

SCIENTIFIC AMERICAN

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[NEW SERIES.]

NEW YORK, SEPTEMBER 8, 1877.

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IMPROVED BOARD CUTTING AND SEASONING MACHINES.

In the annexed engravings we represent a new machine for cutting boards and also an improved steam seasoning press. Fig. 1 is the board cutting machine, the invention of Mr. H. T. Bartlett. It is claimed to cut from the thinnest veneer up to boards of $\frac{1}{8}$ th to $\frac{1}{4}$ inch in thickness, equal in quality to the same thickness of sawed material and requiring no further planing, both sides being perfectly smooth.

To accomplish this result the usual conditions of cutting are reversed, the log being held stationary while the knife moves through it with a drawing motion.

This is the important feature of the machine; the drawing stroke of the knife being effected by a vertical and horizontal movement of the frame to which it is attached by means of crank and radial rods, with their driving mechanism situated beneath the floor, entirely out of the way. Power is applied by a single 12 inch belt giving the main driving wheels 20 to 25 revolutions and cutting a corresponding number of boards per minute. The several devices for holding the log and the automatic feed during the operation of cutting, while possessing much merit, need not be enlarged upon here. The machine is constructed to cut logs square or round, 8 feet 4 inches long, 28 inches thick, 36 inches wide.

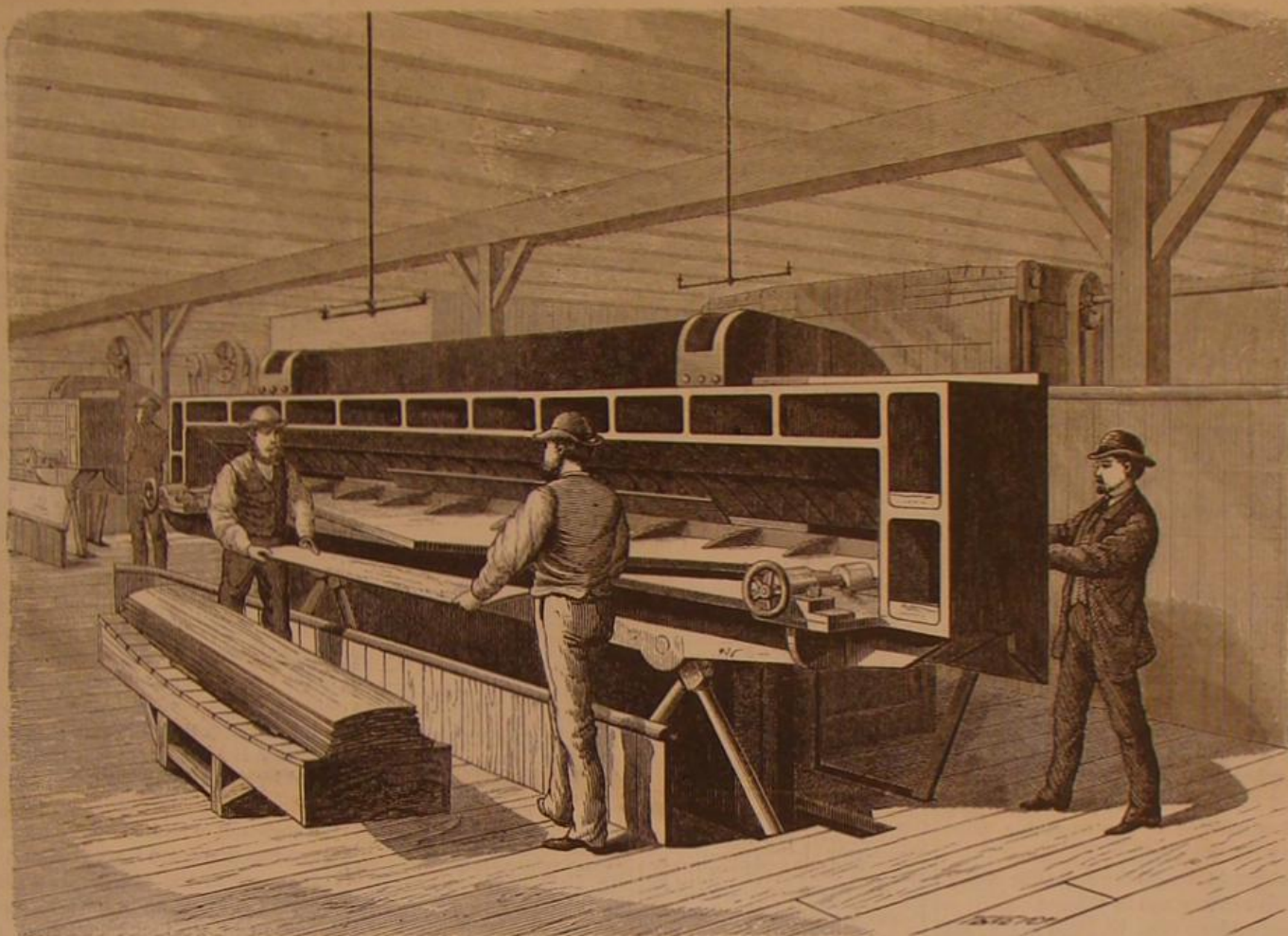
The variable drawing motion of 16 to 40 inches of the knife, we are informed, enables the machine to accommodate itself to all the variations in the texture of the material. There is no dead point during the cut, which is continuous, so that the work is done with comparatively little friction and with economy of power. Another valuable feature in the machine is the adjustability of the cut-

ting table to any height so as to bring narrow logs into the first or longest part of the drawing stroke. With three men to attend the machine and one or two to prepare logs, the

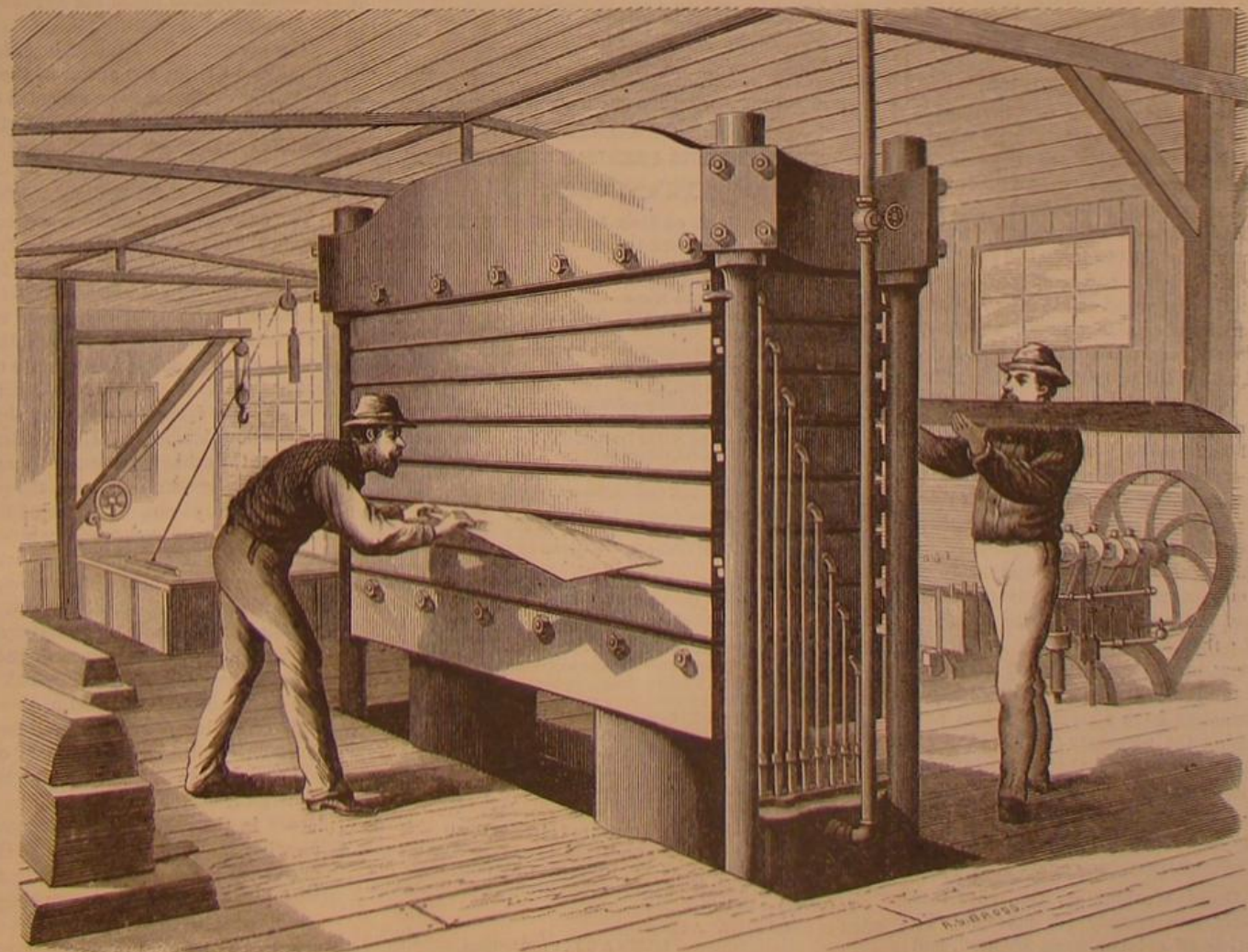
apparatus, running at full capacity, 10 hours per day, can, we are informed, produce 280,000 feet of veneers; or its average production is about 50,000 feet of veneer, 20 to 25 feet

of $\frac{1}{8}$ to $\frac{1}{4}$ inch and 10,000 feet of half inch stuff. The facility with which the machine cuts boards of the thickness last named is remarkable, and it is, we believe, the first invention which improves upon the work of the saw in that respect. A $\frac{1}{4}$ inch mahogany board 24 inches in width was exhibited to us, which had just emerged from the knife, and which, so far as firmness of grain and smoothness of surface were concerned, was ready for immediate use. Hitherto the work of cutting machines has been confined entirely to veneers, by means of the apparatus represented in Fig. 3, the construction of which will easily be understood. The present machine is the first, however, as we are informed, to produce cut boards of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, and up to $\frac{3}{4}$ inch thick, with the grain firm and unbroken, and the surfaces so smooth as to need no further dressing.

By the steam press, Fig. 2, the use of the dry kiln is obviated, and thin lumber of all kinds can be thoroughly seasoned in from two to twenty minutes. It is unnecessary for us to review the present requirements for drying and seasoning lumber. Large space is required for air-drying, which is a slow and expensive process, and after it is concluded the wood is often warped, and exhibits wind buckle or season checks. All these disadvantages are claimed to be avoided in the new steam drying press—the invention of Philip Pfeffer. This consists of a series of steam-heated chambers, the steam being introduced by a pipe at one end of each chamber and passing out at the other, thus keeping a constant circulation of hot steam.



BARTLETT'S MACHINE FOR CUTTING BOARDS.—Fig. 1.

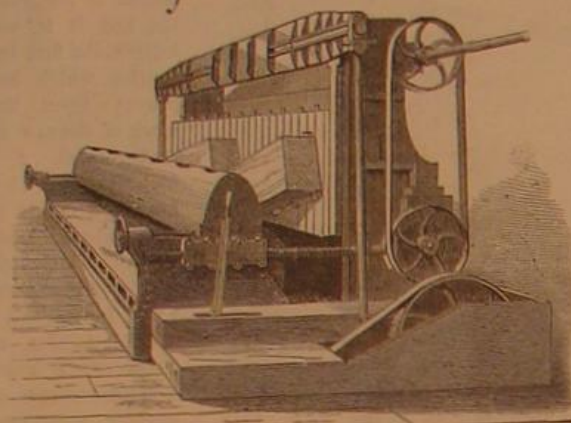


STEAM LUMBER-SEASONING PRESS.—Fig. 2.

Valves are arranged to govern the entrance and exit of the steam as may be desired. The chambers are adjusted to separate, leaving an aperture between each of an inch or more, according to the thickness of lumber to be seasoned. The boards are then inserted between the faces of each chamber and the pressure applied by forcing the chambers together, either by hydraulic or steam power. The heat of the chambers causes the sap in the wood to become vaporized, which passes off through vents or channels in the opposing face of each chamber, or through perforations in the faces of the lining plates leading to grooves or channels in the inner sides.

The rapid action of the machine was well shown by a test conducted in our presence upon a cedar board 11½ inches wide, ½ thick, and weighing four pounds, and wholly unseasoned, being just from the cutting machine. It was placed in the press for five minutes, at the end of which time it was found to have shrunk ¼ of an inch in width, and to have lost 1½ pounds in weight. The same principle is applied to curved plates, and thus lumber is seasoned and shaped at one operation. This will particularly apply to coffin, piano, and chair

Fig. 3



manufacturers. It is hardly necessary to point out that these machines are of the character which work revolutions in the manufacture to which they relate; and this, not merely from their capability of yielding better material, but from the fact of the economy which they insure. It certainly can be no longer economical to saw thin boards when it is possible to produce the same without loss by sawdust, and without requiring the subsequent planing to fit them for use, resulting in a gain of 40 per cent to 50 per cent on material. The saving of time effected by the seasoning press is too obvious to need any reference here.

Both machines were patented through the Scientific American Patent Agency in this country and in Europe.

For further information, address Geo. W. Read & Co., 186 to 200 Lewis street, foot of Fifth to Sixth street, East River, New York city, at whose large veneering and hard wood lumber establishment both machines are in daily and successful operation, and with whom arrangements may be made for the purchase of territorial rights or licenses to use either or both patents.

THE WOODRUFF SCIENTIFIC EXPEDITION.

We have to acknowledge the receipt of a new prospectus of the Woodruff Scientific Expedition, an enterprise which, as we recently explained, has for its object the conveying of a class of students around the world on a two years' voyage of combined instruction, amusement, and science. We observe that the fee (payable in advance fifteen days before the ship sails) has been reduced from \$5,000 to \$2,500 per head, and that the steamer Ontario, a larger and more commodious ship, has been substituted for the vessel originally proposed. There are various other inducements offered, which, if the entire enterprise were not, as we learn, based on a series of contingencies, would render the project a very attractive one.

But it appears that not only does the necessary capital for its execution depend on the obtaining of 400 subscribers at \$2,500 or \$2,000 each—naval cadets being taken at the latter figure—but the various scientific gentlemen who are to accompany the vessel have agreed to go under the conditions that such material support is first secured. Similarly we understand the testimonials quoted in the prospectus to be given by these eminent writers, with the understanding that if the scheme as explained to them can be carried out, then the project is worthy of public attention.

In the present hard times, probably no capitalist would invest so large a sum as a million dollars in a project of this kind, and hence the promoters have adopted the best and most feasible way of raising the necessary funds. But on their success depends the realization of the scheme, and it, perhaps, is open to question whether 400 people can be collected willing or able to pay down the goodly sum required in advance. We shall probably revert to this subject again.

H. F. ANDREWS, M.D., of Washington, Ga., says that cologne water is an efficacious remedy for poisoning by poison ivy. A good article of cologne must be used, and frequently applied. The vesicles should be broken when the remedy is applied.

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DISCOVERY OF SATELLITES OF MARS.

Professor Asaph Hall, of the Washington Observatory, has recently announced the interesting discovery of two satellites attendant upon the planet Mars. At about 11 o'clock on the night of August 16, Professor Hall, by the aid of the great 26 inch refractor telescope, noticed a very small star following Mars by a few seconds. Two hours later he looked again, and to his surprise found that the distance between planet and star had not increased, although the former was moving at the rate of 15 seconds per hour. Hardly crediting his discovery, Mr. Hall delayed further observation until he could bring the matter before his colleague, Professor Newcomb, and that astronomer, being confident that the discovery of a satellite had been made, calculated roughly its time of revolution, which he found to be 1 day and 8 hours. This enabled the prediction of the probable place of the satellite on the following night—a prediction which was verified. On the morning of August 17 another satellite appeared, and its identity was fully recognized.

The distance of the first satellite from the planet is between fifteen and sixteen thousand miles, which is less than that of any other known satellite from its primary, and only about ¼ the distance of the moon from the earth. It is exceedingly small, having a diameter of not over 100 miles. The inner satellite is believed to be still closer to the planet, and to have a period of less than 8 hours. The first moon is distant 80, the second 30 seconds from their primary. Further and more accurate details will, however, soon be forthcoming, as probably the keen eyes of astronomers the world over will now be turned upon Mars. Next to our moon, more full and accurate knowledge is possessed regarding Mars than of any other heavenly body. Venus is nearer to the earth, but when most closely approximated she is invisible, being concealed by the solar light. Mars, however, may be examined under favorable circumstances, and during the present year the conditions are especially advantageous, owing to the planet being in opposition to the sun, near perihelion. The apparent disk is now larger in the proportion of 3 to 1 than when the planet is in aphelion, while the illumination is more brilliant in the proportion of 3 to 2. At the same time the planet is nearer perihelion than previously for more than 30 years; so that in the heavens its brightness is but little inferior to that of Jupiter.

While the surface of Mars has been mapped with remarkable accuracy, and although probably no other planet has been subjected to more keen and continuous scrutiny, yet up to the present time all searches for satellites attendant upon upon it have been fruitless. Most astronomers have not hesitated to assert that none such existed, though it has been said that if Mars has moons they are too small to be recognized by any telescope extant; but in any event the probable presence of Martian moons was not to be predicated on any phenomenon exhibited by the planet itself, and if their existence was suspected it was because it would be more in accordance with the nebular hypothesis that they should be present than absent. In a work on astronomy published some 40 years ago, we find mention of a phenomenon on Mars which might possibly lead to the idea that the planet was subjected to reflected light from some near body, and that was, that a curious and persistent illumination of the planet had been noticed, which, under the circumstances, was unaccountable, save under the hypothesis that the planet was slightly phosphorescent.

The discovery is a triumph both for Professor Hall and for Mr. Alvan Clarke, the maker of the great telescope. It, besides, shows what may be expected of the still more colossal instrument which at no very distant day we hope to see established in the Lick Observatory.

MACHINE HONESTY AND ITS CIRCUMVENTION.

The exceedingly ingenious mechanical devices often found among the tools of burglars and safe-breakers are in themselves sufficient to demonstrate the fact that all the inventive ingenuity is by no means confined to honest people; and it is scarcely necessary to say, to any one conversant with that peculiar instinct of the inventor which causes him to regard almost any mechanical obstacle as a challenge to his abilities, that in the bell-punch and similar apparatus of "machine honesty" the desire to overcome the difficulty is added to the nefarious incentive. Hence attempts to "beat" the machine, as the crime is vulgarly termed, are not uncommon, nor yet unsuccessful, although the perpetrators are usually in the end found out. The use of this apparatus began in this city about two years ago, when it was discovered that stage drivers and car conductors were in the constant habit of supplementing their scanty earnings with drafts on the fares collected. Accordingly that ingenious contrivance known as the bell-punch was largely introduced, receipts of the companies at once increased, and it was hoped that the evil was prevented. The bell-punch perforates a slip and the piece punched out is retained in a receptacle in the machine. At the same time a bell is sounded and a hidden indicator moved on a dial. Hence the fares collected are shown first by the number of holes in the slip, second, by the number of pieces punched out, and third, by the indicator; while a placard in the vehicle warns the passenger to listen for the ring when his fare is collected. Hardly had the punches come in use when frauds were detected. A smart mechanic drove a thriving business by making neat little bells which were inserted in the conductor's coat sleeve. The latter would, on collecting a fare, pretend to punch a hole in the slip—covering, however, a hole already made—and at the same time by pressing his arm against his body would sound his

concealed bell and so satisfy the passenger. This, by the employment of detectives, was soon stopped; but the ingenious conductors still managed to "keep ahead of the punch" by simply neglecting to use it when the cars, as is often the case, were so packed as to render close observation of their movements impossible. Several city car lines eventually abandoned the device for apparatus much more simple, to which we shall refer further on. Recently, however, another detection of bell-punch frauds has been made, and a regular conspiracy has been revealed between sundry ingenious scamps who showed the conductors how to pick the locks of their punches and set back the indicators, for the consideration of \$1 per day, the conductor, of course, making up this amount and as much more as he safely could by theft.

There are various other devices analogous to the bell punch now in use on our city car lines. None of them, however, punch slips. One is a metal box suspended in full view on the conductor's breast. On receiving a fare he is required to move a catch which sounds a bell and changes a number indicating the quantity of fares received, which appears on the front of the box. Another machine displays no number, but simply rings a bell and moves an indicator locked up inside. Some of these machines were constructed at first to register only a certain number of fares, say 1,000, and then to return to the naught point. The conductors soon discovered this, and after collecting the money they would ring the bell up to its limit, help themselves to the amount of money they wished, and then register anew fares to correspond with the amount they left for their employers.

It will be observed that the tendency of all these machines is to make the passenger a policeman over the conductor to keep him in the path of rectitude, and it is curious to notice that the more of these devices there are invented the more is this duty imposed upon the passenger. The largest street railroad line in this city, that on Third Avenue, has abandoned the bell-punch for a simple dial in the car, with which is connected a square rod which traverses the length of the vehicle near the roof. In order to turn this rod, and so sound the bell and move the index, which the conductor is required to do on the receipt of each fare, a wrench must be used, and, of course, the arm lifted high above the head. This compels the conductor to take a noticeable position, and as the rod is accessible only while he is on the vehicle, the conductor can not, as with the bell-punch or other portable device, pretend to register fares while temporarily off his car. The movement of the dial hand attracts attention, and thus the watchfulness of the passenger is still further enlisted.

There are two devices, however, which advance considerable further in this same direction. One is the fare-box, by the use of which the railroad company tacitly asserts that it prefers to trust to the honesty of the public in general than to that of its employees, and the other is a most ingenious apparatus, of which we shall presently speak, and which literally compels the passenger to look after the employees in order to keep himself from being swindled.

The fare-box is, however, fast becoming a bone of contention. It is simply a box into which the passenger is invited to place the correct fare. The driver—there is no conductor in such cases—is not allowed to receive or put in money, and the extent of his pecuniary duty consists in handing back change for small bills, said change being previously sealed up in envelopes, and as the driver aforesaid has always to return the amount he starts out with, he cannot conveniently steal any. When the passenger puts in his money the driver can see and count it, and that done he moves a slide which dumps it into a locked box below, whence it is removed by an official at the terminus. The box, we have stated, is a source of aggravation to the sovereign public, first, because one set of unthinking individuals are constantly throwing in too much and clamoring for change after the money is engulfed in the locked receptacle, when removal is impossible, and second, because perverse people decline to be ordered to do anything by the railroad company and demand that if their fares are wanted somebody must come and get them. The latter have multiplied of late, and are vigorously asserting themselves. The driver cannot take the fare, and if the passenger refuses to comply with the rules, that passenger must be put off the car. The passenger resists and a disturbance results, the upshot of which may be to block the line, and, as was the case here recently, keep some 200 other passengers in rear cars waiting a considerable time.

By far the most ingenious of all these devices is that devised for use on city cabs. There is a metal circular case on the face of which are two concentric circles. The inner one is marked as a clock, the other is divided decimally to indicate dollars and cents. The hands on the inner circle are controlled by clockwork, that on the outer circle must be moved by the driver. From one side of the clock extend wire rods on which is a sign with the words "to hire." Between the rods is a watch. The whole is pivoted on the cab just in rear of the driver's seat, and in such a manner that when the "to hire" sign is turned uppermost it stands above the roof and is plainly visible. In face of the passenger in the cab is an opening through which the watch is seen when the sign is turned down.

If, when the cab is hired, the driver does not turn down the sign, the passenger will demand it, because otherwise the watch cannot be seen, and by this watch the time for which the cab is used and paid for is determined. But the action of turning down the sign starts the clock, and this then goes on registering hours and minutes. When the passenger leaves the vehicle he pays his fare, and this the driver registers on the dial bell-punch fashion. The driver must then

turn his sign up. If he does not, the clock will continue running, and he will have to pay for the time himself at the regular tariff of 50 cents per hour. So from the two dials at the end of the day the inspector sees just how long the cab has been used and the amount collected. On the back of the clock is still another dial, on which is an index which moves over one division every time the sign is turned down. This shows the total number of trips, and is locked so that the driver has no access to it. It prevents the driver charging for trips only a fraction of an hour in duration as for a full hour. It will be seen, therefore, that by noting the trips and number of hours employed, the inspector can at once calculate the amount which the driver owes.

It is difficult to see how such a device as this can be defrauded. The objection to it is its inapplicability of such conveyances as stages and street cars; and for these vehicles some device which shall absolutely ensure the honesty of their conductors or drivers is still a necessity. We commend the subject to inventors as a promising one for their efforts. Only let them remember that, however ingenious they may be, ingenuity as sharp as theirs will probably be brought to bear to circumvent their apparatus. Perhaps the safest rule to go by is to try to contrive a device which shall, like some of those wonderful intricate locks, be impracticable of access or alteration even to the inventor himself.

FOOD.

In discussing, last week, the subject of how shall working men live, we quoted a table prepared by a working man's wife, showing a list of necessities on which her husband, herself, and five children (under 9 years of age) subsist. This category, which is claimed to represent the cheapest and most economical living attainable by the compiler, we here republish, as we propose to use it as a text for some further remarks.

WEEKLY.		DAILY.	
Rent.....	\$2 00	1 quart milk, 6c.....	\$ 42
1 barrel wood.....	25	2 quarts potatoes, 6c.....	42
2 pails coal.....	16	2 8-cent loaves.....	1 12
Burial society.....	22	1 1/4 pounds meat, 20c.....	1 40
Oatmeal.....	14	Salt.....	2
2 pounds butter.....	60	Pepper.....	2
3 1/2 pounds sugar.....	40	Mustard.....	2
Half gallon oil.....	9	Matches.....	1
2 cakes soap.....	14	Starch.....	3
1 pound soda.....	3	Bluing.....	1
Half pound tea.....	25		
Newspapers.....	12	Total.....	\$3 47
Shaving.....	10		4 50
Total.....	\$4 50	Total.....	\$7 97

It will be observed that this, among other things, is intended virtually as a practical answer to the question as to the minimum amount of food on which a family of presumably average size and weight can live without detriment to health. The ultimate destiny of food is, to quote Dr. Wilson of Edinburgh, "the development of heat and other modes of motion, which together constitute the physiological phenomena of animal life." Food not only, however, supplies potential energy—which becomes converted into actual or dynamic energy—but it supplies the material for the development of the body. Hence inorganic and organic matters are both necessary, the latter, however, being alone oxidizable or capable of generating force. The organic constituents are divided into nitrogenous, fatty, and saccharine compounds—the inorganic into water and saline matters. Of these the nitrogenous portion constructs and repairs the tissues, it is the muscle and brain producer; the carbonaceous portion goes to maintain animal heat, aids the conversion of food into tissue, generates fat, etc.; the saccharine portion has heat-producing powers inferior to the fatty constituents, and finally the water and saline matters dissolve and convey food to different parts of the system, consolidate tissues, remove effete products, etc. In general, however, the phenomena of nutrition depend mainly on the chemical interchanges of nitrogen and carbon with oxygen, and therefore different articles of diet are estimated in nutritive value according to the amount of nitrogen and carbon they contain.

Dr. Letheby, in his valuable work on "Food," gives a table showing the amount of carbon and of nitrogen in a large number of articles of diet. From this table we have taken the values of the varieties of food in the above list, and we find that the sum total of the entire regimen amounts to 18,117 grains of carbon and 751 grains of nitrogen daily. According to Dr. Wilson, the dietaries of women should be about one tenth less than those of men, and of children under ten years about one half (maximum) those of women. Applying these ratios to the aggregate, we find that the husband's daily diet is 4365 grains of carbon and 180 grains of nitrogen; and the wife's 3928 grains of carbon and 162 grains of nitrogen, and the remainder constitutes the food of the children.

Now this diet is not enough to support life in the husband and to enable him to work. In other words, we mean to say that a man that attempts to do even moderately hard work on food containing the proportions we have mentioned, is steadily falling behind in the struggle for existence. And it is mathematically obvious that he cannot improve matters save at the expense of other lives. From the mean of all the researches which have been made by eminent physiologists—and they cover thousands of instances—Dr. Letheby gives the following as the amounts required daily by an adult man for idleness, for ordinary labor, and for active labor:

	Carbon grs.	Nitrogen grs.
Idleness.....	3816	180
Ordinary labor.....	5688	307
Active labor.....	6828	180

Compare these figures with those quoted, and it will be seen

that the nitrogenous products in the latter are just equal to the requirements of an idle man, and far below those of one at work, while the carbonaceous products—which do not form muscle—are somewhat in excess in one case, and too low in the other. But a better idea of the comparative nature of diets can be obtained from some of the following instances of the dietaries of low fed and well fed operatives in England, which we take from the tables of Drs. E. Smith and Playfair.

The mean of twelve classes of low fed operatives, which include the farm laborers and weavers over the different sections of the kingdom, shows an average daily dietary of carbon 4881, and nitrogen 214. These are about the worst fed people in England. The staple of diet is breadstuffs, and then potatoes—not a class on the list gets more than 18 3/4 ozs. of meat in a week—yet the average of all is above that of the American workman. Let us examine, however, some instances of well fed operatives. The English railway navy (whose class corresponds to that of the workman under consideration) has 8295 grains of carbon, and 482 of nitrogen; the blacksmith, 6864 carbon, 437 nitrogen; soldiers in peace, 5246 carbon, 297 nitrogen; prize fighters (training) 4366 carbon, and 690 nitrogen. The mean of eleven classes of well fed operatives is carbon 5837, nitrogen 400.

The trouble with the diets of our working men is not in their cost, but, as in the present case, in their bad selection. Here are 5 1/2 lbs. of food (butter and sugar) which together aggregate 23234 grains of carbon and no nitrogen, at a cost of one dollar per week. The butter could be altogether abolished, and the sugar reduced one half; the eighty cents so saved could be laid out in Indian meal, or dried peas, beans, rice, barley meal or fish, all of which contain large proportions of nitrogen. A pound of red herrings, costing say 10 cents, contains 217 grains of nitrogen; a pound of skim cheese at the same price contains 485 grains; split peas, worth about 8 cents a quart, contain carbon 2699, nitrogen 248; beef liver, always cheaper than beef, contains carbon 934, nitrogen 204, while beef itself contains carbon 1854, nitrogen 184.

It may be said that working men cannot be expected to consider chemically everything they eat. Perhaps not, but it is the duty of sanitary authorities, and others charged their welfare, to do it for them. Half a pound of cheese, a pound of Indian meal, and a quart of milk, together aggregating 5187 carbon, and 449 nitrogen, cost 14 cents. On this a man could do steady work for one day, and could keep on on the same diet continuously. The same sum would purchase one loaf of bread and a quarter of a pound of butter, on which, as a continuous diet, a man could not subsist. For the guidance of working men who wish to base their living on proper and cheap food, we give herewith Dr. Letheby's table:

	Grs. per lb.			Grs. per lb.	
	Carbon.	Nitrogen.		Carbon.	Nitrogen.
Split peas	2099	248	Skimmed milk.....	438	43
Indian meal.....	3016	120	New milk.....	599	44
Barley meal.....	2563	68	Skim cheese.....	1947	483
Rye meal.....	2693	86	Bullock's liver.....	974	244
Seconds flour.....	2700	116	Mutton.....	1900	189
Oatmeal.....	2831	156	Beef.....	1854	184
Baker's bread.....	1975	88	Fat pork.....	4113	106
Pearl barley.....	2660	91	Dry bacon.....	5687	95
Rice.....	2732	68	Green bacon.....	5426	76
Potatoes.....	709	22	White fish.....	871	195
Turnips.....	263	13	Red herrings.....	1435	217
Green vegetables.....	430	14	Suet.....	4710	—
Carrots.....	508	14	Lard.....	4819	—
Parsnips.....	554	12	Salt butter.....	4885	—
Sugar.....	2365	—	Fresh butter.....	6456	—
Molasses.....	2395	—	Cocoa.....	3834	140
Buttermilk.....	387	44	Beer.....	274	1
Whey.....	154	13			

The American Institute Exhibition.

It will not be the fault of this paper if the coming exhibition of this Institute should prove to be a chaotic mass of half arranged merchandise on the opening day (September 12), for we have so often given notice of the fact that an exhibition is to be held, and have as repeatedly given notice of the time; nor will it be the fault of the officers of the Institute, for the building is always ready in time; but will, we presume, be the fault of the exhibitor, who, as a general rule, procrastinates, and is often many days behind. We should think that, if an exhibition is worth attending at all, that the exhibitor would desire that his exhibit should be arranged upon the opening day, and not a week or ten days later. For information address General Superintendent, room 22, Cooper Union Building, New York.

A Remarkable Railway Bridge.

The new iron railway bridge over the river Douro, near Porto, Portugal, crosses it with an arch of a single span which measures 160 meters (520 feet) and has a rise of 42 meters (138 feet 6 inches). It is crescent-shaped in form; that is, the extrados and the intrados, which are connected by struts in the form of St. Andrew's cross, are farthest apart at the crown.

MANUFACTURE OF EBURINE.—Eburine is a composition formed from the dust of ivory or bone cemented together with gum tragacanth or albumen, and colored at pleasure. In some cases pressure and heat render the addition of any glutinous matter unnecessary.

A NUBIAN TEMPLE.—The temple of Ypsambul, in Nubia, is cut out of a solid rock, and is of vast dimensions. In it are four colossal figures sixty-five feet high, twenty-five feet across the shoulders, with faces seven feet high, and ears about a yard long.

IMPROVED OVERHEAD SEWING MACHINE.

We extract from *Iron* the annexed engravings of Laing's patent overhead sewing machine, which has the rare merit of being an entirely novel and unique method of producing a stitch. It causes the needle to pass completely through the fabric from "overhead" to the under side, and then passing upwards round the edge, once more pierces and passes through the material, and so on, *ad infinitum*. This is a copy of the action of hand-sewing in making a seam where the thread or cotton continually encircles the two edges which are brought together to be united.

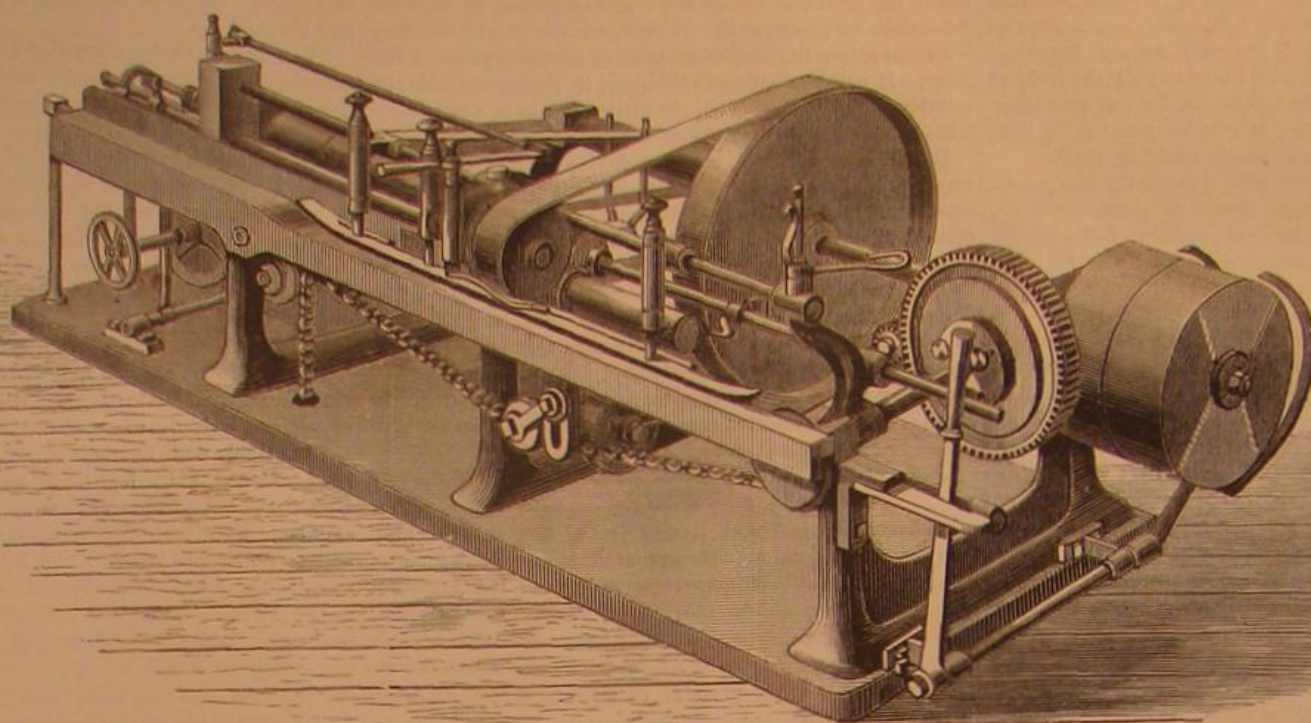
This effect, or stitch, is beautifully produced by a circular helical needle, *a b*, Fig. 3, which makes two or three turns round a central spindle, *I*, Fig. 3. The interior diameter of the circular needle is considerably greater than that of the spindle within it, and as the driving band, *H*, is arranged by guide pulleys, *f*, to pass only round one side of the needle and spindle, *I*, the needle is thus pressed away from the spindle upon one side, and is suitably placed for piercing the material as it revolves. One end of the spiral needle, *b*, is,

of course sharpened, and the other end, *A*, by a hook, engages the thread, and which thus carries it through and through the material, making a lapping stitch round the edges of the seam, which cannot thus be distinguished from hand sewing except by its wonderful regularity and even-

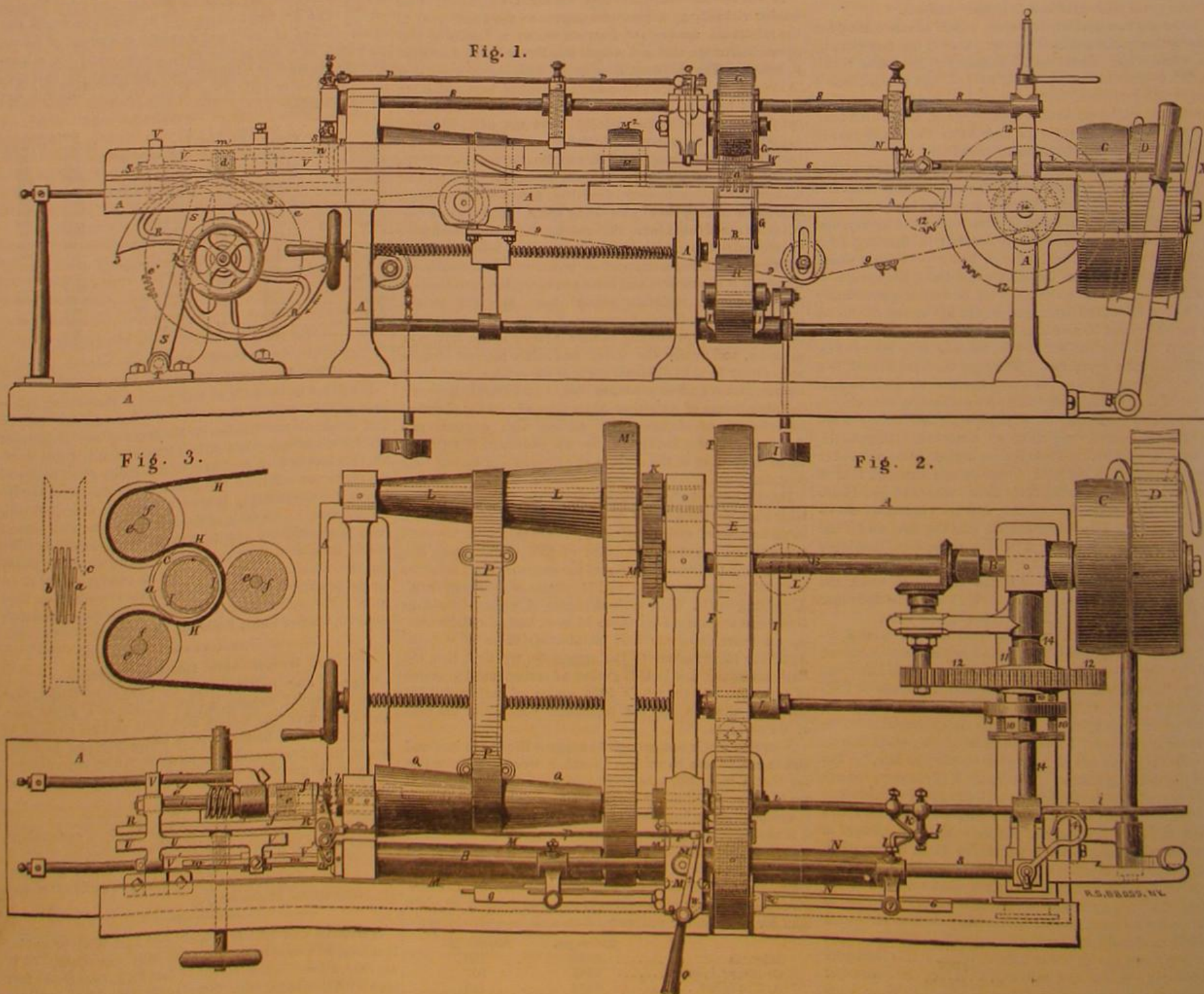
the feed table, and passes it over from left to right at a speed which may be varied by changing the cog gearing, 12. Upon the same principal shaft is also a large pulley, *F*, which operates the band, *E*, that passes round the series of rollers, as shown in Fig. 3, and thus drives the needle. A counter-shaft has another pulley, *G*, upon it that drives by a band the thread cylinder. Upon the counter-shaft, between the two standards, is a driving cone, *L*, which, by an adjusting band, *i*, may be set to drive the opposite cone, *Q*, at a varying speed, according to the position of the band, which is determined by a guide traveling upon a screwed spindle.

