded shank of the hook to engage with the toothed head, and a loop or half link attached to the toothed collar to re ceive the trace or other article and serve as a guard to pr vent the hook from becoming accidentally unhooked.
An improved type clamp, patented by Mr. William J. Adams, of Philadelphia, Pa., consists of four tongued and grooved flat metal bands, each bent at a right angle, so that
when fitted together they form an adjustable rectangular when fitted together they form an adjustable rectangular
frame that may be extended or contracted as required to fit a form of types.
A binding for oil cloths, so constructed as to confine and protect the edge of the oil cloth while allowing the binding to be rolled into a coil, for convenience in handling, storage, transportation, and use, has been patented by Mr. George S. Eaton, of Brooklyn, N. Y. The invention consists in a flexible metallic oil cloth binding, made with a thickened flanged edge to rest against the edge of the oil cloth, and at the same time allow the binding to be wound into a coil.
Messrs. Elias Leak, of Longton, and John Edwards, of Fenton, England, have patented an improved apparatus for supporting pottery ware in kilns and ovens. This invention relates to certain improvements in apparatus for supporting pottery ware in kilns and ovens while being baked, glazed, or otherwise fired, and has especial reference to the seggars in which the ware is placed and supported while in the kiln or oven.
An improved lamp burner, patented by Mr. Orlando Mer rill, of Courtland, Ala., is so constructed that wider and narrower wicks and larger and smaller chimneys may be used with the same burners.
Mr. Joseph Kintz, of West Meriden, Conn., has patented an improvement in extension chandeliers, which relates to the means for retaining the extension rod of a chandelier in any position, as drawn out to lengthen the chandelier, and for releasing it, so that the spring may act to draw up the rod. The inventor makes use of a slide rod having its surface grooved or ribbed concentrically and sliding in a collar that is fitted with loose sectional nuts or clamping blocks, which are inclosed within a beveled cup or ring. The cup is moved in one direction by a spring to force the nuts inward and clamp the slide rod, and is fitted for movement by hand to release the nuts by means of a trigger placed in a con-
venient position operating through a sliding tube that is venient position opera
connected to the cup.
Messrs. Amos A. Deuse and James Deuse, of Chester, Conn., have patented a die for forming double spiral grooves in bits or gimlets, consisting of the two halves having the longitudinal and slightly tapering grooves and diagonal crossbars, one pair of the bars being smaller than the other.

A chop conveyer for millstones, patented by Messrs. James H. Ellis, Alexander Scott, and Eli S. Edmondson, of Goderich, Ontario, Canada, consists in a spiral conveyer fitted to revolve in a channel around the bedstone and below the level of the grinding surfaces, which carries the chop to a discharge spout; also, in the construction and manner of operating the conveyer.

Business Success.
Among the rare bits of wordly wisdom uttered by Major Eastburn, one of the former magnates of State street, whose familar face and form as he stood at his office door at noon day will be recalled by many, none may be more profitably considered at the present time than his comment on making haste to be rich. ‘I I've stood here on State street," said he, "for forty years, and I have seen men accumulate fortunes by speculation, and I've seen these fortunes disappear I have seen men go up in worldly wealth, and go down, and I've always noticed that those persons who were content with slow gains and six per cent interest came out ahead in the long run." The greatest of proverbial philosophers has also said, "A faithful man shall abound with blessings but he that maketh haste to be rich shall not be innocent," and again, "He that hasteth to be rich hath an evil eye, and considereth not that poverty shall come upon him." He hastens best who hastens slowly; not lazily, for there must be work, backed by energy, perseverance, intelligent selfdenial, and thorough business habits. Believers in business impossibilities are not as numerous as formerly. For years we seemed to be living in the atmosphere of venture and great undertakings, and our whole industry was tinged with the unearthly light, but of late years we have been suffering from a collapse of these great hollow ideas, and there is hope for a return of the staple prosperity of earlier times.

The past six years of depression has solidified all branches of business. Prudence and economy is now the motto of the successful merchant. The misfortunes of the past did not come for naught. It is a delusion to suppose that success is attained by any kind of patent process. Books are sometimes advertised with such taking titles as "The Secret of Success," " The Road to Wealth," etc., but they make the path of success no plainer or easier for those who are looking for a short road to wealth, power, honor, and influence. These come only of years of intelligent labor and de votion to business, prudence, economy, honest dealing, courage, and perseverance. He that would have true and lasting success must deserve it. A fortune won by blunder or accident, by short cuts, by strategy, or close bargains is not success, and is likely to leave its possessor as quickly as it came. Success must be conquered in a legitimate way. The man who enters business only for plunder and gain, with no thought of his reputation or character, is not a good busi ness man, and is never regarded by his fellows as a success ful man. The truth is that real success does not mean
wealth, social position, or political honors alone. To these wealth, social position, or political honors alone. To these
must be added honesty, a heartfelt consideration for others, civility, promptitude of thought and action, intelligence, so briety, and every manly virtue.
The truly successful business man is one who is complete in everything that belongs to his calling. He has a thorough knowledge of what has been done in his business, and ap plies this knowledge with untiring diligence to the under takings before him. He watches and studies the markets, knowing how much is produced of the commodity in which he deals and the amount consumed; he is prompt in decision and execution, truthful in word and conduct, and keeps his credit unimpaired. In all that he does he commands the respect and confidence of all with whom he deals, and maintains a high and noble character before the world, which is beyond all price. The principal of the "survival of the fittest" is nowhere more applicable than in business matters.
The unworthy and incapable are sure in the long run to sink The unworthy and incapable are sure in the long run to sink
to their proper level.-American Manufacturer and Exporter.

## How Copyright Differs trom Patent Right.

The Supreme Court of the United States has lately given two opinions which illustrate what mistaken notions of copy right are sometimes held by courts, as well as by lawyers
and clients. Some years ago Charles Selden, of Cincinnati, published a book entitled "Selden's Condensed Ledger, or Book keeping Simplified." In this book, and in one or two others that he published about the same time, the author ex plained a new system of book-keeping which he had in vented, and gave such directions, specimen pages, headings, etc., as would enable a person to understand and apply the system. Each of these books was duly copyrighted. Sel
den claimed that his copyright secured to him a monopoly of the system which he had invented, and demanded a roy alty for the privilege of using it. The system appears to have been a desirable one, and the royalty was paid by a goodly number of persons, including not a few county audi tors. But others made use of it without asking the inven tor's permission or paying any royalty, and one person published a book embodying substantially the same method. Litigation resulted, and the question was raised whether Selden's plan or system of book-keeping was protected by the copyright of his books. The Circuit Court of the United States decided that it was. This judgment is now reversed
by the Supreme Court, which does not deny that a work by the Supreme Court, which does not deny that a work on book-keeping may be the subject of a copyright which will
prevent the unauthorized copying of the book. But the system or secret of book-keeping described in the book is not a subject of copyright. This is an invention for which protection, if any there be, should be sought under the paten laws. The court drew a distinction between a book as a
composition and the art, process, or secret described in it. 'A treatise on the composition and use of medicines," say the opinion," "be they old or new, on the construction and use of plows, or watches, or churns, or on the mixture and application of colors for painting or dyeing, or on the mode
of drawing lines to produce the effect of perspective, would
be the subject of copyright; but no one would contend that be the subject of copyright; but no one would contend that
the copyright of the treatise would give the exclusive right to the art or manufacture described therein."
In the other case referred to, copyright was claimed in a map of New York city constructed on an original and peculiar plan. Substantially the same plan was used without authority in a map of Philadelphia. The United States Supreme Court, without denying that the unauthorized publication of the map of New York would be piratical, held that the copyright did not protect the mere plan, and hence did not prevent the defendant from making a map of another city on the same plan. $-N$.Y. Times.

## A File of Novel Construction.

The Ironmonger states that at a recent meeting of the Royal Scottish Society of Arts, Mr. J. Kirkwood, of Edinburgh, described a new file for soft metals and wood. This tool is formed of about 200 pieces of separate steel, connected by an iron bar which is passed through the whole and bound together by a screw. The advantage claimed for the file is that filings of soft metals or wood can be got rid of by simply loosening the screw, and thereby separating the plates, this being done with very little delay or inconvenience. Each file will, it is said, last three years, outwearing 30 dozen ordinary files. The cost of the latter would be $36 l$. and the saving that would be effected by using the new file would be $32 l$. Mr. Kirkwood's file is said to be capable of performing quicker and better work than the cut files in ordinary use.
This file seems to be simply a copy from American patents granted several years ago. For example: J. W. Houston's patent, January 19, 1858, shows a file made as above described; G. B. Cubberley's patent, June 2, 1868, ditto; J. H. Clark, July 5, 1870, ditto. In all of these patents the tool is formed of separate pieces of steel, connected by an iron bar, passed through the whole, bound together by screw, and operated as above mentioned.

## British Solidity and Caution.

Our neighbor, the World, pungently remarks that if the evidence about the Tay Bridge had been given concerning an American structure which had tumbled down and killed ninety or a hundred persons, would not our esteemed British contemporaries have denounced American fraud and flimsiness? As to the metal used for the columns, moulders employed in the work for twenty-seven years "never saw worse;" the coke used for melting it was inferior; holes and cracks were patched up with cement; none of the defective columns, "which were numerous," were broken up, but went into the work, and so on. The most favorable testimony was that of one of the foremen who had been engaged in casting these columns, and he said that the material "was not so terribly bad-for building iron." Not a few witnesses, such as ex-Provost Robertson, of Dundee, an engineer, testified as to the habitual recklessness of the drivers on the bridge.

Other habitual travelers gave up the bridge on account of the oscillations and took to the ferry. Alto gether the evidence thus far taken seems to indicate such "scamping" in fitting up the bridge and such recklessness in using it as our British brethren have been accustomed to depict as exclusively and characteristically American, and to compare, to our manifest shame and disadvantage, with British solidity and caution.

## More New Mines.

The Tucson (Arizona) Citizen, of February 7, contains the following: Some exceedingly rich mines have been discovered on the east side of the Graham mountains, in Stock ton's Pass, about twenty-two miles from Safford and twelve from Fort Grant. The first locations here were made by B. D. Jones, brother of Senator Jones, and since that time locations have been made by others. The most important claims developed are the Delaware and the Pioneer. The ledge is twoand a half to three feet wide, and traceable from 1,800 to 1,900 feet without a break. The assays are $\$ 2,300$ in silver and $\$ 722$ in gold. The claims are situated on the north side and in plain sight of the main traveled road. The discoveries have created considerable excitement, and many prospectors are flocking there. One of Jones' mines, the Garibaldi, carries magnificent gold ore, the shining particles being visible in every piece of rock. There is plenty of wood, water, and grass in the vicinity, and a town site has already been located.