The use of these two differential cones is to give a horizontal variable sliding motion to the thread or string barrel. The end of the cone through which the

screw portion of the spindle passes is provided with a movable catch which gears with the screw; the action of the machine itself throws the catch in and out of gear with the screw according as the stage of sewing operations requires that the string or thread barrel should recede slowly into the hollow cylinder, or emerge suddenly therefrom to resume its



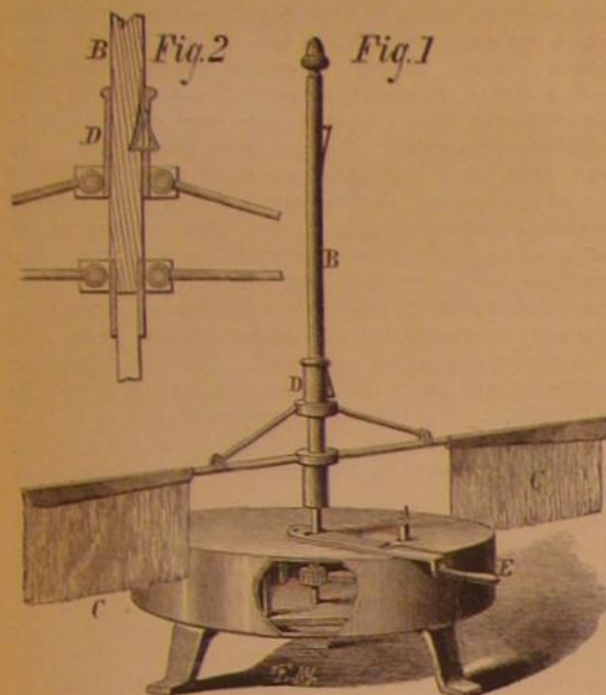
LAING'S OVERHEAD SEWING MACHINE.



LAING'S OVERHEAD SEWING MACHINE.

normal position. This action is very ingeniously obtained by a weight to bring the thread barrel out, and by the screw-engaging catch gradually drawing it in.

This means of obtaining the sliding motion of the thread barrel has, in the latest designs, been considerably modified. The use of the drawing thread, which also carries the whole of the suspended weight, has been substituted by an involute cam, with a double throw and deep step back to the axis, as shown in Fig. 1. The slow revolution of the cam causes the inclined surface of its throw to bear upon a stud in a rocking lever, S. At the extremity of this rocking lever, in a radius from its axis, T, is a toothed quadrant, which gears in a rack attached to the thread barrel, and which is thus steadily drawn in. When the half revolution has been completed, the drag weight, X, draws over the lever, S, down the sudden step, and thus shoots out the thread barrel ready for its next gradual feed. The length of feed may be varied by change of cams.



FLY FAN.

The thread is held against the circumference of the hollow spindle when thrown from the barrel. The barrel in revolving carries round with it the thread thus held or jammed against it, and pulls tight the stitch last made, the slack of the thread being transferred to the barrel by the action of the thread catch or drag.

The fabric to be sewn is fed upon the table of the machine from left to right in a direction parallel to the axis of the spiral needle.

The amount of grip or edging embraced by the over-edge stitching will be regulated by distance from the axis of the needle at which the material is fed in, and this may be determined by a fence upon the feeding plate. As the fabric is fed past the plate or fence, it is caught and carried forward by a spiked endless chain, which passes over two chain pulleys, one at each end of and situated below the feeding table. One of the said chain pulleys is fixed upon a countershaft, which is driven by gearing from the main shaft of the machine. The speed of the feed will be varied according to the rate of revolution of the chain wheels, which can be regulated by the use of change wheels in the intermediate gearing. The fabric is held down to the feeding table by a pressure whose tension may be regulated by a screw.

The latest practical improvement in this arrangement consists in the presser being carried in two brackets from a spindle, which runs parallel to the axis of the needle. In the brackets are a couple of coiled springs, which give the necessary pressure upon the material, and when the pressure is not required it may at once be lifted up clear of the material.

An exceptionally fine adjustment for the rate of feed is now applied to the machine. This is effected by using friction wheels to pinions instead of the spur gearing, and by introducing a friction clutch on the shaft that drives the pitch chain by which the width of the stitches is regulated, as well as the tension on the spiral needle. This tension is prevented from reaching an extent which would be dangerous to the needle, by reason of the friction clutch slipping before that degree of tension is reached.

In course of time the thread coiled upon the barrel becomes exhausted, when the spiral needle may be automatically re-threaded, so that a fresh thread is placed in the eye of the needle, without stopping the machine or interrupting the progress of the work: and the string and thread barrel being again brought out of the cylinder by the action of the weight, a fresh supply of thread or string is coiled thereon, and the work proceeds as before.

The thread may be supplied to the machine in banks of such a length as to fill the thread or string barrel. A perhaps preferable arrangement is to use a reel driven by the machine, and alternately measuring from a bobbin and transferring its measured contents to the exhausted thread or string barrel. The re-threading of the needle is effected by a tube, which, after feeding the thread or string to the

reel, catches it into the hook or eye of the needle, and afterwards severs the thread by bringing it in contact with a knife edge.

In sewing with this machine the pitch or width between each stitch may be regulated by the relative speeds of rotation of the needle and the travel of the feed chain. When the latter feeds slowly, the pitch of the thread or stitch will be very short; when the latter travels quickly, the pitch will be large. The elastic nature of the needle enables it to extend to suit the varying pitch of the stitching. The relative speeds of the feed chain and rotating needle may be adjusted by the change wheels, W.

The speed of movement of the thread barrel towards the feeding end of the machine is adjusted according to the breadth or grip of cloth through which the seam is made, that is to say, the barrel is caused to unwind the thread or cord faster or slower, according as a broader or narrower "grip" is required. This adjustment is made by shifting the driving belt on the cones by means of the belt shifting operated by the screw and hand wheel.

The automatic threading is accomplished by a very ingenious and simple operation. So long as the needle is working with a supply of thread from the sliding string box, and so long as the string box is continuing its steady travel outwards, the threading lever is pushed back out of the way. But as soon as the cylinder has almost completed its travel, the inclined side of a plate comes in contact with the end of the threading lever, which carries the end of a fresh hank, stretched across an open fork, in its extremities. Just as the stroke of the string cylinder is completed, the lever is suddenly thrust forward, so that the tail of the needle catches up the string from the loop, and re-threads itself, when at once the threading lever returns out of the way. The eye of the needle is thus not a perforated one, but a species of hook in which the string is gripped by the rotation of the needle.

IMPROVED AUTOMATIC FLY FAN.

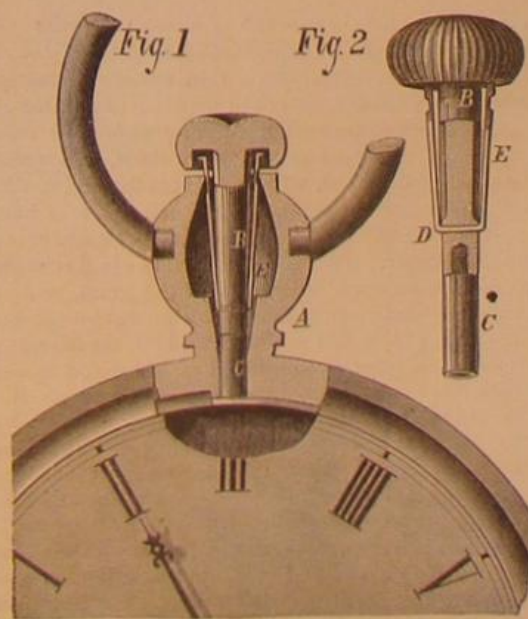
The invention illustrated herewith consists of vanes or fans which are rotated by suitable mechanism with the object of agitating the air and driving away flies. The device may be placed upon a dining table, in show windows, beside invalids' beds or children's cradles, and will prove especially convenient for confectioners.

The circular box which forms the base contains a simple train of clockwork, which is wound up by a key applied to the shaft, A. This mechanism rotates the vertical shaft, B. On said shaft is a sleeve having a ring flange, to which last are suitably hinged the arms which carry the fans, C. To the middle of the arms are attached braces which are hinged to another flanged sleeve, D. On the shaft, B, are catch springs, as shown, by means of which the upper sleeve, and consequently the arms and fans, may be adjusted to any height. The motion of the fans is thus regulated. The pivoted bar, E, has a notch which slips over the squared end of the shaft, A, preventing the latter from turning and thus stopping the movement of the clockwork when desired. In Fig. 2 a sectional view of the sleeves and method of hinging the arms and braces is given.

Patented August 21, 1877, through the Scientific American Patent Agency. For further particulars address the inventors, Prather and Shirley, Lisle, Iowa.

COMBINED PUSH-PIN AND WATCH KEY.

This invention consists in a removable push-pin for watches, which is provided with spring for holding it in place in



the stem of the watch, and with a watch key point at its inner end which may conveniently be used for winding the watch.

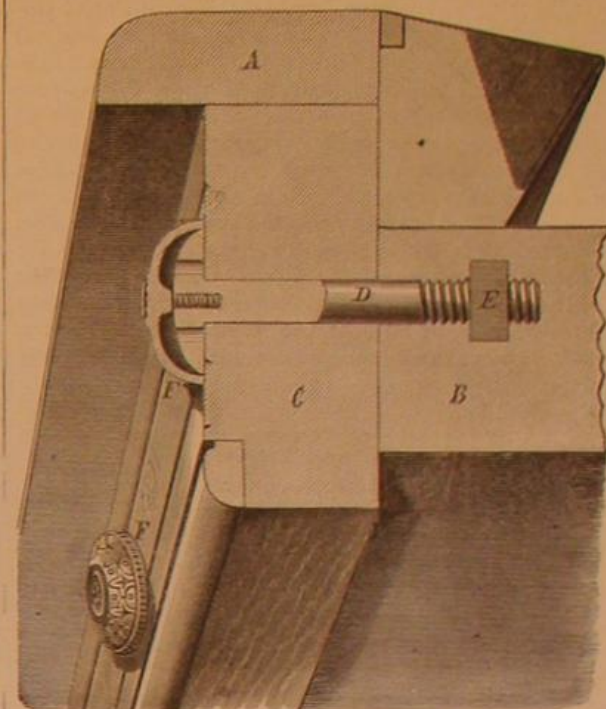
Referring to the illustration, Fig. 1, which is an enlarged sectional view of a watch stem containing the improved push-pin and key, A is the stem of a watch, which is chambered out, leaving an internal angular edge at the top of the stem. B is a push-pin, seen detached in Fig. 2, having a milled head, into the inner end of which a steel watch key point, C, is screwed. The push-pin is drilled transversely at

D, and is grooved longitudinally from this point to the head to receive a wire spring, E. This spring extends upward at each side of the push pin, and is notched to receive the edge of the watch stem. The notches are of sufficient width to permit of moving the push-pin sufficiently to operate the case spring. When it is desired to wind the watch, the key is drawn from the watch stem and used as an ordinary key. When the point, C, becomes worn or broken it may readily be unscrewed and replaced by a new one. The advantages claimed for the invention are that it obviates the complication of stem winders, and at the same time provides a key that always accompanies the watch.

This improvement was patented through the Scientific American Patent Agency, by Augustus A. Fisher and Simeon H. Lucas, of Santa Fé, New Mexico, June 26, 1877.

IMPROVED FASTENING DEVICE FOR BILLIARD CUSHION RAILS.

It has hitherto been customary to use, for the attachment of the cushion rails to the bed of a billiard table, bolts,



which were provided with large finished heads, and which were so applied that, while the body of the bolt passed through the cushion rail, and its threaded end engaged with a blind nut let into the bed, the head of the bolt took its bearing on the outer face of the cushion rail. This head, in which were holes to allow of its being turned by a suitable tool, has commonly been exposed to view. We illustrate herewith a novel device for covering the head, which may be applied without the use of any separate screw or washer, and without requiring any countersink or other alteration on the rail.

A is the cushion rail; B the bed, and C the frame of the table; D is the bolt, the threaded end of which is engaged by the nut, E. In the head of the bolt a hole is drilled and tapped to receive the screw head of the ornamental cap, F, which is set in place after the bolt is inserted. A knurled surface near the outer edge of the cap allows of its ready manipulation in screwing it upon the bolt. The cap is struck up of sheet metal in a tasteful pattern, or it may be an ornamental casting of bronze or other metal, having the screw a part of the same. By this construction the cushion rail is not weakened, as is the case where the bolt head is countersunk or let into the rails; the screw of the ornamental cap being a part of the cap itself, makes few parts; and when replacing or a new design may be wished, for ornament, the cap can be readily unscrewed from the bolt, while the table can be employed as usual. It may be made, we are informed, at a small cost, and it saves the usual expense of finishing the bolt heads, besides being an ornament to the table.

Patented July 31, 1877. For further information address the inventor, Mr. H. W. Collender, 738 Broadway, New York city.

Preparation of Celluloid.

Paper is treated by a continuous process with 5 parts of sulphuric acid and 2 of nitric acid, which convert it into a sort of gun cotton. The excess of acid is removed by pressure, followed up by washing with abundance of water. The paste when thus washed, drained, and partially dried, is ground in a mill, mixed with camphor, ground again, strongly pressed, dried under a hydraulic press between leaves of blotting paper, cut, bruised, laminated, and compressed again in a special apparatus suitably heated. It is said to be hard, tough, transparent, elastic, fusible, becoming plastic and malleable at 125°. It ignites with difficulty, is decomposed suddenly at 140° without inflammation, and gives rise to reddish fumes. It is inodorous, and does not become electric on friction.—*Bull. de la Soc. Industrielle de Rouen.*

STEAM POWER IN FRANCE.—It is computed that France now possesses steam engines of an aggregate force of 1,500,000 horse power. This is equal to the effective labor of 31,000,000 men, or about ten times the industrial population of the country.

Communications.

Manufacture of Tobacco.

To the Editor of the Scientific American:

Your answer to J. W. F., who asked how the raw taste of tobacco can be removed, is a wilful insult both to the tobacco user and to the manufacturer. He has a reputation to preserve as well as the sugar refiner, or the baker, or any other man. In the manufacturing of chewing tobacco the leaf is taken out and carefully examined, and all dirt removed; then it is put in large bins, where it is sprinkled with a sirup made of best brown sugar and licorice; after it becomes partly dry, it is made into rolls, then taken to press.

If G. W. F. wishes to manufacture his own chewing tobacco, let him first get some green hickory or sugar maple, cut into small logs, say two or three feet long and from five to eight inches diameter, then with a large auger bore holes three parts through. Make a stick of hard wood to fit the hole easy; leave it a little longer than the depth of the hole. This stick is to be used for a rammer. Wash your tobacco clean, let it dry or nearly so, remove stems and all bad portions, stuff it into your logs hard; the tighter it is rammed the better. When nearly full make a plug and drive it in so tight that it will keep cut all outside moisture. Pile up your logs in the woodshed or some place where they will not be exposed to the weather or the wet ground. After stuffing your logs let them rest for about two weeks, then examine for the ones that show a tendency to split. Take the ax and cut open. If you open only one log at a time, as you need the tobacco, it will keep good for years. If you keep the air from it the last plug will be better than the first. The wood sap will give it a pleasant flavor. If you wish to make it sweeter, make a sirup of 1 lb. sugar to $\frac{1}{4}$ lb. licorice, boiled in two or three gallons of water. Sprinkle lightly and toss well.

Mansfield, Pa.

ALEX. THOMPSON.

Bees and Hives.

To the Editor of the Scientific American:

Since the appearance of my communication in SCIENTIFIC AMERICAN of April 21, many of your readers have written me for more definite information in reference to certain points connected with bee-keeping, and with your permission I will answer through the columns of the SCIENTIFIC AMERICAN. The information asked comes under the following heads:

First, The distance bees will go to collect honey.

Second, Is it necessary to provide food for the bees?

Third, A more particular description of the hive I use.

Fourth, How to prevent loss in winter.

Fifth, How to prevent the ravages of the moth.

First, then, as to the distance bees will go to collect honey. There has been much speculation in reference to this point, and many conflicting opinions advanced. As I was the first to obtain the Italian bee in this section (none of this variety, at that time, within twenty miles of mine), I decided to investigate thoroughly, during the honey season, and the result was I found the Italian bees seven miles from their hives, collecting honey. The great difference in color of the Italians from the native bees rendered it a very easy matter to trace them. I think the native bees, being smaller, do not go as far for honey as the Italians. It is not so easy, however, to determine, as there are some of the native bees in every section, which renders it very difficult to trace, from any one apiary; but from what evidence I have been able to obtain bearing upon this point, I think it safe to say the natives go five miles at least to collect honey. There are many amusing traits in the habits or instincts of bees. If a hundred hives are ranged side by side with the entrances not more than two feet apart, and the bees leave such hives in quest of honey, they return by thousands every hour, yet not one fails to enter its own hive if unmolested. But if the hives are changed so that bees enter other than their own hives, they are immediately slain and cast out of the hive. There are traits in the nature of bees which seem to be akin to reason as manifested in the human family.

It is not absolutely necessary to furnish food for bees. The myriads of flowers in forest and field afford honey in great abundance. Some of the principal sources of honey are clover, buckwheat, basswood, fruit flowers, red raspberry, catnip, etc. Yet under my system of management I find it profitable to furnish my bees with nearly all the food they require for their own use. I have constructed a feeder on entirely new principles, so I can put each stock in its own hive, and so that all the bees of the hive can have access to it, and not a bee from any other hive reach it. The food I prepare for them costs only about seven cents per pound, and meets all the wants of the bees as well as honey collected from flowers. By this arrangement I furnish nearly all the food my bees require for their own use, and thus secure as surplus all the honey the bees gather from flowers throughout the season, which is a great increase over the amount otherwise obtained. As the bees consume a great deal of honey in rearing their young, constructing combs, and for their own daily wants the year round, with my arrangement I have had a swarm of bees take from the feeder, in one hour, over a gallon of food, and store it in combs in the hive.

It is hardly possible for me to describe the hive I use, on paper, with sufficient accuracy as to give a correct idea of all its parts; it must be seen to be fully understood. I will, however, give a general description of some of its leading

points, and here let me say that I have no objection to any one using it who wishes to do so, and if I possessed sufficient skill I would describe it so that every bee keeper could construct one for his own use. The central portion has six movable comb frames suspended on rabbetings on the ends; this section will hold about 40 lbs. of honey, and is for the permanent occupancy of the bees; here they build their combs, in the movable frames, here they rear their young and store up sufficient food for their own use. At the sides and top are arranged thirty small glass boxes, in which the bees store their surplus honey. Each box holds about 4 lbs., and gives the honey in the best possible shape for market. The boxes are so placed in connection with the hive that in entering them the bees are not obliged to pass through any partitions, but pass directly to the boxes. These boxes when filled are removed, and empty ones substituted in their places. They are so arranged as to be removed separately or collectively. A ventilator is arranged for winter use, so that the bees winter in perfect safety on their summer stands. In connection with straw packing, I consider the use of this ventilator renders bees safe in any climate.

As to the bee moth, a strong stock of bees is never injured by this pest; bee keepers who keep their bees strong and in a healthy condition will find no trouble from this source. Stocks must first become weak and diseased from some cause before they will be injured by the bee moth.

Bee keeping is a very profitable occupation when managed on correct scientific principles. Great progress has been made within the past twenty years. I know of some bee keepers in New York State that keep upwards of 300 stocks, and some years sell more than seven thousand dollars worth of honey.

West Gorham, Me.

MRS. L. E. COTTON.

Architectural Science Class.

ELEMENTARY REPLIES.

QUESTION.—Describe different materials used by painters. Describe ingredients of color.—The materials used by painters are paints, oils, driers, stains, varnishes, etc. Colors or paints may be divided into five classes, according to their principal ingredients. Lead paints, most commonly used, have white lead or carbonate of lead as a basis. This material is ground up in oil in a stiff paste. Linseed oil, with litharge or other driers, and sometimes turpentine, are added to it to form the paint ready for use. The required tint is obtained by adding to this the proper coloring pigment. The exact proportion of ingredients is regulated by the nature of the work, climate, etc. Red lead enters into the composition of the priming coat because it is a good "drier," and sets "hard." Linseed oil is used as a medium for applying the paint; it fills up the wood pores, and acts as a preservative. Turpentine makes the paint easier to work, and more liquid, but it plays no part in the preservation of the wood, as the greater part evaporates. Driers are mediums to cause the contained oil to dry and set quickly. Various materials are used, as litharge, sugar of lead, etc. Zinc paints have zinc oxide as a basis. Silicate paints are manufactured from almost pure silica, which is not acted upon by any metal or acid—in fact, is almost indestructible. This kind possesses the advantages of great durability, has no galvanic action when applied to iron, as in the case of lead paint, and does not tarnish by the action of gases. Colors are made same as the lead paints, and are mixed in the same way. Oxide of iron paint acts as a good preservative for ironwork. Bituminous paints are used for a similar purpose, and for rough carpentry. Stains are mixtures used to darken wood to the color of the imitated wood. Varnishes are of various kinds—copal, etc.—and are used to preserve the paint, and give a gloss to the finishing coat.

QUESTION.—Describe the process of common painting wood and ironwork.—Woodwork is prepared for painting by brushing over all resinous knots with a thin coating of knotting (a compound of shellac dissolved in naphtha) or gold size, to confine the resin, and prevent it running under the paint. The priming is then laid on, any plain color, well worked into the pores of the wood, with and across the grain; when this is dry, the stopping is done. All nail and brad holes, etc., must be well filled up with putty, and lightly rubbed off with glass paper. The second and following coats are applied with more care, brushed with the grain, and the work covered equally everywhere, showing no tool marks or running edges. If the last coat is to be light, the second and third should be similar in color, and if it is to be finished dark, dark color must be used for the previous coat. Ironwork should be cleared free of all rust, oil, or grease before painting. A good first coat is color made up with red lead; the other coats may be similar to that used for wood. Iron being almost non-absorbent, three coats are sufficient for new work, unless in very exposed situations, and for the same reason, care must be taken, especially in ornamental work, not to fill up the fine lines of leafwork, etc., by using too much paint, as the character of the work would thereby be injured. It is not so much a thick coat as a thorough one that is the best protection.

QUESTION.—In coloring walls what precautions should be used?—The walls should be thoroughly dry. In coloring walls the coats should be carefully laid on and smoothly, each coat being rubbed slightly with sand paper before applying the next. The "flattening" or finishing coat should be made a few shades lighter than the pattern, as it darkens in drying. Japanner's gold size, if used, should be applied quickly, as the turps evaporates quickly, leaving an indelible glossy surface. A certain time should be allowed between

the coats, the drying of the same depending upon the quantity of driers used, the weather, and temperature of the apartment. To expedite the work, new walls are generally "distempered" when not dry enough to receive the permanent decorations. Distemping is a kind of painting with color prepared with size or some other glutinous substance. In distemping, the walls must be dry and free from damp; if not, at the completion will be shown all the defects. Two or three coats should be applied, in order to obtain an even color.

ADVANCED REPLIES.

QUESTION.—Explain the theory of coloring.—The accepted theory is that there are certain colors that cannot be produced by any combination of other colors. They are termed primaries, because all other colors can be obtained by mixing them in certain proportions. The primary colors are red, blue, and yellow. Some authorities substitute green for yellow. Secondary colors are derived from mixtures of the primary colors in pairs—as violet from red and blue, orange from red and yellow, and green from yellow and blue. Tertiary colors are produced from secondaries—as citrine from orange and green, etc. White and black are usually considered neutrals. To secure "harmony of colors" they must be equalized to the varying proportions shown in the solar spectrum—the three primaries being used either in their purity or compounded. The eye being constructed to see white light, when looking on a colored surface, it is best pleased by a contrast. Contrasting colors to harmonize should be mutual complementaries of each other—making up the full complement of colors contained in the solar rays. The complement of any primary—say, red—will be the secondary compounded from the other two primaries—as green from blue and yellow—red will thus harmonize with green, blue with orange, and yellow with violet. The best proportion for mixing primaries, so as to harmonize, is; red, 5; blue, 8; and yellow, 3. The latter is the most vivid, and should obtain a prominent position. Blue is least vivid and retiring, and should be kept in the background—red to be used as an intermediate color.

QUESTION.—Describe the proper mode of painting wall surfaces.—To paint wall surfaces properly often five coats are necessary; but if the plaster be not very absorbent four will be sufficient. If the work is required without gloss the last coat is mixed with turpentine only, which is called flattening; if the work be not flatted the finishing coat is two of turpentine to one of oil. For the priming coat boiled oil should be used, then the three coats of white lead and oil, or more if required; generally the first coats should be some shades darker than the finishing coat. The proper drier to be used for walls is sugar of lead, and in painting wall surfaces great care should be used in selecting the very best quality of oils and white lead—the older the oil the better.

QUESTION.—What is the best paint for ironwork?—The best paint for ironwork is either the oxide of iron paint, known as the Torbay paint, or the silicate oxide paint, both consisting of oxide of iron and silicious matter, to which any color may be added and applied in the usual way. They can be applied even after the surface has commenced to rust, as from their nature they amalgamate freely with the rust, forming an impervious coating adhering well to the surface, and yet sufficiently elastic to prevent cracking when the iron expands or contracts under variations of temperature. Bituminous or tar mixtures, thinned with linseed oil, are well adapted for ironwork, especially when they can be applied hot, or to the heated surface of the metal, so as to insure a firm adhesion by entering the pores. A mixture of silicate oxide with tar also forms a good durable coating on iron. When ironwork is to be painted with ordinary lead paint red lead should be used. The adhesion of such a coating on ironwork can seldom be depended on in consequence of the non-porous surface. This is further prevented by the galvanic action that sets in between the iron and lead. Galvanizing, or coating the surface with a preparation of zinc, is also frequently resorted to as a preservative. With all such coatings the surface must be perfectly clean and free from rust. It is advisable, so as to prevent rusting, that all ironwork should be coated with some preservative soon after it leaves the mould, forge, or mill.—Building News.

Converting Iron into Steel without Melting.

The known processes for transforming iron into steel (refining by the oxygen of the air, or the Bessemer method, or Reaumur's method, improved by Siemens, Martin, and others), ingenious as they are, do not and cannot give but imperfect intermediate compositions between the castings of true iron and steel. Although of undoubted utility and low in price, these products are not applicable to any of the manufactures requiring fine steel. To overcome these defects, and to give to the metals the requisite qualities, Messrs. Kraft & Julien-Sauve Fils, of Paris, subject them for some hours to a red heat in a retort filled with carbonaceous matter, over which is slowly passed a current of azote of carbonic oxide, and of various carbonated hydrogens. They introduce wood, vegetable charcoal, peat, coke, or any kind of vegetable materials, very dry, and heated to a temperature of about 50°, into a hydrocarbon oil of any kind (such as the heavy oil of schist), which is also heated to the same temperature. This latter is absorbed in the proportion of from 12 to 15 per cent, and they form with bars of Bessemer metal, Martin metal, or any other product arising from the refining of cast metal, as above mentioned, alternate layers, the whole being enclosed in a vessel, similar to a gas retort and of desired form, and heat gradually to a red heat.

By these means the excess of oxygen that is contained by the vegetable materials in presence of the vaporized hydrocarbons is transformed into carbonic oxide, and their azote into ammonia, in such wise that the metals under treatment are immersed in a gaseous medium, which is allowed to be the best for the purpose of converting them into fine steel.

Now, as it may occur that before this absolute conversion the productive source of the gas may be exhausted by distillation, they provide against this inconvenience by passing through the apparatus a current of carbonic acid or carbonic oxide mixed or not with azote. When they obtain this gaseous mixture from the products of the combustion of the furnace which serves to heat the apparatus, they separate from it its free oxygen, and change it to carbonic oxide by causing it to pass over carbonaceous matter heated to red heat before it is passed to the metals. In the Siemens, Ponsard, Muller, and other retorts, the principle of which consists in the gasification of combustibles, they give a mixture of the gases, which they employ equally to the heating of the apparatus as to the transformation of the metal to steel. The gas which escapes from these furnaces also serves for this double purpose. When, on the contrary, they obtain this gaseous medium by direct calcination of limestone, or the mixture of this with other carbons, the gaseous products (carbonic acid and carbonic oxide) are passed directly into the apparatus containing the layers of charcoal and metal. They obtain at the same time from the lime, which they may convert into pyrolignite of lime, the little pyroligneous acid which separates equally from the wood as from the hydrocarbonated peat during the heating to red heat, and which they take care to collect as is ordinarily done in the distillation of wood.

It will be understood that the mixed gases produced and composed in and that have passed through the apparatus may on their passage therefrom be collected in a gasometer to be again used for the same purpose, or passed under the furnace of the apparatus, where they will be utilized as combustibles. If the products prepared according to their process are melted, cast steel of the finest quality will be obtained, and by these means they may obtain without melting steel of the first quality for the manufacture of files and other articles from Bessemer metal, Martin metal, and generally from all metals which are obtained from castings, either by refining with the oxygen of the air, or by refining by reaction. In addition to the steel they obtain simultaneously and at will, from the lime, the ammonia, and the pyroligneous acid, tarry hydrocarbons, which they use over again, and wood or peat charcoal of denser quality than that used originally, not only fit for domestic purposes, but for use in metallurgy.

If cast iron particularly acted upon, and if this cast metal heated to red heat is exposed in a retort to a current of carbonic acid alone or mixed with air, it will be transformed into steel, and the gas will become carbonic oxide, which in passing into another retort charged with Bessemer metal at red heat will effect the conversion of this metal into fine steel, and will itself be converted into carbonic acid. Thus the carbonic acid (CO_2) raised to the casting its excess of carbon (C) is transformed into carbonic oxide (CO); this passing over the iron of the Bessemer metal and the like will give up the carbon (C), and will return to the state of carbonic acid (CO_2). From this a given volume of carbonic acid gas being given enclosed in a gasometer they may, by passing this gas in the retorts heated to red heat and charged, the first with cast iron, the second with Bessemer metal, the third with cast iron, and the fourth with Bessemer metal, and thus in succession (provided that the series commencing with cast iron terminates with one or two retorts charged with Bessemer metal) transform the whole of the metal into steel, and on collecting the gas in a second gasometer the same operation may be recommenced, and so on indefinitely. If the passage of the gas takes place in a converter charged with melted cast iron, the transformation of the casting is more regularly and easily done, and with less loss of iron.

A FIRE ESCAPE ACCIDENT.

A distressing accident occurred at the Astor House, New York, just across the way from this office, recently, through the breaking of a fire escape while the owner and exhibitor of the same was endeavoring to lower himself from a lofty window. The apparatus known as the Kenyon Fire Escape consists of a wire rope $\frac{1}{2}$ inch in diameter, one end of which is secured within the room. The other end is wound on a drum, which is provided with brakes and arranged in connection with a stout belt, so that by regulating the brakes the wearer of the belt can cause the wire slowly to unwind and thus may lower himself in safety. The exhibitor, Mr. S. E. Hardman, of Providence, R. I., attempted to do this, but some part of the apparatus became inoperative; and in endeavoring to fix it, he brought some sudden strain on his rope so that it broke at the point where it turned over the sharp edge of the window sill, causing the unfortunate man to fall headlong to the pavement beneath, killing him instantly.

The failure of the wire rope simply indicates that it must have been of poor quality. Had a single wire of steel or even iron been used, the tensile strength would have far exceeded any strain which one person descending could have put on it. As it is, probably deterioration of the metal, coupled with the abrasion by the sharp stone edge of the window sill, determined the break. The casualty only goes to show another source of danger which should

be provided for by making lowering ropes not only abundantly strong but also by applying to them means of protecting them from accidental injuries. In general, however, we do not think the portable fire escape problem is by any means solved yet. There is still an excellent opportunity for inventors to devise some system which shall be absolutely safe and certain in its action, and at the same time shall require nothing or nearly nothing to be performed by the presumably thoroughly frightened person whose life it is designed to protect.

Artificial Gems.

What we popularly call paste is technically known as strass; this is also the French word for the same substance (from M. Strass, its reputed inventor). Paste, then, is a material with which diamonds are imitated, and by mixing up with it metallic oxides of various kinds, colors in great variety are imparted to the paste, by which it serves as a representative of the various colored gems. Strass is prepared, according to the method of M. Donault, who has attained great proficiency in this art, from silica, potash, borax, and oxide of lead, and sometimes arsenic. Rock crystal and flint consist almost entirely of silica; but as flint generally contains a little iron, the silica obtained from it is liable to have a tinge of color, which is detrimental to the fidelity of the imitation; rock crystal is therefore employed.

The crucible in which the materials are melted claims particular attention, since, if the substance of which it is formed contains metallic particles, color would be imparted to the strass. Hard porcelain and Hessian clay are the best materials for this purpose. When the crucibles are supplied with the proper quantity of ingredients, they are placed in a porcelain furnace, where they are exposed to a steady heat for twenty-four hours, and then allowed to cool very slowly, so that a kind of annealing goes on. By this means is produced a strass, or paste, which, after passing through the hands of the lapidary, who gives it the form necessary for "setting," presents us with an imitation of the diamond.

Having once produced strass which imitates diamond, all the other gems may be imitated, by mixing with strass various metallic oxides and other substances, according to the color which it is desired to produce. Herein is manifested great diversity of opinions, different experimenters advocating different modes of procedure and different ingredients. One experimenter recommends the following ingredients: To imitate topaz, add glass of antimony, precipitate of Cassius, and oxide of iron, to the white strass; for ruby, add oxide of manganese; for emerald, oxides of copper, iron, and chromium, and acetate of copper; for sapphire, oxide of cobalt; for amethyst, oxides of manganese and cobalt, and precipitate of Cassius; for beryl, glass of antimony and oxide of cobalt; for garnet, glass of antimony, precipitate of Cassius, and oxide of manganese.

M. Donault has given directions somewhat different from the above; but we need not particularise them, as it would carry us into too minute details. We may, however, mention that he produces the imitative rubies by a particular treatment of the composition employed for topaz. This composition is 1,000 parts of strass to 40 of glass of antimony and 1 of purple of Cassius; at a certain stage of its preparation it affords an opaque mass, translucent at the edges, and affording thin laminae of a red color. A part of this opaque topaz matter, added to 8 parts of strass melted in a Hessian crucible, and left 30 hours in a potter's furnace, affords a beautiful yellowish crystal. If this crystal be remelted by means of a blowpipe, it produces a strass nearly equal to the finest Oriental rubies. The art of producing imitative gems, ingenious as it is, is necessarily a confined one; for as soon as faithful copies of certain jewels are obtained, the object of the art is attained. The object is to deceive the eye; for, as M. Dumas remarks, "the most perfect description of strass, if it imitate no particular and identical gem, has no value, because it deceives nobody." There is a less perfect but a curious mode of producing artificial gems, with what are called doublets, by a process of cementation. The artificial gem consists, in this case, of two pieces of white transparent glass, or of crystal, which is cut into two pieces, conjointly so shaped that both together present the external form of the gem about to be imitated. A transparent cement is then formed of Venice turpentine and mastic melted up together in certain proportions, and to the mixture is added a portion of some coloring matter, according to the nature of the gem. Carmine, crimson lake, Prussian blue, verdigris, dragon's blood, Spanish annatto, etc., are employed, either separately or mixed one with another, until the required tint is imparted to the gummy mixture.—*British Trade Journal*.

The Manufacture of Mosaics.

The modern process of making mosaics now commonly followed at Rome is this: A plate, generally of metal, of the required size is first surrounded by a margin rising about three quarters of an inch from the surface. A mastic cement, composed of powdered stone, lime, and linseed oil, is then spread over as a coating, perhaps a quarter of an inch in thickness. When set, this is again covered with plaster of Paris rising to a level with the margin; upon which is traced a very careful outline of the picture to be copied, and just so much as will admit of the insertion of the small pieces of smalto or glass is removed from time to time with a fine chisel. The workman then selects from the trays, in

which are kept thousands of varieties of color, a piece of the tint which he wants and carefully brings it to the necessary shape. The piece is then moistened with a little cement and bedded in its proper situation: the process being repeated until the picture is finished; when the whole, being ground down to an even face and polished, becomes an imperishable work of art. The process is the same for making the small mosaics so much employed at the present day for boxes, covers, or articles of jewelry; and this work is sometimes upon almost a microscopic scale.

The Florentine mosaic, which is chiefly used for the decoration of altars and tombs, or for cabinets, tops of tables, coffers and the like, is composed of precious materials in small slices or veneers; and by taking advantage of the natural tints and shades which characterize the marble, the agate or the jasper, very admirable effects may be produced in imitation of fruit, flowers, or ornaments. The use of this kind of mosaic is extremely restricted, on account of the great value and expense not only of the materials, but of the labor which is spent upon them. None but the hardest stones are used; every separate piece must be backed by thicker slices of slate or marble to obtain additional strength; and every minute portion must be ground until it exactly corresponds with the pattern previously cut.

Formic Acid as an Antiseptic.

The number of antiseptics is now so considerable that it seems almost hazardous to wish to increase it. Each new antiseptic that appears is extolled as the only saviour, and page after page of testimonials proves its excellence and infallibility. As the people may easily be distracted if every "discoverer" pours forth the abundance of his paternal joy over his offspring, which is frequently far from ripe, it is easy to see that the series of experiments made without prejudice by disinterested persons are of great value. In these experiments, made and published recently by Bidwell and others, they overlook, says G. Feyerabendt, one substance which for certain purposes cannot be replaced by any other, namely, formic acid. He does not lay claim to priority, for Dammer, in his excellent dictionary, mentions its antiseptic properties, nor is he a manufacturer of the article; so he does not speak in his own interest, but in that of the subject.

In acid solutions, formic acid far surpasses carbolic acid, and is especially adapted to the preservation of fruit syrups. Experiments made by Feyerabendt in his own household for two years have, without exception, been crowned with success. He has two jars of pickles made with vinegar and sugar from the year 1875, that have only been covered with a loose glass cover, yet they have preserved their freshness and show no trace of mould or decay. The taste of formic acid is pure, acid, and pleasant, the price low, and its use very simple. He has employed from $\frac{1}{4}$ to $\frac{1}{2}$ per cent of it in vinegar, fruit juice, glue, ink, etc., and is convinced that even smaller quantities will answer the purpose.

He especially seeks to excite the attention of housekeepers, and feels confident that they will be satisfied with the results and introduce formic acid as a good and true friend in pantry and kitchen.

Ordinary formic acid is made by heating together to 110° C. equal parts of dry oxalic acid and glycerin, until no carbonic acid is evolved. The pure concentrated acid is obtained by decomposing the formate of lead by sulphuretted hydrogen, and might contain lead.

The Oregon Silver Mud.

Professor Silliman of New Haven informs us that the alleged argentiferous mud of Wasco county, Oregon, an account of which we recently copied from the *San Francisco Examiner*, is a fraudulent production. As regards the form in which the silver was added, Professor Silliman says that the metal in the sample analyzed by him was spongy, in a gray powder, and generally in the condition in which silver appears when reduced by zinc. An authentic example from the locality, obtained by a trustworthy correspondent of Professor Silliman, yielded no silver whatever.

Coloring Zinc Roofs.

Among recent German inventions is a simple process, depending on the use of acetate of lead, by which every kind of color is applicable to sheets of zinc. By mixing black lead, for instance, with the salt, a very agreeable light brown hue is obtained. It is by this process that the cupola of the synagogue at Nuremberg has been painted. A sufficient length of time has already elapsed, it is said, to show that the atmosphere has had no influence on the zinc sheeting of the roof, thus showing the practical value of the process in such cases. By the addition of other coloring matters, light or dark shades of yellow or gray may be produced.

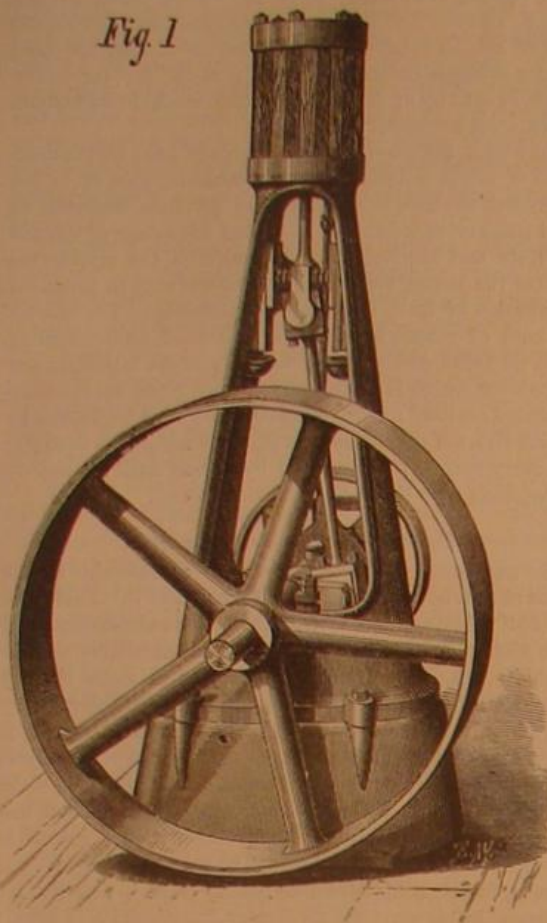
A Large Steam Pump.

Messrs. Cramp and Sons have now completed, with the exception of the boilers, the immense steam pumping engine which is intended for the Frankford Water Works, Philadelphia. The entire machinery will be ready to go into operation by October 1. This engine was built at the contract price of \$46,000, and has a pumping capacity of 10,000,000 gallons per day. It is a double cylinder engine, the smaller cylinder being 40 inches and the other 60 inches in diameter. The pumps are 21 inches in diameter, and five feet stroke. The Frankford reservoir has a capacity of 36,000,000 gallons, to which have been run a 30 inch pumping main and 20 inch distributing main. There will be three boilers, two of which will furnish steam for 500 horse power. The third boiler will be held in reserve for emergencies.

IMPROVED STEAM ENGINE GOVERNOR.

We illustrate herewith a new and simple device which acts both as a governor and as an automatic cut-off. It is quite sensitive, may be adjusted so as to allow of the engine being

Fig. 1



run at any desired speed, and is so constructed that in case of its rupture the engine is caused to stop.

A, Fig. 2, is the eccentric which connects with the valve rod in the usual way. Its hub is guided by gibs, B, which rest on the slides shown; and at the same time are provided with lateral grooves into which the edges of the slides enter, as shown in the sectional view, Fig. 3. The slides are adjustable so that wear may be taken up. To the eccentric are attached the system of levers, C, which are pivoted to the arms of the disk in which the device is disposed, and to which are attached the weights, D. Also attached to the eccentric is the coiled spring E, the outer end of which is fastened by a screw and nut, by means of which the tension of the spring may be increased or diminished at will.

The shaft passes through the slot shown in the eccentric, which slot is of such length as to permit sufficient lateral motion of the eccentric to prevent the valve from opening at the minimum throw. It will be obvious that, when the speed of the engine increases, the weights, D, are thrown out by centrifugal force, and the eccentric is moved across the shaft. The travel of the valve is thus reduced until the engine is brought back to its former speed. If there is a tendency to decrease the speed, the spring, E, draws the eccentric in the opposite direction so as to impart a longer stroke to the valve. The joint action of the tension spring, E, and weighted levers, C, on the sliding eccentric thus serves to keep up the uniform motion of the engine according to the degree of speed to which the engine is adjusted, while in case of breakage of the spring it will be clear that the action of the weights will be such as to reduce the valve throw to minimum and so stop the machine.

The device has been applied with much success to small engines of the type shown in Fig. 1, which are especially constructed for small steam yachts. We are informed its addition does

not increase the cost of the engine over that of one fitted with the usual ball governor.

Patented through the Scientific American Patent Agency, by Mr. H. Tabor, May 22, 1877. For further information address the makers, Messrs. B. W. Payne & Sons, Corning, N. Y.

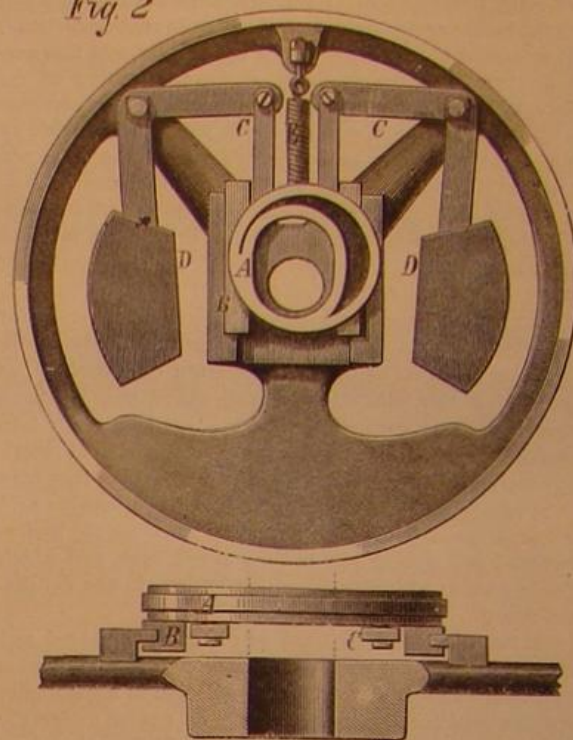
Docks of Liverpool.

The docks on the Mersey are, perhaps, the most magnificent series in the world. They extend over a water area of 255½ acres, and possess 18½ miles of quays. Facing the river they present an unbroken line of more than 6 miles. On the Birkenhead side, the water area, including the Great Float, is 163 acres, the quays are more than 9 miles in length, making in the whole 421 acres of water area and 28 miles of quay space, a set of statistics which will probably afford a clearer idea of what has been done than the most elaborate attempt at word painting.

The Corn Dock is of comparatively recent construction, and boasts a splendid range of warehouses and elevators. Into this dock the largest ships engaged in the grain trade can be brought with perfect ease, and here they can lie against a range of magnificent warehouses ten stories in height, and with a cellar story below the level of the water. The corn is discharged from the vessels which bring it in bulk by very simple yet effective machinery worked by hydraulic power. From the ships it passes into the cellar floor, which is perfectly rat-proof and water-tight, and thence is raised in a species of hopper worked by the same power to the topmost floor. Each of these hoppers, of which there are ten in all, carries exactly one ton, and it can be filled, raised, and discharged in something over a minute. On reaching the topmost floor a valve opens and the grain pours out in a steady stream upon an endless band of india rubber about 15 inches wide, which is kept in constant and rapid motion over a series of rollers. The effect of this motion is very curious. The corn keeps its place exactly on the band; not a grain falls to the ground on either side until, on arriving at the point of discharge, a guiding shoot sends the stream into the section of the particular floor marked out for it. By a simple system of registration the keepers of this vast granary—which is believed to be the largest in the world—can point out with unfailing accuracy the whereabouts of each consignment in store. The precautions against fire are elaborate in the extreme—a fact which need surprise no one who remembers how cruelly Liverpool has suffered from its ravages in the past. In addition to the usual orders about lights, no steam engine is allowed in the place, and fire hose ready for use are fixed on every landing of every stair. The motive

power of the engines is, as we have said, water, which is obtained from a lofty tower at the dock gates. The water is pumped into the machinery at the top of the tower by steam, the engine used for the purpose being capable of producing a pressure of 700 lbs. to the square inch. This same power is also utilized for the purpose of opening or closing the dock gates, and it is said to be even more perfectly under control

Fig. 2

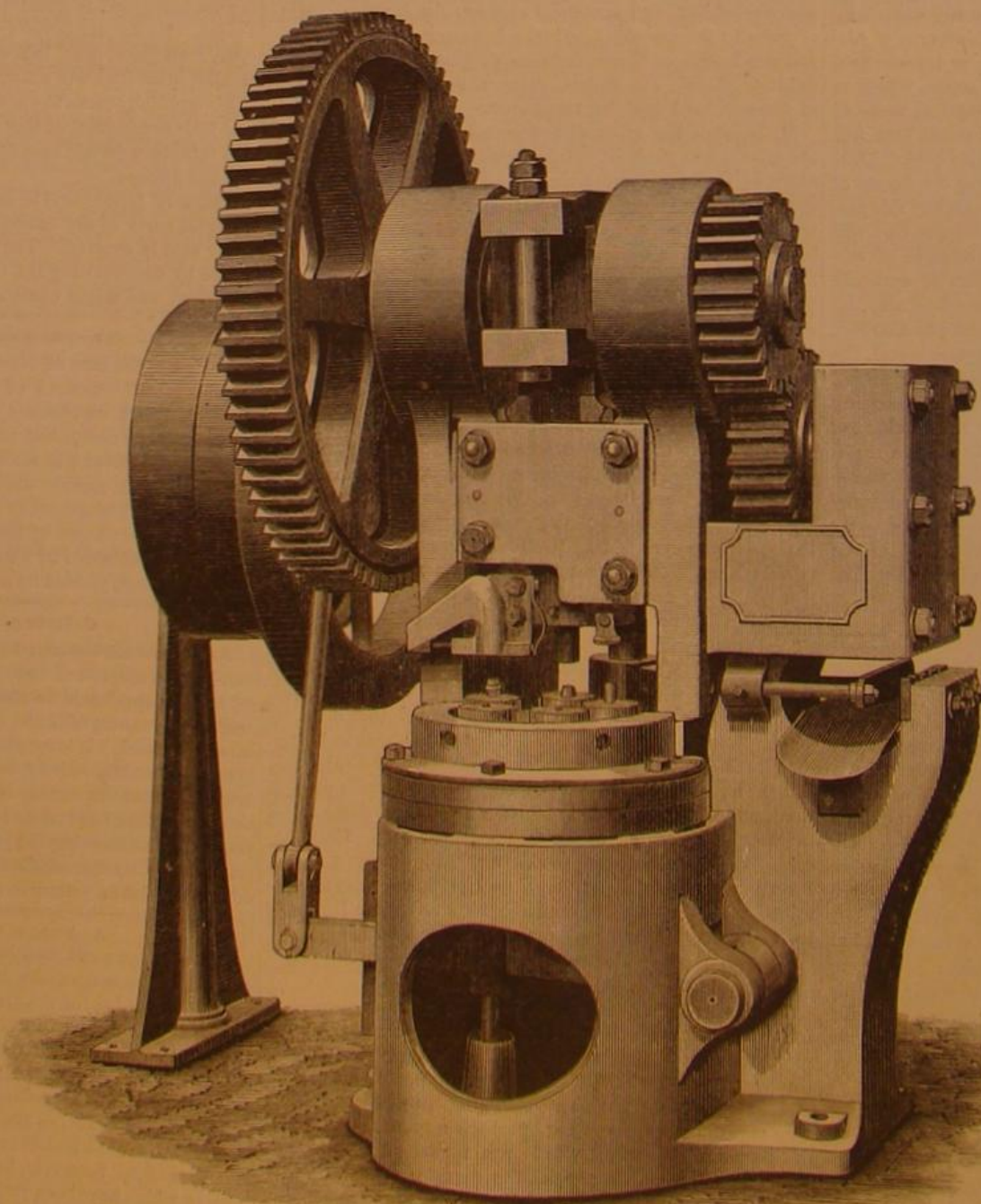


STEAM ENGINE GOVERNOR.

than steam itself. One last matter of detail—the warehouses will hold 165,000 quarters of corn, and the elevators and machinery are capable, without any undue pressure, of lifting from the ships and putting into place in the warehouses 250 tons of corn per hour.—*British Trade Journal*.

IMPROVED RIVET-MAKING MACHINE.

We illustrate, from *The Engineer*, a new and simple rivet-making machine, recently patented by Messrs. W. Collier & Co., of Salford, Manchester, England. One of the great defects in all previous rivet-making machines has been their liability to form the head of the rivets out of center with the shank, and one of the principal objects Messrs. Collier & Co. have had in view has been completely to obviate this, and render it impossible to make crooked headed rivets in the new machine. The general design of the machine and its mode of working will be readily understood from our engraving. The header or "snap" is carried in a vertical slide which has a reciprocating motion imparted to it by an eccentric shaft driven by suitable gearing. The dies, five in number, are carried in a circular table and brought successively under the header or snap by an intermittent feed motion, which not only moves the table until the die is perfectly central with the snap, but locks it, and holds it firmly while the rivet is headed, so that should the iron get more to one side than the other it will right itself by pressure and not spring the table and form a crooked head. The motion for moving and locking the table is carefully protected from scale and water. An ejecting apparatus lifts the headed rivets out of the dies, and a simple self-acting motion picks them up and delivers them clear of the machine into a wrought iron trough or other suitable receptacle placed by the side of the machine. An apparatus is also attached for cutting the iron into the required lengths for making into rivets, with adjustable measuring stop to measure the pieces.



COLLIER'S RIVET-MAKING MACHINE.

THE CLAMOROUS FROG.

BY C. FEW SEISS.

This frog, first described by Merrem as the *rana clamitans*, is a widely distributed species, and, although numerous in many sections of this country, is commonly supposed to be the young of the bullfrog (*rana catesbeiana* of Shaw). It is, however, a distinct species.

There is one strong specific character in the clamorous frog by which it can always be identified, namely, the elevated fold of skin which originates behind each eye, passing over each tympanum, and disappearing near the bend of the back. These cutaneous elevations are always present in the clamorous frog, even in quite immature animals, while they are never found in the bullfrog at any age.

I have seen specimens of this frog colored almost exactly like the bullfrog, so color alone cannot be taken as a criterion in the specific identification of frogs; nor can it in the majority of animals.

I subjoin descriptions of three living specimens of *rana clamitans*.

No. 1 (male). Form rather robust; snout somewhat pointed. Head, anterior part of body above, and back of tympanum, bright green; posterior portions of the back and sides pale olive brown, or light greenish brown. Arms and legs pale olive brown. Upper posterior surface of body and legs, also the sides, spotted with small pale blackish-brown blotches and spots; nates mottled darker brown and white. Tympanum almost twice the size of the eye, bronzed, with a light green center. Throat lemon-yellow, passing into yellowish white on the abdomen. A few dark marks on the upper jaw. Body and posterior extremities slightly tuberculous. Latero-dorsal cutaneous ridges prominent, extending from orbit to bend of back. Length, from tip of snout to vent, $2\frac{1}{2}$ inches.

No. 2 (female). Snout less pointed than in No. 1. Head, and anterior part of back, grass-green; posterior part, and legs, olive brown, much darker than the preceding. A few blackish brown spots on the rear back. Legs barred with black-brown. Sides spotted black and white. Labials marked with blackish brown wavy lines, inclosing whitish spot. Tympanum but little larger than the eye. Nates

and latero-dorsal ridges, as in the male; the brown mottling of the nates darker, almost black. Skin more or less tuberculous. Length $2\frac{1}{4}$ inches.

No. 3 (female). Before each orbit, below each nostril, a large green spot. Rest of head and fore part of body, dull olive green, with a tinge of brown. Remaining parts as in No. 2, but the colors paler and the markings less distinct.

The male, as described above, was called the spring frog, *rana fontinalis*, by LeConte, Holbrook, and DeKay; and the green and yellow frog, *rana flavi-viridis*, by Harlan. Holbrook says the spring frog is only found in cold spring water.



THE CLAMOROUS FROG.

The typical *clamitans* I have found to be the most common about ponds and streams, and our spring frog was captured in a creek, far distant from any spring. Its abrupt croaking note is exactly similar to that of the other. Its habits are the same, and I have witnessed a male of this variety embracing a female of the typical variety, *clamitans*.

The food of the clamorous frog is various. Insects of all kinds, crawfish, worms, salamanders, and small frogs, I have known it to devour. I have seen a female seize and swallow young frogs of her own species, and which probably were her own offspring. The young frogs were invari-

bly swallowed head foremost, and the devourer presented a ludicrous appearance, when a posterior extremity of the unhappy young frog protruded from either side of her mouth, having the appearance of a huge waxed moustache.

Electricity of the Heart.

Muscular contraction, it is known, is always accompanied with electric phenomena; the difference of electric potential between two points of a muscle, undergoes a diminution, which, according to Bernstein, precedes, by about one one-hundredth of a second, the contraction of the muscle. This electric variation has been observed on various muscles, and in particular on the heart (by Du Bois Reymond and Kühne), and recently M. Marey has represented it graphically by photographing the indications of a Lippmann capillary electrometer. The *Journal de Physique* states that M. De la Roche has tried the experiment on the heart of a living man. Two points of the epidermis of the chest were connected with the poles of a capillary electrometer, by means of electrodes, formed each of a bar of amalgamated zinc, with a plug of muslin at its lower end saturated with sulphate of zinc. Held with insulating handles, the bars were applied, one with its plug opposite the point of the heart, under the left nipple, and the other to another point of the chest. The mercurial column was then seen to execute a series of very distinct periodical pulsations synchronous with the pulse; each pulsation even marked the double movement of the heart (of the auricles and ventricles). The amplitude corresponded to about

one one-thousandth Daniell.

THE IWAKUNI BRIDGE, JAPAN.

We are indebted to the *Illustrated Adelaide News* for the annexed engraving of a very curious bridge, in existence near the town of Iwakuni, Japan. The structure is simply a series of arches from pier to pier, but instead of filling up the space between the arches to the tops, or bridging across from summit to summit, and thus providing a straight and level pathway, the designer has placed steps on the arches themselves, so that the traveler is obliged to ascend and de-



A CURIOUS BRIDGE AT IWAKUNI JAPAN.

scend five eminences to make the crossing. This extraordinary structure is three hundred years old and is regarded as one of the natural curiosities. The supporting pillars are of stone, and the superstructure of wood.

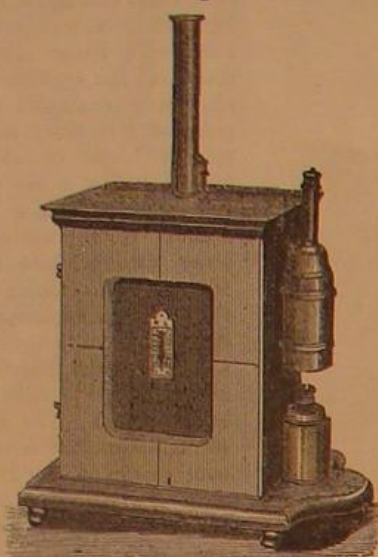
IMPROVED GERMINATING APPARATUS.

The apparatus represented in the accompanying cuts is intended to test the germinating capacity of seeds, and is designed to be used by seed dealers, gardeners, and others.

The apparatus is shown in Fig. 1, and in Fig. 2 is seen a vertical longitudinal section. Fig. 3 is a vertical cross section, and Fig. 4 shows one of the perforated seed plates with which the apparatus is provided.

As shown in Fig. 1, the apparatus is enclosed in an iron covering with a tightly closing front door, through which the seed plates, *a, a, a*, are placed. The plates are introduced into the apparatus and supported on shelves, *c, c, c*, made of perforated sheet metal. The seed plates are made

Fig. 1.



of a mixture of pulverized firebrick, sawdust, and powdered charcoal. Every seed plate has a number of oval indentations or cells, in which the seeds are placed, and these cells are made proportionate to the size of the seed. The seed plates are placed in sheet metal pans, *b, b, b*, in which is a sheet of felt of the same size as the plate. Both seed plates and shelves are enclosed in a jacket formed of two rolls of sheet metal, the space, *d, d, d*, between them being filled

Fig. 2.

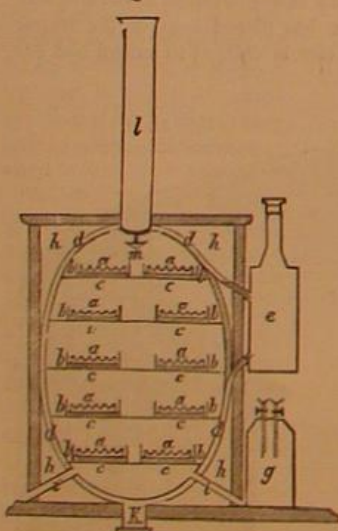
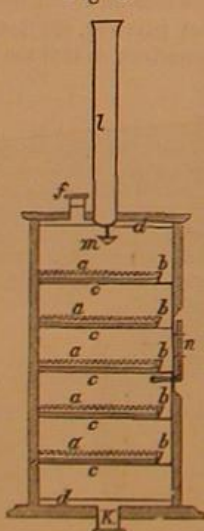


Fig. 3.



with water which is heated by a communication with the vessel, *e*, which is also filled with water and heated by a petroleum or alcohol lamp, *g*. To prevent the loss of heat by radiation, the spaces, *h, h*, are filled with ashes or any non-conductor of heat. Cold air is admitted to the interior through the channels, *i, i*, and the moisture is conducted away through the pipe, *l*, which has a small drip cup, *m*, for the water of condensation. At *k* is shown means for drawing off the water if desired.

Fig. 4.

The temperature in the interior of the apparatus is observed by the thermometer, *n*, Fig. 3, whose mercury bulb is placed in the interior of the apparatus.

When it is desired to use the apparatus, the seed plates are dipped into water, absorbing a certain amount. The plates are then placed in the pans, in which water has been previously poured. The seeds are then wet and placed in the cells. If it be desired to germinate the seeds at the temperature of the atmosphere, all that has to be done is to keep up the supply of water in the pans, but if a more rapid germination is wished, the apparatus is heated by the lamp until the requisite temperature is obtained, when that heat is kept up by reference to the thermometer and regulating the lamp.

The article upon the gorilla in our last issue should have been credited to Frank Buckland, in *Land and Water*.

NOTES OF PATENT OFFICE DECISIONS.

PATENTS.

Adams brought a suit in equity against the Joliet Manufacturing Company for infringement upon his letters patent for an "Improvement in Corn Shellers." The object of the invention in question was to secure an operative automatic feed, which, without the care of an attendant, would keep the stream of ears of corn steadily and uniformly running into the sheller, instead of permitting it to pile up or choke in the throat. This he accomplished by a series of wings, wheels, or projections, so arranged on a shaft as to revolve in the same direction in which the corn was running, and so placed relative to the throat as to force into the corn sheller all misplaced or hesitating ears. Upon the question of novelty, a large number of devices for feeding or regulating the feed of corn shellers, thrashing machines, straw cutters, planing machines, carding machines, etc., were introduced in evidence. One of these devices, in feed regulators for corn-shellers, which preceded the complainant's, was, in form of construction, almost precisely like that of complainants, except that it revolved in a contrary direction. It consisted, in brief, of a winged shaft, or beater-bar, over the throat of the sheller, so arranged as to revolve in the opposite direction to the stream of the ears of corn, and to drive back the overriding ears as they approached the throat. When at rest, however, and without the gearing by which the motion was secured, the two devices would strike the eye as substantially alike. The circuit court, however, has just rendered its decision sustaining the complainant's patent. It holds that the prior device was found to do but little towards securing the desired result, as the ears thrust or knocked back only got in the way of others, and the machine was therefore still liable to clog, so as to make the feed irregular, and require frequent attention from an attendant, and that an improved result was obtained by the complainant's device.

In the infringement suit of Henderson vs. The Cleveland Co-operative Stove Company, it appeared that the specification of the complainant's patent for an improvement in coal stoves, described a combination of a combustion chamber, and a circulating air chamber surrounding the hopper, as the substance of the invention, and further stated that, in whatever form of stove the said improvement was applied, both elements, namely the combustion chamber and the circulating air chamber, must be preserved. The Circuit Court holds, however, that a separate claim of the patentee to each of the elements can, nevertheless, be maintained, and that no inference of the abandonment of an individual element made the subject of a distinct claim can arise from the mere fact that the specification states the invention to consist of its combination with another feature.

The Supreme Court of the United States has lately rendered its decision in the equity suit of Russell vs. Place, for infringement of letters patent. The main question involved was whether the defendant could set up certain defenses—such as want of novelty in the invention, its use by the public for more than two years prior to the application for the patent, etc.—a judgment in an action at law for infringement of said letters patent having previously been recovered against them by the said complainant. The court decides that before the judgment of a court of competent authority, rendered in a prior action between the same parties, can prevent the defendants from availing themselves of such defenses in a subsequent suit, it must be certain that the consideration and determination of the particular matter set up in the defense to the subsequent suit was necessarily involved in the verdict and judgment in the prior suit; and that if this did not clearly appear from the face of the record, extrinsic evidence consistent with the record might be admitted to establish the fact.

COPYRIGHT CASES.

A decision has lately been rendered by Judge Shepley, in the suit of Richardson vs. Miller for the infringement of a copyright for circular playing cards. The defendants contended that their prints were unlike the cards copyrighted by Richardson, and did not infringe the copyright. They further insisted that his copyright was invalid for the reason that his prints were not the fit subject of a copyright. It appeared that there were certain marked differences between the prints of the copyrighted court cards of the complainant and the court cards of the defendants. There was much less space in the center of the cards. The faces of the kings and queens were turned in a different direction. There was a difference in the spaces between the heads on the court cards. There were marked differences in color, also, so that the cards of the defendants were easily distinguished from those of the complainant. But on the other hand, there was a striking similarity in those distinctive features of the main design wherein the printed cards of the complainant differed from other playing cards previously used. In the court or face cards of both complainant and defendants, there was a suit spot in the center of a circular card, with five similar heads arranged at equal distances from each other around the central suit spot, with five smaller suit spots near the outer margin of the circle, at equal distances apart and intermediate between each pair of heads. The court holds that these distinctive features of the main design being thus reproduced in the impressions of the defendants' prints, it is no answer to the charge of infringement that the whole of the design has not been copied, if those features of it have been appropriated which substantially embrace the novelty of the conception and the value in the application of the art of the designer. The doctrine is as applicable to prints and

engravings as to books, that one cannot take the vital part of another's work, although it may be but a small part in quantity, or insert distinct and material portions of one work into the general texture of another, constituting its chief value, without being chargeable with infringement.

In regard to the second ground of defense, the court, while admitting that it would not lend its aid to protect the authors of immoral works, says that there is nothing immoral or improper in the complainant's playing cards themselves, and the fact that they may be used by persons to violate the laws against gambling will not, of itself, deprive them of the protection of the law.

GIANT LILY.

This huge lily is quite different in aspect from any other in cultivation. Leaves very broad, those near the root and lower part of the stem, stalked, oval-acute, with a heart-shaped base; the upper stem leaves nearly stalkless, with a



rounded base, and diminishing in size; in size and shape very much like a catalpa leaf. Blooms in summer on a stalk from 7½ to 9½ feet high. The flowers are greenish-white outside, tinged with violet on the inside, large, 6 to 7 inches long, funnel-shaped, with divisions slightly reflected, fragrant, pendulous, 8 to 15 (sometimes 20) on each, tall and stout stem. Native of the Himalayas. Usually grown in greenhouses, but will grow in the open air if well protected. A well drained position, good, deep, and very sandy soil, are indispensable. The best position for it is isolated, a few feet within the margin of a shrubbery, with a warm exposure. Also suitable for association with hardy subtropical plants. A box or barrel should be turned over the plant in the fall, and well filled with leaves.

Bulbs are very large, conical, with scales which are very broad at the base and narrow at the top, very fleshy, not compressed, and of a greenish-white color.

New Haven as a Manufacturing Center.

The New Haven Chamber of Commerce, through its Secretary E. S. Wheeler, is inviting the attention of manufacturers to the advantages offered by New Haven to manufacturing enterprises. These consist of a good harbor, ample wharfage, cheap and rapid communication with New York by water and rail, ample facilities for foreign exportation, direct rail communication with New England, the West and Southwest, with low freights, a large body of skillful mechanics, a smaller indebtedness than any city of its size in the Union, a low rate of taxation, a low rate of assessment, thirty-three miles of sewerage, an ample water supply with one hundred miles of water mains, an admirable fire department, a healthy location, building cheap, and sales plenty and low priced, and educational advantages unsurpassed. Manufacturers wishing to escape excessive taxation and secure a location for manufacturing goods economically and marketing them at home and abroad successfully, should go to New Haven.—*N. Y. Tribune*.

Adulteration of Beeswax.

The recent adulteration of yellow beeswax with rosin has led to the invention of a new method for its detection. E. Schmidt recommends the following process for the rapid and accurate detection of relatively small quantities of pine resin. He heats 5 grammes (75 grains) of the wax to be tested in a flask with four or five times the quantity of crude nitric acid, specific gravity 1.31 to 1.33, until it boils; and it is kept boiling a minute, then an equal volume of cold water is added, and enough ammonia (which must be added very cautiously) put in and shaken to cause it to smell strongly of ammonia. The alkaline liquid is decanted from the precipitated wax into a cylindrical vessel. If the wax was pure the liquid will have a yellow color; if the wax was adulterated with rosin the liquid will have a more or less intensely reddish-brown color from the formation of nitro-products. This being a colorimetric test, it is well to have some perfectly pure wax for comparison. The reaction is much more violent during boiling if rosin is present. As little as 1 per cent can be detected in this way.

A New Gold Salt for Toning.

BY DR. J. SCHNAUSS.

Until now there have been used only the single and double chloric salts of gold for toning. During the past winter Mr. Neumayer, student of chemistry from Munich, visited my establishment and undertook under my directions the preparation of a gold bromide and a gold bromide of calcium, for the purposes of experimenting with these salts and their uses in photography.

Thin leaves of gold are readily dissolved in bromine water and in bromine gas. But a more rational and less disagreeable mode of preparation is by the action of hydrobromic acid, nitric acid, and aqua-regia.

During the evaporation of the gold bromide, which has a dark appearance and smells strongly of bromine, great care is necessary, owing to the fact that the gold bromide vaporizes more easily than the chloride. Bromide of gold is difficult to crystallize. By the addition of an exact equivalent of bromide of calcium dissolved in water, and evaporated, small granite-red crystals of double salts are obtained. $KBr + AuBr_3 + 5H_2O$ can be with difficulty dissolved in water; but a thin solution is of a deep red color, and effloresces in dry air.

I have tried these double salts, also the gold bromide, with several additions as a toning bath. In its general effect on silver copies it is analogous to gold chloride combinations, except that in the same proportions it acts more energetically.

The addition of soda bicarbonate gives a blue-black tone, melted acetate of sodium a purple colored tone.

For a lasting gold bath, in form of a *sel encaussé*, these salts are recommended.—*Archiv.*

How to Prepare Photographs for Printing Blocks.

In the *Photographisches Archiv* appear the details of a simple method of securing an outline photograph in metal suitable for printing with type in the ordinary printing press. It is necessary to be somewhat of a draughtsman, no doubt, in order to be able to do the work well and rapidly, although nothing is said on this head, but hardly any one could, happily, undertake the matter.

Only a well marked photograph with bold lines, and in which minor details are of no account, is suitable, and the negative is in the first place put into a camera or other apparatus to furnish an enlarged positive. Upon this enlarged positive are traced, in Indian ink, the bolder lines which it is desired to retain, a pen or brush being employed for the purpose, according to the nature of the work or the desire of the draughtsman. After all details have been in this way traced, with thoroughly black pigment, the lines of a thickness corresponding to the original object, and of such a nature as to be readily reproduced by photography, the print is treated with chloride of lime or other bleaching agent, and in this was the whole of the image obliterated with the exception of the block lines made by the draughtsman.

The picture is now photographed, and in this way a small negative secured, or one, at any rate, of the dimensions of which the printing block is to be. In this case the negative will be perfectly opaque in the lights and transparent in the shadows, and from it may be easily produced, by any of the etching processes, an engraving upon zinc capable of being used in the printing press with type.

Chloride of lime is specially mentioned as the bleaching agent wherewith to render invisible the details of the silver image, after the draughtsman has done his work. We should think that a solution of bichloride of mercury would be much more effectual in making the original photographic image disappear.

Aluminum.

In a recent meeting of the Miners' Union at Freiberg, Professor Winkler described some experiments made to measure the power which aluminum possesses of resisting external influences. Tablespoons made of aluminum, of silver (75 per cent), and of German silver of best quality, were the subjects of experiment. They were in the same daily use, and were weighed at regular intervals. These spoons were purposely brought into contact with the greatest variety of food, and each time after using were rubbed with soap, washed in hot water, and rinsed with cold water. They were also occasionally washed with a dilute solution of carbonate of soda, so that they were in daily contact with hot and cold acid and alkaline liquids.

In the course of time there was a change in the appearance of the spoons. The aluminum, which at first was a beautiful white, lost its brightness and acquired a dead, bluish-grey color; the German silver also lost its brightness, while its color changed to a disagreeable greyish-yellow; the silver stood best, as it only lost its polish, but remained comparatively white. Repeated weighings showed an average annual loss in weight of:

0.630 per cent for aluminum,
1.003 " " German silver,
0.403 " " silver;

so that if it were possible to use them until entirely used up, a silver spoon would last 248 years, one of aluminum 158 years, and one of German silver 99 years.

The spoon form was selected merely because it offered the best opportunity for measuring the amount of chemical and mechanical loss in comparison with other metals and alloys tested. The results of these experiments showed that aluminum is not nearly so easily attacked as has hitherto always

been supposed, but is more like zinc; and if it could be made at a low price, it might be employed for a great variety of purposes.

NEW BOOKS AND PUBLICATIONS.

LIGHT—A SERIES OF SIMPLE EXPERIMENTS, ETC., by Alfred M. Mayer and Charles Barnard. D. Appleton & Co. 549 and 551 Broadway. 1877.