A railway with some novel features has been recently opened between the station of Ribeauville (on the Strassburg Basle line) and the town of that name, about 4 kilom. distant. The line is on the road (with which the rails are level), and has a narrow gauge of one meter. There are inclines of forty mm., and curves of fifty meters radius. The train requires only one engineer and one guard. The locomotives weigh nine tons, and among the rolling stock are ten platform wagons, which are arranged for conveying wagons from the main line, without the goods being transferred. These platforms carry two rails, corresponding to the normal larger gauge, and they rest on two bogie trucks, having four wheels aach. Thus the larger wagons can be conveyed over the sharpest curves of the narrow line. These platform wagons weigh three tons, and the large wagons, with full charge, weigh fifteen tons, giving a total weight of eighteen tons, which, divided among the four axles, gives a maximum load of only four tons fifty per axle. Passengers, as well as goods, are conveyed on the line. The total cost as well as goods, are conveyed on the line
american industries, No 38.

## the manufacture of printing inks.

On the first page of this paper we illustrate the leading processes of the printing ink manufacture, as conducted by one of the oldest houses in that branch of business. In the carly history of printing it was common for printers to make their own inks; but with the more varied requirements of modern printing offices, it has been found that greater economy and generally better results could be obtained by making of this department a separate trade
The making of first quality printing inks is a nice opera tion; it requires a high degree of skill and a nicety of judg ment obtained only by long experience, although the general methods employed have shown but little change in many years. All practical manufacturers have, however, certain trade secrets, the value of which would be recognized only by an expert, but which they carefully guard, touching de tails of grinding the color, making the varnish and lamp black, and the various pigments they employ in colored inks
In our illustrations the view at the upper right hand cor ner shows the furnaces in which the lampblack is made. This is the color basis of most of the black inks, although finely divided charcoal and occasionally other blacks are also used to some extent. The making of the black is a sim ple and well understood process, but on the materials em ployed therefor and the quantity of black used depends much of the success of the ink manufacturer
The picture to the left at the top, showing the varnish making, presents a part of the business on which, quite as much as the color, depend the distinctness and brilliancy of all first class inks. Linseed oil is largely used for this purpose, though other oils are likewise employed, and resin oil has been extensively used in the cheaper inks. By boiling the fatty constituents of the oil-glycerine, palmitine, etc.are volatilized. For the best inks, the oil is clarified by digesting for some hours with dilute sulphuric acid at a temperature of 212 degrees, then washing with hot water, when it will dry quickly and thoroughly; the oil is then boiled, and the inflammable vapors that rise are ignited, which, after burning for some time, are extinguished by a cover placed over the vessel. In order to promote quick drying, manganese in its different states and other driers are sometimes added. The view entitled "color plant" shows the department where the various pigments for colored inks are prepared. These are made of almost everything which can be practically worked to give the different shades desired, either mineral, animal, or vegetable, the pigments being prepared so as to be as little liable to change as possible, and then kept on hand to make the basis of the different colors, by taking exact quantities or proportions by weight of each. The coal tar or aniline colors have been very fashionable for some years, and, although they give great brilliancy at first, it has been found they are not lasting.
The black ink making room at the right of the general view shows where the lampblack or other carbonaceous blacks employed are mixed with the hot compound of burnt oil and resin. The mixing is effected in a cylindrical vessel by a revolving shaft with fingers.
The color grinding, as shown in the large view at the bottom of the page, is done by powerful iron or stone mills, in which rollers of great strength, driven by steam power, reduce the mixture to so fine a state that no coarse particles can possibly pass.
Besides the ingredients mentioned above, soap is sometimes used in order to prevent smearing, assist in obtaining sharpness of impression, and help to make the ink leave the types readily when the paper receives the impression. Yellow resin soap, thoroughly dried in slices and reduced to powder, has been considered the best for this purpose.
The qualities which good ink must possess are as various as the widely different uses for which it is employed. Some ink is made to print on dry paper, and some with the sheets wet; highly finished stock requires an ink of different body from that which is to be used on soft paper. All fast printing must have an ink especially adapted for that purpose, and in printing on tinted papers, either with black or colored inks, the best results are only obtained where the ink is made especially for the particular work in hand. The rollers with which the ink is spread over the types must not be injured by any substance in the ink, but the ingredients of the latter should rather be such as will preserve and keep the rollers in good working order. Copper and steel plate printing, and also printing on stone, each require different kinds of ink, and it has been customary with plate printers and lithographers, until within a few years past, to make their own inks. To this department of the business, the firm, since the introduction of steam presses, have given great attention, and their efforts have been attended with conspicuous success, both in black and colored ink.
The making of fine printing inks was first commenced in this country by Mr. George Mather, in 1816. Previous to that time the finer qualities of ink were imported from
England and France. This led Mr. Mather, who was a practiEngland and France. This led Mr. Mather, who was a practi-
cal printer, to turn his attention to ink making, and after a long series of experiments, he succeeded in making black inks equal to those which had previously been imported. Mr. Mather died in 1861, but the business which he had established and so long conducted was, four years before his death, turned over to two of his sons and his son-in-law, Ralph N. Perlee, who continued it under the firm name of Geo. N. Perlee, who continued it under the firm uame of Geo.
Mather's Sons. In 1878, Mr. D. W. C. Mather retired from
the business, and the present members of the firm consist of S. Talmage Mather and Ralph N. Perlee.
About the time of the retirement of Mr. George Mather from business, color printing was being developed. Mr Mather had produced, for many years, such colored inks as printers needed for special and immediate use, as shown in the title pages of "Harper's Pictorial Bible," printed in 1847, and other illuminated works, but now a call had risen for stocks of ready-made colored inks, to be kept in store. Consequently, a thorough course of experiments were made chiefly under the directions and personal tests of Mr. Perlee, which were attended with such marked success that the irm obtained the orders for almost the entire amount of letterpress colored inks used during the war for printing the government "greenbacks" and bonds. At this period also, the issue of pictorial papers became a large business, and an entire change in the ink manufacture was necessitated for the production of an article which would be best adapted for the work, and here also Mr. Perlee's efforts were eminently successful. The Picturesque Europe and America the Picturesque World, the Art Journal, and many other works of this character, have been printed with the fine woodcut inks of this firm.
The ink works, as shown in our engraving, are located at Jersey City, and the large establishment now required for the manufacture forms a striking comparison with the limited premises and primitive conveniences which sufficed for the business of the house when it was first established. It is always pleasant, however, in making this record of the development of our leading industries, to note the progress of a long established branch of manufacture, as is shown in the history of ink making by this firm, their factory being the only one which has been in conti
The New York office of Messrs. John Mather's Sons is ocated at No. 60John street.

## Safeguards to Human Life

Mr. T. Blake, M.P., recently addressed a meeting of the electors, in which he took severely to task the administration and the war policy of England in sending an in vading army into Zululand. Among other remarks he said: "I regard human life as the most sacred thing. How it is guarded in England! Even if a man has to be put to death, look at the many safeguardsothere are that his condemnation shall be just, and that the sentence shall be as humanely as possibly carried out. He is first tried, an advocate being provided for him; and if he be condemned there is a minister of religion in the person of the jail chaplain to attend him to give him spiritual counsel and comfort. Everything is done to prepare him for his end, and then on the dread day when he is to suffer the last penalty of the law, the high sheriff-who is a bigger man altogether than the Lord Lieu-tenant-is there, or some one to represent him, to see that the sentence is carried into effect. What, however, do we do with a man who, instead of having killed only one other fellow creature, comes home from the field of battle, having killed many men with his own hand or helped in the
slaughter of many hundreds or thousands of his fellow creaslaughter of many hundreds or thousands of his fellow creatures? To such men we give titles and distinctions, and we present them with swords of honor. Calcraft, that late pub lic hangman, exercised his office for the government for a number of years. He took the lives of persons condemned to die, and he strove to do his task as expeditiously as possible, so that the suffering should be as short as might be. He did this work of his for many years. But Calcraft received no pension at the end of his official career; he was they didented at court; he was not made privy councillor officer, whose hand is also red with blood, a new sword. Calcraft, and his successor, Marwood, did their dread work in the name of the law, in the name of the Queen, and in the nation's own appointed way. Why do we hold them in such abhorrence, and yet applaud the man who cruelly takes the lives of his fellowmen, if they are of a different color, who have done no wrong? A man who kills his fellowman is justly regarded as a murderer, while the man who kills 1,000 men, or is the cause of their being killed, is lauded and honored, and is regarded as a great hero. There are some of those officers who have returned from Zululand who exult over the number of Zulus they put to death with their own hands. The men who fight the wars are, it is to be remembered, not the men who make the quarrels. If those who make the quarrels were but to fight them out themselves we should have, I think, but few wars. Everything that adds to the war spirit of the country-as our immense outlay in armaments does-is a national curse. However, I must not dwell
too much upon this war policy; but I feel strongly about the sanctity of human life, and that war should be entered upon only as a very last resort. For what, after all, does
war determine? Not which part to the quarrel is in the right, but simply which is the stronger. I, therefore," con cluded the speaker, "advocate arbitration between nations and the settlement of their quarrels in much the same way that individuals are obliged to settle theirs."

## Catching a Cannon Ball.

Recently, at Leeds, John Holtum, a gymnast, was charged before Mr. Bruce, the stipendiary magistrate, with unlaw fully wounding Elijah Fenton, a market porter, in the Prin cess Concert Hall, in that town. Holtum had, during the week, been giving performances showing extraordinary week, been giving performances showing extraordinary
strength in the handling of heavy clubs, cannon balls, etc.,
and on Friday night he offered a prize of $£ 50$ to any person who could catch a ball fired from a cannon as he (Holtum) had done on several consecutive nights. The challenge had been accepted by three men, and a cannon having been placed in position on the stage, a suitable cartridge and a ball weighing seven pounds were rammed-home. When Holtum called upon those who had accepted his challenge, Elijah Fenton presented himself, stripped off his coat and waistcoat, and, standing about six yards away from the cannon's mouth, declared that he was ready, and placed his hands in a position to secure the projectile. An attendant fired the cannon, when, to the horror of all present, the ball struck Fenton in the forehead and knocked him down. He managed to crawl off the stage, and at first it was thought that he was not much hurt. Shortly afterward, however, the case assumed a much more serious appearance, and Fenton was removed to the Leeds General Infirmary, where it was found that he had received a compound fracture of the skull, and that his recovery was almost hopeless. The stipendiary magistrate remanded Holtum until Tuesday. Mr. Hobson, the proprietor of the Princess Concert Hall, promised that the performance in question should not be repeated on his premises, but stated that Holtum had been performing on the Continent in this way for five or six years, and never had an accident of this kind before.-London Iimes.