There have been so many attempts to popularize scientific experimenting, that we took up this little book with some curiosity as to the new guise in which we were sure Dr. Mayer would present his experiments. The way in which that curiosity is gratified is to us very satisfactory. The experiments are capitally selected and equally as well described. In fact the book is conspicuously free from the multiplicity of confusing directions clear enough to the writer but not to the reader, with which works of the kind too often abound. Beginning with the heliostat and its simple construction, Dr. Mayer takes up the phenomena of reflection, refraction, and decomposition of light, giving a few—and carefully avoiding too many—experiments in each branch, which are the best suited to fix the particular principle under study. Complicated and expensive apparatus is avoided, and everything needed for the entire course may, we are told, be bought for 15 dollars. There is an abundance of excellent illustrations, and Mr. Charles Barnard, who describes the various experiments as they were produced before him, has certainly ably supplemented Dr. Mayer's work. Altogether the book is very commendable, and especially so to the readers of the *SCIENTIFIC AMERICAN*.

A TREATISE ON ENGINEERING CONSTRUCTION. By J. E. Shields, C.E. New York: D. Van Nostrand & Co., Publisher, 23 Murray street. Price \$1.50.

A plainly written clear and readable little book, which owes its value to the fact that it is claimed to be the results of the author's own experience gained in a professional practice of many years. It deals with practical subjects throughout. There are chapters on sand, concrete, caissons, pile driving, etc., under foundations—a division is devoted to masonry, another to tunnels, and the last to engineering geodesy. An excellent work for young students in the profession, and a handy book of reference for any civil engineer.

THE RAILWAYS OF NEW SOUTH WALES. A report on their Construction and Working from 1872 to 1875 inclusive. By John Rae, A.M., Commissioner for Railways. Published by the Government, Sydney, N. S. W.

Mr. Rae's report shows with much clearness the advantages accruing from investing capital in railways well managed and opening up a new and growing country to commerce. At the end of the four years noted there were 437 miles of road in the colony in operation and an additional length of 251½ miles in progress. The expenditure for rolling stock, machinery shops, etc., had been about \$2,500 per mile—43 per cent of the earnings were spent in maintenance and working. For every mile open the earnings were \$7,436—the expenditure being \$3,619 and the net earnings \$3,886. The net earnings show an increase of 13 per cent for the year 1875 over that of the year 1874. A supplement to the report gives detailed descriptions of the lines and works of construction, which will be found of value to railroad civil engineers for purposes of reference and study.

MANUAL OF THE RAILROADS OF THE UNITED STATES FOR 1877. By Henry V. Poor. 10th series. Published by H. V. & H. W. Poor. 68 Broadway, New York.

Poor's manual gives as usual a valuable and very full compilation of statistics relative to all the railroads of the country, showing their present status and also their history during 1876. The past year, we learn, has been one of great depression in the railway business although the aggregate results of all operations has been "fairly satisfactory." The number of miles of road opened during the year was 2,505 against 1,919 miles for 1875, 1,911 miles for 1874. This increase is due to activity in the Southern Pacific lines and in narrow gauge lines in Ohio, Texas, and Colorado. No new lines of any magnitude have been undertaken. The gross earnings of the business have fallen off \$5,575,365, and the net earnings have increased \$946,314, the latter owing to the economies practiced in operating the roads. The information given regarding the various lines covers financial condition, property, etc., with much detail. There is a valuable appendix showing State debts and liabilities.

A TREATISE ON THE USE OF BELTING FOR THE TRANSMISSION OF POWER. By John H. Cooper, M.E., Philadelphia. Claxton, Remsen, & Haffelfinger, 624 Market street.

A thorough and complete treatise on the subject of belting has been needed by mechanical engineers for a long time. Information on the subject, of which there has been no lack, has remained scattered through the files of this and other journals or has appeared in the shape of chapters in works covering very much wider ground. Hence the matter of belting has not obtained that exhaustive treatment which its importance really warrants for it, and hence we are more gratified to see so well qualified an engineer as Mr. Cooper undertake and carry the task to a successful completion. The only blemish—if it indeed be one at all—is that his work is too full; original papers are quoted in abundance where perhaps condensation would have better suited the needs of the practical reader while the risk of repetition might have been avoided. But as a whole the book is excellently well compiled from a large number of sources. The best and newest of all on the subject has been culled. Practical hints and suggestions abound, there is a multiplicity of rules, recipes, and useful tables, and an ample supply of good woodcuts.

Inventions Patented in England by Americans.

From July 31 to August 6, 1877, inclusive.
AXLES.—B. T. Babbitt, New York city.
BARBED WIRE FENCE.—H. W. Putnam, Bennington, Vt.
BOOK.—E. S. Boynton, New York city.
EXTRACTING WORT FROM MALT.—R. d'Heureuse, New York city.
FIRE ARMS.—E. T. Starr, New York city.
GAS APPARATUS.—W. W. Batchelder, New York city.
PLUMBER'S TRAPS, ETC.—J. E. Folk, Brooklyn, N. Y.
PUNCHING AND SHEARING MACHINES.—D. Brickner, New York city.
SEWING MACHINE.—L. R. Blake, Boston, Mass.
SHOE MACHINERY.—H. G. Thompson, Milford, Conn.
TELEGRAPH INSTRUMENT.—T. A. Edison, Menlo Park, N. J.
TOOL HOLDER.—E. F. Bengler, Williamsport, Pa.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the *SCIENTIFIC AMERICAN*. We are prepared to get up first-class wood engravings of inventions of merit, and publish them in the *SCIENTIFIC AMERICAN* on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW HOUSEHOLD INVENTIONS.

IMPROVED SHADE HOLDER.

Gustavus H. Reck, Bethlehem, Pa.—This invention relates to an improved shade holder that adapts itself to any shape of burner, with iron, brass, lava, or other tip of a larger size than the body; and the invention consists of a shade holder having arms and springs fastened by their bent ends into a U-shaped collar or ring. The springs produce a firm fitting of the shade holder to the burner without being liable to get shaky or loose, as the arms and springs are attached without solder, and retained firmly by the binding action of the collar or ring, forming thus a strong, durable and tightly fitting shade holder.

IMPROVED LAMP BRACKET.

John Forster, Coal Valley, Ill.—This invention relates to an improved safety lamp stand for sewing machines, pianos, or stoves, and other purposes, and consists of a base part clamped or screwed to the table of the sewing machine or other object, and provided with a detachable standard and oil cup stand, the standard having an adjustable stand and collar for the lamp, and a pincushion at the top.

IMPROVED RECIPROCATING CHURN.

Daniel A. Fiske, St. Louis, Mo.—When the dasher of this churn is raised the wings turn down, permitting the dasher to rise easily through the cream. When the dasher is forced downward the wings are thrown up, and the inclined surfaces of the various portions of the dasher cause the cream to rotate. The upward motion of the dasher checks this rotation. The intermittent rotary motion of the cream is effective in separating the milk and butter, and the same motion tends to unite the particles of butter.

IMPROVED WRINGER.

Edwin Banfield, Jermyn, Pa.—This machine is designed for use as a wringer and as a mangle upon table linen, bedclothes, and other plain articles that are free from buttons, hooks and eyes, and other fasteners. The invention consists of the combination of wringer rolls, of a bevel guide to transfer the waste water where it is guided by cleats into a tub, and inclined tables or levers, to which the guides and cleats are attached. When the machine is to be used as a mangle, the table, with the cleats, is inverted, and the tables are adjusted in a horizontal position.

IMPROVED ROTARY CHURN.

William Knaggs, Richview, Ontario, Canada.—The object of this invention is to furnish an improved churn dasher which shall be so constructed as to bring the butter very quickly, and gather it quickly and thoroughly. The dasher rod is made square, passes through square holes in the centers of crossbar, and its end revolves in a step or socket attached to the bottom of the churn body. The other end of the rod is enlarged, passes through a bearing, inserted in a hole in the top of the churn body, and attached to or formed upon a small plate secured to the top. By this construction, when the dasher is turned forward the milk is drawn inward by the bars, is forced through the opening between their inner edges, and strikes against the inclined bars, by which it is divided and thrown in opposite directions. When the dasher is turned backward the rear sides of the bars act as paddles or ladles for gathering the butter.

IMPROVED ROTARY CHURN.

Honoré G. Fougea, Cape Girardeau, Mo.—This invention relates to a new motive power which is especially designed for mixing liquids, for churning butter, and for other purposes where a rapid and alternate rotary motion is found useful. The aperture may be made small enough to fit an ordinary tumbler, or can be constructed on a scale large enough for churning butter or washing fabrics. The upper end of a spindle has a bearing in a handle, which is screwed fast upon the cap. The lower end of the spindle is screw-threaded to receive the shaft of a dasher, which may be of any desired form. Between the upper end of the dasher shaft and the top of the cap a balance wheel is applied, on the tapering part of the spindle, and confined by friction, so that in the event of the dasher meeting with a resistance which would be liable to injure the machine the said wheel will slip. Inside of the cap is fitted a collar which may be made of sheet metal, and which is constructed with a circular flange that receives upon it a cylinder. The collar will prevent fluids from getting inside of the cap. The cylinder is designed to prevent fluids which are being agitated from flying out of the vessel containing them. The machine is operated by means of a strong chord, which is wound around the pulley on a spindle, and which may be held in the hand or attached to a lever, and guided by a pulley. This improved agitator will be found very useful for mixing all kinds of fluids, for churning, making ice cream, beating eggs, washing fabrics, and for many other purposes.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED CORN PLANTER.

William M. Steel, White Day, W. Va.—This invention consists in the combination of the U-shaped iron bars with the axle of the sulky, to adapt it to receive the operating parts of the machine; and in the combination of the bar, the hopper or hoppers, the dropping slides, the spring bar, the stand, and the block or blocks with the U-bars and the axle and wheel of the sulky. To the rear side of the axle are bolted the forward arms of two U-shaped iron bars, within which is secured a wooden bar. To this bar is attached a long hopper, or two short hoppers, to receive the seed, and from which the seed is removed by dropping slides which have holes formed in them of such a size as to contain enough seed for a hill, and pass through slots in the front and rear sides of the hopper. The forward ends of the dropping slides are pivoted to a spring bar, one end of which is attached to a stand attached to the axle near one wheel, and its other end projects so as to be struck by a block or blocks attached to the spoke or spokes of the other wheel. The slides are kept from coming out any more seed than enough to fill their dropping holes by rubber blocks attached to the forward side of the hopper. The seed drops from the slides, through holes in the bar, into the conductor spouts, attached to the lower side of the said bar, and upon the lower ends of which are formed, or to them are attached, points to open the soil to receive the seed and points to cover the seed. The spouts are connected by a rod, so that their lower ends may be adjusted to plant the rows wider apart or closer together. The distance apart of the hills is regulated by the number of blocks attached to spokes of the wheels. The amount of seed dropped for a hill is regulated by using slides with larger or smaller dropping holes.

IMPROVED STONE-QUARRYING MACHINE.

John B. McRae, Mount Holly, Ark.—The object of this invention is to work the large quarries of soft white stone which are found in Texas and other States, and which produce a very useful building material, by a machine which is designed to cut the stone in the quarry directly into blocks of the required size in a quicker and more economical manner than with the present slow and tedious methods of quarrying them; and the invention consists of a car with a steam engine or other motor driving a vertical and adjustable front saw, a horizontal and adjustable saw back of the same, and a third vertical rear saw, at right angles to the front saw, to divide the long pieces of stone cut from the bed into blocks of the required size. The rear saw is made vertically adjustable by a suitable lever and guide arrangement. A car of suitable size is propelled to the place of work on a track laid in the quarry. The car is provided with a steam engine or other motor, by which the cutting saws are revolved and the car moved forward while the machine is in operation. The car is moved up along the bed of stone as the cutting progresses. At the front part of the car is placed a vertical saw, of suitable diameter, that cuts down into the bed of stone.

IMPROVED HYDRANT VALVE.

Frederick Shriver, Grand Rapids, Mich.—The object of this invention is to construct a hydrant valve that cannot freeze or become obstructed so as to be inoperative. Above the valve seat openings are made through the sides of the part of the valve that projects into the supply pipe and passages are formed in the projections on opposite sides, which extend downward below the casing to permit the escape of waste water. The valve consists of a follower, which is reduced in diameter to receive the packing which caps over its end and extends upward to the shoulder, which is under a nut to retain the edges of the packing. Below the packing a centrally perforated disk is placed, which is provided with a lip around its outer edge that projects downward. Below the disk there is a leather or rubber

packing disk, and a screw passes through the disks and packing into the follower, holding all of the parts together. Above the shoulder the follower is reduced in diameter to permit the waste to escape through the passages when the valve rests on its seat. A rod is screwed into the valve for operating it. The part is connected with a supply pipe, and the valve is raised it closes the upper portion of the hydrant by a pipe. When the valve is raised it closes the waste passages and allows the water to pass from the passage through the openings to the chamber, and thence through the pipe. When the valve is closed the water remaining in the pipe escapes through the waste passages, and should one of the passages become clogged the other is sufficient for the escape of the waste water. The valve casing may be made partly from pipe fittings, or it may be cast entire from steam metal or other suitable machinery.

IMPROVED MILLSTONE-DRESSING MACHINE.

Frank Miller, Lapeer, Mich.—The object of this invention is to furnish a device for dressing millstones which will keep a perfectly true surface upon a stone, and will feed the cutter forward automatically as each cut is made. The invention consists in a combined frame and slotted arm, a pivoting bolt, pivoted slotted lever, sliding crosshead, cutter, pawl, ratchet wheel, and a swiveled screw adapted for use in dressing millstones. A small rectangular frame is planed perfectly true, from the inner end of which an arm projects which is slotted longitudinally to receive a bolt, by which the inner end of the lever is pivoted. The inner end of the lever is slotted longitudinally to receive a pivoting bolt, so that the said bolt may be adjusted to cause the cuts to approach each other at a greater or less angle, as may be desired. The lever rests and vibrates upon the top of the frame and arm. The part of the lever that is over the frame has longitudinal flanges formed upon its upper and lower sides, to serve as ways for a crosshead to slide upon. To the crosshead is pivoted the end of a pawl, which rests upon the upper end of the cutter, or upon some other stop attached to the said crosshead. The cutter makes the cut as the crosshead is drawn inward, and as the said crosshead is pushed outward the engaging end of the pawl strikes against the teeth of the ratchet wheel and turns it. As the screw is turned by the outward movement of the crosshead the lever will be moved laterally to bring the cutter into the proper position for making another cut. With this construction the stone will be dressed from the eye to the skirt, just the same as a stone will wear, facing the stone at the eye or center, and cracking it at the skirt.

IMPROVED ADJUSTABLE GAUGE FOR SAWMILLS.

Franklin Wheeler, Berlin, N. H.—This invention has relation to gauges for circular-saw mills; and the nature of the invention consists in a gauge or guide applied to a bar which is adjustable between guides, and provided with a handle and a latching device. The bed plate of the gauge is secured upon a solid foundation, and arranged at right angles to the plane of the saw. On this bed plate are constructed two parallel guides, between which is a sliding gauge bar. A gauge roller is applied on a post, so as to rotate freely, which post is rigidly secured to one end of the bar, and stands perpendicular to it. A handle is secured to a bar at the end bearing the roller, and which is perpendicular to this bar. To this handle is pivoted a latch bar, to the free end of which a shouldered latch pin is loosely applied, which passes freely through the bar and enters one of a number of holes made through the bed plate between the guides. Rising from the pivoted end of the latch bar is a tongue, between which and the handle is a spring that acts to keep down the latch pin. By firmly grasping the handle and tongue the pin will be raised out of its hole, and the gauge bar can be adjusted endwise, according as it may be desired to edge the stuff to be sawed. The top of one of the guides is graduated by marks corresponding to the holes, and a pointer fixed to the bar opposite to the latch pin is used to indicate the position of the roller with respect to the saw.

IMPROVED TWISTING SPINDLE FOR MAKING CORDAGE.

Charles E. Brownell, Moodus, Conn.—The object of this invention is to furnish an improved spindle for twisting twine and other three or more strand cordage, which shall be so constructed as to enable the twist to be made tight or loose, which shall be evenly balanced, and which will stop itself automatically should one of the strands break. To the spindle is attached two plates. In the plates are formed holes to receive the journals formed upon the end plates of the fliers. To the upper side of the upper plate are attached the ends of springs which have bends formed in them near the hollow journals of the fliers to receive the strands. The springs are so formed that when left free their bends will be upon the outer sides of the hollow journals, and their outer ends will project beyond the periphery of the plate. By this construction the tension of the strands will draw the free ends of the springs inward; and, should the said strands break, the elasticity of the said springs will throw their outer ends outward, to strike against the frame of the machine or against stops, attached to said frame to stop the device and prevent waste of material. The springs thus act as tension devices and as automatic stops. The tension upon the strands may be varied by regulating the force of the springs and increasing or diminishing the number of coils of the strands around the arms. The ring plate on the spindle can be driven at different velocities, thus imparting to the fliers any relative number of revolutions to one of the spindle. In this way the twist of the strands can be exactly adjusted to the last twist, so that the completed cord will not kink.

IMPROVED DREDGE BUCKET.

James McSpirt, Jersey City, N. J.—The object of this invention is to provide a device for operating dredge buckets and grapples by means of levers and connecting rods, and to dispense with the usual windlass and other objectionable devices. This arrangement of the lever and connecting rod forms a pair of toggle joints for each half of the bucket, which are capable of forcing them together against great resistance. A roller is journaled in the upper part of the frame for guiding the chains that operate the buckets. A chain is attached to the sheave, and winds partly around it when the buckets are closed, and extends upward to the crane that supports the buckets, and a chain is attached to the upper end of the lever, and passes under the roller and upward to the crane before mentioned. It is obvious that the levers and devices described in connection with dredge buckets may be employed with equal advantage to operate grapples.

IMPROVED INDICATOR FOR MINING SHAFTS.

Calvin O. Richardson, San Francisco, Cal.—This invention consists of a bell having a spring tongue or clapper that vibrates easily, so that when the bell is attached to the hoisting rope of a mining shaft, and the tub or cage descending, the clapper will strike the bell when there is a slight checking or variation in speed, which is caused by the momentum of the clapper overcoming the slight resistance of the spring tongue. Thus warning is given of the descent of the cage or tub. A more violent ringing is caused as the tub approaches the bottom, by the brakeman making a few sudden pressures upon the brake, thus warning the workmen to stand from under.

IMPROVED STEAM ENGINE.

William Walker, Bury, England.—This is a tri-cylinder engine of the vertical pattern. The pistons have reduced extensions, and a bored passage extends through both. When a piston recedes in its cylinder the extensions uncover the live ports and admit steam to the contiguous cylinder which thus acts on the contiguous piston and forces it down. When this last-named piston rises, an aperture in its extension registers with the live steam port and the exhaust of the contiguous piston then takes place down through its bored passage. Thus, as each piston descends, it opens the port of a contiguous piston, and, as it rises, it opens the exhaust for the piston on the other side. The engine is reversed by a suitable rotary valve.

IMPROVED HOISTING MACHINE.

Henry Batt, Kentish Town, London, Eng., assignor to Leonard G. Tabraham, Boston, Mass.—This invention consists in the combination of the

fast and loose pulleys, short shafts, sliding gear wheels, large gear wheels, and clutches with each other. When certain wheels are in gear the machine works with great power and slow movement. When other wheels are in gear a faster movement is obtained, but less power. When other wheels are in gear it will work as a single purchase hoist and with medium power and speed. Brake straps are arranged for controlling the movement of the apparatus, which are attached at one end to the frame, passing over a drum wheel, and their outer ends are attached to the short arms of bent levers, which are pivoted at their angles to the frame, or to supports attached to said frame, and are provided with catch bars to hold them in place when adjusted.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED HORSE-DETACHING APPARATUS.

Warren Jones, Berlin, Wis.—The object of this invention is to provide an improved horse-detaching apparatus for vehicles, designed to enable the driver to entirely disconnect the team without getting out of the vehicle, either for convenience in practical every-day use, or for special emergencies in the event of a runaway or fall of the horse. To this end the improvement consists mainly in the particular construction and arrangement of a locking stud for the trace combined with the ferrules on the whiffletree, so as to be moved outwardly from the end thereof to release the tracer; and it also consists in the combination with the detaching devices of a peculiar form of brake designed for simultaneous and joint operation with the detaching devices, to stop the momentum of the vehicle and prevent accidents which might occur, after the horse is loose, in going down hill or over dangerous roads.

IMPROVED HANDLE ATTACHMENT FOR CARPETBAGS, ETC.

Abraham Kaufmann, New York City.—The object of this invention is to provide for satchels, traveling-bags, pocketbooks, and similar articles an improved spring clasp for holding the jaws of the satchel frame rigidly in closed position, the spring clasp being used in connection with the handle or separately at the ends of the satchel frame, as desired, and forming a neat and reliable closing device in addition to the lock. The pivot clasp at present in use on satchels and bags bind sometimes too tightly on the jaws so as to chafe the leather of the same, or work too easily so as not to close the frame reliably, or get bent or broken, or present other objectionable features, which this clasp is intended to overcome, as it will always fit the frame, lock the same rigidly, and be operated especially when connected to the handle by the mere raising of the handle, without separately taking hold of the clasp for closing. The invention consists of a clasp, of angular or other shape, pivoted to posts of the outer jaw and binding over the other jaw. The clasp is retained in locked position by a spring pin entering a hole of one of the posts, and being pushed back for releasing the clasp by a sliding thumbpiece. The swing clasps are provided with sockets, into which ferrules at the ends of the satchel handles are inserted and locked by a kind of bayonet joint.

IMPROVED BOOKBINDING.

Oswald Routh and John S. Routh, New York City.—This invention relates to the binding of books; and it consists in fastening the leaves together by means of metallic clips which take the place of the usual tape. The invention is especially applicable to schoolbooks, but it may be applied with advantage to books of other descriptions. The common difficulty with tape-bound books is that the tape becomes torn or broken by the constant and usually careless opening of the book, and the leaves of the book become loose, and are soon lost or destroyed. Another difficulty with books bound in usual manner with tape is that the cover must be formed on the book; a finished cover cannot be applied. By this improvement these difficulties are avoided, and the book is made stronger and more durable, and may have applied to it an embossed or ornamental cover.

IMPROVED BALE TIE.

Robert G. Stewart, Augusta, Ga.—This invention relates to means for fastening bands around bales of all kinds of material; and the nature of the invention consists in a novel way of uniting the lapped ends of a bale band by means of a screw, whereby a substantial and safe fastening can be made with great facility. A screw is passed through one of the holes of the end of the band until the neck comes within the hole. The upset portions are then reset or pressed back, so that they will not allow the screw to be removed, but will allow it to turn freely. The screw thus permanently attached to the band will not get lost. When the ends of the band are lapped around a bale, the screw is set home into the end, and a firm fastening is made. By means of a wrench of a suitable kind, the ends of the hoop can be very forcibly drawn together and held fast.

IMPROVED COFFEE CLEANER.

Patrick McAuliffe, New York City.—This invention has reference to an improved machine for cleaning and polishing coffee in superior manner, the machine being of simple construction, run with comparatively small power, and producing a very satisfactory result, as all the skinny particles are screened off and the appearance of the coffee greatly improved. The invention consists of revolving scoop-shaped wings or stirrers, in connection with a drum or cylinder mounted loosely on the stirrer shaft, and following the motion of the stirrers, the drum being made of sheet metal, with laterally alternating perforated and not perforated sections. The weight of the coffee and the motion of the stirrers impart to the loosely mounted cylinder a motion in the same direction as the stirrers, but considerably slower than the same. This produces continuous changes in the position of the coffee in the cylinder, so as to exert an additional cleaning and polishing influence upon the same. The influence of the lifting and dropping of the coffee by the stirrers, in connection with the difference of the motions of the stirrers and cylinder, produces the effective polishing of the coffee by a machine of simple construction and operation.

IMPROVED COPYING PRESS.

Elias Gill, San Francisco, Cal.—This invention relates to an improved copying press, of simple and effective construction, that combines economy, utility, and convenience with lightness and facility in handling, the same requiring no extra stand, but being placed, without fastening, on any table or support, and readily put away when not required for use. The press is readily operated by bringing the cam handles toward each other, allowing the top board to remain for a short time in this position, and then reversing the cams, so that the rubber springs raise the top board and admit the taking out of the copying book. The press may be furnished at less cost than any one of the common screw presses in use, while it furnishes just as good copies. It needs not to be screwed or fastened down to keep in place, as the pressure is exerted at the same time at both ends of the same. The press, when of wood, is light and easily handled or removed, but strong enough for all the purposes required.

IMPROVED CONCRETE PAVEMENT COMPOUND.

Edwin Jacques, Great Falls, N. H., assignor to himself and Raphael Gotler.—The object of this invention is to construct street pavements, sidewalks, and basement floors of a compound or concrete which will not be liable to crack, nor to be injuriously affected by frosts or extremes of temperature, and which will be cheap and require only ordinary skill to lay it down. Formula: For about twenty-seven square yards of pavement, mix together, in about the same proportions named, 1 barrel of gas tar, 30 lbs. of "gum" tar, 1 lb. of alum, 1 lb. of washing soda, 1/4 lb. of brown potash, 19 ordinary sized wheelbarrow loads of sharp sand. The gas tar is boiled with the gum tar about one hour and a half. Then add the potash, alum, and soda, dissolved in about one gill of water. The sand is then added by making alternate layers of it with the first named ingredients. The concrete is then run through a machine suitably adapted to the purpose, which thoroughly mixes the ingredients. The bed or ballast for the

pavement is composed of small stones, properly tamped down, and then the hot concrete is spread on the gravel to the thickness of about three inches, and rolled down solid. For gutters, add a finishing coating of boiled tar.

IMPROVED TOOL STOCK FOR DENTAL ENGINES.

Edwin Telle, New Orleans, La.—This stock is formed by coiling a wire spirally and then coiling another wire around it in the other direction. This construction makes the stock flexible, and prevents the wires from uncoiling when in use. The stock may be made of steel or other suitable metal, may be made of any desired flexibility, and may be made flexible for the entire length, or may be made partly flexible and partly solid, as may be desired. With this construction the various operation of smoothing rough surfaces upon teeth, and of shaping, smoothing, and polishing complicated gold filling, will be much more pleasant to the patient than when said operations are performed with the wheels, disks, and points mounted upon rigid stocks, and there will be much less liability to break thin and delicate corundum disks.

IMPROVED MEASURING DEVICE FOR FILLING CARTRIDGES.

John D. Wilkinson, Plattsburg, N. Y.—The object of this invention is to furnish to sportsmen and others an improved cartridge loading implement, by which the charges of powder of the required size are obtained in quick and accurate manner, and the loader consists of two cylinders, one sliding within the other and turning between top and bottom plates, to which they are pivoted. The top cylinder has an opening and changing tube, registering with an opening of top plate and funnel, and the lower cylinder a connecting tube and opening registering with exit opening and spout of bottom plate. When the loader is clamped to the table, adjusted to the charge desired, and the powder placed in the funnel, the drums or cylinders require only to be turned from the supply hole to the discharge hole and back, and a charge is furnished with each forward turning of the drum, so as to produce the rapid and accurate charging of the shells in uniform manner.

NEW AGRICULTURAL INVENTIONS.

IMPROVED RIDING PLOW.

James L. Florance, Plano, Texas.—The object of this invention is to furnish an improved riding or sulky plow which is so constructed that the plow may be readily lowered into, raised from, and adjusted to run at any desired depth in the ground, and which may be adjusted to take or leave land, and to hold the carriage level when both wheels are running upon unplowed land, and when one wheel is running in a furrow. To the rear part of the side bars of the frame are attached the upper ends of two bars, the lower ends of which are bent outward, or have hooks formed upon them, to catch upon a crank when the plow is raised out of the ground to pitch the plow forward and prevent the forward end of the beam from interfering with the tongue or its brace frame.

IMPROVED CORN HARVESTER.

Washington B. Mayfield, Seneca, Mo.—The object of this invention is to furnish an improved machine for harvesting corn by stripping the ears from the stalks while standing in the field; and the invention consists in the combination of strippers, bales, levers, and a box made with an inclined bottom, a vertical flange or apron, and a detachable back, with the wheels and axle and the frame work of the machine. The strippers are formed of a number of parallel fingers, placed about an inch and a half apart, and made about an inch and a half wide upon their upper sides. The fingers are made thinner upon their lower sides, so that the stalks cannot wedge themselves while being drawn through. The ears, being thicker than the spaces between the fingers, will be stripped from the stalks and left upon the said fingers. The strippers are made to move up and down vertically by guide pins attached to their rear ends, and which pass through vertical slots in the apron or flange. The strippers are hung with their forward ends inclined upward so much that when the said strippers are raised above the level of the forward side of the box the ears will slide from them into the said box. When a sufficient quantity of ears has been collected the sliding back of the box is raised and the ears are allowed to slide out, and are left upon the ground in a heap.

IMPROVED DEVICE FOR DEPOSITING FEED IN TROUGHS.

Andrew J. Rush (Simpson's Store P. O.), Nineveh, Pa.—The object of this invention is to furnish an improved device for feeding grain to sheep in troughs, which is so constructed as to spread the grain evenly through the trough, and prevent the spilling and waste of the grain from the crowding around of the sheep. The invention consists in the combination of bars, wheels, sliding bottom, and lever with the feed box; in the combination of regulator and its lock with the feed box, the lever and the sliding bottom, and in the combination of the curved rods; and the sliding stroke board with the sliding bottom, the lever, and the feed box. To the outer corners of the sliding bottom are pivoted the ends of two rods, which pass through the guides attached to the forward parts of the sides of the box, and through the projecting ends of a bar attached to a board, that slides up and down upon the rear side of the lower part of the box. The rods are so curved that, when the sliding bottom is drawn outward to allow the grain to flow out, the sliding board will be lowered to stroke off or level the grain in the trough, so that it may be of uniform depth, giving all the sheep an equal chance at the feed.

IMPROVED MILK COOLER.

Charles W. Loller, Unionville, Pa.—This invention has reference to a milk cooler that admits the action of the cooling medium on the bottom and sides of the pan, together with an adjustment of the level of the water to the level of the milk in the pan. The invention consists of a milk pan with bottom inclined from the sides toward the center line. The pan is set into and connected to an inclosing water tank, having adjustable exit pipe to regulate level of water in the same. The cold water enters at one corner and passes around the pan in the surrounding space to an exit pipe at the opposite corner, its level being controlled by a vertically sliding pipe, to correspond to the level of the milk in the pan. The bottom of the pan is made dishing by being inclined at a suitable angle from the longer sides to the center line of the pan. This produces triangular spaces between the bottom of pan and vat, into which the cold water may enter, so that the bottom of the milk pan is cooled off in the same manner as the sides. The connection of pan and vat forms a connected cooler that is conveniently handled. The vat may be readily cleaned by taking out the sliding tube, and the milk drawn off from the pan by an exit pipe and suitable stopper, in the customary manner.

IMPROVED TOBACCO PLANT PLANTER.

Robert A. Knox, Ghent, assignor to himself and Darrall Brothers, Louisville, Ky.—This is a hand-machine for setting out tobacco plants, and is so constructed as to open a hole to receive the plant, guide the plant into the hole, and press the soil around it. In using the machine, it is carried by the handle, and is placed upon the spot where the plant is to be planted, and the other hand is pressed down upon the knob of a rod, which forces the head into the soil and opens a hole to receive the plant. The operator then removes his hand from the rod, allowing the head to be withdrawn from the ground by a spring, takes a plant from a sack that he carries around his neck, and drops it root downward into the spout, a semi-conical plate guiding it into the hole opened by the head. The operator then presses two handles together, which forces sliding bars downward and presses the soil around the plant. The two handles are then released, allowing the spring to raise the bars, and with the thumb of the hand that grasps the two handles the operator presses the rod, which swings the lower part of the plate back and allows the machine to be raised, leaving the plant standing in the ground.

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Notes & Queries

It has been our custom for thirty years past to devote a considerable space to the answering of questions by correspondents; so useful have these labors proved that the SCIENTIFIC AMERICAN office has become the factotum, or headquarters, to which everybody sends, who wants special information upon any particular subject. So large is the number of our correspondents, so wide the range of their inquiries, so desirous are we to meet their wants and supply correct information, that we are obliged to employ the constant assistance of a considerable staff of experienced writers, who have the requisite knowledge or access to the latest and best sources of information. For example, questions relating to steam engines, boilers, boats, locomotives, railways, etc., are considered and answered by a professional engineer of distinguished ability and extensive practical experience. Inquiries relating to electricity are answered by one of the most able and prominent practical electricians in this country. Astronomical queries by a practical astronomer. Chemical inquiries by one of our most eminent and experienced professors of chemistry; and so on through all the various departments. In this way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present. The large number of questions sent—they pour in upon us from all parts of the world—renders it impossible for us to publish all. The editor selects from the mass those that he thinks most likely to be of general interest to the readers of the SCIENTIFIC AMERICAN. These, with the replies, are printed; the remainder go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which should be answered by mail; in fact, hundreds of correspondents desire a special reply by post, but very few of them are thoughtful enough to inclose so much as a

postage stamp. We could in many cases send a brief reply by mail if the writer were to inclose a small fee, a dollar or more, according to the nature or importance of the case. When we cannot furnish the information, the money is promptly returned to the sender.

(1) F. R. asks: How is liquid bluing made? A. The greater part of the laundry blues in the market consist of Prussian blue dissolved in water by the aid of oxalic acid or potassium ferrocyanide (yellow prussiate). The quantities are about 17 per cent dry oxalic acid, or 18 per cent potassium ferrocyanide.

(2) G. L. D. says: Why can a person turn a screw easier with a long screw driver than with a short one? A. Because the long screw driver tips a little and so gives more leverage on the screw than the short screw driver.

(3) G. W. S. asks: 1. Will eosine make a reliable ruling ink that will not fade? A. No. 2. What is used for setting aniline colors, so as not to copy when dampened? A. You will not succeed in making an eosine ink that will not copy more or less when moistened.

(4) W. H. T. asks how to make collodion of dark purple color for the purpose of insulating fine copper wire? A. Collodion may be made by dissolving gun cotton (the low grade) in equal parts of absolute alcohol and ether. It may be colored or tinted to suit by slight additions, to the solvents, of the various coal tar dyes. The drying may be expedited by the use of hot air.

(5) J. S. B. asks: 1. How can I electro-plate with gold and have the deposit have the appearance of 16 and 18 karat gold? A. The following is said to give fine results when properly worked: Make the anode of an alloy composed of 1 part silver, 9 parts copper, and 30 parts gold. Immerse this, connected with the positive pole of a strong battery, in a hot aqueous solution of potassium cyanide contained in a small porous cup, and place the cup in a large vessel of copper. Fill up around the cup with water to which has been added a little ammonium nitrate, connect the copper with the zinc of the battery, and heat the whole to about 110° Fah. on a stove, while the current is passing. When the solution has taken up enough of the alloy (which may be determined by means of an hydrometer, or by weighing the dry plate before and after), remove the solution and plate from it in the usual manner, using the alloyed anode. 2. By what means can I best solder small pieces of steel together? A. Heat the joint sufficiently, flux with acid zinc chloride solution, and use a plumber's solder. 3. How can I best nickel plate on zinc? A. Give the zinc a good coating of copper, using a strong battery, and then plate on the nickel from an ammonio-nickel chloride bath.

(6) S. A. S. asks: Of what dimensions should I make a tank to hold 1,300 gallons, height and width to be the same, length one third longer? A. The proportions (inside measurement) should be 4 feet 9 inches width and depth, and 7 feet 4 inches length.

(7) R. E. M. B. asks: Can you give me a recipe for making a varnish impervious to water, to use on a fishing rod? A. To make it, put gum shellac in a vessel, with alcohol sufficient to cover it and keep it in a warm place until the gum is dissolved. If too thick, add alcohol until thin enough to flow readily.

(8) A. S. says: I have been trying to solder zinc, but cannot get the solder to adhere. I have used rosin and sal ammoniac, but neither will make it adhere. A. Use as a flux, muriate of zinc. To make it, dissolve zinc in muriatic acid and use after ebullition has ceased.

(9) F. B. H. asks: Would an apparatus constructed of India rubber lose its efficiency (strength and elasticity) if required to work in steam in a boiler, and would it lose this if immersed in water? A. Yes, in time.

(10) J. G. says: I am running a corn mill by water. I notice that at times my leather belt, which runs on a wood pulley at one end and an iron pulley at the other, gives off sparks of electricity. What is the cause? A. Friction of the belt upon the pulleys.

(11) J. J. H. asks: Why is it that the shadows of two objects appear to protrude and meet each other when the objects are moved toward each other, and that the protrusion proceeds from the shortest shadow? A. The effect is produced by the overlapping of the penumbra at the sides of the shadow. The penumbra of the long shadow or the shadow of the object the farthest away is the largest, and reaches the shadow of the nearest object first, making that side more dense, which makes it appear to protrude from that side first.

(12) H. H. asks: Can a spindle be made to run 32,000 revolutions per minute? A. It does not seem impossible.

(13) H. S. W. says: I find in using varnish that numbers of small bubbles rise on the surface of the work and seriously detract from the smooth appearance. What is the cause? A. It may be due to roughness of the surface varnished, presence of moisture in the wood, unevenly cut brush, imperfect fluidity of the varnish, or poor spirit solvent, etc. Use a well cut sash or fine varnish bristle brush, see that the wood is dry, and do not lay on the coatings too heavy. With shellac varnish, perfect smoothness in the coating is with difficulty obtainable unless the first coat is rubbed down properly with pumice.

(14) W. H. G., Quebec, asks for a recipe for waterproofing cloth? A. In one vessel dissolve 1 lb. of the lead acetate in about a gallon of rain water, and in another dissolve 1 lb. of alum in 3 gallons of water. Pass the cloth first through the lead bath, then through the alum solution, and finally wash in water, and dry. Another common method of waterproofing is the following: Boil 4 1/2 ozs. of white soap in 3 1/2 gallons of water, and separately dissolve 5 1/4 ozs. of alum in 2 1/2 gallons of water. Heat these two solutions to 190° Fah., and pass the goods once through the soap bath, and afterwards through the alum solution. Lastly, dry it in the open air. The alum causes the precipitation of an insoluble alum soap within the fiber.

(15) L. F. B. asks: Will it be safe to run a six feet fly wheel up to four or five hundred revolutions a minute? The wheel has six arms and an oval-shaped rim about four or five inches wide. A. You do not send sufficient data, but if the wheel is well proportioned, it can be safely run at the higher speed named.

(16) W. G. says: I have a velocipede of the three wheel kind; how is it I cannot make it go advantageously on a good level and solid gravel road? A. If, as we suppose, the trouble in the gravel road is caused by the wheels cutting in too deeply, the remedy is to make them with wider treads.

(17) J. N. J. asks for a recipe for making citrate of magnesia? A. Take carbonate of magnesium 25 parts, citric acid 75 parts, distilled water q. s. Mix, reduce to a thick paste, which dry at a temperature of about 75° Fah. To make the effervescent mixture take of the above 14 parts, and mix with bicarbonate of sodium 13 parts, citric acid 6 parts, and powdered white sugar 3 parts. Moisten the mixture with a sufficient quantity of alcohol and pass it through a tinned iron sieve to form a coarse powder. Dry in a moderately warm place and keep in a well closed jar.

(18) L. E. says: Will you give me the best method of casehardening iron? A. Pack the articles to be casehardened in an iron box filled with bone dust or animal charcoal made of burnt leather. For small articles short pieces of gas pipe will do instead of an iron box. The ends must be stopped and luted with clay. The leather may be burnt in a pan or in a stove, and it must be reduced to powder before being packed around the work. Heat the receptacle and the contained work red hot, in a furnace, for a length of time proportionate to the size and thickness of the articles. Thin articles will require to be kept at a red heat only a few minutes, while heavy articles may require half an hour or more. When sufficiently heated, quench the work as soon as possible in cold water.

(19) E. M. asks how malleable iron is made? A. Malleable cast iron is the mode of decarburizing cast iron by a process of cementation by means of hematite, which imparts a portion of its oxygen to the carbon in the cast iron, forming a chemical union and extracting the carbon from the castings. Scales derived from the process of rolling iron bars are sometimes used. The castings are packed in iron boxes, carefully luted, and kept in a furnace at a red heat for several days.

(20) F. T. M. asks: How can I weld malleable and wrought iron together? A. Try a high heat, and use powdered borax as a welding flux.

(21) G. W. D. asks for a method of separating iron ore in fine grains from common sand, and also asks if the mass can be passed through water resting on a liquid of greater density than the silicate portion, but not too dense to allow the iron particles to pass through? A. Metallic iron and many of its oxides and other combinations may be cleanly separated from sand by means of powerful magnets, preferably grouped into batteries the poles of which form part of the surface of a cylinder. We do not know of a fluid having all the requisite qualities to be of practical value in the way you suggest.

(22) H. V. asks: What is the method of diluting tinctures, etc., that is, what quantity of spirits and water are used in reducing from the tinctures to the 30th and highest dilution? A. The rule is, we believe, to reduce the strength of the tincture one hundred times at every dilution, thus: 1 part (by weight) of standard tincture (=a)+100 parts diluent=a'; 1 part a'+100 parts diluent=a'', and so on. The diluent is usually either water or a spirit just strong enough to hold the substances in solution.

(23) S. T. asks: Was a post mortem examination ever held on the bodies of the Siamese twins? What was the result of the investigation? A. Yes. The result showed that there was a union at the two ensiform cartilages, which were joined very near the median line of the band. There were three pouches, the lower one being separated from the skin by a very delicate layer of tissue, and passed from the abdomen of Chang and was lost in the duplicature of the suspensory ligament of the liver of Eng. Above this was a similar pouch belonging to Eng, and between this and the under surface of the ensiform conjunction was the third and largest pouch, also prolonged from Chang's abdomen, until it reached the peritoneal cavity of Eng, but was not continuous with it. Thus two of the pouches belonged to Eng. A connecting band was also found between the livers. The two portal circulations were connected and the peritoneal process extended across the ligament.

(24) L. K. says, in answer to E. C. H., No. 7 (23), who asks how to make a good Babbitt box: When the shaft or journal is adjusted to the proper place, sprinkle on some powdered rosin. When the metal is poured in on this rosin it burns, causing the metal to flow, by keeping it hot, into all parts of the box.

(25) Gas, Pittsburgh, asks: What was the process employed for the manufacture of oxygen gas by the company which attempted to introduce it into use in conjunction with the ordinary gas? A. It was produced by the union of a jet of oxygen and a jet of common street gas, the street gas supplying the hydrogen. The oxygen gas was made by subjecting a quantity of manganese, placed in a retort, to a heat of 850° Fah. in combination with a steam jet whereby the oxygen was liberated and carried into a gasometer for use.

(26) W. H. B. asks: Will you give me the name of some good work on optics and lens grinding? A. Consult Lommel's work.

(27) C. H. J. S. asks: Will you give me directions for making putty? A. Glazier's putty is made by working up whiting with drying oil. Polisher's putty, or putty powder, may be made by keeping molten tin exposed to the air at a strong red heat, in an open crucible, till it is converted into a white powder.

How can I make the magic water pens? A. Triturate any of the aniline colors soluble in water with enough thick gum solution to form a paste. Place a little of this in the hollow part of the pen with a tight spring to

keep it in place when dry, and to direct the flow of liquid when in use.

(28) C. H. K. asks: 1. How is caustic ammonia used for rheumatism, as recommended in the SCIENTIFIC AMERICAN? A. It should be diluted with about 30 parts of water and applied externally. 2. I am somewhat confused by the different names: "Caustic ammonia," "liquor of ammonia," "aqua ammonia," etc. Are they not different names for the same thing? A. Yes. It is a solution of gaseous ammonia in water. The proper name for it is ammonium hydrate.

(29) A. L. L. asks how far apart to space the holes in a pantograph, and by what mathematical rule it is figured? A. There is no rule for spacing the holes. Make them as close as consistent with the strength of the instrument. The scales of the drawings are to each other as the distances of the pencil and of the tracing point from the pivot.

(30) D. N. B. C. asks: Is there any simple method by which to determine whether well water, still palatable, is contaminated with sewage or other dangerous material? A. Add to a small sample of the water enough of an aqueous solution of potassium permanganate to impart a slight but perceptible tint. If this disappears shortly, it may be concluded that the water is unfit for drinking purposes. Add to another sample about 1/10th its volume of a saturated, cold aqueous solution of tannic acid, and allow to stand covered for 24 hours. Any notable quantity of organic matter in the water will be indicated by the formation of a precipitate.

(31) T. R. asks for a preparation that will keep white holly (wood) from getting soiled? A. Use a thin varnish made of bleached shellac dissolved in alcohol.

(32) A. H. W. asks for a recipe for a cement to be used cold, for cementing pieces of glass together without heating the glass? A. Boil isinglass in water, to a creamy consistence, and add a little alcohol. Warm before using.

How can I make the best dark bronze for cast iron? A. Melt together equal quantities of sulphur and white oxide of tin.

(33) Enquiring Reader asks: What is the best and cheapest process for manufacturing table salt from rock salt? A. Ordinarily it is simply washed and ground. All qualities are not sufficiently pure for table use.

(34) W. B. asks: Can I obtain glass that will melt in an iron ladle over a common coal fire as lead is melted? A. Soluble glass, composed of 1 part silica and 2 parts potassium or sodium carbonate, melts at a low temperature.

(35) W. F. R. asks for the number of stars stripes, and arrangement of the American flag? A. The number of stars should be thirty-eight. The number of stripes thirteen. The first stripe at the top red, the next white, then the colors alternately, making the last stripe red. The blue field for the stars is square, of the width of the first seven stripes, namely, four red and three white. The proportions of the flag should be as three to five.

(36) W. S. F. asks: Will you tell me how to galvanize hoop iron? A. Clean and scour the iron, and dip it into a bath of melted zinc covered with a layer of sal ammoniac.

(37) B. A. W. says: I have a quantity of brass chain, and I want to give it the color of gilt or gold that will not tarnish? A. Boil the articles in a dilute solution of terchloride of gold, to which some bicarbonate of soda has been added.

(38) D. R. K. asks: Why is it necessary to have a siphon to a steam gauge? A. The siphon is used for the purpose of keeping water in contact with the gauge.

(39) I. M. B. asks: What is the *modus operandi* of washing brass and copper vessels with lead without a battery? A. You probably refer to what is known as tinning, which is effected by dipping the articles into a tin bath, having first washed them with a solution of sal ammoniac.

(40) P. W. asks: What is the duty required of the fusible plugs placed in the crown sheet of locomotive fireboxes? A. To give the engineer warning. There might be no water in the crown sheet when the plug melted.

(41) E. W. D. asks: How are buggies polished? A. After the varnished surface is fully dried, rub down with rottenstone and a piece of woolen cloth, wet with water. Raise the polish by rubbing with the bare hand on which a few drops of sweet oil have been rubbed.

(42) T. E. B. says: A. contends that by taking a given point as a center and with any radius, describing an arc, you obtain an angle as of 20°, 45°, 90°, and so on until an angle of 360° is reached, when you have described a circumference. B. claims that you obtain arcs and not angles of those degrees, although the angles are measured by the intercepted arcs. B. considering an angle as the space included between any two lines running from a given point. Which is right? A. A. has the correct idea.

(43) W. A. K. asks: Can you give me an effectual method of dispatching house crickets? A. Insect powder may be efficacious, but a surer remedy is to stop up all cracks or crevices where they resort.

(44) F. H. asks: Why are the sunset tints colored red and gold? A. Little is known of the causes that produce the brilliant and varied colors assumed by the sky, particularly at sunset. They are unquestionably, however, connected with the aqueous vapor contained in the atmosphere: and the reddish hue, the most common of all, is probably owing to the greater facility with which these rays are transmitted through the watery particles.

(45) C. J. F. asks (1) for the analysis of the springs of Seltzer, Vichy, Carlsbad, Kissingen, and Congress water? A. You will find books at the leading drug stores that will give you an analysis of these waters.

2. Can I combine the different salts together so as to resemble the true waters, to bottle and charge in a fountain with carbonic acid gas? A. Yes. 3. How is the extract made that is used in ginger ale? A. It is composed of ginger extract with a little wild cherry, lemon, or other flavoring, and water.

(46) E. M. H. says: 1. Having a two horse power engine making 200 revolutions per minute, I wish to use it to pump where I want 30 lifts of the pump bucket per minute. The pulley on line shaft of engine is 9 inches in diameter. By running a belt from this 9 inch pulley on a 5 feet in diameter pulley, would it give the required number of lifts in the pump? A. Yes, if there is no slip. 2. There being a crank 9 inches long (on the same shaft that the 5 feet pulley is on) to which the rod of pump is fastened, what is now the power of the engine on the pump? Is not the power increased by thus decreasing the motion? A. You have not increased the motion, but the mechanical effect per stroke will be greater, in the proportion of the pulleys, neglecting friction.

(47) M. C. asks: What can I use to take coal tar off greenhouse pipes? A. We think a solution of potash will answer very well.

(48) S. C., of Mexico, asks: What advantages are there in the short-horned cattle over those of other classes, that make such great difference in their value? A. They give better milk, and their flesh is more valuable.

(49) O. M. M. asks how to make gold lacquer? A. To 1 gallon of methylated spirits of wine, add 10 ozs. seed lac and 4½ ozs. of red sanders; dissolve and strain.

(50) O. P. asks: What per cent of 1 horse power will it take to run a sewing machine, as it is run by any one sewing in the ordinary way? A. About 10 per cent.

(51) R. S. B. asks: What preparation can be used for painting the chimneys of steamships with red lead, so that the heat will not destroy the color as it does with common paint? A. We think it is difficult to make this color permanent, under the circumstances. Good varnish, ½ gallon; boiled linseed oil, ½ gallon; add red lead sufficient to bring to consistence of common paint.

(52) J. B. says: What is the best method of propelling a rowboat? A. By oars.

(53) I. N. D. asks: Will ripe tomatoes make strong vinegar? A. Probably not economically.

(54) J. W. D. McC. asks: Can copper be galvanized with gold? If so, what is the most simple but effectual method? A. A hot aqueous solution of the double cyanide of gold and potassium is used for the bath, with a battery of over two Smee cells for small work. Or the gold solution may be poured into a porous cup immersed in a quantity of salt water contained in a small copper cup. The whole is set on a fire until the gold solution has attained a temperature of about 110° Fahr. A rod or plate of zinc is then placed in the salt bath, and the article to be plated, previously thoroughly cleaned, is immersed in the gold solution, and connected by means of a copper wire with the zinc. Under these conditions a deposit is soon obtained.

(55) W. T. R. asks: Can steam be introduced in a steam boiler from a pipe (1 inch) 400 feet long and used from boiler same as if made in boiler? We are using a rotary engine direct on to pipe. I want to put in a cylinder engine, but condensation is so great in the pipe it will knock out the cylinder head. I want the boiler in case supply from pipe fails us at any time. A. Yes. In stead of passing steam into the boiler before use, connect the engine directly to the pipe. You can easily attach a branch so that the boiler can be used when desired. Felt the pipe well, and provide a trap to carry off the condensed water.

(56) C. C. H. asks how "fraud" vinegar is made? A. It is probably a cheap, weak vinegar, the acidity of which has been strengthened by addition of a little oil of vitriol or acid lime sulphate. Vinegar of like properties has been made from pyroligneous acid—a product of the distillation of wood.

(57) M. M. asks how silk is dissolved with a liquid? A. Dissolve 16 parts (by weight) of copper sulphate in 144 to 160 parts of pure water, add 8 to 10 parts of glycerin (specific gravity 1.24) and mix by shaking. Into this, while cold, drop slowly a solution of caustic soda, while stirring, until the light blue precipitate at first formed is completely dissolved to a dark blue liquid. This fluid dissolves silk readily.

(58) C. G. C. says: I have a large, square, cut-glass inkstand, which is broken. Can you give me the composition of a cement with which I can repair it, and which will withstand the action of the ink? A. Use a strong solution of best gelatin in warm acetic acid. As ordinary inks contain tannic or gallic acid, the gelatin will only be rendered more insoluble if the ink comes in contact with it at the joint. The cement may be obtained at most druggists—one of the latest names under which it is known is "stratina."

(59) C. H. asks: Of what is belt lacing leather made? A. It is made of calf skins.

(60) Mc. Bros. ask: What is used for filling the letters of zinc signs? A. Use pitch 11 lbs., lamp-black 1 lb., turpentine q. s. Mix with heat.

(61) S. R. R. asks: What does the foundation of the towers of the Brooklyn bridge rest upon? A. Upon bed rock in some places; gravel, boulders, etc., in others.

(62) J. P. F. says: I wish directions for melting brass in crucibles in an ordinary blacksmith's fire? Also directions for brazing iron or steel? A. Heat the crucible slowly with the contained brass; when melted, cover the surface with a layer of powdered charcoal. To braze, file the surfaces clean, and unite them carefully, and retain them in place by riveting or by winding with wire. Deposit spelter solder or soft brass where the union is to be made, heat carefully in a clear re (charcoal is best) and flux with borax.

(63) C. M. asks: 1. What is the best method of making vinegar from grapes? A. Provide two wooden vats, made of oak. At a little distance from the bottom of each fix a wooden grate, on which place a layer of small grape twigs, leaves, and stems. Press the juice from the grapes. Fill one of the vats and half fill the other. As soon as fermentation begins in the half filled vat, fill it from the full one, and every day fill the one that has remained half full with a part of the contents of the other. By this daily transfer of half of the contents of one vat to the other, the vinous liquid is brought into contact with the air until acidification is completed. 2. Is there any inexpensive and effective method of preserving grapes for winter use? A. Yes, keep in a dry cool place. 3. If wood ashes are a good application to the soil of a grape vine, why would not a weak solution of commercial potash answer the same purpose? A. It would.

(64) E. W. D. asks: 1. For the period of the comets 1680, 1811, 1843, Donati's, Coggia's, and 1356? A. 1680, 10,000 years; 1811, 3,065 years; 1843, 376 years; Donati's, 2,000 years; Coggia's, 10,000 years; 1356 was predicted for 1890. 2. If the form of the earth is due to its being thrown from the sun in a hot state? A. The sun in condensing from a nebulous mass left behind portions which condensed and formed planets, etc., these planets taking on a rotary motion before they fully solidified naturally become globular.

(65) R. & W. ask for a recipe for making best varnish for household furniture, and best process for polishing when done? A. Best African copal 4 lbs., drying oil 1 gallon, turpentine 1½ gallons. Boil the gum and oil until it strings well. When somewhat cooled, add the turpentine. To make it dry quicker, dryers may be added during the cooling. To polish, after an even surface is produced by rubbing with powdered pumice stone applied with a woolen cloth, rub with rottenstone and oil, and finish by rubbing with the bare hand moistened with a few drops of oil.

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

G. W. E.—It is a combination of iron with sulphur—called pyrites. You can find something about it on p. 7, vol. 35.—C. F. C.—The package marked A. contains only quartz pebbles. Quartz is, when not contaminated, pure silicic acid—a combination of the element silicon with oxygen. B. is a calcium phosphate, chloride, and fluoride, called apatite. Unmarked specimen contains tennantite—a sulphide of copper, iron, and arsenic.—M. F. M.—No. 2 contains oxide of iron, alumina, lime, and silica. No. 2 is felspar. No. 3 is partially decomposed orthoclase, with oxides of iron and a little copper. No. 4 contains clay, mica, and oxides of iron. No. 5 is pyrites. No. 6 is felspathic rock, the coloration of which is due to iron oxides. No. 7 is partially decomposed syenite. No. 8 consists principally of lime carbonate. No. 9 is gypsum. No. 10 is hornblende with pyrites.—A. K.—It is iron pyrites.—R. L.—It is a quartzose rock, with bright specks of pyrites. It is not valuable.

COMMUNICATIONS RECEIVED.

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

On Electrical Experiments. By F. J. M.
On Curving a Base Ball. By R. D. W.
On Remedy for Poison Oak. By H. F. A.
On Labor and Capital. By A. B. W.
On the Silver Mud Springs of Oregon. By B. S.
Also inquiries and answers from the following:
F. J. A.—D. C. H.—C. C. H.—W. T. & Co.—T. P.—C. R. M.—A. L.—I. A.—E. H.—A. P. A.—J. O. R.—I. M. D. McC.—C. E. T.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

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

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

Hundreds of inquiries analogous to the following are sent: "Who deals in optical glasses? Who makes Bessemer steel wire? Who makes and sells miniature engines? Who makes a good composition for covering steam pipes?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

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FOR WHICH

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Granted in the Week Ending

July 31, 1877.

AND EACH BEARING THAT DATE.

[Those marked (r) are released patents.]

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Our object in calling attention to the defects in the means employed and the methods adopted for lubricating cars is to account for the constant and almost universal annoyance from hot boxes. A record kept on one line showed that in one month there were 3,034 hot boxes. We take the foregoing from the *Railroad Gazette*. It is indicative of the great demand there is at the present time for improvements in railway journal boxes. The aggregate length of American railway lines is now about eighty thousand miles. The consumption of oil, grease, and waste for lubricating car wheels is enormous; and the delays, accidents, and damages from hot boxes very great. It does seem as if some ingenious mind could invent a simple improvement that would obviate all these evils. On this head our cotemporary makes the following suggestions:

"The lubrication of railroad cars is a much more complicated subject than at first sight appears. Not only is it a question of the quality of the lubricants used, which is of itself still involved in much darkness, and the secrets of which will perhaps not be revealed excepting to the earnest interrogations of mechanical, chemical, and microscopic science, but there are questions of material and proportions of the journal and journal bearing, and construction of the oil-box itself. Let any one talk with a manufacturer of journal bearings for cars, and he will learn that there is very great diversity of opinion with reference to the material and methods of manufacture of

such bearings. Brass compounded in various ways, phosphor-bronze, Babbitt metal, lead, etc., all have their advocates. The manufacturer will tell you that, if railroad companies were only willing to pay a fair price for good bearings, there would be very much less difficulty with lubrication. Now, undoubtedly the material which forms the bearing is a very important element, but it is obvious that, as the journal rubs against the bearing, the quality of the former is just as important a factor in the question of friction as that of the bearing is.

IMPROVED METHOD OF COMPRESSING COTTON.

Since the close of the late civil war, much attention has been given to the problem of putting the cotton crop of America into such shape as to give vessels and rail lines the greatest possible revenue from its carriage.

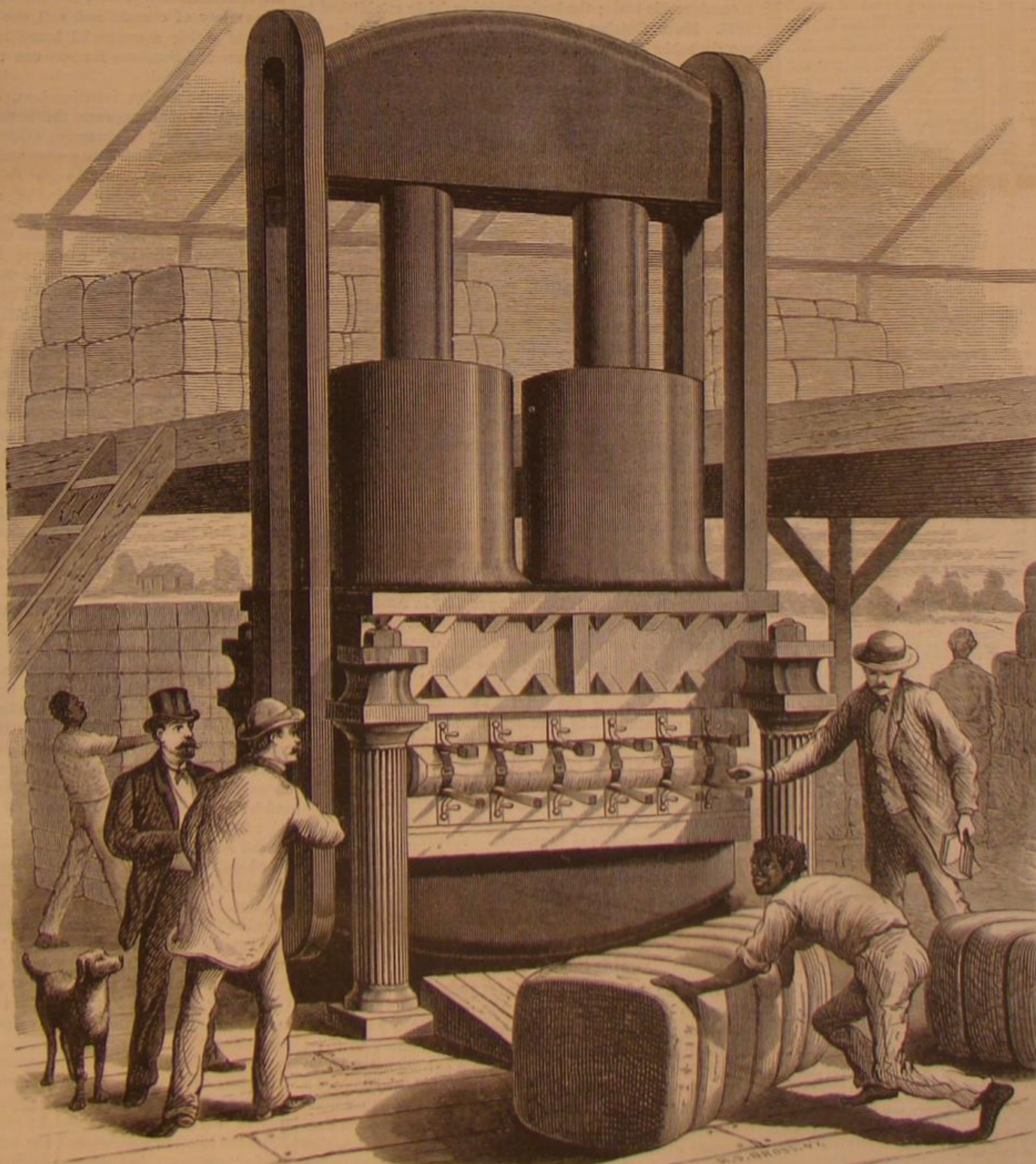
To a great extent this has been brought about by the fact that since the above period railroads have been active competitors for this business. Prior to the war no cotton was carried by rail from the South direct to spinners, Northern markets, or for export; while to-day it forms a very important element in the business of our great trunk lines. Not only is cotton now carried overland direct to our American mills, but in all important centers bills of lading are given by

the rail lines to all points in Europe, and the exchange is sold against these bills to local banks at these points. Memphis, Nashville, St. Louis, Montgomery, Selma, and other cities afford buyers and shippers export facilities to-day equal to New Orleans or Savannah. For the crop year just closing it is no exaggeration to say that the trunk lines of the North have carried 1,000,000 bales. This revolution has been brought about by the compress.

In 1865, a car load of compressed cotton consisted of 30 to 35 bales. To-day, from 40 to 45 bales, weighing 20,000 lbs. is the standard. Low rates and the most rigid economy are now compelling an advance in the last named tonnage. Cars capable of carrying 25,000 to 30,000 lbs. are replacing the old standard of 20,000 lbs. Improved road beds and bridges are making these loads safe and economical to move. And now the rail lines are demanding heavier loads.

The object of the invention herewith illustrated is to accomplish this point. Band stretchers, pulleys and tighteners, and devices of such nature usually require special fastenings, thus compelling the compress to throw out the buckles that come on the cotton and substitute others adapted to the tightening mechanism. This is expensive. The use of the stretcher involves considerable loss of time and may reduce the work of the compress from 70 to 35 bales an hour.

Mr. Burr's method, it is claimed, allows the employment of any fastening in use, and, instead of reducing the capacity of the compress, increases it. The bed or saddle of the press and, B, the follower or bottom block, to which the platens are attached, are shown in Fig. 1. These platens have fixed ribs, A, Figs. 2 and 3, running transversely across their faces. At B are blocks placed in the spaces between the ribs and having a thickness equal to the height of the ribs and a length equal to the width of the bed. These blocks are provided with two or more guide rods, C, that pass through the plates, D, and are secured by the check nuts, as shown. These nuts, besides acting as guides, regulate the height to which the blocks, B, rise. Recesses are formed in the blocks, B, to receive springs of rubber, E. These springs surround the guide rods, and bear the blocks upward with such force that their combined action is more than sufficient to hold up the superimposed bale. Twenty to thirty bands cut to proper length are fastened by twine into a snug bundle and the buckles fastened on the ends, as shown in Fig. 4. These bundles are laid up—
[Continued on page 102.]



BURR'S IMPROVED METHOD OF COMPRESSING COTTON.—Fig. 1.

Scientific American.

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AMERICAN FRUIT IN FOREIGN MARKETS.

Hitherto, for the most part, the least profitable seasons for fruit-growers have been those of most abundant crops. Not unfrequently the waste of fruit for lack of means for getting it to market, or to markets not already over-stocked, has amounted to millions of dollars' worth in a single season; a recent and intelligent estimate puts the loss for such seasons as high as \$15,000,000.

Thanks, however, to the ingenuity of our inventors, American fruit-growers no longer need to see the best fruits of their labors, the most bountiful gifts of Nature, made practically valueless by local plethora, while half the world is longing for a taste and willing to pay a good price for the unattainable luxury. Rapid transit, refrigerating ships and cars, and other means of forwarding fresh fruits to great distances have widened enormously the market for such products; while contrivances for drying, preserving, canning, and so on have lately been so multiplied and improved as to make it possible not only to prevent wholesale waste of fruit, but to secure for distant or future use the whole crop of the most abundant years. As a natural consequence, fruit raising promises to furnish from year to year a wider and more regular source of profit; and every year's inventions will help to make the industry more and more remunerative and sure.

The home market for fruit, fresh and canned, is already co-extensive with the whole country, and the fruit season lasts the entire year; the foreign market widens almost as rapidly. The following figures, from an extended review of the condition and prospects of the export trade, printed in the *Tribune*, shows the progress made during the past sixteen years, the years severally ending July 1st.

1861.....	\$ 269,000	1870.....	\$ 542,000
1862.....	238,000	1871.....	509,000
1863.....	364,000	1872.....	804,000
1864.....	865,000	1873.....	1,703,000
1865.....	1,001,000	1874.....	990,000
1866.....	492,000	1875.....	1,633,000
1867.....	380,000	1876.....	827,000
1868.....	406,000	1877 (11 mos.).....	2,831,000
1869.....	306,000		

This for the exportation of fruit to Europe. Considerable quantities go also to Australia, South America, and the West Indies. The large figures for 1865 are owing, in part, to the exportation of fresh apples, which was then begun on a considerable scale; the business being fairly established in 1873. Since October, 1876, the shipments to England—mostly baldwins, greenings, russets, and Newtown pippins—have amounted to nearly four hundred thousand barrels, always at remunerative prices. Circulars recently issued from Liverpool state that as a result of the season's trade a preference for American apples has been established in England, and that hereafter, whether the English crop is large or small, large supplies of well selected American fruit are likely to find a good market there. The capacity of the English market for fresh peaches and pears has not yet been tested. There is reason to believe, however, that it will be limited solely by the capacity of our refrigerative ships to land supplies in good condition. The foreign market for canned peaches is almost unlimited, upwards of seven hundred thousand dollars worth having found a lively demand abroad during the first ten months of the season of 1876-7. And dealers are unanimous that, for the present, peach-growers will do better to can their surplus crop rather than dry it. The foreign market for dried peaches has yet to be tested. If the recently invented evaporators prove capable of drying large quantities cheaply and well, the demand for dried peaches abroad may be indefinitely increased. At present the price is too high to tempt the working classes to buy, and they are our principal customers for dried fruit, particularly those of Germany. The poor people of England and Russia buy to a limited extent; France is also a buyer, but whether for domestic use or for distillation is not positively known. The miners of Australia are also large buyers, but there is not much reason to count largely on a permanent market there. Fruit growing is increasing rapidly in Australia, and before many years the colonies in that quarter of the world must be able to supply at home the home demand. The demand for dried apples in Europe and Australia is now very great, so long as the price does not exceed seven cents a pound; at five cents the market is practically unlimited. Last year something like fourteen million pounds were exported. Curiously sliced apples, though really better than the quartered, will not sell at all abroad. Foreign buyers want them cut in pieces as large as possible, the larger the better. The manner of packing is also important. For the European market the packages must not be smaller than barrels, and hogsheads are preferred. Australia, on the contrary, will not have packages as large as barrels. For that market the apples must be put up in 55 lb. and 100 lb. kegs, suitable for transportation to the interior on the backs of mules. Venezuela also demands small packages.

INDIGESTIBLE MEDICINES.

It is not an uncommon blunder for young or ignorant physicians to write prescriptions, the ingredients of which chemically reacting upon each other produce substances wholly different in nature and physiological effect to those intended to be administered. Not long ago we noted an instance of how two harmless drugs when combined formed a highly poisonous mixture, and it may so happen that innocent medicaments may unite to produce a compound dangerously explosive. For the knowledge that still another danger lurks in the apothecary's vial we are indebted to Dr. J. W. Compton, of Evansville, Indiana, who has called the attention of physicians to the frequent indigestibility of their

curative potions. If medicines are not dissolved in the digestive fluids of the stomach and intestines they can never be absorbed; if not absorbed they can never enter the circulation and hence cannot produce the results intended. There are various diseases which affect these fluids. Thus, they may be carried off by hemorrhage and sweats, in some maladies the saliva may be withheld, in others the gastric juice becomes deprived of its solvent principles or may be arrested, liver ailments may withhold the alkaline bile, and so on; so that the medicine, especially if solid, instead of producing the slightest good, acts merely as an irritant and foreign substance, and occasions at best loss of valuable time. Dr. Comstock gives several striking instances of invalids rejecting medicines in an unaltered state, the drugs being in all instances given in the form of pills, and he calls especial notice to the fact hitherto apparently overlooked that if, in a depraved state of digestion from disease, solid food cannot be digested for the nourishment of the patient, solid medicines cannot be digested and appropriated to the cause of disease. Dr. Comstock, we think, might have gone a step further and questioned how far all large doses are beneficial, or in other words how much of the dose does the work and how much is simply excess and consequently foreign matter. The homœopathic practice of medicine furnishes any number of instances where infinitesimal quantities of specifics produce the most marked effect, certainly an effect as plainly apparent as that resulting from a large dose allopathically given. Now if the combining equivalents, so to speak, for a given result are present in one case, they are equally so in the other, the end reached being the same. Hence in the latter example it follows that a very large proportion of the dose is useless if not harmful, while it usually has the further demerits of being expensive and distasteful.

THE SUGAR INTEREST IN PERU.

BY PROFESSOR JAMES ORTON.

It is singular how exotics are becoming the ruling objects in Peru—Europeans, horses, sheep, sugar-cane, coffee, oranges, grapes, bananas, wheat, eucalyptus tree, etc. Peru, though rich in minerals, was never plentifully supplied with useful animals and plants; but possessed of every conceivable variety of climate and soil, she has shown herself capable of giving a congenial home to every form of life. Northern and Southern Europe can meet in this little Republic.

Among the foreign introductions, always excepting the immigration of Europeans, the sugar-cane is the most important. Better than guano or saliter, it is destined to be the surest and most inexhaustible source of the wealth of Peru. The annual yield of sugar and spirits is estimated at \$20,000,000. The recent rise in the price of sugar has given a new impulse to its cultivation, and the prospect is that Peru will ere long be a formidable rival of Cuba and the other Indies. The usual cane crop in the West Indies is 1,130,000 tons; in Java, 200,000; in Brazil, 170,000; in Louisiana, 75,000; in Egypt, 40,000. The crop in Cuba last year was thirty per cent below that of 1875, while the beet crop in France and Germany was well nigh a failure. In 1875, Peru exported 60,000 tons; in 1876, over 70,000. That amount will be greatly increased this year, provided laborers can be obtained. But thousands of acres are lying idle for want of hands. In fact, the commerce of Peru is diminishing for lack of labor and capital, and Peruvian statesmen are anxiously looking to China for the one and to Mr. Meiggs for the other. The squint-eyed Celestials outbid and outdo the mongrel races along the coast, and the mountaineers cannot endure the lowlands. But Chinamen must be better treated than they have been. Even now, great as is the demand for foreign labor, the natives, as in Trujillo, would persecute the Asiatics and drive them from their shore.

In no other country, save Egypt, is the cane crop so sure as in Peru. Occasionally, as in 1871, the crop may suffer by drought from want of the supply of water from the sierras; but in the course of ten years, the decrease would not amount on the average to more than twenty-five per cent. As the cultivation is regulated by irrigation as in Egypt, Peru has an advantage over Cuba, where planters depend on the weather. At present, Peru can compete with any other country, save Egypt, since she can grow the cane without intermission. The slave labor of Cuba cannot produce it so cheaply. The cane grows more slowly than in Louisiana, and hence is richer in saccharine matter. The amount of juice to the cane is about sixty-five per cent, and its average density is 10°. In Northern Peru, two tons of cane give four hundred gallons of juice, each gallon yielding 1-35 lb. of sugar. The best season for planting the cane is November, and the yellow variety (originally from India) is preferred to the red, being richer. The first planting takes fifteen months to mature; after that, the crops ripen every twelve months. This is true only of Northern Peru, where the soil is thinner but more tropical than at the south; in Cañete, for example, it takes fully two years for the first crop to mature. Three or four crops are obtained before replanting is necessary. The green and ripe cane are seen in the same field; there is cutting on one end and planting at the other; so that the ground is never idle. The actual time spent in the manufacture of sugar is eight months; the rest of the year is occupied in repairing acequias, etc. From the small establishments, the sugar is exported in the crude "concrete;" in the larger mills, it is first refined. For inland transportation, western Bolivia being supplied from Peru, it is put up in conical loaves, weighing 45 lbs. each

Under the present American tariff, refined sugar goes by New York to Europe, the law favoring the New York refiners without benefiting the consumer or the Government revenues. Then, too, the Hawaiian Reciprocity Treaty, allowing free importation of sugars from the Islands, tends to turn the sugar of Peru across the Atlantic.

The sugar cane is cultivated on both sides of the Andes, but it does not grow at a higher altitude on the western slope than 4,500 feet, while on the eastern side its limit is 2,000 feet higher. In the Marañon region, as at Moyobamba, Tarapoto, Alpina, and San Regis, and also in the Urubamba Valley (Upper Ucayali), it grows luxuriantly but will not give crystallized sugar; so it is turned into aguardiente. There the grain ripens in six or seven months after planting. Considerable sugar of excellent quality is manufactured at Abancay on the Apurimac, but rudely purified with clay; it is mainly consumed in Cuzco, where it brings forty cents a pound.

But the Pacific slope of Peru, particularly of northern Peru, is the great sugar district; there it is fast taking the place of cotton and rice. The whole coast presents a series of arid wastes and fruitful valleys—alternating Sabaras and Edens. Nothing is wanting but water to convert the entire coast into a garden twelve hundred miles long. But it is worthy of remark that wherever the railroads run from the coast into the mountains, they seem to have changed the meteorological character of the lowlands, rains being more frequent on the coast terminus than formerly.

Every port above Callao exports sugar, those of Talaveria and Eten taking the lead. All told, there are about one hundred and twenty large sugar estates on the coast. Lambayeque and Chiclayo contain eighteen, of which that of "Pátapo" is the chief and probably the largest in the country. It guarantees \$5,000 a month freight to the railroad. The Pacosmayo Valley has fifteen, of which the "Lurifico" is the most important, and to which I shall recur. The rich valley of Chicama near Trujillo is crowded with sugar plantations: its twenty-four mills produce to the value of one million soles per month. The machinery is English. The "Casa Grande" of Sr. Albrecht is the most complete. Further south, near Chimbota, in the Valley of the Santa, are two large establishments, "Puente" and "Vizcos," the former has American machinery precisely like that of "Lurifico," only the charcoal process is not used. Chonca, just above Lima, has fifteen estates, of which "Palpa" is the largest, while around the capital are more than twenty, among them the well furnished establishment of "Santa Clara." In the valley of Cañeta are the extensive plantations of the late Henry Swayne, twenty-five hundred acres being under cultivation. There are also numerous cane estates in the departments of Ica and Arequipa, but they yield comparatively little sugar.