## Blistering of Paint and Varnish. <br> by frank fielding.

Many are the opinions expressed regarding blistering, and lthough some very sensible theories are advanced, we are inclined to believe that the bottom of the subject has never been reached. We hold an opinion of the cause of this trouble, and it may be that this opinion bas been forestalled by others, but as we have never seen the points laid down in print, we present them here.
Blistering of a varnished surface after the varnish has had proper time to harden is due to the evaporation of moisture which lies confined under the shell of varnish. This evaporation is caused by heat, and it is seldom, if ever, a blister will rise upon a varnished surface without the temperature is raised to an extreme degree, near to that which the varnish received in its manufacture.
The accumulation of moisture under the varnish may be brought about in several ways; the most particular oue being in the closing in of moisture in the rough stuff. During the rubbing of the rough stuff the water used is partly absorbed, and unless due care is taken to give ample time for "drying out" before the application of subsequent coats, a great amount of moisture will be confined within the cells of the rough stuff.
Boiled oil contains moisture, as of water, and in cases where steam is used to express the oil from the seed this percentage is increased. Turpentine, an extremely volatile liquid, also forms an evaporating substance which is ren dered active by a slight heat, and in its haste to reach the air it disturbs the outer surface, either lifting an elastic coating into bubbles or blisters, or bursting open a hard and nelastic one into cracks.
The primary cause, then, of blistering is moisture either in the form of wet moisture or of evaporating liquids, such as turpentine. The wood may be unseasoned, or it may have been wetted in the course of preparation, such as steaming to bend, etc. The rough stuff water may have been applied before the evaporation of liquids had taken place, either of which would bring about disastrous results. "Dry blistering" is simply the hasty absorption of the liquids from outer coats by putty or paint which is expressly porous, depriving the coating of the requisite amount of binding and adhesiveness.

To prevent blistering, close up every lurking place for moisture by the use of the $A \mathrm{~B} C$ system of painting, which will be found to be as easily done as repeating the alphabet. Be careful to have each coat dry before applying another, and you may laugh at the trouble which some of the craft call "deviltries."-Coach Painter.

## Effect of Intense Cold on Beer.

There are some advantages and many disadvantages to the brewer arising from very cold weather. Beer keeps far better when the thermometer stands below $50^{\circ} \mathrm{F}$., but when the thermometer is for days several degrees lower than the freezing point, the usual arrangements for storing beer in this country altogether fail to keep it in good condition. The ordinary cellars, both of breweries, retail establishments, and private houses, are but ill adapted to protecting beer from intense cold, and the result has been apparent during the ast few weeks in large quantities of beer either turning up cloudy or failing to drop bright; with a reduction of temperature there is a diminished power of holding albuminous bodies in solution, and therefore some of these separate, producing a cloudiness which requires a long period of high temperature to removeagain. Another result of cold weather is to cause beer to turn flat; in its normal and healthy state beer should undergo a slow but regularly secondary fermentation, by which a certain amount of carbonic acid gas is evolved which serves to keep up the "life" of the beer; at very low temperatures the organisms which cause this fermentation are inactive, and no gas being evolved, the beer becomes flat. The greatest danger to beer during the winter months is the sudden changes of temperature; with the thermometer one day at $55^{\circ} \mathrm{F}$. and the next at $25^{\circ} \mathrm{F}$., it is impossible to keep beer in condition, at least with the usual cellar arrangements which prevail in this country.

## THE SAWYER ELECTRIC LIGHT.

The practical working of the Sawyer system of electric lighting was recently exhibited to a few gentlemen in an ordinary up-town residence on West 54thstreet, in this city. Seven lamps were distributed at convenient points-one in the rear of the hall, one upon the center table as a drop light in the front parlor, two upon a double arm gas fixture of the ordinary pattern in the front parlor, and three in the rear. It is stated that the seven lamps are operated upon one elec-

trical circuit, supplied by a single generator transferring four horse power. The current travels about 1,600 feet through conductors having a diameter of a quarter of an inch.
The lamp, based upon the incandescence of a pencil of carbon immersed in nitrogen gas, is in no way different in principle from the Bouliguine or the old Sawyer-Mann lamp exhibited some years ago. The pencil is contained within
a globe two inches in diameter and ten inches high, sealed at the bottom by means of a cement, which, while adhering
perfectly to the glass and metal, is sufficiently elastic to compensate for the unequal expansion of the two. It softens only at a temperature of $500^{\circ}$ Fah. The globes are charged by the process invented some time ago by Thomas B. stillman, which is so simple in its details and so rapidy perated that a single workman can prepare fifty lamps per hour at a cost of about thirty cents, in such a manner that, according to Stillman's calculation, the amount of atmospheric air remaining is only an infinitely small fraction of the normal quantity.
The large engraving on this page illustrates the manner of filling the lamps with nitrogen gas. Several lamps are placed upon a stand and connected, one with the other, so that the gas that fills the last lamp in the series must pass through all of the others. In this manner the gas is made to do double duty. The nitrogen gas is generated by a process which is not made public. It is stored in gas bags, and when required for use it is forced from the bags by heavy weights through the purifying and drying tubes, A, sodium, B, and bottle, C, whence it is conducted by a flexible tube to the series of lamps on the table, D. The last lamp in the series is provided with a flexible tube dipping in water in the jar, E , to prevent the re-entrance of air to the lamps when the flow of nitrogen is shut off
The sodium furnace, B, contains a wrought iron tube partly filled with melted sodium, through which the nitrogen is forced to remove traces of oxygen. The bottle, C , is simply filled with fiber to prevent small particles of sodium oxide from reaching the lamps. The cost of the nitrogen is stated at eight tenths of one cent, and that of its purification as one and one fifth cents; the total cost of recharging a lamp, when the nitrogen is exhausted or becomes mixed with air, being, inclusive of the wages of the workman, two and three fif ths cents, against a cost of seventy cents for the process usually employed. The carbon pencil, seven inches in length and about three thirty-seconds of an inch in diameter, is fed upward as fast as disintegration takes place at the point of contact, by means of a regulator, which will be substituted by an automatic feeder as soon as the arrangement can be perfected. Mr. Sawyer says that one of these pencils, used for five hours a day, will last at a minimum calculation from his experiments, not less than ninety days, and, at a maximum, fortwo years. The cost of the pencil is a trifle less than two cents, and the cost of replacing and recharging with nitrogen nine and three fifths cents. The bag of sodium and the large spiral conductors at the base of the carbon, which were distinguishing features of the Saw-yer-Mann lamp exhibited about a year ago at No. 94 Walkerstreet, have been discarded. Two small steel rods take the place of the latter. The globe, which is not unlike the chimney of an ordinary kerosene lamp in general appear-
ance, is embedded in a nickel-plated base, which may be
hishly ornamented or not, according to the taste or means or
the user.
Photometric tests, it is said, have been made with a Sugg photometer, such as is used by the gas companies for the same purpose, and each light was registered as equal to twenty-seven and five tenths standard candles, or a little more than twice the value of a five-foot gas burner, which usually registers from ten to twelve standard candles.
Mr Sawyer claims that his system of distribution is en-


EXHIBITION OF THE SAWYER ELECTRIC LIGHT
tirely novel and original, but declines for the present to give description of it, his patents not having been as yet secured. The regulator, we are told, is based upon the plan used by he old Berlin house of Siemens Brothers, by which only such a volume of current is supplied as is necessary to overcome the resistance. The light is readily toned down to a glimmer by turning a button in the wall. In its optical pro

perties this light is much like gas. It is yellow, steady, and soft, and consequently not irritating to the eye. It has none of the blue rays incident to the voltaic arc arrangement, and the shadow cast by intervening objects is softened and mellowed at the margin. For practical purposes it is intended that the power of each lamp shall not exceed that of two ordinary gas jets.
The relative economy of this system of lighting we are unable to learn. "Approximate estimates" of cost make it much cheaper than gas; but in the absence of specific data for exact calculation, such estimates do not go far to satisfy the popular mind.
the racine canoe.
The pretty little canoe shown in the annexed engraving is the outgrowth of the experience of the Racize Boat Com-


THE RACINE CANOE.
pany during the year 1879 . It is made of birch, cherry, or cedar, according to the taste of the purchaser. Three sheets of the wood are cemented together with the grain of the inner sheet crossing the grain of the outer sheets, and the whole, while green, is pressed into the desired form under heavy pressure, making a body with but a single seam under the keel. The decks are made in the same way. The ends are nicely sheathed with brass, and the boat is finished with coach varnish, bringing out the beauty of the wood.
The boat thus made is very strong and not liable to injury with ordinary usage. It never leaks, and it is in every respect complete and well finished, and is of the most approved model.
The dimensions of the boat are as follows: Length, $131 / 2$ feet; beam 28 inches.
The boat shown in the engraving, when full rigged, weighs but 80 lb .
The parties building this, make open canoes, row boats, and shell boats on the same plan. They are finished with water-proof fillings and varnishes, and are very handsome and desirable. In a canoe similar to the one shown in the engraving, a trip was made late last season from Racine, Wis., to New Orleans, La., a distance of about twelve hundred miles, via lake, canal, and river.
Further information may be obtained by addressing the Racine Boat Company, Racine, Wis.

## THE FRANKLIN DRAUGHT

 REGULATOR.The accompanying engraving represents the well known device in common use for operating a damper in the flue of a steam boiler by steam pressure. This device is substantially the same as that patented by Patrick Clark, in 1854, but it is combined with a recently patented improvement known as the Franklin regulator.
The improvement consists in erecting above the weighted lever, A, a plate, B, from which is suspended any desired number of weights ( $a, a^{\prime}, a,^{\prime \prime}$ ) by rods which are furnished above the plates with thumbscrews, and are forked below so as to straddle the lever, A. The suspension rods and their weights may be so adjusted by the thumbscrews that the


THE FRANKLIN DRAUGHT REGULATOR.
. his time, except when coaling or feeding water, can be utilized in other work.
For further information apply to Turl's Iron Works, agents, foot of West 28th street, New York city.

## The Alaska Fisheries,

The United States coast-survey schooner Tukan sails from The United States coast-survey schooner Tukan sails from
San Francisco, in May, for Alaska, in charge of Mr. Tarleleast unique.
ton H. Bean, who has been directed by the Commissioner of Fisheries to make a thorough examination of the character and resources of the Alaska sea and river fisheries.

## A NEW GAS ECONOMIZER.

The annexed engraving represents a novel device for enriching and economizing coal gas. It is simple and easily applied, and is said to be very efficient. On the top of the liquid-tight vessel, A , there is a dome, B , from the center of which a glass tube, C, projects. This tube is closed at the top, and at the bottom opens into the vessel, A. A float, D , having a cork bottom, slides upon a tube, E, which enters the vessel, A, at the bottom, and communicates with a pipe, F, leading from the gas meter. In the upper portion of the float there is a shallow chamber which communicates by small perforations with small vertical tubes arranged around


## STRONG'S GAS ECONOMIZER

the float. From the top of the float a needle, $a$, extends upward into the glass tube, C, and serves as an index of the movements of the float. The vessel, A, is provided with a filling tube, through which some of the lighter hydrocar bons are introduced into the vessel. The float rises and falls freely as the depth of the liquid varies in the vessel, but the weight of the float remaining the same its displacement is not affected by the quantity of liquid in the vessel, and the gas ejected into it from the float will always have the same quantity of liquid to rise through, thereby insuring uniformity in both the press. ure and the quantity of gas supplied. Gas conveyed to the float through the tube, E , passes into the vertical tubes and rises up through the liquid as indicated by the arrows, and finally passes out through the tube, $G$, for distribution to the burners.
The gas is enriched by its passage through the hydrocarbon, and the light given by it is correspondingly increased.
This useful invention was recently patented by Mr. George T. Strong, of Port Hope, Ontario, Canada, from whom further infor ination may be obtained.