The "Lurifico Hacienda" near Pacosmayo being a representative establishment, I will describe it. The estate was once the property of the unfortunate President Balta, afterwards of Henry Meiggs. It now belongs to Mr. Ford of the house of Dreyfus & Co., and is under the superintendence of Mr. Kauffman, from Ohio. Two thousand acres are covered with sugar cane, the rest being given up to rice for the laborers. English steam plows are used in cultivation. The mill works were designed by Cahill and constructed by Morris of Philadelphia. They cost when put up \$250,000. The engine is ninety horse power, and the roller weighs twelve tons. Three small locomotives from Paterson, N. J., bring in the cane from the field and discharge it upon a "conductor" seven feet wide and one hundred and fifty feet long. The dried pressed cane, called "bagass," affords all the fuel used for engine and locomotives. There are twelve copper "defecators" or purifiers, each holding four hundred gallons; when full fed, the mill can fill eighty defecators daily. In the defecators, the juice, "guarapa," is treated with lime and heated by steam to 140° to remove acid and scum. Thence the liquor goes to two of the twenty filters filled with animal charcoal, and next into large iron tanks, whence it is transferred to three copper "vacuum pans" in succession, No. 1 having a vacuum of six inches, No. 2 of thirteen inches, No. 3 of twenty-two inches. In these it is boiled by the exhaust steam. When it leaves the third pan, it has a density of 27°, and is called "syrup." Carried to the clarifiers, where it is treated with steam to remove more scum, it passes next into the rest of the charcoal filters, and then into two other iron tanks from which it is drawn into a fourth copper exhaust pan, called "strike pan," with a vacuum of twenty-five, where it is boiled for one hour till it becomes a thick syrup. Then by letting in a small portion of thinner syrup, it grains, and by continuing this, the size of the grain increases. From the strike pan it goes into the "coolers," which are pans five by six feet on rollers. When cold, it is transferred to the "mixer," where it is stirred by machinery so that it will run into the "centrifugals," which make 1,200 revolutions a minute, to be deprived of its molasses. The coarse grained sugar thus made is called "muscabado" or "granulado" No. 1, and is exported in bags. The grains are apparently cubes, but are really monoclinic prisms. The molasses is taken to the "blow-up," where it is subjected to jets of steam, skimmed and taken to the strike pan, and made into sugar No. 2. The refuse molasses and guarapa are taken to the distillery and put into large vats for fermentation, thirteen all told, ten feet deep and ten feet in diameter; thence to the still, rectifiers, and condenser. Every day 1,400 gallons of rum of 40° are made.

The Lurifico works are capable of turning out per day

35,000 gallons of juice, requiring one hundred and seventy-five tons of cane, or nearly 50,000 lbs. of muscabado. The length of the process from pressing the cane to bagging the sugar is two days, including one for cooling. In the field and mill there are 939 Chinamen, who get two rations of rice per day, one sol a week, and two suits of clothes a year. They all live within a small enclosure called "Galpón," adjoining which is an excellent hospital under the charge of Dr. Heath. They work ten hours a day—five hours before breakfast and five hours in the afternoon. On Sunday, which is pay day, they work but four hours. In less than four years the majority will be free, as their term of servitude will expire: some will re-contract for a year or two at higher wages, but many will set up for themselves, for the great ambition of the more intelligent Chinamen is to keep a shop or fonda. The labor question is therefore constantly revived, and is the uppermost topic at the sugar haciendas of Peru.

THE EMIGRATION OF AMERICAN MECHANICS TO ENGLAND.

During the past three months some three hundred and twenty-five mechanics have emigrated from this country to England under contract with English employers. In England, for some time past, building trade strikes have been the rule, and at present these are in progress in London, Manchester, and seven other large cities and towns. It is to avoid the effects of these strikes that employers seek to import American workmen, so that, in brief, the case is precisely the same as if railroad corporations here, during the late uprising, had imported English navvies and train hands to fill the places of their former employees.

Now we need not point out that this is a bad status for any workman in a strange country at the outset. Necessarily he becomes at once an object of aversion to the leagued members of his trade, and this is none the less intense because he is a foreigner. He will find, however unjustly, Yankee cheap labor in England placed beside Chinese cheap labor here—the difference recognized only in kind. Law and justice, it is true, are on his side, but the difficulties of his position will not be modified thereby. While his contract holds he may continue on, but at its close, or if he emigrates under no contract, then he comes into competition with the great mass of working men, and enters into a condition far worse than that which he left his own country to escape. The United States Consul at Liverpool has issued a public warning against the current report that fewer men are out of employment in England than in the United States. He says that many American mechanics are now in suffering and in destitution abroad; that able-bodied working men are constantly calling at the Consulate for relief which cannot be accorded, and he positively asserts that neither skilled nor unskilled working men from abroad can find employment in England. The English journals themselves express surprise at the emigration, and call it "a complete reversal of the ordinary course of things." As for any relief from labor troubles being gained, the *Engineer* reviews the present strikes in progress and sees no likelihood of any such result. On the contrary, it says that "facts do not predicate peaceful times for the emigrants." Our working men will find, moreover, that the English practice of their trades is not their practice; that English habits of life are not their habits; that, in short, they have got to begin and learn much that is new and strange before they stand on an even footing with their English tradefellows. And they will further find that if, after their contract time has expired, they return home, their years of labor abroad have not brought them nearer to independence, but that there are still new associations to be formed and a new start to be made. It is better to stay at home, better to be first sure that every channel of honest work in this country is exhausted, better to learn to live on reduced wages until the better times which must eventually arrive are at hand, for when they do come they will as certainly bring their rewards for those who

"Learn to labor and to wait."

PROGRESS OF THE SCIENTIFIC AMERICAN.

Probably there is no weekly periodical in the world whose separate issues are scanned by so many readers as the SCIENTIFIC AMERICAN. In the hundreds of libraries and reading-rooms where it is filed, no journal is in greater demand or more constantly consulted. In many villages each copy of our paper goes through a regular round of circulation and reading from one neighbor's house to another; and not infrequently from a company of readers in one country to others in another country. For example: a Brazilian subscriber writes us that he receives his SCIENTIFIC AMERICAN in that country through a club; after himself and friends have enjoyed its reading, he forwards it to his brother in England; to be by him, after perusal, sent on to another brother in New Zealand.

In this way the effective influence of the SCIENTIFIC AMERICAN becomes very widespread and enormous; a fact to which our advertisers can testify by practical experience. No other paper brings them so many orders or such intelligent, excellent customers. We estimate the total number of our weekly readers at not far from half a million. The secret of this is that each number of the SCIENTIFIC AMERICAN contains valuable information, which is fresh and useful irrespective of the date of the sheet; and it travels through the world until it is worn out, furnishing entertainment and benefit to every reader into whose hands it falls.

INCREASING THE FLOW OF SPRINGS.

It is a well known fact that rain water and the water produced by melting snow on high land, sinks into the soil until an impermeable stratum is reached. Then it follows that stratum as the same tends downward, thus producing subterranean rivers or brooks. When a well is dug this underground water is sought for; but when the water itself comes to the surface, then the source is commonly known as a spring. In both cases, however, the water flows along a slope higher of course at the point of departure than at the point where the water is obtained. But during its journey obstacles are often encountered which check the flow, so that sometimes a well can be pumped out much faster than it will fill. Hence, after every drain upon its resources, it is necessary to wait a considerable period in order to allow the scanty influx to replace the amount of water removed. Such wells frequently dry up altogether during the present season of the year.

There is a simple way of increasing the flow of wells, devised some years ago by M. Donet, of Lyons, France. Ordinarily the mouths of wells are left open; hence all along the water, from well to original source, there is an equilibrium of air pressure. M. Donet's plan is simply to close the well and pump out some of the air. This creates an excess of pressure to drive water into the well; the supply is thus increased temporarily, and at the same time the underground channels through which the water passes are enlarged by the stronger stream, and so the supply also becomes permanently augmented.

In the case of a spring, however, one of the principal advantages is that the water lifts or ought to lift itself to the level of the soil, and consequently, when a pump is needed, then the source is no better than any ordinary well. There is a way, however, of increasing the flow of springs by the aid of a simple siphon, which has been devised by M. Chefdebien. At the point where the spring emerges make an airtight tank, having a close cover, into which insert a pipe. Bend this pipe over and carry it along for a few hundred feet or so, until by following the downward trend of the land, the end reaches a level, say six feet lower than that of the spring level. Now, apply a pump and draw water through this tube. It thus becomes a siphon (the pump is at once removed), and the water continues to flow under the influence of a portion of the atmospheric pressure equivalent to the difference of level existing between the spring and the lowest end of the tube.

M. Chefdebien has tried this plan on a spring which took 24 hours ordinarily to fill a hollow place in the rock containing about 200 quarts. From the spring he led a piece of lead pipe four inches in diameter over a distance of 192 feet, so that he obtained a difference of level of nearly 8 feet. A watertight and airtight vessel was also built on the spring basin, so as to surround the natural escape orifice. This was six years ago. During that time the water has run constantly; and instead of yielding 200 quarts per 24 hours, it has given 3,800 quarts steadily per same period. That is, the flow has, by the above simple expedient, been increased nineteen times.

Scientific Chess.

The *Boston Daily Globe*, in commenting upon the Chess Record in the SCIENTIFIC AMERICAN SUPPLEMENT, says: "We unhesitatingly give it as our opinion that there is no other Chess Department in any paper on the earth, under the earth, or in the heavens above the earth, that 'can hold a candle to it.' All those who miss seeing this department of Loyd's will miss a golden treasure."

Coming from any other source we might be inclined to regard such encomiums as mere flattery. But the *Globe* is a wide-awake newspaper, and its chess editor is one of the ablest writers in this sphere. If he does not know wheat from chaff, no one does.

Carrier Pigeons for the English Herring Fishing.

Messrs. Moir and Son have a number of pigeons pretty regularly employed for the purpose of bringing early intelligence of the results of the herring fishery, and the experiment has been very successful. One of the birds, says the *Aberdeen Free Press*, is taken out in each boat in the afternoon, and after the nets have been hauled on the following morning and the extent of the catch ascertained, the pigeon is despatched with a small piece of parchment tied round its neck, containing information as to the number of crans on board, the position of the boat, the direction of the wind, and the prospects of the return journey, etc. If there is no wind to take the boat back, or if it is blowing in an unfavorable direction, a request is made for a tug; and from the particulars given as to the bearings of the craft, she can be picked up easily by the steamer. The other advantages of the system are that, when the curers are apprised of the quantity of herrings they may expect, they can make preparations for expediting the delivering and curing of the fish. —*Land and Water.*

SIZING FOR SIGN WORK.—One of the best mordants or sizing for sign work is made by exposing boiled linseed oil to a strong heat in a pan; when it begins to smoke, set fire to the oil, allow it to burn a moment, and then suddenly extinguish it by covering the pan. When cold it will be ready for use, but will require thinning with a little turpentine.

REMEDY FOR POISON IVY.—E. A. Blood, of Bloomington, Ill., says that bran poultice is an infallible cure for poison ivy.

IMPROVED FARM LOCOMOTIVES AND STEAM ROAD ROLLERS.

Messrs. Aveling & Porter's well known road and farm locomotives and their steam road rollers have had a new duty and are now adapted for use in connection with the Blake Crusher Company, of New Haven, to their stone and ore crusher. The crusher is mounted on strong wheels, as illustrated, and, by the aid of the Aveling locomotive or their steam roller, can easily be removed from quarry to quarry or to any place where it may be found more convenient or cheaper to take the crusher to the material than to move the material to the stationary crusher. As either of the engines can likewise be used for hauling or consolidating the broken stone, or driving the crusher, the convenience and economy of this arrangement will be manifest.

Messrs. Aveling & Porter, we are informed, have built upward of 1,300 road and farm locomotives; and their extensive manufactory at Rochester, England, has, during the last two years, been doubled in capacity. By reason of the varied duties to which the Aveling traction engine can be applied, including hauling, plowing up prairie land, thrashing, and general farm work, the demand has very greatly increased, and from six to eight engines leave Messrs. Aveling & Porter's works every week throughout the year.

The road locomotive is largely employed instead of the ordinary portable engine for farm and other work; it is extensively used in Great Britain for plowing and hauling farm produce, and heavy material on ordinary roads, and its reliability and great economy, when taking the place of animals for such work, have built up for the manufacturers a prosperous and growing business in England.

The engines are built of great strength and comparative lightness. Their ability to ascend steep grades with heavy loads, their handiness, security against damage when traveling even on rough roads, are leading results obtained.

As an illustration of the value of these locomotives for hauling purposes, the following estimate of the daily expense, we are informed, may be taken as approximately correct, altering cost of labor and fuel for different localities:

Size of engine, say, 16 horse power; journey 12 miles out, loaded, returning empty; grade of road varying, say, from 1 in 25 to 1 in 10; load (without wagons) 12 tons.

Wages, engineer, \$2.50; assistant, with wagons, \$1.75; coal, half a ton, \$2.50; oil and waste, \$0.50; interest and wear and tear, say 15 per cent, \$2; water, say, \$1.25. \$10.50, total cost of hauling 12 tons of material 12 miles, or about 7 cents per ton per mile.

One man only is required for the entire management of the engine, and the total cost of running one of these locomotives, of sufficient size to haul and drive the largest thrashers, does not exceed \$4.50 per day, including wages, fuel, and oil. Such an engine would easily convey loads of 10 tons of material on ordinary roads and ordinary grades.

The steam road roller of Messrs. Aveling & Porter costs about the same sum for running expenses, and the results of constructing and maintaining roadways, by the aid of this machine, are, it is claimed, that a saving of from 50 to 65 per cent in material and wear and tear is effected.

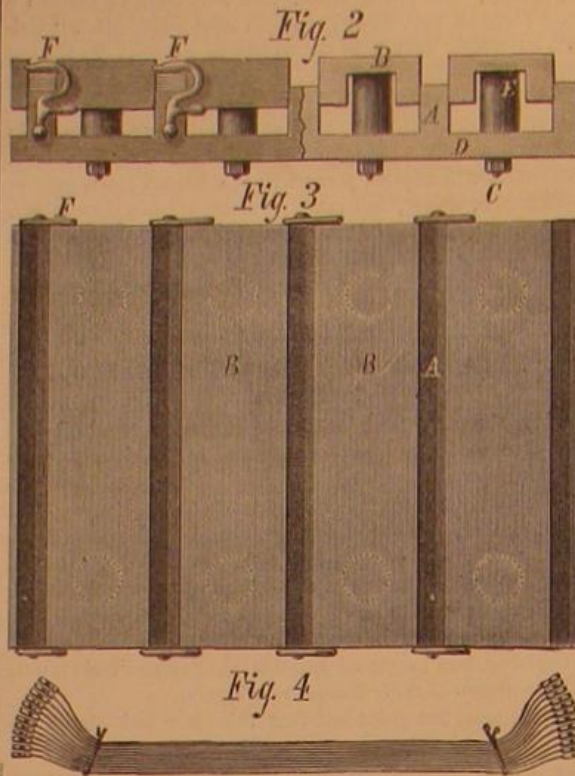
At the Philadelphia Exhibition, in 1876, the only prize awarded for steam road rollers was given to Messrs. Aveling & Porter. Both during and after the Exposition the locomotives were employed by the British and Canadian Commissioners in removing from place to place large quantities of heavy machinery and material.

Mr. W. C. Oastler, 43 Exchange Place, New York city, is Messrs. Aveling & Porter's representative in America.

NOTE FROM THE EYE.—Take a horsehair and double it, leaving a loop. If the mote can be seen, lay the loop over it, close the eye, and the mote will come out as the hair is withdrawn. If it cannot be seen, raise the lid of the eye as far as possible, and place the loop in it as far as you can, close the eye and roll the ball a few times, then draw out the hair. The substance which caused so much pain will be sure to come with it.

[Continued from first page.]

on the ribs, A, and held in place by the spring hooks, F, Fig. 2. It will be seen that, as the uncompressed bale lies upon the blocks, B, it may be moved about without



disturbing the band which lies between them. The operation of the machine is as follows: A bundle of the bands, as shown in Fig. 4, is placed on each of the ribs and between the movable blocks, which prevent them from moving laterally. They are held on to the face of the ribs by the hooks,

ance of the bands), the press moves up until it is fully compressed. As soon as the pressure is applied the movable blocks yield until they rest on the plate, D, leaving the bands not only in contact with the bale, but, in the case of full bundles, forced into the cotton from an inch to an inch and a half.

The bands are now fastened, the press lowered, the bale removed, and the operation is repeated. The supply of bands is renewed from time to time as they become exhausted. We are informed that 30 bands have been found not to be too many to put in each bundle. Thus the time consumed in reefing or passing the single band through the press is saved. This results in a marked increase of the amount of work done by the press.

Again, the absolute contact obtained by this method renders impossible poor or shiftless work by a careless tier. These platens are in successful use on the presses of the Union Cotton Compress Association of Memphis. Patents were issued to John T. Burr, dated September 15, 1874, and January 23, 1877, through the Scientific American Patent Agency. Further information may be had by address A. E. & J. T. Burr, either Memphis or Nashville, Tenn.

The Coming Great Famine in Madras.

A calamity greater, says the *Saturday Review*, than any that has yet occurred in India during British rule, is now threatening the Presidency of Madras. The famine of this year, which the Government is at present fighting to the extent of its resources, is to be succeeded by another due to the failure of the rains of the Southwest Monsoon, which will continue over another year and which will inflict with double rigor a people already weakened by past suffering. It is reported that even during the present famine more people have been found dead in Madras in one morning than died during the whole of the Bengal famine, and it is asserted that more than half a million of inhabitants have already succumbed.

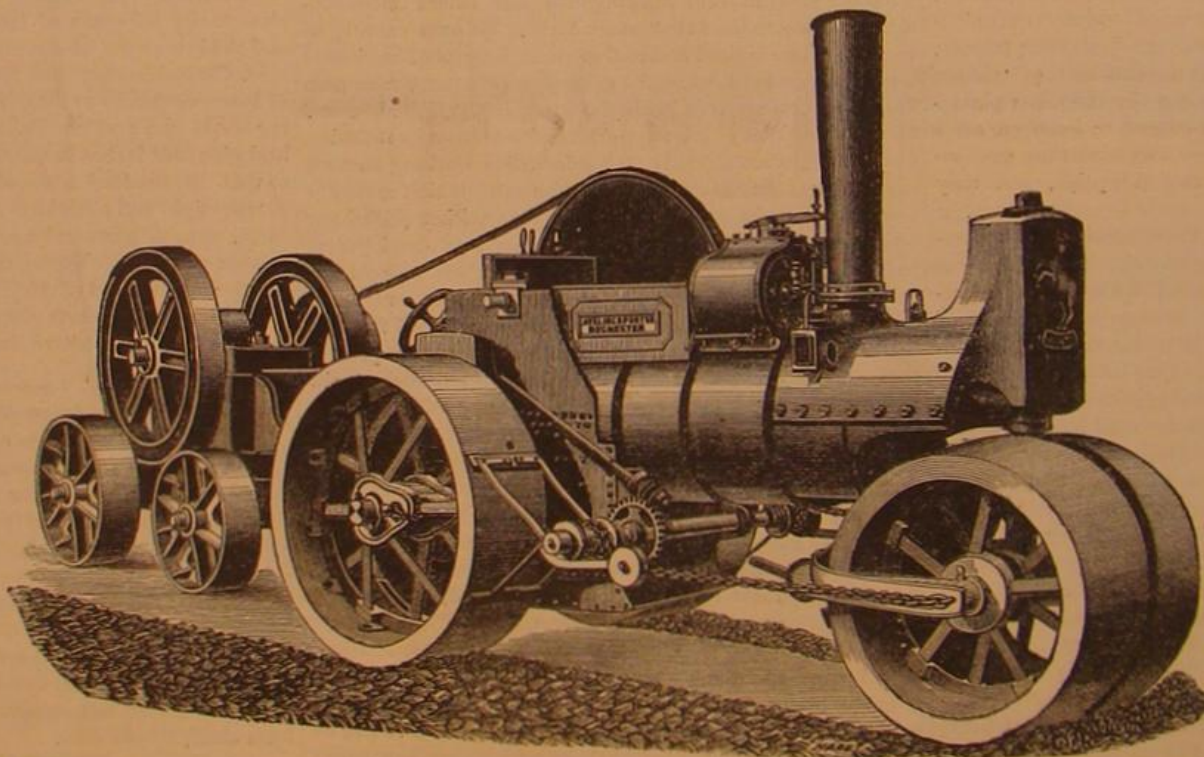
The difficulties of the situation are increased by the lack of means of inter-communication. There are very few railways, and most of the grain is taken into the interior by bullock carts. But there is no food for the animals any more than there is for man, so that practically there is no way of carrying relief into the distressed districts.

It will be seen that in this case eight portable and cheap field railways will be of great utility. There is no fear of scarcity of grain provided money be obtained to buy it and means of transportation suitable for the purpose be at hand. The funds are already being raised by appeals to the charitable in England, and to inventors and manufacturers the world looks for the necessary railways or other modes of carriage. It has been proposed that men be used for traction purposes on these roads instead of bullocks, six men being estimated equal to one brute. It is hardly necessary to add that the cheapness of the system proposed will be an important consideration, as the routes will probably be both long and numerous.

Dipping Acid for Brass.

A dipping acid for brass is made by mixing together nitric acid, sulphuric acid, and muriate of ammonia, or sal ammoniac. There is no certain rule by which to mix the acids. The bath is composed mostly of nitric acid, the sulphuric acid and the muriate of ammonia being present in inferior quantities. The mixture must be so strong that a momentary immersion will be sufficient to make the work bright and clear. To remove the acid, wash in hot water; and to dry the work, imbed it in fine hot sawdust. Heating the work before dipping will remove the oil or grease, which must be removed, or the acid will not act effectually or satisfactorily.

THE BEST OILSTONE FOR SMALL DRILLS, ETC.—An Arkansas or Wachitas stone, which can be procured of almost any hardware dealer, is the best for sharpening small cutters and drills. Use plenty of sperm oil on the stone, and keep it enclosed in a tight box or case made to secure it. Clean the surface of the stone occasionally with kerosene.

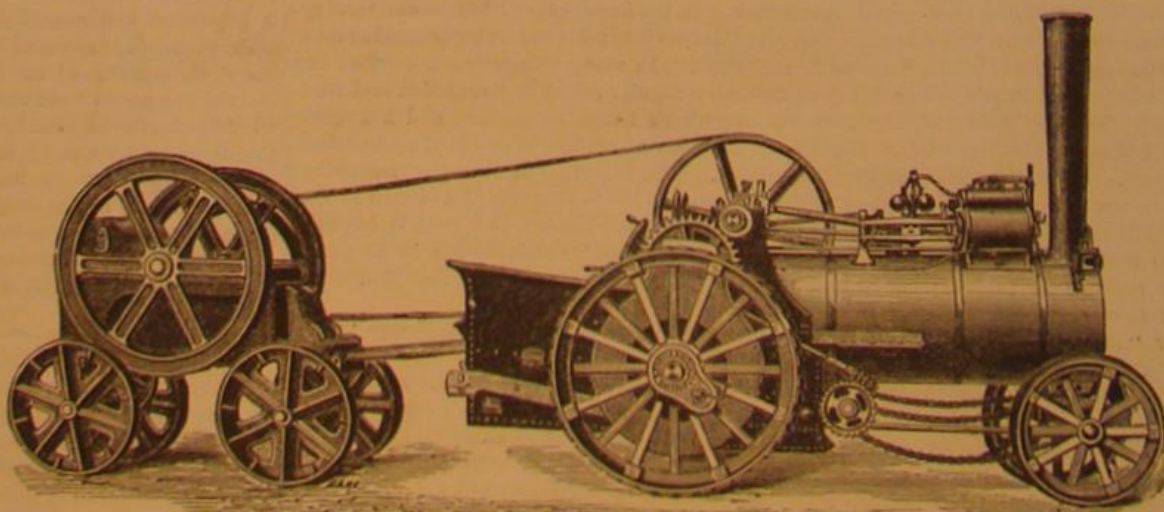


AVELING & PORTER'S STEAM ROAD ROLLER AND BLAKE'S CRUSHER.

F. A bale of cotton is now put into the press, where it is supported by the movable blocks.

After the bale is adjusted to the required position (the movable blocks holding it up and preventing any disturb-

ance of the bands), the press moves up until it is fully compressed. As soon as the pressure is applied the movable blocks yield until they rest on the plate, D, leaving the bands not only in contact with the bale, but, in the case of full bundles, forced into the cotton from an inch to an inch and a half.



AVELING & PORTER'S ROAD & FARM LOCOMOTIVE AND BLAKE'S CRUSHER.

COMBINED SKIMMER AND FORK.

The annexed engraving represents a new instrument designed to be used for cooking purposes, and is so constructed that it may be used as a skimmer and a fork. The two parts are connected in such a manner that they may be slid back and forth upon each other, to adapt the instrument to be used as a skimmer or as a fork, as may be desired.

The skimmer is convexed and perforated with numerous holes, in the usual manner. The fork is made of iron or steel wire, and the prongs and the lower part of the handle are curved upon the same arc as the skimmer. The shank or lower part of the fork passes through and slides in a keeper attached to the back of the skimmer near its rear edge. The prongs of the fork pass through holes in the skimmer near its forward edge. The prongs of the fork are made of such a length that when it is drawn back the points of the prongs may be back at least as far as the forward edge of the skimmer, and when the fork is pushed forward its prongs may project far enough for use as a fork.

Patented through the Scientific American Patent Agency, February 1, 1876, by Emerson E. Flagg, of Brattleborough, Vt.

IMPROVED HOP CULTIVATOR.

This machine has been constructed for digging hop ground by steam power. In the best cultivated hop gardens it is the custom to dig the whole of the land by hand, in others small two-horse plows are used to plow between the rows of hops, these rows being afterwards dug by hand.

Although originally designed for use in hop grounds, the machine is well adapted for sugar plantations and other agricultural work. It is not hauled by a wire rope as steam plows or cultivators are, but is propelled by its own hind wheels which receive motion by gearing. The framework is of angle iron, and at the after end carries a three-throw crank shaft; on this crank shaft is keyed a bevel wheel which gears with a pinion on a vertical shaft; this vertical shaft carries a V pulley which receives motion from the engine by a hempen rope. In front of the V pulley are the guide pulleys, so arranged as to allow the implement to turn round without interfering with the position of the rope on the driving pulley.

The cranks work three vertical connecting rods, which are in the form of the letter T inverted; in the lower parts are fitted the tines; a radius rod is jointed to each connecting rod a short distance above this crosspiece which carries the tines; this radius rod acting as a fulcrum causes the extremities of the tines to describe an oval; as the crank shaft revolves (in a contrary direction to the road wheels) the tines enter the ground nearly vertically; as the crank passes the lower center the tines are pushed backwards, tear the earth up, and turn it over. A train of wheels transmit motion to the road axle, on which the driving wheels run loose, but are thrown into gear by clutches worked by screws, which are tapped into the axle. The machine is steered by the leading wheels.

In setting to work, the hemp rope, which is driven from a V groove in the flywheel of a portable engine, is led round the field on pulleys and porters, and takes a turn round the driving pulley on the machine, as shown in the engraving, which we copy from *Engineering*. When the digger has made a journey up the field and arrives at the headland, the tines are lifted by the hand wheel, which depresses one arm of the bell crank; on the other end of this bell crank the forward ends of the radius rods are hung, and as it is forced back the tines are lifted out of the ground; the land-side wheel is then released by withdrawing the clutch, the inner or land-side wheel remaining stationary.

The machine and tackle are worked by three men and a boy, namely, engine driver, a man to attend to the machine, a boy to steer, and one man to move, at each bout, the anchors, which are ordinary farm wagons with pulleys fixed to them.

With an eight horse power portable or traction engine five acres can be dug per day at a depth of 9 inches.

These machines are constructed by Messrs. J. and F. Howard, of Bedford, England, from the design of Mr. J. H. Knight, of Farnham.

Testing the Gas of New York City.

Arrangements have lately been made to test the gas furnished by the several companies to New York city. The pure sperm candle, burning 120 grains per hour, is used as the standard. The principal instrument used in the tests is called a photometer, and is placed in a room, the walls and ceiling of which are painted black. The instrument consists of a 60 inch graduated bar, connecting with two sperm candles on one side, and with the gas-measuring and burning appliances on the other, comprising an ordinary wet meter, a pressure gauge, and a governor. Upon the bar is a sliding box, containing what is called a Letheby disk,

which is placed vertically to catch the light from both sides. All light is then excluded from the room. By experimenting with the disk the examiner learns, by the position of the box upon the graduated bar when the light falls with equal strength on both sides of the disk, whether the illuminating power of the gas reaches the required standard, that of 16 can-

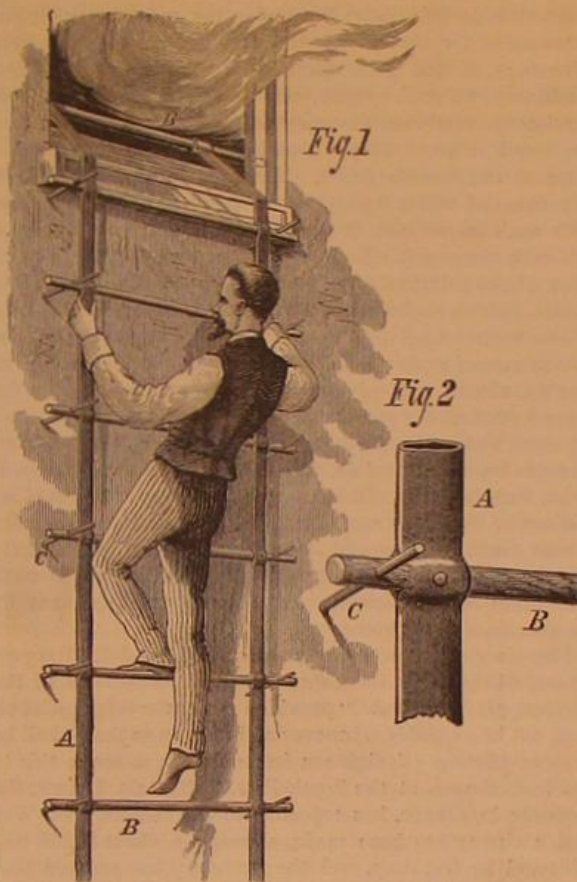


FLAGG'S COMBINED SKIMMER AND FORK.

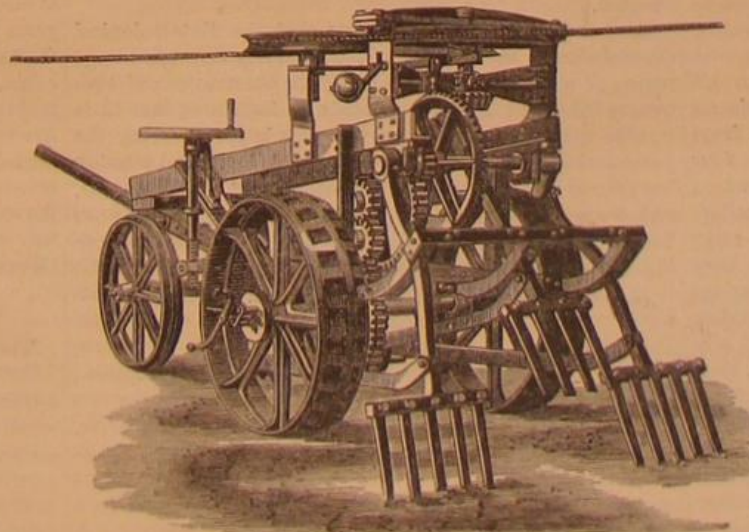
dles. The gas must be used at the rate of five cubic feet per hour, and the meter shows the rate at which the gas is burning.

ALLEN'S IMPROVED FIRE ESCAPE.

The accompanying engravings represent a new flexible or folding ladder, designed as a means of enabling persons



to escape from the upper stories of burning buildings. The side supports, A, Fig. 2, of the ladder are made of webbing woven tubular or of double thickness, with openings transversely through it at proper intervals to receive the rounds,



KNIGHT'S HOP CULTIVATOR.

B. The latter have studs or arms of wood, C, fixed into their ends for the purpose of holding the ladder away from the wall, and thus insuring a good foothold to the person descending. The top round, B', is made larger than the others, so that it may extend across the window inside and thus securely sustain the ladder. It is intended that the ladder shall be kept rolled up beside the window, so that in case of fire it may at once be thrown out, when it will uncoil and be ready for use, as shown in Fig. 1. The inventor states that two or three persons may descend at once, and that the ladder constructed as above explained is capable of sustaining a weight of 1,000 lbs.

Patented through the Scientific American Patent Agency,

June 26, 1877. For further information address the inventor, Mr. Isaac H. Allen, Black Creek P.O., Welland county, Ontario, Canada.

Professor S. P. Langley's New Method in Solar Spectrum Analysis.

No observation of modern physical astronomy is more striking in its conception than that which attempts to determine the motion of a celestial body by the altered wave-length of its light, and none has attracted more general attention. It is popularly understood that the proper motion of certain stars in the line of sight has been thus completely demonstrated, but those particularly engaged in such studies know how far astronomers have till very lately been from the certainty attributed to them.

It can hardly, however, be deemed superfluous to still offer, upon so important a question, the results of an independent method of measurement, and one which renders errors from instrumental displacement, on the danger of which so much stress has been deservedly laid, in the sense in which the word is here used, not only unlikely but impossible.

The theory of the proposed method is very simple. Let two spectra be formed side by side, the one of light from one edge of the sun, the other of light from a point 180° distant. The instrument being in adjustment, if these points be in the neighborhood of the solar poles which are relatively at rest, all the lines will be continuous in both spectra. But if the instrument is rotated till the light comes from points on the eastern and western sides of the sun, which are in relative motion, not only will the solar lines be discontinuous, in the two spectra: as though the one receiving light from the advancing or eastern side had been slid past its neighbor toward the violet: but any mal-adjustments of the instrument, which simulate this effect, can be with certainty be detected by a means to be shortly described. The solar spectrum consists of two distinct kinds of lines, one caused by absorption in the solar, the other by absorption in the terrestrial atmosphere. These latter being formed by light from all parts of the sun are independent of its rotation.

The prisms are adjusted, till, on looking on the sun directly, the lines are all continuous in both spectra, then the instrument is put in the telescope and the slit placed at such a position-angle that the light in spectrum A comes from the vicinity of the north solar pole, that in spectrum B from the south. On looking in, we see a very long and narrow spectrum, filled with dark lines and exhibiting the chromospheric lines on both sides. It is divided by what appears to be a very fine dust line, in two exactly corresponding parts, and is in reality two distinct spectra, as we see by the opposed chromosphere lines; but as the sources of light for both spectra are relatively at rest, all the dark lines are still continuous. But now (without disturbing any adjustment), revolve the whole 90° about the optical axis passing through the center of the solar image, so that spectrum A is formed by light from the eastern or advancing edge of the sun; spectrum B by light from the western or retreating one. A curious change has taken place. By a very minute but perceptible quantity, spectrum A appears to have been slid past its neighbor, toward the violet end, so that every solar line in the first is "notched" at its junction with the second; while, at the same time, the telluric lines are as unaltered as the fixed lines of a micrometer web would be, by moving a scale about in the field. The effect is the same as though the spectra were tangible things, like two engine-divided scales, whose numerous delicate divisions (represented by the solar lines), were all in exact juxtaposition a moment before, and are all now just perceptibly displaced, as when a vernier plate is moved till a coincidence is made at a new stroke on the limb.

Moving the instrument 90° more, we come again into the axial line of the sun, and the coincidence should return; with still 90° more we are again in the equator, but now spectrum A is formed by light from the western edge, and this time it is moved the other way, as if it were a scale which had been slid by a very slight but distinctly perceptible amount toward the red end; while still the telluric lines retain their continuity, assuring us that no mal-adjustment has occurred.

It will be admitted that this change is, if real, excellent experimental evidence that the wave length is virtually different in light from the eastern and western limbs, as theory predicts. For, granting that the instrument is mal-adjusted in any unknown way or degree, any instrumental cause will affect solar and telluric lines alike, and we may in fact defy ingenuity to suggest an error of adjustment, which will modify one and not the other.

It will be remembered that many lines in the spectrum are only seen when the sun is low. These are clearly due to the absorption in our atmosphere. Many thousands, as we know, are due to absorption in the sun's atmosphere. There remains a large number of lines not coincident with any we

produce at the electrodes of our battery, and always present in the spectrum. Of these we do know that they are either caused by the sun's atmosphere or ours, without always knowing which, for these can only be inferred to be telluric from their growing stronger as the sun sets, and this, though easily determined in the case of a single line, becomes a task of great labor where we deal with thousands. It is evident, however, that after having used known telluric lines to determine the fact that the refrangibility of solar lines only is altered, we can reverse the process, and classify unhesitatingly hereafter all lines as telluric which are unaffected by the changes that compel others to betray their solar origin. To merely see these two spectra with clearness, then, is to be enabled to pick out the telluric lines from the others, as though they were mapped before us. They are mapped in fact, and it becomes, under the proper conditions, a matter of simple inspection to determine them.—*American Journal of Science and Arts.*

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

During the last session of Congress, acts were passed authorizing the Commissioner of Patents to extend two patents, if in his judgment the applicants were entitled to it. One of these cases, that of E. T. Russell, for a combined rubber and steel car springs, patented Nov. 29, 1853, and extended in 1867, has just been refused; the other, the Voelter wood-pulping apparatus, has not, I believe, been yet decided.

The commission to try Mr. McClary Perkins met last Monday, but the authorities having the matter in charge refuse at present to have anything to say about the proceedings, preferring to have the matter kept secret until the decision of the commission is announced.

The scientists of this city have been considerably excited over the discovery of two satellites of Mars by Professor Asaph Hall, of the Naval Observatory, with the aid of the new 26 inch refractor. It appears that the Professor really saw one of the satellites on the 11th. ult., but had no opportunity then to wait for the planet's motions, and therefore failed to recognize it as a satellite. He, however, saw on the 16th. ult., at 11 h. 43 m., a faint star near the planet, so faint that the latter had to be thrown out of the field of view in order that the former might be seen. It was nothing remarkable to find a star there, however, as there are many in the region where Mars may now be seen, but this one appeared to be following the planet, which led the Professor to particularly notice it and to carefully measure the distance between them about one o'clock. At two o'clock he made another measurement and found that the two stars kept the same distance from each other. He then stopped observations for the night; but on the next morning mentioned his observations to Professor Newcomb, who concluded that it must be an asteroid or else a satellite of Mars which has hitherto escaped notice. As it was known there was an asteroid in that neighborhood the two astronomers waited with some anxiety for the reappearance of the object, but Professor Newcomb was so well satisfied that it must be a satellite that he set to work to calculate its time of revolution, which he found to be about thirty hours. The planet could not well be seen until near ten o'clock on the night of the 17th., and this time of revolution showed that the satellite, if it was one, could not probably be seen until nearly the morning of the 18th., but if it was an asteroid it could be seen on the night of the 17th. As soon as the planet could be seen the professors were on the watch, and to their dismay they found a star just where the asteroid should be; but Professor Hall became satisfied from his measurements that it could not be an asteroid, and Professor Newcomb, seeing Mars apparently passing the object, from his calculations thought that it would surely be seen at four o'clock on the morning of the 18th. at the same place where it was discovered on the 16th. They accordingly waited, and were gratified with the sight of the star in the exact place predicted by Professor Newcomb. From this they were perfectly satisfied that the object of their observations was a satellite of Mars, and to their inexpressible gratification they shortly after discovered a second satellite. At the end of the thirty hour period, the evening of the 18th., their observations were confirmed by the reappearance of the satellite; and Mr. Todd, another of the astronomers, thought he discovered a third object, which may yet prove to be still another satellite. The following extract from the official report of Rear-Admiral Rodgers, in charge of the observatory, gives all the data relative to the position, time of revolution, etc., that has been obtained at the time of this writing:

"The first satellite has an apparent distance from the center of Mars of 82 sec., and its time of revolution around the planet is 30 h. Its magnitude Professor Hall estimates as the 13th or 14th. The plane of its orbit has now a considerable inclination to the line of sight from the earth to Mars. At its elongations its angles of position are 72° and 252°. The second satellite was discovered August 17th at 16 h. It appears to be quite as bright as the first one, and at the elongations has nearly the same angles of position, which correspond to the equator of Mars. Its apparent distance at the elongations and its periodic time are not yet known. The following are the preliminary elements of the outer satellite as calculated by Professor Simon Newcomb: Major

axis of orbit, 82 m.; angle of major axis, 70° and 250°; minor axis, 28 m.; passage of satellite through western axis, August 14, 16 h., 40 m.; the period of the inner satellite or satellites is so short, probably less than eight hours, that it cannot be fixed."

The cotton report for August, of the Department of Agriculture, makes a good showing, but a slight decline is observable over the condition as reported for the previous month, which was 93.4, the average for this month being 93. In Louisiana the promise is extraordinary. In Concordia parish the best crop since 1870 is expected; and in Union parish, "the best since 1860." In some of the Atlantic coast counties there is frequent mention of inferior fruiting; and in the Carolinas generally there has been too much succulence from too abundant moisture. In Georgia and Alabama, on the contrary, there has been injury from drought, but of late the weather has been more favorable. In some of the Mississippi bottom lands, some of the cotton has been abandoned on account of too much wet weather. Considerable complaint of the caterpillar is heard from some parts of Texas, but they do not appear to have affected the crop seriously, except in a few cases. The caterpillar has also appeared in a few places in Louisiana, Alabama, Florida, and Georgia.

The Secretary of State has received a dispatch from our Minister to Greece, in which it is asserted that the United States can now and henceforth will control to a large extent the grain markets of Europe. Russia has been our only competitor in this trade; but under the most favorable circumstances for that power the United States has had the advantage of that great cereal-producing country, as our machinery, railroad system, elevators, and simple customs regulations combined have enabled us to place our grain on shipboard at about 15 per cent less cost than the Russian shippers can handle theirs. The war in which Russia is now engaged will certainly not lessen these advantages, and with such an outlook it does not seem too much to assert that with reasonable efforts we shall control the English and some of the principal continental markets. In anticipation of this, British capitalists are now engaged in building six of the largest sized iron vessels designed expressly for the conveyance of grain on English account; and it is suggested that we should not only strain every nerve to meet the increased demand for our breadstuffs, but that we should supply ships also. It is further suggested that, if we wish to retain this trade for all time, some cheaper means of transportation than railways will be found necessary, and that if we had one or two more canals like the Erie, or if the capacity of that could be increased sufficiently, it would seem likely that we could readily retain this trade in our hands until such times as our population became so great as to readily use all our grain at home.

The river and harbor appropriation bill of 1876 appropriated \$100,000 for the improvement of the mouth of the Mississippi river, but "provided that the appropriation shall not be available whenever and so long as there shall be an open channel of eighteen feet of water at mean tide to and from the sea at the South Pass." Captain Brown, the engineer in charge, has reported to the Secretary of War that a survey has been made, showing a channel 250 feet wide and 18 feet deep, and the Secretary has ordered that further expenditure of the \$100,000 be stopped. The dredges that are working on the other passes will therefore be withdrawn. This is construed as an official acknowledgment of the success of Captain Eads' jetty system, and it must be very gratifying to him, in view of the official opposition he had to encounter before he could get his plans adopted.

Reports just received here state that the Entomological Commissioners have made an extended trip through a large region of our western territories. The observations of Professors Riley and Packard coincide in indicating that little trouble need be feared from the grasshoppers during the present year in the west. The wet, cool, backward weather has proved unfavorable for the development of the insects, and there are only a few localities where the numbers hatched are insufficient to do any damage worth mentioning. Professor Riley speaks more doubtfully about Colorado in this respect than as to Missouri, Kansas, and Iowa, on account of the greater diversity of surface and climate that Colorado affords, yet even as to that State he is very hopeful. In Minnesota and Dakota, Mr. Whitman has compiled a report of the observed flights of grasshoppers for the present year. Their directions varied in a puzzling manner, and it is difficult to draw any conclusion from the record as to their destination. Several of the flights were observed to go towards the northeast, which may account for the recent complaints from Canada of a visitation of the "hopper." A very encouraging circumstance for our farmers is that no account of the swarms which passed over Dakota describe the insects as alighting either to hatch or feed.

Major Powell, in charge of the geological survey of the territories, states that there is but a comparatively small area of arable land now owned by the United States, and is preparing for Congress, at the direction of the Committee on Public Lands, a report to maintain his assertions. The Major's statements, however, are severely criticised by the western papers, who state that he runs an imaginary line through Minnesota, Iowa, and Kansas, separating the "arid" and the "humid" territory, west of which he says that farming cannot be successfully carried on. It is stated that the experience of thousands of settlers contradict his theories, and that even if they were correct at present, there is

no doubt that tree planting would redeem the so-called "arid" districts, as it has many other similar localities.

One of the Japanese Postal Commissioners is in this city, and has been taking observations of the working of the General Post Office, with a view to incorporate some of its features with the postal service of Japan. He was afforded every facility for carrying out the object of his visit, and appeared much pleased with what he saw.

Washington, D. C.

OCCASIONAL.

The Locusts in Kansas.

To the Editor of the Scientific American:

In answer to many questions now being asked, I would say that, from all that can be ascertained, there is no danger whatever of another general invasion of locusts into Kansas and adjacent States this fall. This has been my opinion all along, and the experience of the past two months strengthens it. The insects that developed in and arose from the country invaded last year flew, as I said they would, in a N. and N. W. direction up to the early part of July; after which their course was more irregular, and finally set in the opposite direction, namely, S. S. E. and S. W.

The country in which they hatched has been evacuated, and serious injury was confined to the extreme N. W. counties of Iowa and to Kandiyohi and some half dozen surrounding counties in Minnesota. With a few rare exceptions, the departing swarms have been light, and have vanished beyond record without doing harm. "What has become of them?" is a common question. They were mostly diseased and parasitized when they rose, and kept dropping in scattered numbers in the country they passed over, to perish without notice and without issue. The more healthy have been lost to sight in the thinly settled regions of the Northwest. Those which rose late in June and early in July from Minnesota, after flying northwestwardly, retraced their course and have lately been flying over Iowa and now over parts of Kansas. They have done no serious injury, nor do I anticipate any. Those which left Minnesota a year ago acted very much the same way; but they were followed by immense hordes from the country N. W. of Minnesota and from British Columbia, for they bred all through that region in 1876. The present year, on the contrary, all the information that I can gather indicates that the insects are not, and have not been, in noticeable numbers in these northwest hatching grounds. Dr. Packard did not find them in Wyoming, Montana, or Dakota, and there are none in Manitoba or in any of the more settled portions of British America. I expect to find the same state of things in the Saskatchewan country. From the mountain regions west of Kansas there is no danger, because the insects now developing in the higher mountain parks and passes are so relentlessly pursued by parasites and other enemies. Hence I say to all who are in the same state of mind: Plant, and leave the locusts out of account. As I have remarked elsewhere: "There is a constant struggle for supremacy between the plant-feeder and its carnivorous enemies. The Rocky Mountain locust got the upper hand during the excessively dry seasons of the early part of the present decade, and has been so numerous for the past three or four years that its enemies have rioted in plenty, and at last, in their turn, have increased inordinately. * * * Nature maintains her average in the long run, and a few seasons of drouth and locust ravages are apt to be followed by a period of more rainy seasons and locust decrease." C. V. RILEY.

Glyndon, Minn., August 21, 1877.

Growth of the Human Hair after Death.

Dr. Caldwell, of Iowa, states that in 1862 he was present at the exhumation of a body which had been buried two years before. The coffin had sprung open at the joints, and the hair protruded through the openings. On opening the coffin, the hair of the head was found to measure eighteen inches, the whiskers eight inches, and the hair on the breast five to six inches. The man had been shaved before being buried. In 1847, a similar circumstance occurred in Mercer county, Pa. In digging a grave, the workmen came upon the skeleton of a man that had been buried ten years. The hair was as firm as during life, and had grown to a length of eleven or twelve inches.

Copyrighted.

The Germans attribute sharp tricks to the Yankees, but following is quite as bold a swindle as any of our own. An advertisement has been circulated promising to send for one mark (25 cents) "a beautiful secret, how to become very strong," and signed M. L. Müller, in Erfurt. A person who sent the required amount received a printed slip with the following prescription, enclosed in an unpaid envelope (prepayment is still optional over there): "To become strong! Take a bottle of good red wine, bury the wine in the earth in the neighborhood of an ant-hill, and leave the wine there a whole year. Then dig up the wine again and drink some of it occasionally, and you will receive strength which will increase to your astonishment. M. L. Müller, in Erfurt." The same slip contains the usual copyright expression, "reprints forbidden," or literally "Nachdruck verboten."

"We find Mount Union College," says Chief Justice Chase, "healthful, national, making integral education attainable by all;" has superior courses, professors, museum, apparatus, board facilities, \$500,000 property benefiting its 13,097 students, who earn expenses teaching winters without losing time. For new catalogue, address Pres. Hartshorn, LL.D., Alliance, O.

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

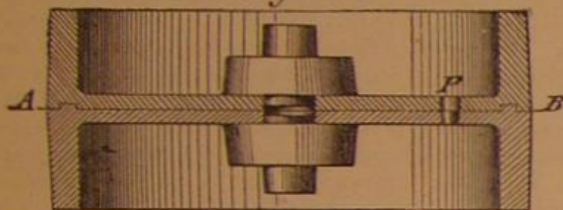
NEW SERIES—No. XXXII.

PATTERN-MAKING.—PULLEYS.

For the sake of durability, patterns for pulleys are generally made of cast iron. For convenience in moulding, it is usual to make them in halves, as shown in Fig. 230, A B being the line of division; the hubs are of wood, as they frequently have to be changed to suit different sizes of shafts.

We may commence by building up a wooden pattern for half of the rim, making it of such a size as to allow for its being turned by the machinist after being cast. Two castings having been taken from this pattern, they are bored and turned to equal dimensions, the proper draught for moulding being given in the process. A slight projection is turned upon one half, fitting into a recess on the other as shown at B. When placed together the two halves form the whole rim. The cast iron arms may be made either the full thickness or in halves. If made the full thickness they will be fixed to one of the half rims. As half the thickness of the arms is made to project beyond the half rim, it will form a guide to keep the two rims central, so that in this case the projection shown at B need not be made. The arms are fitted to the ring by turning, and at the same time a hole is bored through the center to form a guide for the hub, as shown at P in the cut. When the arms are cast in two halves, and a half fitted in each rim, the pattern is easier to mould, as a level parting is secured. The rims must not only be kept central but be prevented from turning one on the other, hence the necessity for the hole to contain a pin, as shown at P. For convenience in drawing the pattern out of the sand, a

Fig. 220.

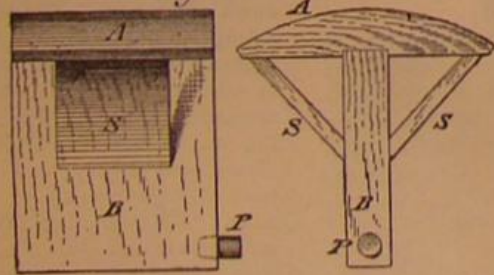


couple of holes may be bored and tapped three eighths or half an inch, or larger if thought necessary, near the rim, diametrically opposite each other.

Occasions often occur when it is inexpedient to go to the expense of a pattern for making a pulley, especially if the pulley be large and only one or two castings required. In this case we may make use of the following contrivance, though it must not be expected that as well shaped castings can be made with it as from a finished pattern.

Fig. 231 illustrates by two views the apparatus as made wholly of wood. A is a piece shaped to the circle of the pulley. It is supposed to be large enough to extend at least about a sixth of its circumference; the depth of A is equal to the width of the rim. B forms a connection between it and the center, where the print, P, is fastened. S S are

Fig. 231.

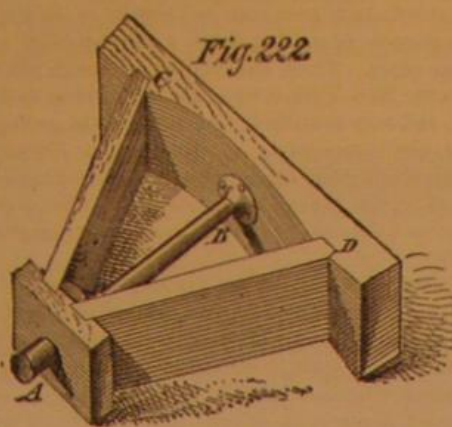


simply braces to stiffen the frame, the use of which will presently be described.

A core box must now be made embracing a section of the interior of the pulley. If the pulley is to have six arms, the core box will take up a sixth of the interior, if four arms, a fourth. We will suppose the pulley is to have six arms. The core is made as shown in Fig. 222. A B represents the arm of the pulley passing through the center of the box; from C to D is exactly a sixth part of the inner circumference of the rim. A sixth part of the hub is fixed in the other corner. The piece, C D, is loose at the joints, as it is necessary to take it off to get out the core. The arm also is loose. When a core is made in this box the arm, A B, is first pulled out; then the piece, C D, is removed, and afterward the other pieces. The hollows around the ends of the arms may easily be formed by the core maker, or they may be formed in the box, as seen in Fig. 222. The hollow or fillet at the end of the arm near the center must be worked out solid with the arm itself, while that which is at the circumference is worked in a piece fixed to C D, the arm being diminished so as to center this piece without making a feather edge. A plain straight arm, oval in section, is the cheapest and most convenient for pulleys made in this way. It may, however, be curved like the arc of a circle, but not made S-formed, as it could not then be drawn out from the solid core.

The moulder, having prepared a level bed, places upon it

the frame, Fig. 221, allowing the print to impress itself in the sand; a weight is then placed upon the frame to keep it in position while the sand is piled around the curve and made level at the full height of the same. The frame is then shifted, and the sand moulded in again. This process



is repeated until the circle of the pulley is finished. Into the mould so prepared must now be placed six cores made in the box described in Fig. 222, and also the core to make the hole for the shaft. The whole is then covered with a level cope, and prepared for the casting.

Improvement in the Manufacture of Sulphuric Acid.

Professor Post, in his new work *Ueber die Fortschritte der Chemischen Gross-Industrie*, says, in regard to this important manufacture, that there is scarcely any branch of chemical industry where the work has been going on more quietly than here, and to none have so many valuable contributions been made during the past year. In the manufacture of the sulphurous acid, the residues and waste products from various metallurgical operations are coming more and more into use, while the residues left from roasting pyrites are carefully worked over into metal or vitriol, or prepared for other uses as in purifying illuminating gas. Still, in view of the high price of pyrites abroad, many of the technical chemists there anticipate a period when they shall have to return to the use of sulphur. The Platten furnace for roasting pyrites dust is coming into more frequent use, while that of Gerstenhöfer seems to be losing ground. The latter, of course, still holds the field where ores that are apt to sinter or furnace products (like the lead products of Freiberg) are used, as there, in consequence of subsequent concentration, a certain amount of sulphur in the roasted product is required. In the Platten furnace sintering would be very inconvenient. Hasenclever's furnace for blende is exciting more interest, and a new modification of his sliding furnace for pyrites has also been introduced.

It is interesting to notice the practical use of sulphuretted hydrogen gas for the manufacture of sulphurous acid. This gas, which is often formed as a by-product, has hitherto only been a source of annoyance and injury. It is also important economically to observe the employment of compounds of oxygen and nitrogen obtained in the manufacture of aniline.

Probably the most important publication of the year on this subject was the prize essay of Brode on the Glover towers. In this he proves the utility of these towers even for dilute and comparatively cool sulphurous vapors.

The changes in the form of platinum apparatus employed to concentrate the acid are extending. The system of Faure and Kessler (whose apparatus is in use at the Peekskill Chemical Works, and in other places in the United States), has become better known, but the new forms of the old boiler have not been the only subjects of discussion. Post publishes a very interesting original communication upon "Changes in these Apparatus," too long for insertion here. He says: On the whole it seems as if more confidence was reposed in the latter than in that of Faure and Kessler, the introduction of which gave rise to the invention of the latter. Dr. Schott emphasizes the fact that there is the greatest tendency, in all branches of industry where distillation or evaporation is carried on, to lessen the capital invested in apparatus, and also the cost of running it. In the manufacture of spirits, too, the stills are much flattened. It seems as if Faure and Kessler had only intended to lessen the consumption of platinum by leaving off the helmet or head of the alembic, and reducing the platinum covering of the boiler, and in doing this they struck upon the idea of evaporating about four inches of acid in a shallow vessel shaped like a saucer. The helmet was replaced by a tall, broad, and well-cooled cap of lead. The advantages of a shallow stream of acid are noticeable in the larger quantity concentrated, smaller consumption of coal, and greater dilution of the acid distilled over (17° to 18° B.). Still, the necessity of frequent repairs and consequent interruption of the process interferes with its general introduction. Soon after the disadvantages of this apparatus became known, two European dealers in platinum, Desmoutis, Quennessen & Lebrun of Paris, and Johnson, Matthey & Co., of London, each came into the market with a boiler, the form of which showed that the two latter had made good use of the experience of the first-named inventors. To favor a strong evaporation and produce a dilute acid distillate, they retained the same form of kettle, then united with this was a systematic heating of the acid in the kettle, but many disadvantages of

Faure and Kessler's dish evaporation were removed by restoring the platinum head.

In 1875, in Prussia alone, 51,881 tons of raw material were consumed in 19 factories, employing 836 workmen, and making 69,985 tons of oil of vitriol, worth \$1,359,300. One tenth of the raw material consisted of metallurgical waste products.

Utilization of the burned pyrites is becoming more general in Germany. A number of manufacturers on the Rhine have united together to import pyrites containing copper from Spain, and have the burned product worked up into copper or its salts, in their factory at Duisburg. The burned pyrites of Schönebeck, which are free from copper, are used to purify coal gas, either alone or after treatment with the manganese solution remaining from the manufacture of chlorine. It is also employed in making green vitriol to neutralize the sulphuric acid formed by the oxidation of the bituminous shales of the brown coal formation, for which iron was formerly employed. The burned pyrites of Schöeller are regularly employed, mixed with other ores, for making iron.

In regard to its use for road-making, for which it is well fitted by its solidity, dryness, and uniformity, Sarrazin gives the following warning. If the pyrites contain any zinc, sulphate of iron and sulphate of zinc are formed, by oxidation, and after a long time spread to the land adjoining and destroy the vegetation, rendering the land useless.

Girardin, Aimé, Morin, and Henri have described in *Ann. Chem. Phys.* the four largest deposits of pyrites, and analyzed 28 of those used in France for making sulphuric acid. The percentage of sulphur in these varies from 30 per cent. to 53 per cent., with an average of 45½ per cent. In 5 they report traces of arsenic; in 5 others a slight trace, while in the others the arsenic was reported at from 0.01 to 0.23 per cent. In 1874, as much as 174,400 tons, worth \$1,200,000, were consumed in France; of which the mines at Sain-Bel, Department of the Rhône, furnishes 121,000 tons. Belgium, Norway, and Spain furnished 18,000 tons. The consumption of acid has increased two-fold in France and three-fold in England within ten years, much of the increase being due to its use in the manufacture of fertilizers. A knowledge of the foreign constituents of the ores, especially arsenic and gangue, is very important to the manufacturer. The arsenic passes into the numerous products which are made by the use of sulphuric acid from pyrites; carbonate of lime is decomposed in roasting the pyrites, and is detrimental, first by producing carbonic acid, which renders the gases impure, and secondly by forming sulphate of lime, which involves a loss of sulphurous acid and makes the use of the burned pyrites in metallurgy difficult. Fluoride of calcium (fluorspar) produces hydrofluoric acid, which produces injury in the leaden chambers, by attacking glass vessels used to hold nitric acid, so that the latter comes into contact with the lead and destroys it.

The sulphuretted hydrogen gas produced in the manufacture of sulphate of ammonia is utilized in Kunheim's works in Berlin in this way, that the gas is conducted into the pyrites furnace, where it comes into contact with the glowing pyrites and is completely burned. In this way they not only recover the sulphur that would otherwise be lost, but also avoid injury to their neighbors from the odor of escaping sulphuretted hydrogen. The nitric compounds contained in aniline residues are utilized at the Schönebeck works by passing these acids through a Glover tower.

A Curious Underground Railway Accident.

In the open country, where unfenced road crossings are frequent, it is easy for cattle to stray upon the track, and it is not surprising that accidents from such causes should take place. But that a disaster should occur upon an underground railway in the heart of a great city, seems almost incredible. Such, however, was the actual fact, recently, in this city, the scene of the accident being within the central tunnel of the Harlem Underground Railway, Fourth avenue, near 57th street. The New York and Boston express train was at that point approaching the station at 42d street, half a mile distant, when the engineer discovered four wild bulls upon the track. The locomotive struck the animals and was thrown from the track. The passengers were greatly terrified and jarred, but no person was injured. All the animals were killed. It appears that they belonged to a herd of wild Texan cattle which was being driven across the city; and on passing the level ground near the Grand Central Depot, in front of the tunnel railway entrances, these four animals suddenly wheeled and dashed off into the middle tunnel on a full gallop and encountered the locomotive as stated. It is evident that the entrances to the underground railway need to be better guarded. Perhaps some ingenious person can devise a system of gates to be operated by the cars.

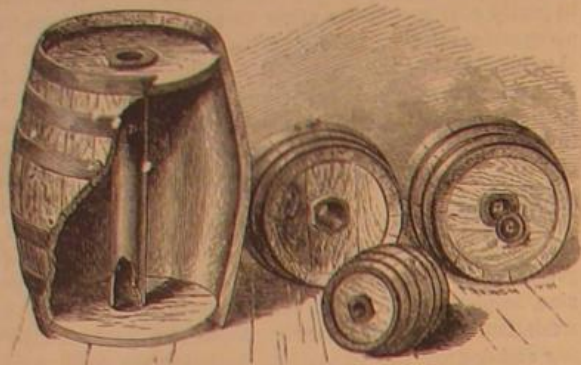
Artificial Lemonade.

Loaf sugar 2 lbs., tartaric acid ½ oz., essence of lemon 80 drops, essence of almonds 20 drops. Dissolve the tartaric acid in two pints of hot water, add the sugar, and lastly the lemon and almond; stir well, cover with a cloth, and leave until cold; put two tablespoonfuls into a tumbler, and fill up with cold water. This drink, it is said, will be found much more refreshing and more palatable than either ginger beer or lemonade, and costs only 30 cents for ten pints. The addition of a very little bicarbonate of potash to each tumblerful just before drinking will give a wholesome effervescent drink.

HOFFMAN'S IMPROVED BEER CASK.

The object of this device, which is intended for the use of brewers' uses, is to provide a simple and effective mode of rapidly cooling beer. A metal tube extends from end to end of the cask, and is fastened to the heads. The ends of the tube are secured and closed by means of adjustable taps or are pivoted to rings or a box which incloses the ends of the tube. The device is readily and cheaply applied to casks and barrels now in use.

Among the advantages claimed are that the tube gives great resisting force to the barrel, and that the tube may be



charged with ice, thus causing the beer to keep in good condition.

Patented July 10, 1877, by Mr. John Hoffman, Toledo, Ohio, who may be addressed for further particulars.

ELECTRICAL APPARATUS TO INDICATE OVERSTRAIN OR WEAKNESS IN BRIDGES OR OTHER STRUCTURES.

This invention relates to certain means of obtaining a prompt indication of the unsafe condition of such structures as bridges, roofs, etc., when such unsafe condition is caused by overloading or undue or excessive strain of any member or of the whole structure, or by derangement of parts at joints or connections, or by any change of condition, either sudden or gradual, from that under which the structure was designed to serve.

In the case of a bridge, for instance, the various members of which are subjected to either tensile or compressive strain the several proportions of such members are so adjusted as to afford a determined margin between the ultimate breaking load or strain and the greatest load or strain to which such member is intended to be exposed under traffic or use. This margin may be reduced by various causes, as the passage of an excessive load, a sudden jar produced by slight obstructions to, or perhaps partial derailment of, wheels, breaking of flanges, etc., or within the structure itself, loosening of rivets, gradual weakening of the member under frequent repetitions of the load, imperfect workmanship, flaws in the material or errors of calculation not apparent at the time of erection. Such lessening of the margin of safety need not be fatal to the structure, provided it can be detected and suitable remedial measures promptly adopted and the originally designed margin of safety obtained.

In the case of members exposed to tensile or compressive strain no permanent injury will result until the limit of elasticity of material is exceeded. Indication of overloading will be recorded before this limit has been reached.

In the case of dislocation or derangement of parts, as the slipping out of position or shutting by of butted joints—as in upper chords, or vertical posts, or oblique struts—in all such and in all similar or analogous cases, it is the object of this invention to furnish a ready means of obtaining a direct indication that such overstrain or derangement has taken place, although no permanent set or immediately apparent evidence may have been left upon the member or structure itself.

The invention consists in attaching upon each member of the structure an insulated wire or conductor, as shown in the cut, so arranged that an electric circuit may be made or broken, by any convenient mechanical means, by the abnormal condition resulting from the excessive strain or dislocation of parts, from whatever cause it may arise, through which a motion either in the substance of the member itself or between contiguous and adjoining members has taken place, the closing or rupture of the circuit to be indicated by an annunciator, operated by the electric current from a battery through electro-magnets suitably arranged, the armature of the magnets being so adjusted that, as in the case of hotel call-bells, a number or indicator shall be exposed, said

number to indicate a particular part or member of the structure.

Patented through the Scientific American Patent Agency, July 10, 1877, by John Forbes, of Dartmouth, Nova Scotia.

Amber and Antiquities under Berlin.

The streets have been torn up recently in Berlin, Prussia, for the purpose of putting down a much-needed system of drainage pipes. These excavations, although not nearly so deep as the New York sewers, are unearthing various curiosities, and may contribute something to the geology of that ancient city. According to the *Berliner Fremdenblatt*, a considerable quantity of amber has been found in one of these excavations, in Alexandrinen Strasse. One piece, which was shown to the editor of that paper, was as large as a hen's egg.

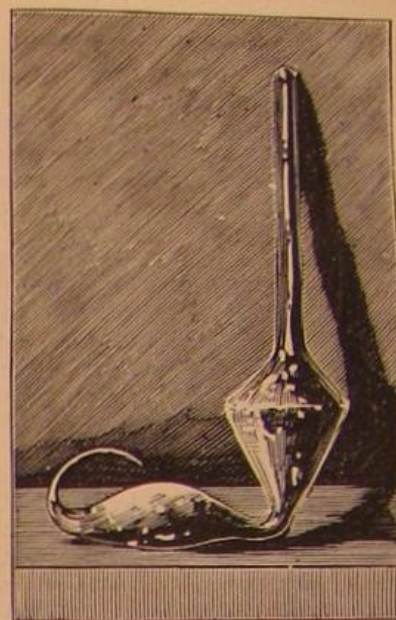
The result of this discovery has been the issue of a circular by the city magistrate Duncker, addressed to the officials and overseers of the work, in which he states that the work of sewerage the inner portion of the oldest part of Berlin offers an excellent and most desirable opportunity to become acquainted, to a certain extent, with the soil and ground on which the ancient towns of Berlin and Kölln were built, such as has never before been offered, and may never occur again. In very ancient times two fishing towns named Berlin and Kölln occupied the spot where the modern Berlin stands; the latter of these has been mentioned as long ago as 1237, the former in 1244. The magistrate, therefore, instructs the officers in charge of the work to observe, first, the layers of earth, and second, to note any articles found which seem calculated to throw light on the state of civilization of early times, and to collect such articles and send them to the museum, in Kloster Strasse, 68. In regard to the artificial soil they are to note whether it is clay, sand, loam, peat, stone, refuse, or the like, and to note what utensils of metal or pottery are found therein. Bones and other remains of animals and men, indications of old walls, pile works, wells, etc., are to be observed. The character of the natural earth beneath the loam and accumulated artificial soil is also to be stated. A table accompanies the circular showing to what articles the attention of the workmen is to be called. The laborers also receive suitable instructions in the circular. Finders of coin and other articles of value will be paid a suitable reward.

Another of the curiosities already brought to light in these excavations is a dozen wooden coffins found in the Spittel Markt (Hospital Market), near Niederwall Strasse. They were piled one on the other, three deep. These coffins do not date from prehistoric times, but possess a respectable antiquity of at least 260 years. The spot was once used as a potter's field, but has not been used since 1620. Notwithstanding their age, the coffins and the bones in them are per-

If these coffins originally contained the bodies of paupers, it may be asked why they were so carefully prepared with tar and lime. If, however, they held the corpses of persons that had died of contagious diseases, may not this have been done as a precaution to prevent a spread of the disease?

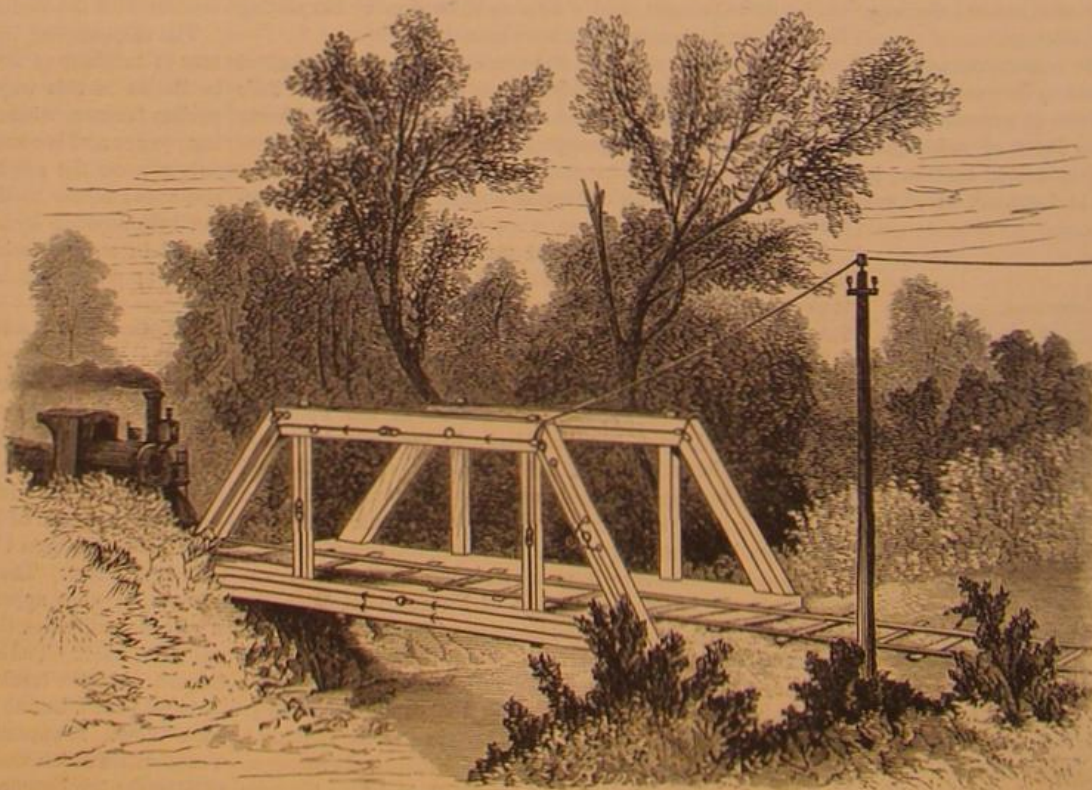
Wine 1,600 Years Old.

We do not often drink wine that is 50 years old, less frequently that which has celebrated its centennial, and wine of



200 years age is an absolute rarity. In the famous Kath-keller at Bremen the visitor is shown casks of wine of wonderful age, and looks with admiration on the cask labelled 1624. The celebrated French chemist Berthelot recently had the pleasure of exhibiting to his colleagues in the French Academy of Sciences some wine about 1,600 years old. He had even succeeded in separating the alcohol from this wine, so that the assembly could see alcohol of 1,500 or 1,600 years age. The color of this ancient wine is not very tempting; in taste and smell it is not remarkable, and it is doubtful if a connoisseur would be pleased to find it on his table.

Berthelot spent the month of May in Marseilles, and while there visited the Borely Museum. His curiosity was excited by a glass vessel which was sealed up and contained some liquid. What kind of a fluid could it be? The Professor obtained permission from the Mayor of Marseilles to open the vessel and take the liquid with him to Paris. The total quantity was only 35 cubic centimeters (about 1 fluid ounce or wine-glassfull). The liquid is genuine wine, is of a brownish color, and contains, in suspension, a solid substance, which does not form a sediment; the odor is decidedly vinous, with a very perceptible aroma, and reminds one of the taste of wine which has been boiled in contact with fatty substances, or, if you please, of sweet apple wine. The taste is strong and hot on account of the large amount of alcohol, together with acid and a trace of some aromatic substance. The coloring matter had almost entirely disappeared already; and only a trace of sugar was found in the wine. The percentage of alcohol corresponds to that of a weak wine; the proportion of acid is almost normal. This is probably the first time any one has handled alcohol of such age. The liquid had kept thus long because it was hermetically sealed up in a glass vessel—a very uncommon occurrence. The tube which held the wine was blown out like a hanging lamp, and after being filled with wine was very neatly melted together,



ELECTRICAL APPARATUS TO INDICATE WEAKNESS IN BRIDGES, ETC.

fectly preserved, and in some of the coffins pieces of the clothing still remain.

Professor Virchow is making a thorough investigation of this curious circumstance. He expects to find out the substance with which the wood is saturated and which has protected it from action of the soil. The wood appears to be young oak. The separate planks are 3 centimeters (1 1/2 inch) thick, and covered outside and in with a thick coat of tar; besides, the coffins seem to have been a layer of lime on the inside. At present the wood is so hard that the workmen have already broken several axes and saws upon it. The planks are held together by large wrought iron nails, which differ essentially in form from those in use at the present day. They are 8 cm. (3 1/4 in.) long, 4 cm. (1 1/2 in.) wide, and 2 cm. (3/4 in.) thick. On the broad side of the nail is a peculiar furrow running its whole length, which may probably have served to impart to the nail greater power of holding on.

just as it would be done to-day in our blowpipe flame.

The composition of the glass itself indicated a great age, and like all antique glass was rich in potash and poor in lime. This tube was found at Aliscamp, near Arles, on a broad plain which had been used in the time of the Romans as a burial or funeral place; a farmer who was plowing unusually deep brought it to light. The antiquarians are inclined to the belief that there was once a glasshouse at Arles which produced very fine workmanship. The glass tube was made on French soil, and probably reaches back to the first occupation of Gaul by the Romans.

In regard to the motives which led to the wine being so carefully sealed up in a glass tube, Berthelot thinks that it may be attributed to some religious ceremony or offering to the spirit of the departed. The place where it was found, "Campi Elysei," a burial place that was examined long ago, adds another argument in favor of this view.

THE BOX TORTOISE.

BY C. F. W. REEDS.

"Land turtle" is the appellation by which this chelonian is commonly known. Its correct herpetological name is *Cistudo clausa* (Gmelin). Dr. Holbrook describes it under the name of "*Cistudo Carolina—Edwards*" ("North American Herpetology," 1842, vol. I, page 31); and Professor Agassiz, the *Cistudo Virginea*, of Grew ("North American Testudinata," 1857, vol. I, page 445).

Few reptiles vary in color so greatly. I have examined individuals of this species which were of a uniform blackish-brown color, entirely spotless; others bright yellow, with black blotches and rays; others black, with yellow spots; and still others, reddish yellow, with black and brown spots, lines, and dashes. It is impossible to find two individuals of this species exactly similar in coloration.

The box tortoise is polyphagous. I have known it to eat berries of many kinds, apples, melons, tomatoes, earth worms, and carrion; and, in captivity, green corn, and meat, both raw and cooked. I believe it might subsist entirely upon "buns and water crackers." I emphasize the "it," for this reason: A tender-hearted lady, a member of the Society for the Prevention of Cruelty to Animals, having observed the box constrictors at our Philadelphia Zoological Garden were fed with living pigeons and rabbits, suggested "buns and water crackers" be substituted, and thus avoid cruelty to animals! I suppose the old lady thought the very sight of the food named by her would cause the box to smack their labials in wild delight, and to cause them to exclaim in the ophidian tongue, "Oh buns! yum—yum—yum!"

The female box tortoise, when young, lays one or two eggs; when older, six or more. The eggs are nearly globular in form, and are of a dirty or yellowish white color. Like the eggs of serpents, they are covered with a tough skin, not with a hard shell as in the birds. The eggs are deposited in holes in the ground, which the female tortoise excavates with her hind legs and feet only, using them alternately, throwing out the loose earth with her feet. One or two eggs are laid in each hole, and are carefully covered over before she quits the spot. The whole number of eggs are generally deposited in the immediate vicinity.