## London Fogs.

The Londoners are, as usual at this season of the year, in great tribulation over their fog. On the theory that the steam from a kettle will disperse fog in a room, a writer in the Lancet believes that by send ing out an army of steam engines on foggy mornings about the London streets, they might produce a cloudless sky. A most telling prospectus could be made out of the advantages of blue sky over yellow fog. The name of the company, Capital and Labor suggests, should be the "Fog Dispersing and Blue Sky Assurance Company," and a copy of the prospectus should be particularly sent to ladies and gentlemen known to suffer from bronchial affections. An army of puffing engines would, of course, be somewhat expensive, and it may be rather irritating to be awakened, say at the hour of 4 A . M., by a chorus of steam engines, but considerations of this kind ought not to be allowed to stand in the way of the realization $G_{i}$ an idea which is at

The Abolition of Labor.
In an extended study of the intellectual and industrial history of mankind (in the new Australian quarterly, the Victoriun Revievo, Mr. James Smith says in summing up his conclusions:
In the earlier stages of human progress the race invents, only or chiefly, such implements and machines as are supplements to, or substitutes for, or multiplications of, muscular power. This is the aim or end of mechanism, which replaces manual labor by appliances that relieve the operative, while they increase the production of desirable objects. But as the cerebral development of the higher members of the family of man proceeds, invention takes a loftier flight and finds a wider scope. By giving us the telescope, the microscope, and the spectrum, it extends the power of vision, and endows us with something like another, and with certainly a finer, sense; while the telephone, microphone, and macrophone, are an extension of the faculty of hearing; and looms of every description, sewing machines, organs and pianofortes, type setting and type writing machines, and numerov.s other inventions of a similar character, may be regarded as an extension of the powers of touch. Ultimately science confers upon us the electric telegraph, which may be said to be an extension of the nervous system of every one of us: inasmuch as the thought which the brain transmits with such startling rapidity to the hand that writes the telegraphic message is transmitted with equal celerity, and by a similar agency, to any part of the world; so that, strictly speaking, the nerve centers of any person in communication with this agency are linked with fibers which cover the entire surface of the civilized globe.
Hence, if I have succeeded in making my meaning clear, the industrial development of the civilized races proceeds, pari passu, with their cerebral development. At first man toils laboriously, with nothing to help him in procuring the means of subsistence but the clumsy strength which inheres in his uncouth limbs. Then he constructs a few implements of the rudest and most primitive character. Then he gradually improves upon these, and learns how to forge metal and to fabricate tools. Then he becomes a mechanist; then he arrives at the art of manufacturing labor-saving machinery; then the discovery of the power residing in compressed steam enables him to make enormous strides in every department of industry; and the railroad, the steamship, and the electric telegraph virtually double or treble the term of his natural life, while indefinitely augmenting his strength. And so, as the laureate sings-
"Through the ages one increasing purpose runs.
And the thoughts of men are widen'd with the process of the suns."
Meanwhile, owing to the magnitude of the productive forces which are thus brought into active operation, there is an immense augmentation of their material results, and this, we must not omit to observe, is accompanied by a steady decrease in the amount of physical exertion which is necessary to accomplish those results. In the primitive ages of the world, bulk of frame, strength of limb, strenuousness of muscle, and robustness of thew and sinew count for much, both in war and in peace-both with the hunter who subsists by the chase, and with the husbandman who, at a later epoch, tills the ground. But, as the race advances, as the brain grows, and the nervous system is quicker and more sensitive to receive impressions from the outer world and to convey directions to the sensorial organs, and as the five avenues to the mind brighten and expand, mere bulk and muscle subside into minor importance. Manual labor is superseded by mechanical appliances; the artificer rises into an artist; the operative is transformed into the intelligent supervisor of machinery, which effects more in one hour than his unaided hands could have done in a year; and the progress of invention contains within itself the prop ecy of the ultimate abolition of toilsome labor, and of its replacement by those " dumb elephants" who work for us day and night, with no other food than a little coal and water, and who are so docile that the hand of a little child can control, regulate, or suspend their movements. Are we not, then, approaching the millennium of the workingman, and drawing near the time when the very phrase itself will have lost the meaning which has so long attached to it, and will be conferred, as a title of honor, upon the real workers of the race-upon men with large and beneficially active brainsstatesmen, inventors, teachers, natural philosophers, original thinkers, and all who, marching ahead of their generation, hold up the lamp of progress to enlighten the path of the multitude who follow in their steps?
For some years to come, perhaps, there will be a good deal of rough work, which will have to be done by rough hands; but, in the main, I believe the stream of tendency flows in the direction of emancipating the élite of the wagesearning classes from laborious and exhausting toil, and of enabling them to become the superintendents of machinery, emulating, in the perfection of its operation and results, the finest workmanship of human hands.

## A Comfort to Fat People

No doubt, says the London Lancet, it is unpleasant to be excessively obese; but the morbid dread of fat which has in recent years become fashionable has no foundation in physiological fact. Fat answers two purposes; it acts as a
non-conducting envelope for the body, and protects it from non-conducting envelope for the body, and protects it from too rapid loss of heat, and it serves as a store of fuel. In
the course of exhausting diseases, it not unfrequently happens that the life of a patient may be prolonged until the pens that the life of a patient may be prolonged until the
eserve of fat is exhausted, and then he dies of inanition.

Fats supply the material of the heating process on which vitality mainly depends. In great excess it is inconvenient;
but the external layings-on-of-fat is no certain measure of the internal development of adipose tissue; much less does a tendency to grow fat imply or even suggest a tendency to what is known as "fatty degeneration." It is time to speak out on this point, as the most absurd notions seem to prevail. Again, it is not true that special forms of food determine fat. That is an old and exploded notion. Some organisms will make fat, let them be fed on the leanest and scantiest and least saccharine descriptions of food; while others will not be "fattened" let them feed on the most "fattening" of diets. The matter is one in regard to which it is supremely desirable and politic to be natural, adapting the food taken to the requirements of health rather than substance. Simple food, sufficient exercise, and regular habits, with moderation in the use of stimula
maxim of a safe and healthy way of life

## Perseverance and Health.

We believe there is a great deal of truth and wisdom in what our excellent contemporary, the Sanitarian, says on the above subject: A man who inherits wealth may begin and worry through three score and ten years without any definite object. In driving, in foreign travel, in hunting and fishing, in club houses and society, he may manage to pass away his time; but he will hardly be happy. It seems to be necessary to health that the powers of a man may be trained upon some subject and steadily beld there day after day, year after year, while vitality lasts. There may come a time in old age when the fund of vitality will have sunk so low that he canfollow no consecutive labor without such a draught upon his forces that sleep cannot restore them. Then, and not before, he should stop work. But so long as a man has vitality to spare upon work it must be used, or it will become a source of grievous, harassing discontent. The man will not know what to do with himself; and when he has reached such a point as that, he is unconsciously digging a grave for himself, and fashioning his own coffin.
Life needs a steady channel to run in-regular habits of work and of sleep. It needs a steady, stimulating aim-a tend toward something. An aimless life can never be happy, or, for a long period, healthy. Said a rich lady to a gentleman still laboring beyond his needs: "Don't stop; keep at it." The words that were in her heart were: "If my husband had not stopped, he would be alive to-day." And what she thought was doubtless true. A greater shock can hardly befall a man who has been active than that which he experiences when, having relinquished his pursuits, he finds unused time and unused vitality hanging upon his idle hands and mind. The current of his life is thus thrown into eddies, or settled into a sluggish pool, and he begins to die.

## Injurious Effects from Vulcanite Plates.

Samuel Sexton, M.D., in an article published in the American Journal of the Medical Sciences, for January, 1880, states that vulcanite plates produce diseases that are more frequently the source of reflex aural disease than any others worn. They have been in use for over twenty years, and their adoption is very general. The constituents of this are caoutchouc, the sulphur required in the vulcanizing process, and vermilion or the sulphide of mercury, used for the color it imparts. The quantity of the latter ingredient is believed to be equal in weight to both the other substances mentioned; accurate knowledge, however, is withheld by the manufacturers.
The gradual disintegration of these plates, as they are worn in the mouth, liberates a salt of mercury whose poisonthey are othe tists elicit the fact that at least one-third of all those who attempt to wear them experience great irritation of the mouth, an irritation that is frequently accompanied by hypersecretion of the buccal fluid. The sufferer usually lays aside the plate until informed of the necessity of becoming accustomed to its presence by uninterrupted use. Vulcanite is a non-conductor of heat, and the effect of its contact with the highly sensitive tissues of tl e mouth is to produce hyperæmia and inflammation. Another source of injury is the very close contact of these plates, which is maintained by atmospheric pressure, and may favor the absorption of their substance.

## Dirt and Bodily Heat.

The part which the skin plays in the regulation of bodily heat is not adequately estimated. The envelope of complicated structure and vital function which covers the body, and which nature has destined to perform a large share of the labor of health preserving, is practically thrown out of
use by our habit of loading it with clothes. It is needless to complicate mattersby allowing it to be choked and encumbered with dirt. If the skin of an animal be coated with an impervious varnish, death must ensue. A covering of dirt is only less inimical to life. We are not now speaking of dirt such as offends the sense of decency, but of those accumulations of exuded matter with which the skin must become loaded if it is habitually covered and not thoroughly cleansed. The cold bath is not a cleansing agent. A man
may bathe daily and use his bath towel even roughly but remain as dirty to all practical intents as though he eschewed cleanliness; indeed the physical evil of dirt is more likely to ensue, because if wholly neglected, the skin would cast off its excrementitious matter by periodic perspirations with off its excrementitious matter by periodic perspirations with
desquamation of the cuticle. Nothing but a frequent wash
ing in water, of at least equal temperature with the skin, and soap can insure a free and healthy surface. The feet require especial care, and it is too much the practice to neglect them. The omission of daily washings with soap and the wearing of foot coverings so tight as to compress the bloodvessels and retard the circulation of the blood through the extremities, are the most common causes of cold feet. The re medy is obvious: dress loosely and wash frequently.-Lancet.

## Gas and Electricity.

In his recent inaugural address before the Society of Teleraph Engineers, London, President W. H. Preece said:
The electric light has been making considerable progress, and is gradually forcing itself into practical use, in spite of many of the drawbacks to its employment that have yet to be removed. The lamp of the future has not yet been produced, though steadiness and duration have very much advanced during the past twelve months. There is very little room for improvement in the generating machine, for both the Siemens and Gramme machines convert about 90 per cent of the energy thrown into them into electric currents, and this is a duty which no other kind of machine can show. One of its most notable and useful applications has been on board ship, to further the operations during the night in laying and repairing cables. I was present on board the steamship Dacia, in the Mediterranean, when this was done, and the success was unequivocal.
The Brush machine has recently been introduced into this country, and its performances are certainly wonderful. It
produces an electromotive force of over 800 volts, and 1 hav produces an electromotive force of over 800 volts, and 1 have seen it maintain 20 very steady arcs joined in series. 16 appear to be its efficient limit, and this number of lamps, giving over 1,000 candle power, are casily maintained by an expenditure of $131 / 2$ horse power. The performances of the Brush light are certainly the most advanced form the elec tric light has yet taken. There are over 800 of these lights in the United States; and it is worthy of notice that it. has quietly crept into existence without the aid of the ubiquitous and omniscient newspaper correspondent, or the transmission of any sensational telegrams, to the detriment and discomfort of gas shareholders.
It is assumed by many that the electric light is devoid of heat, but Professor Dewar has shown that a Siemens are radiates heat equivalent to 3 horse power per minute. Moreover, the use of such powerful currents, unless carefully directed, are dangerous to life and limb, and may even, unless properly protected, result in fire.
Gas is not going to be affected by the electric light. The proper function of gas is to generate heat. 94 per cent of the ingredients of gas are consumed in generating heat, and only 6 per cent in producing light. It is remarkable that so amenable and tractable an agent for heating purposes has not been more utilized, but the fact is that the public is ignorant of its properties, careless of its employment, and callous of its defects. It is not too much to say that 50 per cent of the gas manufactured is absolutely wasted for illuminating purposes by the wild extravagance with which it is burnt, and by the want of those systems of regulation which have been introduced to compensate for irregularities and excesses of pressure.

## Feather Plush

For some time past the ingenuity of several manufacturers has alighted upon the idea of utilizing feathers as a material for weaving fabrics in various ways. We thus saw recently two samples of feather cloth which had come from France, and which consisted, apparently, of the down of feathers interwoven with fine woolen warp, in one case throwing the feathers to one surface, and in the other laying them upon both sides; the latter, especially, was a very in teresting and exceedingly light cloth, which we understand is used in France for chest protectors, and is for that pur pose more agreeable, though perhaps not so durable, as flan nel or felt.
From a foreign patent we see that one manufacturer has protected a machine by means of which he produces a cloth or felt, in which he mixes finely broken feathers with wool, and then cards and felts them together. The machine he uses for the purpose is a combination of the opener and scutcher as used in cotton mills, and the fur formers employed in hat works. The feathers, which may be of any cheap kind, are placed upon a feed table, whence they pass under a drum set laterally with steel knives, which break the feathers; from this drum they pass between three strall rollers and a superposed fluted and chased iron roller with a o-and-fro motion endways, as well as a revolving motion, and by which the reduced feathers are ground quite small, and, falling upon a traveling apron, pass on to a spiked drum running in a cage, $w$ rose office is to reduce any pieces which have escaped the action of the rallers. The pounded feathers fall to the bottom of the machine, whence a fan sends them into a proper receptacle, where the feathers are mixed at once with wool. They may be blown direct upon the card table of a carding engine, which, in that case, must The mixture of cover as in in carding cotton.
The mixture of feathers and wool can, of course, be made n any proportion. The inventor states that he has obtained the best results by felting the cloth; the laps made by the carding engines are jointed by friction under the influence of steam, then milled, dried, and subjected to the action of steam at a high temperature in a steam chamber, which latter action is said to thoroughly amalgamate the feathers and the wool.-Textile Manufacturer.

CURIOUS CAPTURE by an oyster and a mussel. was declared to be an independent living moneron, is, iń
A correspondent of Land and Water lately forwarded to reality, sponge protoplasm. 8. That no valid lithological the editor of that journal a box containing a shanny and a distinction exists between the chalk and the calcareous mud mussel; which he describes as having been taken in the har- of the Atlantic; and pro tanto, therefore, the calcareous bor at Looe, Cornwall, in exactly the position represented mud may be, and in all probability is, a continuation of in the accompanying illustration. The shanny and mussel the chalk formation. were taken by a fisherman who was gathering mussels for bait at Looe. Mussels are found in great numbers at the bottom of the harbor there, and the fishermen use a longbandled, four-pronged fork for catching them. A boat is moored over the spot on which the mussels are to be found, and the fork is employed to bring them from below into the boat. In the case in question the shanny and mussel were brought up as shown in our illustration. The fish was alive whentaken, and its head firmly fixed in the mussel. This certainly may be considered a curious capture, and from the evidence it may be fairly assumed that the sha induced to pop his head in-an operation induced to pop his head in-an
which the mussel doubtless resented by imwhich the mussel doubtless resented by im-
mediately clo ing its valves, retaining the fish in its deadily grasp.
In the same periodical some time ago was recorded an even more extraordinary capture than the above, by Mr. Frank Buckland. We reproduce Mr. Buckland's remarks and the illustration which appeared at the time:
"Some time since, when examining the famous oyster beds at Helston, near Falmouth, Mr. Fred Hill, of Helston, was kind enough to accompany me and my friend Mr. Howard Fox, of Falmouth, in our expedition. Mr. Hill mentioned to me at the time that he had a curious specimen of a bird that had been caught by an oyster. The bird and oyster had been mounted in a case by Mr. Vingor, of Penzance. I have received from Mr. Hill a photograph of the event, which I have since had engraved. The history is that a woman who sells oysters went one morning to the Helford river and found the bird-a common rail-quite dead, with its beak held quite firmly by the oyster, which was still alive.
"The bird in all probability was wandering along the foreshore, looking for his dinner, and the oyster-possibly left longer by the tide than usual-was opening his shells waiting the incoming water. The hungry rail, seeing something that looked like a white and dainty bit of food, pecked at the body of the oyster, and probably pricked him sharply with his beak. The oyster then snapped his shells together as quick as a rat trap, and the poor bird instantly became a prisoner to die (or possibly get drowned as the tide rose) in his prison.

## The History of Chalk Flints.

At a recent meeting of the Geological Society (England) a paper was read by Dr. Wallich, describing the origin, mode of formation, and causes of the stratification of the flints which occur in chalk. Taking as the basis of his conclusions the fact brought to notice by him in 1860 , namely, that the whole of the protozoan life at the sea bed is strictly limited to the immediate surface layer of the muddy deposits, he pointed out in detail the successive stages of the flint formation, from the period when the chief portion of the silica of which they are composed was eliminated from the ocean water by the deep sea sponges, to the period when it became consolidated in layers or sheets conforming to the stratification of the chalk. In relation to this subject the author claimed to have sustained the following conclusions: 1. That the silica of flints is derived mainly from the sponge beds and sponge fields which exist in immense profusion over the areas occupied by the Globigerine or calcareous " ooze." 2. That the deep sea sponges, with their environment of protoplasmic matter, constitute by far the most important and esby far the most importal factors in the production sential factors in the production
and stratification of the flints. 3. That, whereas nearly the whole of the carbonate of lime, derived partly from foraminiferaan dcountry in payment of amounts too small to send by postal other organisms that have lived and died at the bottom, and order, but stamps could be sent to prepay answers to letters, partly from such as have subsided to the bottom only after death, goes to build up the calcareous stratum, nearly the whole of the silica, whether derived from the deep sea sponges whole of the silica, whether derived from the deep sea sponges
or from surface protozoa, goes to form the flints. 4. That the sponges are the only really important contributors to the flint formation that live and die at the sea bed. 5. That the flints are just as much an organic product as the chalk itself. 6. That the stratification of the flint is the immediate result of all sessile protozoan life being confined to the superficial layer of the muddy deposits. 7. That the substance which received the name of "Bathybius," and


RAIL CAUGHT BY OYSTER which at present is impossible.

The free evening lecture at the Working Men's College, Great Ormond street, London, on February 21, was given
by Mr. Francis Darwin, M.D., a son of the well known naturalist. The growth of a plant, the lecturer said, might be likened to the growth of a snowball set rolling down a snow-covered hillside. Both plant and snowball grew in size by the addition of matter; but while, if the bulb of a hyacinth were placed in water and kept in the dark, it per ton.

## Telegraph Wires ${ }^{6}$ Crossed $\boldsymbol{\prime}$ by Magpies.

The Journal of the Melbourne Telegraph Electrical Society reports a curious case of interruption which occurred recently on two of the Western lines, Australia. An intermittent "cross" (one of the most troublesome faults to detect) existed for some little time on these lines, and a close inspection was found to be necessary. This resulted in the discovery that some magpies (Australian) had actually built nest on one of the telegraph poles, and, among other materials used in its construction, had taken all the odd pieces
would grow in the ordinary sense of the word, in reality the plant would merely have taken stuff out of the bulb and arranged it in a different way, whereas in the growth of an oak tree from an acorn a quantity of new stuff was formed. These instances of growth suggested the ques tions, first, how a bulb or bean rearranged its matter in forming a plant, and, secondly, how all the new material was obtained that went to form a tree? He intended on that occasion to speak of only one half of the question: How the plant in growing arranged its material? First, it was necessary to know what a plant was made of. If ' 100 1b. weight of some growing plant were taken, say turnips, and the water driven off by drying, it . will be found that the weight would have decreased by 90 lb ., and that the solid, woody part remaining, about 10 lb . in weight, would nearly all burn away, leaving but a few ashes. In order to give some idea of the way in which this large quantity of water was held in the plant, Dr. Darwin com. pared the effect of water on dead matter, such as tea leaves or leather, with the effect of


SHANNY CAUGHT BY MUSSEL. as tea leaves or leather, with the effect of
giving water to a growing plant-the stiff, dry tea leaves became limp and soft, while the drooping, flaccid stem of a living plant, when watered, became stiff and elastic. How could the plant build up a strong, stiff stem with so much of so unstable a material as water, and how did the water become a source of strength to the plant? To understand this they must know how the water was contained in the plant. The solid material was formed into little cavities, and these-an infinite number of little boxes, as it might be-were filled with water. The way in which the water might become a source of strength could be seen by forcing water into a flexible tube or bladder, or by blowing air into an empty glove. The pressure of the water contained within caused the walls of the cells to become stiff. There were other ways, too, in which this stiffness was obtained, the water getting into the texture of the woody stuff and stiffof tie-wire which they could find within some distance of $\mid$ ening it as water stiffened sailcloth. This state of things the spot; scraps which had been thrown aside by the line existed also in the pith, and each cell, being over-filled repairers were twisted up together in the most singular manner, considering that they had no pliers to work with excepting their beaks. Some of these pieces of wire touched one line, and some occasionally the other, causing the "cross" complained of. It appears that lately several attempts at nest building on the part of magpies on the telegraph poles on the plains in the Western District have been discovered.

## The International Postage Stamp.

The Annales Industrielles says that France and Belgium are now making negotiations in regard to an international postage stamp. If the project is realized the payment of
small sums might be made in stamps. If the plan could be small sums might be made in stamps. If the plan could be with water, was for ever trying to leng, itself $S$ med he results of these conditions in the plant were then ex. plained by the use of two pieces of spiral spring, and for a more familiar example the audience were referred to the effect of splitting a dandelion stem. Each half curled over outward because the more elastic pith, trying to lengthen itself, was prevented from expanding on one side by the less elastic bark. With two pieces of spiral spring in a linen tube it was next explained how, when the pressure of water in the cells in the two halves of the pith was not equal, the stem did not grow straight. Not that plants bent accident ally or in a purposeless manner. On the contrary, when the plant bent it was with some distinct and useful object. To the explanation of this point, the rest of the lecture was directed. The directions and forms which the root and stem of a young growing plant might take were happily illustrated with a piece of whitened lead pipe of small bore put through a cork, which did duty for the bean. A great many theories had been offered to account for the fact that the root always tried to grow towards, and the stem away from the center of earth. Having related Andrew Knight's ingenious experiment with a revolving wheel, by which, with centrifugal force as a substitute for gravity, the plant was deceived and the direction of growth in seedlings was changed, the lecturer next dealt with the influence of light and damp on the growth of a plant. The stem was invariably shot out or bent aside in order to get at the light; and the root, with equal persistency and certainty, was sent to find moisture It would have been noticed, Mr. Darwin said in conclusion, that he had, throughout, spoken of plants perceiving the light, and knowing where the center of the earth was, and had used other expressions of a similar kind, usually only applied to animals. He had done so with no idea of being paradoxical, but
because he thought that by thinking of plants in this way
we were more likely to learn what was going on within them. we were more likely to learn what was going on within them.
If we would understand the actions of an animal, we must know what was useful or not useful for that life, and it was quite as necessary to consider in the life of a plant of what use its actions were, and, in a certain sense, why it acted in a particular way.
Advance in the Price of Dirt.-In consequence of the rise in the prices of rags and other fibers, the price of South Carolina clay, used by paper makers to increase the eight of their goods, has lately been advanced two dollars

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## NEW BOOKS AND PUBLICATIONS.

 Directory of the Flour Mill Owners and Millwrights ofStates and Canada, 1880 . Milwauked Wis.: E. Harrison Cawker, editor

Business men having or desiring trade with millers and millwrights will appreciate the value of a list of nameat flouring industry. The book shows a marked improvement on the former directory in size and fullness

Anuario Universal. Almaque Estadistico,
Administrativo y Comercial para 1880.
Mexico: Filomento Mata, editor. 32 mo ,
cloth, pp. 408 .
cloth, pp. 408.
Well filled with information in relation to the govern-
nental, social, and commercial affairs of the State of mental, social, and commercial affair
Mexico, with a plan of the capital etc.
Sewers and Drains for Populous Districts; with Rules and Formule
for the Determination of their Dimensions under all Circumstances. By Julius W. Adams. Illustrated. New
York: D. Van Nostrand, 8vo. cloth,
pp. 228.
In 1857 Mr . Adams was charged with the planning of the sewage system of the city of Brooklyn, covering an area
of twenty square miles; and as chief engineer of the Board of City Works he has taken a controlling part in the development of the great work. The constant inquiry has led to the preparation of this volume, in which he lays down the principles and describes the methods
which he believes to be best adapted to the economical and successful sewering of towns and cities. The work is eminently practical and to the point.
Saws: the History, Development, Action Classification, and Comparison of
Saws of all Kinds. By Robert Grim-
shaw, Ph.D. Philadelphia: Claxton, shaw, Ph.D. Philadelphia: Claxton,
Remsen \& Haffelfinger. Quarto, cloth. Rp. 160. Price \$2.50.
Reserving sawing machines for another treatise, Mr. Grimshaw here describes with great fullness and with a
profusion of illustrations, the saw blade, in all its vaprofusion of illustrations, the saw blade, in all its va-
rieties. The manufacture of saws and the various processes of setting, swaging, gumming, and filing of saws, and related matters are treated in appendices, which contain also many useful tables of gauges, log meas-
urements, etc., and an alphabetical list of all United States saw patents from 1790 to 1880 . The book is
handsomely made and well indered.

Free Ships. By John Codman. New York
G. P. Putnam's Sons. Pp. 54, paper Price 25 cents.

Second edition of No. VI. of Putnam's Economis Monographs. Adds to the original arguments for the restoration of the American carrying trade by the free
importation of ships, a review of the plans of Senato Blaine and Secretary Sherman.
A Manual of Tobacco Culture. By R.
B. Davis. Hickory, North Carolina B. Davis. Hickory, North Brothers. Paper, pp. 30. Gratis. Sets forth the advantages of the Piedmont section of North Carolina for the production of yellow tobacco,
and treats the cultivation and curing of the tobacco plant with special reference to the condition and re quirements of Piedmont.
Safter's Hand Book.
Emerson Smith \& Co., extensive saw manufacturers beaver Falls, Pa., have issued an attractive hand purchase saws, but the book also contans many useful hints on saw mills and machinery, how to straighte
saws, their proper speed, prevention of heating, etc.

## 

HINTS 'TO CORRESPONDENTS.
No attention will be paid to communications unless
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Names and addresses of correspondents will not given to inquirers.
We renew our request that correspondents, in referring
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reasonable tims whose inquiries do not appear afte a reasonable time should repeat them. If not then pubEditor declines them.
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obtain such information without remuneration.
Any numbers of the Scientific American SuppleMENT referred to in these col
office. Price 10 cents each.
(1) W. E. asks: Is the apex of the zodiacal ight in the same direction from the sun as the aphelio point of the earth's orbit? A. The zodiacal light ex e ecliptic.
(2) W. B. asks: 1. Is there an odorless coal oil in the market? A. No. 2. What chemical will dissolve old rubber boots? A. There is no practi-
cal solvent. See pp. 48 and 105, Yol, 39, ScIENTri american.
(3) F. A. P. asks: Is there anything that printers use to put in their ink,vermilion, lake, or black for instance, which will give a lasting gloss? If so
what is it and how is it used? A. Use a fine, we what is it and how is used? A. Use a ine, well reater gloss to ink used in type work.
(4) L. F. T. asks how to make an imitation of ground glass by the use of acids or some inex
pensive material other than machinery. A. The sand blast or wheel is the cheapest method of frosting glass. The only acid that can practically be applied is hydro fluoric, produced by the action of warm sulphuric aci on powdered fluorspar. Hydrofluoric acid in gutta-
perchabottles is quoted at $\$ 2.50$ a pound in New York. (5) A. J. P. writes: I wish for some pro cess of duplicating writing by which I may secure more copies-say 500 -and more distinct than by th new gelatine pad process; also an apparatus not so ex-
pensive as the electric pen or the papyrograph, which pensive as the electric pen or the papyrograph, whic cost, I believe, $\$ 35$ or $\$ 40$. I wish something as cheap
as the first, and effective as the last. I see no reason why the latter might not be afforded for $\$ 5.00$. A. Try proportion ol Use the gelatine pad made in alum wate proportion of glue. Soak writing paper in alum wase
to saturation and dry carefully. Write with any ink on the prepared paper and use as in the gelatine pad pro-
cess; the parts of the gelatine surface not protected by cess; the parts of the gelatine surface not protected by
the ink will be affected by the alum so as to leave a the ink will be affected by the alum so as to leave a
stencil which can be used by inking with a roller as in the electric pen process.
(6) S. A. asks (1) whether it is advisable to build a cistern under the basement of a dwelling house. The archid be ouder the building; other parties contend hould be under the building; other parties conten on account of condensed air in cistern. We would like your opinion on the subject. A. We do not advise placing the cistern under the bouse as proposed. 2 What are the proportions of the best concrete? A. 5 parts gravel or sharp sand, 1 part ground quicklime (fresh).
Mix with a shovel, and slake with water into a thick ortar.
(7) R. G. asks: 1. Does the velocity of a projectile from a gun outside the gun ever exceed the
phase of the same principle: does a ball thrown from the hand ever travel more rapidly than the hand in throwing it? A. Possibly yes, as the muscles of the
fingers give an impulse to the ball.
(8) E. L. K. asks if there is a mixture of y kind that will remove old paint from wagon bodies A. There is no mixture that will remove the paint sucpaint. It is a better plan to soften the paint by heat paint. It is a better plan to soften the paint by heat
from a hot iron, or alcohol or gas flame held near it,
(9) W R H manent magnets be hardened? If so, what temper is
deep yellow. 2. Where can I find information on minor magnets? A. In Supplements 142, Telephones; and 182, Electromagnets.
(10) F. E. G. asks (1) for dimensions for a boiler of an engine 1 inch by 2 inches. A. About six qickness of plates of copper and iron for such a boiler? A. Thickness depends upon diameter of the boiler. 3 . Walve $1 / 2$ inch in diameter and center of valve 1 iuch
val rom fulcrum, and lever 6 inches long, and weight 3 lb end? A. 106 lb . per square inch nearly
(11) F. W. S. asks if there is any method of deadening the noise of presses by any substance that could be placed under the feet of the machines. I run two presses, an 8 Gordon and an Acme cylinder, in the
second story of a brick building, and the jar and noise is annoying to tenants on the floor underneath. A. We hink if the frames of the presses were set on pieces o hick india rubber, and the floor deadened in any of the
(12) R. K. asks: When does a stationary ngine runs backward or forward, or, in other words which way does an engine run when the balance wheel
runs from the cylinder or power? A. If the top of the runs from the cylinder or powerl A. If the top of the
(13) W. R. W. asks: 1. When and where was the ship known as the Three Brothers (formerly the Vanderbilt) built, and who was her first captain?
A. 18.56, at Greenpoint, L. I., Captain Le Fevre. 2. What is her tomage, and is she the largest sailing vessailing ship, but we believe there is a larger English sailing
ship.
(14) W. T. asks: 1. Can I separate the albumen from ordinarily albumenized paper after a photo to be fixed to glass? If so, how? A. We know film, satisfactory way of doing this. Try the following: satisfactory way of doing this. Try the following:
Slightly coat the face with a thin negative varnish, press the print down smoothly on the glass, and, when the varnish has hardened, thoroughly moisten the paper mmonia may be carefully detach the paper. A little print the photograph directly on the gelatin coated lass. 2. What colors could I use (water or oil) for The available pigments are Prussian blue, carmine, verdigris, madder brown, indigo, crimson lake, aw and burnt sienna, cappah brown, and vandyke brown. The aniline or coal tar dyes are also used, but, unfortunately, they are apt to fade. No particular method of mixing the colors is requisite; ordinary oi or water colors will do, but they must be ground extremely fine. The pencils must be small, and their oints unexceptionable. Camel's hair is preferable. he best vehicle to use for thinning out the colors is ordinary megilp,and the smallest possible quantity only
of this should be used; if excess is used, the colors will run. The best medium for laying on the first wash of color is a hotsolution of isinglass. If the lime light is to be used the colors should approximate as nearly as possible to nature. Lamp and ordinary gas light is de icient in blue, the yellow preponderating; where these are used the tints must be arranged accordingly; greens must be bluer than natural, yellows inclined to orange,
and all shades of violet eschewed. Consult Groom's "Transparent Printing on Glass." 3. How are the sheets of paper prepared for ordinary transfers, and what is beirg also gummed.
(15) J. A. E. asks: How can the rattling or ubbling of a kitchen or hot water boiler be prevented or remedied? I have one that is piped with $3 / 4$ inch pipe,
with 9 feet of pipe in the stove, with three return bends . When a coil is used in a stove instead of a water back the diameter of the pipe should not exceed a cerain proportion to its length, with the fewest possible urns, that the water as it warms can pass rapidly to the tank or boiler, and not be retained long enough in he coil to form steam or to get nearly as hot as it is pipe, large diameter, with one bend, or water back ith one ceptum, or if a chamber only, the water will ake care of itself, according to gravity. Bubbling will sometimes caused in a very hot tank when the pressure is relieved by drawing, on the same
water below 212* boils in a partial vacuum.
(16) E. R. asks how to deaden the noise of a foot lathe, so that it will not be heard in the rooms elow. A. We take the following from the Workshop vork bench. Chambers' Journal describes a factory where the hammering of fifty copper-smiths was scarcely udible in the room below, their benches having under ach leg a rubber cushion. 2. Kegs of sand or sawdust pplied in the same way. A sand or sawust is first poured into each keg; on this is laid a board or block upon which the leg rests, and around the leg and block is poured fine dry sand or sawdust. Not only Il noise, but all vibration and shock are prevented; nd an ordinary anvil, so mounted, may be used in a dwelling house without annoying the inhabitants. To
amateurs, whose workshops are usually located in welling houses, this device affords a cheap and simple elief from a very great annoyance.
(17) F. J. B. writes: I have some large Mata stone vases, with ornaments broken off in transportation, and for replacing need a nearly colorless and eat, and that will stand outside weather if without Can liquid glass or white glue be prepared so as to anwer the purpose? A. Try the following: Finely scraped old cheese, $11 / 2$ parts; quicklime in fine powder, 1 part; mix thoroughly, moisten with milk to a paste, and use at once, as it hardens very quickly. Instead of milk a trong aqueous solution of water glass or borax may be used. White lead (in oil) applied on cotton gauze may
also be used advantageously.
(18) C. W. C. writes: I am fixing up a small mill to grind feed for my stock. It has a apair of
sisteen inch burrs which run vertically, to be driven by a common 8 or 10 horse power with a $51 / 2$ or 6 inch belt over a 10 inch pulley. What should be the engnth of the
belt? A. We think the driving and the driven shafts over a 10 inch pulley. What shoula
belt. A. We think the driving and
should not e eless than 12 feet apart.
(19) A. B. writes: I wish to make some mirrors, will you give me formula for depositing the
silver? Have tried carefully the Siemens method de silver? Have tried carefully the siemens method de-
scribed in Surplement No. 105, but do not succeed. What is the trouble? A. You have probably neglected to clean your glass properly, or your aldehyde ammonia
was not right. Try again or use Chapman's process. was not right. Try again, or use Chapman's process.
(20) J. J. C. writes: In receipt for cements in No.'9, current volume, you mention fresh beaten blood etc., for Chinese cement; what kind of blood shall
I use? A. Use such as may be obtained at slaughter Inse? A. Use such as may be obt
houses. Beat tt with an egg beater.
(21) G. B. writes: Some three weeks ago the town council engaged a man to dig a well for the public. He agreed to dig a 5 feet in diameter well for
$\$ ? 2$ a foot in depth; owing to the nature of the ground he had to increase the diameter to 7 feet, which the council said they would receive, and pay him in proportion of above agreement. A dispute has now begun as to what
it should be-the council say $\$ 98$ and his mathema-
 ticians say $\$ 137.20$. Who is right? A. The relative
amount of earth removed will be as the square of two amount of earth removed will be as the square of two
diameters if the price for 5 feet diameter was $\$ 2.00$ per
foot, then for 7 feet diameter it would be as the square foot, then for 7 feet diameter it would be as the square
of 5 to the $8 q u a r e ~ o f ~$
7 or as 25 to $49-49$
200

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(22) J. W. writes: Please give an easy and practical method of setting a locomotive engine ecen-
tric while on the road in case it should slip. A. If the position of the eccentric on the shaft is marked, as it should be, you have only to set the eccentric to the
marks and fasten; if not marked, place the crank on marks and fasten; if not marked, place the crank on
the proper center, throw the valve gear into its proper position, and turn the eccentric around till the cylinder takes steam frecly, and fasten. Whether you tura the ec centric forward or back, will depend up
the go-ahead or the backing eccentric.
(23) E. De N. asks: Will a crooked pipe of the same size and length. having same pressure (for water head, pass as much water as a strright pipe
would? A. No: every bend you make reduces the quantity delivered.
(24) A. S. D. asks: Do the steamboat inspection laws prohibit the use of portable boilers in small steamboatt, such as small ferry boats, when the
boiler is made of lawfol iron and the tubes put close together as the
They do not.
(25) F. A. writes: In answer to A. W. H. (7), of February 14, 1880, No. (7), I would say that I
obtained a fair cony from an electrotype by means of obtained a fair copy from an electrotype by means of
the gelatin pad by saturating a cloth pad with the ink, then pressing it on the electrotype, and, when dry,
placing the same face down on the pad. If A. W. H. placing the same face down on the pad. If A. W. H.
has a better method I will be obliged to him for inhas a better
strucions.
(26) J. W. C. asks: 1. Is tool steel better than machinery steel for magnets? A. Tool steel har dened and drawn to a yellow makes a good magnet if
properly chargeed. 2. Will the Calland battery answer properly charged. . . Wilt he Calland battery anster
as well as a Bunsen battery for a telephone ff not, sidered the best battery for this purpose.
(27) R. H. G. asks: 1. What holds the smooth surfaces together that Professor Tyndall speaks
of as being held as well in vacuo as in the open air? A. The force of adhesion. 2. Also of what is celluloid The force of adhesion. 2. Also of what is celluloid
madeé A, See p. 335, Vol. 39, ScIeNTITIC AMIRIICAN,
(28) M. J. L. asks: 1. What size should a boilier be (light as can be made) to raise and hold two
or three pounds of steam, to run an engine not exceedor three pounds of steam, to run an engine not exceed gine it shold have 12 to 15 feet fire surface. The
thickness of metal may be $1-16$ inch if the boiler is cylthickness of metal may be $1-16$ inch if the boile is cyl-
indrical. 2 . How could the steam be gauged with perfect safety? A. Use both a pressure gange and a safety valve, or if the pressure is not more than three or four
lb. you can use a column of water as a safety valve.
(29) S. A. G. asks: 1. What makes the mark on sawed lumber. Does each tooth make a mark when a circular saw is used? A. If the teeth are evenly
set, each tooth will make its own mark; but if not some set, each tooth will make its own mark; but if not, some
one projecting tooth will mark more distinctly than the one projecting tooth will mark more distinctly than the
others. 2. What would be the power required to run a others. S. What would be the power reguired to run a
boat 60 feet long and 20 feet wide-size of cylinders feet wide, 2 engines, 10 inch cylinder and 30 inch feet wide, 2 engines, 10 inch cylinder and 30 inch
stroke; one flue boiler 46 or 48 inches diameter and 18 feet long.
(30) C. B. G. asks: What is the best fire could manage and carry in her trunk, and where could I get it? A. We think there is nothing better than a ood strong knotted rope.
(31) P. A. H. asks how to make a strong battery out of a new pile Leclanche battery. A. The eiements of Leclanche battery are not suitable for any
other form. If you wish to make a strong battery see directions given in SUPPLEMENTs, No. 157, 158, and 159.
(32) R. E. M. writes: We have two saws, one 54 inches in diameter. the other 60 inches diameter.
Now, if both run at the same speed, which will consume the most power in doing the same work! Both saws
are alike in all respects but as mentioned. A. The larger one.
(33) E. J. C. asks: 1. Can I construct an induction coil of No. 36 wire and No. 16 or No. 24 wire?
I have these sizes on hand. A. For alarge induction coil, No. 16 will do for the primary and No. 36 for the
secondary. For small coils, use four or five layers of
No. 18 or No. 20 for primary and No. 36 for secondary. 2. What size wire is primary and No. 36 for secondy used ins sounders? 1 find 24 too large. A. Nos. 20 to 24 are used for local
sounder sounders, and for main line sounders Nos. 24 to 32 , and
in some cases wire as fine as No. 36 is used. The size depends entirely on the length or resistance of the circuit in which the instruments are used. 3. I constructed a telephone as shown in Supplement, 142, Vol.
6, Fig. 4. It does not work as well as it should. Is it , Fig. 4. It does not work as well as it should. Is it
an exact represcntation of the Bell telephone? A. It is an exact representation of the Bell telephone? A. It is
on the principle of the Bell telephone, and should work well if constructed according to the direction referred
(34) C. W. N. asks: How much will a $5 / 8$ inch wire cable chain support? A. If you mean $5 / 8$ inch
diameter wire rope, about $14,000 \mathrm{lb}$.; if you mean chain of $\%$ inch inch diameter wire, about $26,500 \mathrm{lb}$. A safe working load is but one-fourth or one-fifth these weights.
(35) C. W. W. writes: A mechanical e gineer of high standing claims that a pump will not draw water as high by running the pipo
a knoll as it would raise it vertically.
his assertion he states that it had been tried with a pump in good condition, to draw water out of a canal the bank of which was twenty-one feet eight inches above the level of the water. The pump was located about two hundred feet from where the pipe entered the canal. I claim that the pump or pipe must have been defective, as the only difference a curve would
make would be what little aditional friction the inmake would be what little additional friction the in-
creased length of pipe, due to the curve, would have over a vertical lift equal to the highest point of the curve. I would state that the pipe in question was large enough to supply the pump under any condition. A. The curve makes no difference in the height the pump can lift,
save only the increased friction, but the pipes must be tight; with the curved pipe as described, it is really a siphon in form, and if there be the slightest air leak,
the air will collect at the top of the curve and thus stop the air will collect at the top of the curve and thus stop
the action'of the pump. There should be a cock or valve the highest point to let off the air
(36) W. H. M. asks: 1. What are the reuisite qualifications to become a locomotive fireman? . Activity, faithfulness, sobriety, close observation, apply to for a situation? I don't think it is the master mechance, as Ihave written to several and have re ceived no answer. A. The master mechanic or superintendent. 3. In. link motion, is it necessary for every hanger to be a little above or below the central line of
motion? Will it not work just as efficient by being exactly upon the line of motion? A. It depends upon the proportion of the parts. 4. Which is the accepted mode of firing a locomotive boiler? A. There is no ac-
cepted mode, as the treatment differs with different fuel and different service; the best mode with any par-
(37) W. T. S. asks (1) whether 125 inch stay bolts are sufficient to stay the top sheet of a fire
box $24 \times 42$ inch; one end of the bolts are turned into an eye, the other end running through a clevis with a nut eye, the other end running through a clevis with a nut
on, steam pressure to be 120 lb . per square inch. A. No; you should have at least 30 stays, $3 / 4$ inch or $7 /$ inch diameter. 2. Would there be any objection in using
steam from two boilers, by running a steam pipe from the smaller boile boilers, by running a, running the pum on the smaller boiler to supply it with water? A. No. (38) S. F. A. writes: We have a difference regard to how a key should be fitted in a driving wheel. One party claims that the key should be fitted to bear the hardest, top and bottom; and the other party claims that it should beomitted to bear the hardest on the sides.
A. The key should be a close fit at the sides, but have no A. The key should be a close fit at he sides, but have no
draught; all the draught should be on top and bottom.
(39) W. H. D. asks how in using a "Richards" indicator for taking diagrams from steam engines, one is sure to have the proper spring inserted
in the instrument. The indicator lent me has several in the instrument. The indicator lent me has several
springs all stamped with different numbers, which to springs all stamped with different numbers, which to
an amateur like myself are very puzzling. I want to take diagrams from different engines, under varying pressures of steam, say with $20,30,40,50 \mathrm{ll}$., and up to
100 lb . pressure in the boiler. I suppose I must change the springs for each rise or fall in pressure I work at, as
the springs indicate such a course from some being the springs indicate such a course from some being
stronger than others; 40 to 50 lb . will probably be what I will use most. A. The numbers on the springs are the number of pounds one inch in height of the cards made
with that spring will represent. If you are using, say with that spring will represent. If you are using, say
a spring marked 40 , then in marking off the card, you spring marked 40 , then in marking off the card, you inch in height into 40 parts, each part being one pound per square inch, and so with a spring marked 20 , divide each inch into 20 parts, etc. There should be with the indicator a scale corresponding
to each spring and marked 20 scale, or 30 scale, or 40 scale; these scales are to be used in measuring a card made by a corresponding spring.
(40) E. E. K. asks: 1. What is the weight of an ordinary locomotive without tender? A. For pas70,000 to $80,000 \mathrm{lb}$. 2. What is the weight of the tender? . Depends upon their capacity. 3. What proportion of the locomotive rests on the drive wheels? A. In passenger engines about two-thirds, in freight engines
from four-fifths to the whole. 4. Is there any device in use to prevent drive wheels from slipping, outside of the use of sand? A. None successful that we are aware of. (41) D. L. writes: I wish to locate two hydraulic rams to work together; the fall is 10 feet, and 80 feet through a pipe 1,000 feet long. Will they raise the same quantity of water throngh a tube of 2 inches diameter as through one of 1 inch diameter (outlet tube of course)? Would the rams work successfully in case
the tube were 4 inches diameter? A. The rams will the tube were 4 inches diameter? A. The rams will operate better through a 2 inch than a 1 inch
objection to the pipe being 4 inches diameter.
(42) H. S. asks: 1. What pressure will mercury flasks bear for a steam boiler, as in Supple-
ment, No. 182? A. We do not know the test to which MENT, No. 182 . A. We do not know the test to which
mercury flasks are submitted; but they will undoubtedly
bear ten times the pressure usually carried on steam
boilers. 2. How many flasks, and what size cylinder boilers. 2. How many flasks, and what size cylinder
and propeller would it require for a Sharpie 26 feet long,
$61 / 2$ foot beam, to ogo eight to ten miles per hour? A. 61/2 foot beam, to go eight to ten miles per hour? A
20 flasks submitted to the fire, and 4 or 6 for steam re 20 flasks submitted to the fire, and 4 or 6 for steam re-
servoir; engine 4 inch by 4 inch stroke; propeller 24 or 26 inches diameter, and 33 to 38 inches pitch.
(43) P. H. asks: 1. Should in the speed of circular saws there be any difference for a cross cut and
rip saw? A. No difference of speed between a cros cut and rip saw. 2. What should be the speed of the cylinder of a planer (surfacer), and what the feed for soft wood work, such as general mill work, and what for har wout 800 revolution as furniture? A. For a planer upon the character of the wood and condition of knives. 3. What is the proper speed of a band and what for a scroll saw? A. Speed of band saw 6,000 feet per minute; speed of scroll saw if well constructed and balanced, from 800 to 1,000 strokes per minute.
(44) J. C. B. asks: Can you give me any remedy that will drive off or kill water bugs? Our house is becoming infested with them. A. Persian in-
sect powder thoroughly blown into all the crevices at the wall, around the water pipes, and around range will generally dislodge and kill them. The powder
(45) J. G. S. asks: Can you tell me through he Scientific American how I can copper plate or iver plate small brass articles without a battery,or how to make a battery and liquid to do it as cheaply as pos sible? A. You will find on p. 409 (15), Vol. 40 , of Scl entific American, directions for making a silverin
solution to be applied with a cloth, and on p. 219 (43), same vol., there are directions for coppering castings.
(46) J. S. B. writes: In your issue of March , under "Notes and Queries, your correspondent B. S. (19) complains of the wasting away of copying pad off the impression. If the pad is laid aside for 24 hour it will be found that the ink has been entircly absorbed and a perfectly clear surface is left for another copy. (47) S. B. G. asks: 1. Why was Cleopa tra's monolith named a needle? A. Slender rock called $\cdot$ needies." 2. Has Cleopatra's needle reached New York yet? A. No. 3. In what part of the cit will it be set up? A. Not decided. 4. Does the Cassiquiar 1 River in Brazil always flow in the same direction?

Minerals, etc.-Specimens have been received from the following correspondents, and examined, with the results stated:
G. W. G.-Nickeliferous pyrrhotine-worth an analyde, with sulphide ofiron-not valuable -J. W. K.-Magnetite-magnetic oxide of iron--in
gneiss rock.--J. B. G.-It is quartz rock-of no value

COMMUNICATIONS RECEIVED.
Repo
tion.
On the
On the Iowa Meteorite. By A. W. B.
Curiosities of the Key Board. By
[OFFICIAL.]

INDEX OF INVENTIONS for which
Letters Patent of the United States
Granted in the week Ending
March 9, 1880,
AND EACH BEARING THAT DATE
[Those marked (r) are reissued patents.]
A complete copy of any patent in the annexed list, in cluding both the specifications and drawings, or any patent issued since 1867, will be furnished from this office date of the patent desired, and remit to Munn \& Co., 37 Park Row, New York city.

Alcoholic vapors in water, apparatus for collect

Animal trap, T. Wilson
Audiphone, T. W. Gray
Audiphone, T. W. Graydon ...........
Augers, operating earth, G. H. Wood
Axle box, car, G. W. Brownell...
Axle box, car, G. w. Brownell.
Axle box, car, T. Haynes......
Baling press. A. M. Paxton
Barrel machine, L. Smith .
Barrel machine, L. Smith ...............................
Bedstead, folding cabinet, A.W.\& C. T. Kendrick
Belt
Belt fastening, R. McCully.
Boiler furnace, steam, J. Mahony.
Book for holding blank form
Boot and shoe, J. T. Shaw..
Boot and shoe, R. W. Witham ......................
Boot and shoe sole burnishing machine,
Mathews ..............................
Boring machine, G. Gardner (r)
Boring tool, metal. L. C. Little
Boring tool, metal, L. C. Litt
Bottle stopper, S. S. Newton.
Bottle washing machine
Brake lever, A. C. Fish
Brick machine, C. V. He
Brick machine. J. A. Reeder . ..................
Bulletin board, Watkinson \& Whelan.
Burglar alarm, electric
Button, A. D. Jeffrey

Car coupling, Myer \& Skinner..
Car door sill, grain, D. F.
Car starter, A. stewart.

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| Cars to moving trains, device for attaching, A. Chapin |
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| Carpet stretcher, J. A. Dice .. |
| Carriage spring, W. H. Brace |
| Caster, furniture, C. Brinton |
| Chain guide, oscillating hand, |
| Chair, E. J. Smith | $225,2 \pi 2$

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Clothes pounder, J. Keller, Jr..225,39

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Coke oven, beehive, $S$, Disteher
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Copy holder, A. Iske
Cornice, adjustable
Cornice, adjustable window, J. W. Campbell.
Corset, abdominal, S. A. Cuning
Cotton chopper and cultivator, comb'd, w. s. Nea Cradle, rocking, J. W. Mucks ..
Crank and wheel for machinery, comb, ${ }^{\text {d,H........... }}$ Gmping machine, Stoddard \& Fifield
Cultivator, A. Aker ullivator, A. Aker
Cutlery, pocket, J. D. Frary
Dentaphone, T. W. Graydon
Dentist's chair, E. T.
Dividers, J. $\mathbf{F}$. Sullivan.
Door check, C . Hooner
Dredging machine attachment, J. A. Ball.
Dust pan, E. J. Riley.
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Extinguishing device, F. E. Dallery
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Felly for wheels, metal, H . E. Lambert
Fermenting casks, ventilating valve for, H. Guth
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Fire lighter, B. Swift...................
Fuel burning apparatu
Furnace, $\mathbf{T}$. M. Fell ...
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Gase apparatus, for ensiching and economizing
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coal, G. T. Strong.....
Gong, alarm, C. F. West.
Gong, alarm, C. F. West
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Grain separator, H. E. Wright et al................... 2
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Grinding mill for grain, middlings, etc., Higgin

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Harness, T. Boardman.... ...
Harrow, J. \& G. E. Waggoner
Harrow, wheel, F. Bramer
Harrow, wheel, C. La Dow
H arvester and thrasher, comb'd, c.
Harvester reel, W. H. H. Freeman.
Hat pouncing and shaving machin..............
Hay press, L. B. Lathrop .
Headlight, signal, M. Nichols.
Hog trough, W. G. Vincent .
Hog trough, W. G. Vincent ........
Hoop bending machine, J. W. Jone
Horn and shell goods, making, L. Tillinghast
Horse power, R. C. Wade.
Horse rake, F. E. Kohler
Horseshoe, J. R. Williams
Horseshoe, J. R. Williams ............................
Horseshoe bending machine, J. R. Williams...
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Williams ....................................225,254,
Horseshoe blanks. making, , R. Williams (r)....
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