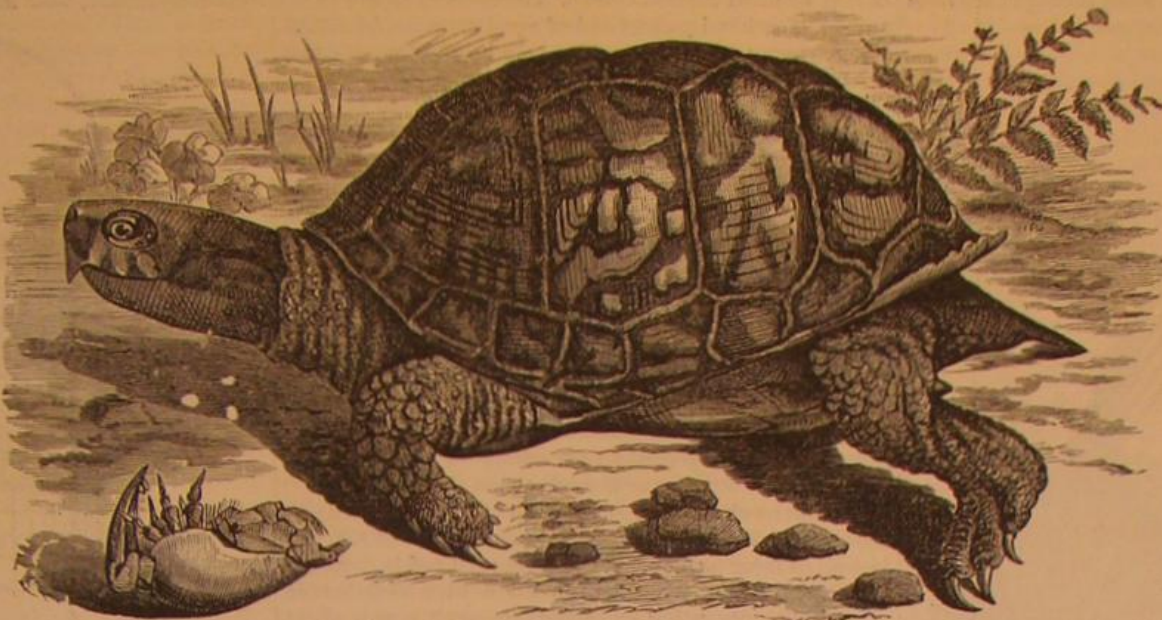
This tortoise is irregular in its time for going into hibernation. So long as the weather is warm it remains above ground, but when the weather grows cold and unpleasant it creeps beneath the surface of the soil. A late or early going into hibernation does not foretell the mildness or severity of the winter following. The winter of 1875 was extremely cold, yet our *Cistudos* did not go under the ground until November 3, 1874, while they buried themselves about the middle of October in preceding winters which proved to be moderate.

In the female *Cistudo* the under shell (plastron) is concave, while in the male it is flat. The specimen from which my sketch was made, is an old male, weighing a small fraction less than one pound. The little crustacean in the foreground is common in the ocean about the sandy beach of Atlantic City, N. J.

Compounds of Silicon with the Platinum Metals.

When platinum is fused in a clay crucible lined with charcoal, it becomes crystalline on cooling and may be readily pulverized. Boussingault has shown that when platinum is fused with charcoal that contains silicic or sand, or in a clay crucible lined with charcoal, it takes up 2.2 to 5.9 per cent of silicon. Under the same circumstances the other metals of the platinum group take silicon as follows: Iridium, 3.7 to 7.0 per cent; palladium, 3.4 per cent; ruthenium, 2.1 per

According to Burmeister, Rengger, and Darwin, the capybara is found frequently in the rivers and waters of Brazil and Paraguay. It is hunted for its meat and skin. It forms the main prey of the jaguar. The food of the water hog consists of water plants and roots. It lives singly and in herds; takes refuge in case of danger in the water, and swims with ease for a considerable length of time. The largest specimen, obtained by Darwin, had a weight of over one hundred pounds, and the length of the largest water hog measured by Burmeister was about five feet long; but it is not unfrequent that dry skins of the animal are sold by dealers of much greater length.



THE BOX TORTOISE.

cent. Carbon is not taken up by these metals, and further experiments show that by igniting carbon strongly with silicic acid, the latter is partially reduced; at very high temperatures the reduced silicon volatilizes and is absorbed by a slip of platinum foil held over the ignited mass.

WATER HOGS.

The South American capivari or capybara (*hydrochoerus capybara*) is called water hog, on account of a superficial resemblance with the hog. It is the giant of the rodents, and for this reason is an interesting subject for the zoologist. The two London specimens are of about the size of half grown hogs. Their color is a dirty grayish, which changes on the back into a reddish or grayish-brown. The bristle-like hair has a length of from one to two inches, and hardly covers the body. It is thickest at the hind portion of

much less skill is required in the use of the tube than in the application of the tourniquet, and that it is more certain in its action.

Japanese Mirrors.

Repairing of mirrors is a process to which the art of Europeans and Americans has not yet arrived. As they make mirrors in Japan, however, the process of repairing is no more difficult than that of mending a stove. The Japanese mirror would seem to be only an improvement on that used by Helen of Troy—a metallic affair burnished and polished. It is a bronze disk, composed of eighty parts of copper, fifteen of tin, and five of lead. It is cast in a mould composed of powdered stone and pulverized crucibles. The casing is polished by hand, as the Japanese alone can polish, and the last process is to rub the surface of the mirror

with an amalgam composed of quicksilver, tin, and lead. And this is done by hand and with a piece of wash leather, till the mirror has a bright reflecting surface. This surface solves the problem of repairing some mirrors, since it can at any time be readily repolished.

At every stage of the work the choicest materials are employed. The cheaper mirrors have sulphide of lead and antimony instead of tin in their composition.

A curious optical effect can be produced by some of these mirrors—probably the best finished. On the reverse, which is also polished, are words and figures in relief. By throwing in a bright sunlight the reflection of the mirror on a screen, these figures are seen to shine through the reflected surface of the mirror. The fact is noted by an English professor in

the University of Tokio, R. W. Atkinson. He has been able to discover no satisfactory solution of the phenomenon, but it is certainly one worth investigation. The body of the mirror is absolutely opaque, and there must be some law of refraction, yet not fully discovered, to account for an appearance so singular.—*Philadelphia Ledger*.



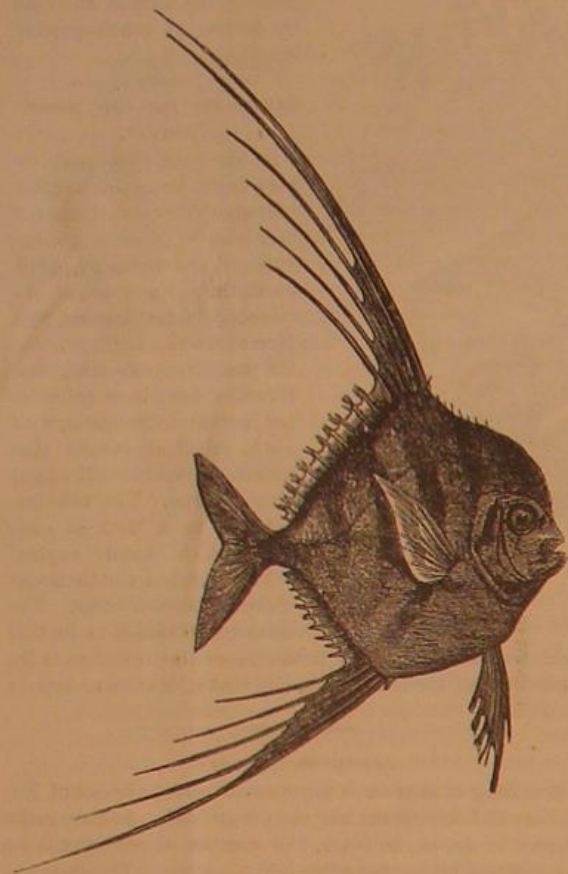
THE WATER HOGS IN THE ZOOLOGICAL GARDENS AT LONDON.

the back. The nose is flat, the eyes are expressionless and set back a considerable distance, forming the main features of the head. The neck and body are strongly built; the hind legs have three and the fore legs have four toes that are provided with broad, rounded-off nails and connected by webs. The tail is only indicated by a short, horny protrusion.

THE CORDONNIER, OR COBBLER FISH.

This fish (*caranx ciliatus*) derives its name from the long sharp spines of the dorsal and anal fins, which to many persons have a fancied resemblance to the awl and bristles employed by cobblers in their trade. It is found quite common in various localities, from the Red Sea, throughout all the Indian seas, and is a good example of the genus to which it belongs. No less than seventy species having been classed in this genus.

The form of this fish is sufficiently curious to render it a conspicuous species, and it may be easily distinguished from



its many congeners by an oblong spot on the operculum and six black bands that are drawn across the body, reaching nearly to the abdomen.

HOW TO CHUCK AND BORE AN ENGINE CROSSHEAD.

A correspondent asks: "How can I chuck a crosshead for a 12 horse engine, and ensure that the holes for the piston rod and the wrist pin shall be true and at right angles with each other?" If the crosshead is a forged one, or if it is of cast iron and the first one cast from the pattern, it will be necessary to line it out with a square, compasses, and scribing block to ensure that there is stock enough to allow it to work clean; if, however, it is known that there is ample material to come off, this may be omitted. The hole for the wrist pin should be bored first, because one hole must be used in connection with a mandril when chucking the crosshead for the second boring. It is easier to turn a mandril for the wrist pin hole than to turn one for the piston rod hole; and furthermore, the wrist pin mandrel can extend through both sides of the crosshead, which would be inconvenient in the case of the piston rod hole on account of the taper.

If the crosshead is lined out, and the lines are carried the full length of the casting or forging, they will still be too short to set the crosshead by, because the thickness of a fine line in the length of the crosshead becomes considerable when multiplied by the length the connecting rod will be; hence, when the crosshead end of that rod is connected, a very minute variation from being square with the wrist pin will cause the connecting rod to require to be sprung to come as it should be with the crank pin journal, unless, indeed, the error be corrected by filing the bore of the connecting rod to suit the want of squareness in the wrist pin. If the latter expedient is resorted to, the brasses at that end will wear unduly on one side face. From these considerations we proceed as follows: We first chuck the crosshead to bore the hole for the wrist pin, clamping it to the face plate of the lathe, and setting it to the scribed lines, if there be any; or we may chuck and hold it by the outside of the metal, trying it with the surface gauge as well as making it run true. By so doing, if there is a want of truth in the casting or forging, between the part parallel with the lathe centers and that parallel with the lathe face plate, we may divide the difference between the two. While setting the crosshead, the holding plates should not be screwed up too tight, so that the work may be moved without giving it heavy blows. When the work is set, the plates must be tightened up gradually, first tightening one a little and then the other, until whole are sufficiently tightened. This is necessary, because completely tightening one bolt first may spring or force the work out of true. After the whole of the bolts are tightened the setting should be tested, to ensure that the work has not moved. The next procedure is to balance the weight of the crosshead upon the lathe face plate by bolting thereon a weight as a counterbalance, testing the balancing by pulling the lathe round by hand and observing if the face plate always stops with one particular part of the work upper-

most. If it does, further counterbalancing is necessary. The hole should be bored with a stout tool, held as close in to the tool post as the circumstances will admit. The last boring should be taken at a comparatively fast speed, and with a fine cut.

The next operation is to turn up a mandrel to fit the holes bored as above. The length of this mandrel should be equal to the diameter of the lathe face plate. This mandrel need not be turned from end to end, but only just as far as to let the mandrel stand central with the face plate when the crosshead is chucked the second time. The mandrel should be for an inch at each end parallel and of equal diameter, its middle being a snug fit, so as to drive very lightly into the two wrist pin holes.

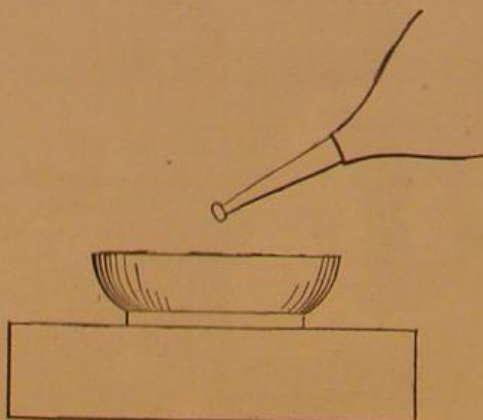
Then chuck the crosshead to bore the piston rod hole, setting it so that the mandrel stands exactly parallel with the face plate of the lathe, and making the outer end run true according to the outside of the metal. To test the setting, the surface gauge is held against the face plate and the hook end of the surface gauge scribe is tried over each end of the mandrel, taking care that the scribe point touches the mandrel very lightly, as otherwise it would be apt to spring. After the turning at this end is roughed out, it would be well to test the work again, because sometimes the packing used in setting the work will compress a little, throwing the work out of true. In cases where the rod end is tried into the hole to fit the taper, watchfulness is required to see that trying the rod does not affect the setting of the work. In finishing the work, two or three fine cuts should be taken so as to ensure a clean, true, and smooth taper hole, which will not take much grinding to get a smooth polished bearing. Instead of using a chalk mark upon the rod end in trying it into the crosshead, it is better to use a little Venetian red mixed with lubricating oil, giving the work a very slight coat.

SIMPLE WAY TO MAKE ICE.

Among the different principles on which the production of artificial cold is founded, stands foremost the evaporation of volatile liquids, during which evaporation the heat made latent in the vapor causes its temperature to be far below that of the liquid from which it originates, and so robs the remainder of this liquid and the surrounding bodies from a great deal of their heat, in this way producing a cold of which the intensity is proportional to the rapidity of the evaporation, and therefore depends greatly on the degree of volatility of the liquid used.

It is a common lecture room experiment to freeze a small quantity of water under the bell jar of an air pump, when the vacuum is produced with sufficient rapidity; a tablespoonful of water placed in a watchglass may be frozen in less than a minute, all what is necessary is that the pump be able to remove the watery vapor formed as fast as it is generated. If the air pump is not in perfect condition, it is necessary to add some auxiliary agent, and this is to place under the bell jar a flat dish filled with sulphuric acid; this, by its great affinity for watery vapor, aids the action of the pump, and makes the experiment successful, even if the pump is in a lesser degree perfect.

This lecture room experiment has been modified into a practical machine by Carré of Paris, and is since some years in operation in many of the Paris restaurants. It consists of a hand air pump, which exhausts the air and watery vapor from a strong glass bottle half filled with water, while this air and vapor before reaching the pump passes through a cylinder with sulphuric acid, which retains most of the watery vapor and makes the evaporation so rapid that a quart of water can be easily frozen in a few minutes, according to condition of machine, of season, and locality.



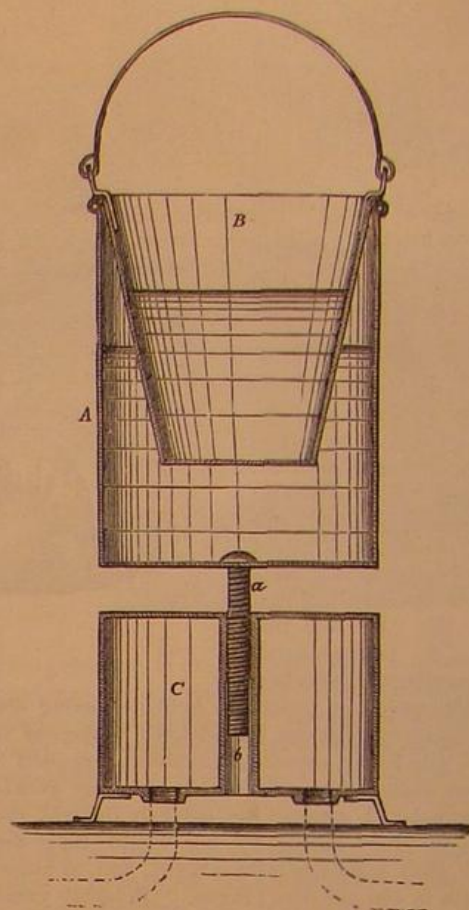
But in place of freezing water by its own evaporation it is more advantageous to use a liquid of greater volatility, such as ether, carbon bisulphide, liquid ammonia, chymogene, or even liquefied carbonic or nitrous oxide. The latter two substances are indeed so volatile that it requires no machinery to freeze water with them; it is sufficient to surround a vessel with either of those substances, when the water in it will be rapidly congealed.

Less volatile substances may also be made to evaporate rapidly enough to freeze water, without the aid of vacuum pumps, by simply aiding their evaporation by means of a blast of air. Böttger has published a simple method of which the whole apparatus required is represented in the engraving. It consists in a flat dish of very thin sheet copper, in which some carbon bisulphide, ether, or chymogene is poured; this dish is placed on a small square board of pine wood, on

which some water is placed, so as to be between the board and the bottom of the dish. When in this condition the nozzle of a bellows is kept over it in the position indicated in the figure, and by working the bellows a blast of air is thrown upon the surface of the volatile liquid in the dish, and so its evaporation accelerated. After continuing this for a little while, the water under the dish is found to be frozen.

IMPROVED GLUE POT.

The desirability of keeping glue, while being used, at the right temperature, and avoiding all liability of its boiling



over, on the one hand, or of becoming chilled on the other, is well known to mechanics who have occasion to prepare and use the material. By the invention illustrated herewith this is claimed to be accomplished with certainty and without trouble. To the center of the under side of the bottom of the shell, A, is secured a screw, a, which extends downward and at right angles to the bottom. C represents the base, from which emanates the heat designed to dissolve the glue. This base has formed through its center an orifice, b, which has within it screw threads corresponding to the threads on the screw, a. The upper surface of the base, C, is closed, as well as its under surface. The screw, a, after being entered within the orifice, b, may be received entirely within said orifice, or but partially so.

Heat being applied into the base, C, by steam, or in any other desirable manner, the shell, A, of the glue pot is turned so as to send the screw, a, after being entered within the orifice, b, which will bring the under surface of the shell closely in contact with the upper surface of the base. In this position the greatest amount of heat is brought to bear upon the glue pot, and the glue within it very speedily begins to boil. Now, to keep the glue, after being properly prepared, at the requisite temperature, it is only necessary to revolve the shell, A, until its bottom is brought out of contact with the surface of the base. In this position a stratum of air, entering between the base and the bottom of the shell, will modify the temperature to any degree desired; and by simply screwing up or down the cylinder, A, bringing it nearer to or further from the upper surface of the base, the glue may be kept on the boil, or simmer, or otherwise, at pleasure, without danger of boiling or getting too cool to use. This invention was patented January 11, 1876, by Mr. C. S. Comins, of New York city.

Hospitals for those who can Pay.

What is called the Home Hospital Association has been organized in London for the purpose of providing comfortable hospital accommodation, with skilled nurses, in various parts of London, for the benefit of patients who can afford to pay for such advantages. Such hospitals will not only be a great convenience to the public, but will prevent the abuse of charities intended only for the poor.

A scheme is also on foot in London for the establishment of a large hospital composed of separate departments, each devoted to special diseases. It is thought that in this way one general medical staff may be able to superintend the whole institution, and that the material may be rendered more valuable for purposes of clinical instruction.

An analysis by Charles C. Dreuding shows that the organic constituents of cotton root bark are a red and a yellow resinous coloring matter, fixed oil, gum, sugar, tannin and chlorophyll.

On August 20th last, Frederick Cavill swam the English channel, twenty miles, from Cape Grisnez, France, to Dover, England. Time, 12 hours.

Rise and Progress of the Beet Sugar Industry in France.

The following is extracted from the Inaugural Address delivered by M. Drouyn de Lhuys at the Agricultural Congress at Compiègne:

Though the avowal be made at the cost of patriotism, it must be owned that the art of extracting sugar from the beet, which has now attained such a marvelous development, is not of French origin. Even the plant itself is not indigenous, having been introduced from Bohemia by the barbarian hordes that ravaged Gaul at the time of the Roman Empire. In his "Theatre d'Agriculture," Oliver de Serres speaks of it as a kind of forage, and appears to have presaged the possibility of extracting the matter which furnished its fermented juice. Its value as food for cattle was enthusiastically advocated by the Abbé Commerel, in a pamphlet published at Paris in 1786, under the title of "Instruction sur la Culture, l'Usage, et les Avantages de la Betterave Champêtre."

The honor of having demonstrated the existence of sugar in the beet belongs to a German chemist, named Margraff, who was born in 1709. He conceived the idea of treating various indigenous saccharine plants, such as carrot and beet-root, with alcohol, and established the fact that beets contain as much as 6 per cent of their weight of sugar. The following extracts from a memoir, which he published in 1745, show in an interesting manner how this valuable discovery, of whose immense future he could have no conception, gradually dawned upon Margraff: "I took the roots of white beet, cut them into slices, and allowed them to dry. Then I reduced them to a coarse powder, eight ounces of which I put into a stopped bottle, and poured upon them sixteen ounces of rectified spirits of wine. The whole was then subjected to heat, which was pushed up to the boiling point of the spirit, while the powder collected at the bottom of the vessel was stirred about from time to time. Immediately the boiling point was reached I removed the vessel from the fire, poured its contents into a small linen bag, and squeezed out the liquid part thoroughly from the latter. The liquid thus expressed was filtered while still hot, poured into a flat-bottomed glass vessel, corked up, and set aside in a cool place. The spirits of wine at once became turbid and at the end of some weeks small crystals were formed, having all the characteristics of tolerably pure sugar. These I dissolved anew in spirits, and thus obtained them of greater purity."

This procedure of Margraff was a mere laboratory experiment. Half a century had still to pass before any practical application of his discovery was made. The second step was also the work of a German, though his name, Achard, indicates descent from a French stock. In 1795 he grew large quantities of beet on his farm in Silesia, and extracted from them sugar in abundance. He even got as far as refining the product, and in 1799 presented specimens of loaf sugar to Frederick William III. of Prussia.

In 1800 Achard published his method in a work entitled "Instruction sur la preparation du Sucre brut, du Sirop, et de l'Eau-de-vie de Betterave," which attracted the attention of the Institute of France. This body caused a detailed report of the new industry to be drawn up, the matter being then of much consequence owing to the loss of the French colonies. Sugar became still dearer when the Continental blockade suppressed maritime traffic, rising then to six and even twelve francs per kilogramme. Impressed by the necessity of procuring for the population an article of diet which had by this time become an actual necessity of life, the Government caused experiments to be made, one by one, upon all plants cultivated in France which were in any degree capable of replacing the sugar cane. In this manner grapes, plums, maize, sorgho, carrot, and maple were passed under review. Rewards were offered for the encouragement of investigation, and in 1810 Proust received from the Emperor Napoleon the Cross of the Legion of Honor and a sum of 100,000 francs for his discovery of grape sugar; while one of his competitors, Fouquet, was awarded 40,000 francs in acknowledgement of his efforts in the same direction. Grape sugar, however, is not crystallizable; it is friable; it must be employed in quantities twice or thrice as large as are required of cane or beet sugar; and in the form of syrup, extracted directly from the grape, it is even less satisfactory.

Further researches were necessary, and now the turn of beet root came. The first French factory for the extract of sugar from beet was founded at Lille, in 1810, by M. Crespel-Delisse. Some Spaniards interned in the Département du Nord, who were familiar with the manufacture of cane sugar, lent him their assistance as workmen, and the venture soon became a great success. From 400 kilogrammes manufactured the first year, the output rose to over 10,000 in the next. The Institute had nominated a commission, composed of Chaptal, Foureroy, Darcel, Guyton-Morvan, de Cels, Teissier, Vauquelin, and Deyeux, who were meanwhile occupied in studying the methods recommended by Achard, and seeking to improve upon them. On March 21, 1811, a *résumé* of their investigation appeared under the title of "Instruction pour Extraire le Sucre de la Betterave." Soon the impetuous genius of Napoleon, excited by a report of Chaptal's, aspired to solve the problem by main force. A decree of January 15 directed the creation of five schools of chemistry, to which 100 pupils were to be attached, 100,000 acres of land were to be cropped with beet, and four imperial factories at once established. The downfall of the Empire carried with it the ruin of this organization, estab-

lished at enormous cost, by re-establishing ocean traffic, and the restoration of the colonies. On the same day that peace was declared the price of sugar fell two thirds, and declined, little by little, to 1 fr. 40c. per kilogramme. The majority of home-grown sugar makers at once succumbed in the unequal contest, but some few brave spirits still maintained the competition. Among these was M. Crespel-Delisse, who had already gone through the crises of 1812 and 1814. With renewed energy he established a central refinery at Arras, attached to it nineteen agricultural estates, destined to supply its wants in raw material, and constructed special workshops for the manufacture of the necessary plant. His contribution to the general output of sugar in the whole of France rose to 4,000,000 kilogrammes yearly. In 1824 M. Crespel-Delisse's labors were made the subject of a special report by Chaptal; in 1827 he was awarded the great gold medal, and 1864 the Government of the Second Empire claimed for him a national recompense as a public benefactor to his country.

It is scarcely necessary to recall how few industries have had such difficulties to surmount and have achieved such rapid successes. In fact, the produce from the beet, when first called into unexpected competition with that of the cane, was little more than a coarse brown sugar (*cassonade*), and there has been no lack of pleasantries at its expense. Many may remember a caricature representing the little King of Rome holding a beetroot in his hand, and crying sadly, "Papa says that it is sugar." Nowadays it is assuredly sugar, and good sugar too. But what vigorous efforts and what indefatigable perseverance have been required to attain this end! To achieve this victory nothing less than a triple alliance of agricultural, chemical, and mechanical science has sufficed.

Let us measure by the aid of figures the distance we have traversed in our onward march since 1827. At that date the annual production of sugar was estimated at 1,000,000 kilogrammes, in 1840 at 27,000,000 kilos., in 1852 at 75,000,000 kilos., in 1846 at 247,000,000 kilos., and in 1871 at 336,000,000 kilos. In 1875 the production had risen to 450,000,000 kilos., while the home consumption did not exceed 250,000,000 kilos., and thus 200,000,000 were available for exportation. Looking back to the glass vessel in which Margraff first crystallized the juice of beet, heated with spirits of wine, it must fain be acknowledged that the career of the home-grown sugar in Austria and in France has been a brilliant one indeed.

Epitaph on an Engineer.

The *Chicago Age of Steel* says that the following epitaph is genuine:

Here lies in a horizontal position,
The remains of
George Washington Brown,
Steam Engineer,
Whose abilities and skill were an honor
To the craft.
His fire was even; water-line at the middle cock;
Steam—just right.
Every action was marked by the pressure gauge,
And limited by the safety-valve,
And so accurately was his machinery regulated
By the governor,
He never met with an accident,
Until most mysteriously—'twas an unlucky day—
Boiler, engine and building, with mortals ten,
All went up
Higher than a kite!
Poor Brown, with nine others, departed this life
By steam
Aged 46, Cincinnati, O., April 14, 1871.
At the inquest,
The Coroner held the deceased "a blameless man."
He was always true;
'Twas the iron that was false;
Providential—so it was to be.
Peace to his dust.

The School Blackboard.

A correspondent of the *New England Journal of Education* states that the Rev. S. R. Hall, LL.D., who recently died in Brownington, Vt., at the age of 82, where he was pastor of the Congregational church for some thirty years, originated the notion of using a blackboard in schools. He first used it in Rumford, Me., in 1816, to illustrate arithmetic. The first one was made of black paper, which he marked upon with white chalk. The notion was at first ridiculed, but Mr. Hall persisted in its use, and finally met with favor. He next used it in Concord, N. H., where he taught for some years. Here it was a great novelty in the public schools, and many visited the school to see its use; but this way of explaining arithmetic was so successful that it was adopted very soon after 1813 all through New England, and now no teacher seems to be able to get on without it.

New Steamship.

The City of Macon, lately launched from the yard of John Roach, Chester, Pa., has been built for the Ocean Steamship Company of Savannah. She is of iron, 2,350 tons; length, 272 feet over all; 38 feet 6 inches beam moulded; depth from base line to top of spar deck, 26 feet 10 inches; depth of hold, 24 feet 10 inches. She has two compound surface condensing engines of 1,650 horse power. Her boilers are four in number, and are tubular cylindrical. Her propeller is of the Hirsch patent. She will ply between New York and Savannah, in connection with the Georgia Central Railroad.

A Satisfactory Grasshopper Machine.

Professor Riley, of the Entomological Commission, has during the summer perfected a grasshopper machine, which seems to be just the thing. It is intended to do away with all extra material, like coal oil, which in the long run is expensive, and to work at all seasons, whether the insects are just hatching or full grown. It is not patented, nor does the Professor intend to patent it, unless it is found necessary to prevent others from doing so. In the *Industrialist*, the organ of the Kansas State Agricultural College at Manhattan, Mr. A. N. Godfrey thus speaks of the machine:

The Mechanical Department has constructed a new locust exterminator for Professor Riley. This machine operates upon the bagging principle. It is, briefly, a large canvas bag stretched upon a light but strong frame and placed upon runners, which extend with curved tips a little in front of the mouth. The canvas is stretched upon the inside of the frame, thus making the bag smooth and even within. This bag has a mouth ten feet long and two feet high, and converges backward to a small box one foot square with an opening covered with wire cloth above, and containing a slide cut-off at the end. This box opens into a small cylindrical bag two and a half feet long and one foot in diameter. This bag is kept in position by two tin hoops attached to a wide runner beneath, which is fastened to the main machine by leather straps. The hinder ring contains the door, which is of wire cloth stretched upon a stout iron ring, which fits tightly within the bag-ring, and swings upon a pivot like the damper in a stovepipe. The door is fastened by a small iron rod dropped through holes in the bag-ring at right angles to the axis of the door. The machine is made to "take more land" by means of two triangular wings about six feet long attached to the ends, from which are suspended a number of teeth or beaters, which, swinging loosely, drive the hoppers towards the center. The wings also serve as attachments for the motor power.

On smooth ground the machine can be easily hauled by two men, but where the grass is tall and thick it pulls harder. The locusts on hopping into the machine soon reach the small back portion, enter the small bag and are attracted to the rear end by the light which enters at the gauze door. When a sufficient number are thus captured, the machine is stopped; the cut-off is slid down in the box, thus shutting the hoppers in the bag; a hole is dug behind the machine, the bag tipped into it, the hoppers buried, and "presto!" the thing is done.

The advantages of this machine are many, some of which are that it requires no additional expense to run it, as for oil, tar, etc.; it will catch the winged locusts as well as the young, if operated on cool morning and evenings; and is adapted to almost all conditions of growing grain. The machine can be made for about ten dollars, and perhaps less. From all appearances the machine will give good satisfaction, and armed with it we may hope to make a successful "strike" against any "locust monopoly" that may try to crush us in the future.

A New Case of Aniline Poisoning.

Not long since we published an article by Dr. Seidler, on the aniline dyes and their effect on the system (*SCIENTIFIC AMERICAN*, page 40, July 21, 1877). Notwithstanding his very plausible theories in regard to the non-injurious effects of infinitesimal quantities of the poison, if such it be, we have some facts from Berlin that seem to throw doubt on his conclusions. On pleasant Sundays in summer large numbers of the denizens of that metropolis seek recreation in the pleasant retreats of Potsdam, the summer residence of royalty. On the last Sunday of July a large number of these pleasure seekers suffered injury from fuchsine poisoning. It seems that reports had reached the Potsdam police that sickness had followed the partaking of some so-called raspberry extract, a favorite flavoring over there, and usually of a very bright red color. The police at once instituted an investigation and found that the raspberry extract sold by a certain Potsdam merchant contained but very little of the juice of the berry and very much aniline, especially fuchsine. The raspberry juice found was at once confiscated and an official warning published in the Potsdam papers against raspberry juice. These praiseworthy precautions prevented any further poisoning during the ensuing week among the citizens of Potsdam, but the calamity broke out again with greater severity among the Sunday guests from Berlin. A number of persons who had been wandering about the beautiful gardens of Sans Souci were resting in Blume's café near the orangery, and drinking white beer mixed with raspberry extract. Soon after partaking of these, symptoms of poisoning were noticed, nausea and vomiting, etc.; some of the ladies even fainted away. Police-consul Thiedecke, Dr. Frank, and others have attributed this sickness to fuchsine, although some of our readers might consider this strange admixture of raspberry and weiss beer, upon the empty stomach of a weary pedestrian, able to produce sickness without the aid of fuchsine. Be this as it may, Berlin raspberry juice is at least suspicious.

Fire Arms Improvements.

Col. Silver, of London, Eng., has made two very good improvements, specially useful in heavy and rapid firing. The first consists of a soft rubber heel plate, which is readily attached to any gun. It takes up the recoil in an admirable manner, and thus permits the firing of heavy charges with impunity.

The second improvement consists of a hard rubber hand

guard, made in the form of a sleeve, that slips over the barrel and forms a non-heat-conducting cover. By the use of this guard the gun barrel may be firmly held in the hand even after it has become scorching hot under rapid firing.

Samples of these devices are furnished by Mr. Joseph Dixon, 7 Bloom Grove, Lower Norwood, London.

Professor Loomis' New Meteorological Deductions.

Professor Elias Loomis of Yale College, after examining the immense number of weather observations collected by the United States Signal Service, deduces the following generalizations. The seven papers wherein the detailed discussion has been embodied have appeared in the *American Journal of Science and Arts* whence the summarized conclusions below given are extracted:

1. Areas of low barometer result from a general movement of the atmosphere towards a central area, and this movement is accompanied by a deflection of the wind to the right, which causes a tendency to circulate around the center with a motion spirally inward.

2. This deflection to the right, which results from the earth's rotation, causes a diminished pressure within the area of this inward movement, and the pressure is still further diminished by the centrifugal force resulting from the circulation about a center.

3. The amount of the barometric depression depends upon the force of the wind, and the geographical extent of the revolving atmosphere. The effect of centrifugal force is not considerable except when the velocity of the wind approaches that of a hurricane. With a velocity of 100 miles per hour, the depression due to centrifugal force may amount to about two inches; but in the winter storms of the middle latitudes, with a velocity not exceeding forty miles per hour, the depression due to centrifugal force seldom exceeds one or two tenths of an inch. In these storms, three quarters of the observed depression of the barometer is usually the effect of the earth's rotation; but in order that the depression at the center may amount to as much as one inch, it is generally necessary that this system of circulating winds should prevail over an area nearly 2,000 miles in diameter.

4. In North America, south of latitude 35°, areas of low pressure are less frequent and generally exhibit a less depression than near latitude 45°, because the area over which a cyclonic movement of the winds prevails is small; and this area is small because, if a cyclonic area could be formed having a radius of 1,000 miles with its center in latitude 30°, its circumference must extend southward to latitude 16°, where the trade winds are steady and seldom interrupted. Such a diversion of the winds toward the north, even if it could be produced, could not be long maintained; so that a large cyclonic area with its center in latitude 30° is well-nigh impossible; and it is impossible that there should be a great depression of the barometer in latitude 30°, except with a wind having a hurricane velocity. This is believed to be the reason why in North America the centers of great storms are generally found north of latitude 40°.

5. The causes which may produce a general movement of the atmosphere toward a central area are (A) unequal pressure as shown by the barometer; (B) unequal temperature; and (C) unequal amount of aqueous vapor. Of these three causes the effect of the first is generally so decided that the influence of the other two causes can only be detected by careful observation; but when the pressure of the air is nearly uniform over a large extent of country, the influence of the other two causes is sometimes very palpable, and their influence is generally seen in a slight deflection of the winds from the direction they would have if wholly controlled by the first cause.

6. A cyclonic movement of a large mass of air is generally attended by an upward motion in certain localities, chiefly on the eastern side of the center of low pressure, and this upward movement results in rainfall. The rainfall is then not generally the original cause of the barometric depression, but rather an incident of the cyclonic movement of the atmosphere. The fall of the barometer during a rain storm cannot be ascribed to the simple condensation of the vapor of the atmosphere, as some have supposed, since a rainfall of one or two inches prevailing over an area 300 miles in diameter near latitude 30° produces scarcely an appreciable effect upon the barometer.

7. The progress of areas of low barometer in all latitudes is determined mainly by the same causes which determine the general system of circulation of the atmosphere; and their normal direction is changed by whatever causes may change the direction of the winds.

8. The heat which is liberated in the condensation of a large amount of aqueous vapor must exert an influence upon the movements of the air, so that while the rain is generally to be regarded not as the original cause but rather as one of the incidents of extensive cyclonic movement, if the rain area has great geographical extent, it may have a decided influence upon the amount of the barometric depression and upon the velocity with which the storm advances; sometimes accelerating its motion, sometimes retarding it, and sometimes holding it nearly stationary in position for two or three days.

The Electric Light.

The Russian Government, it appears, is turning its attention to the electric light as an illuminator for military purposes. In some experiments recently made at St. Petersburg, with the special object of increasing the distance to which the light produced by electricity may be thrown, it

was found that the power of the light is greatly augmented by covering the carbon burner with a thin sheet of copper. The augmented light was sufficiently powerful to render objects visible at night at a distance of upwards of 3,000 yards.

Professor Langley's Apparatus for Eliminating Personal Equations.

A well known source of error in astronomical observations is that due to the deficiencies of the observer himself in the shape of defects in vision, perceptive power, etc. In order to eliminate this, astronomers have adopted two courses; either to find the amount of personal error in each case and apply a subsequent correction, or to diminish or eliminate the same by suitable devices during the act of observation. Professor S. P. Langley describes, in the *American Journal of Science and Arts*, and new and very ingenious apparatus for eliminating the "personal equation" on the star itself. It is constructed and operated as follows:

On the transit pier (or in any other convenient locality) is a small clock, with a conical pendulum, whose bob slides freely up and down the graduated rod, retaining its position where left. A small horizontal wheel in the clock is controlled by the pendulum, and turns once for a certain constant number of its revolutions. This wheel revolves once for each equatorial interval of the transit wires, when the bob is set at a mark near the top of the rod, and by sliding the bob sufficiently downward; with the use of a readily constructed table, we can, given the declination of any star between the limits 0° and ± 60°, set the pendulum, so that this wheel shall make exactly one revolution while the star passes from wire to wire. This wheel carries near its periphery a mercury drop or other contact piece, which once in a revolution is carried past a point fixed near the periphery of a stationary horizontal wheel, concentric with the first, and immediately above it, but insulated and entirely detached from it.

This upper wheel, while thus related to the lower, is entirely disconnected from the machinery of the clock, and is thus far stationary; but it can be revolved by cords passing from a groove in its circumference to the hand of the observer at the transit. As the upper, or ordinarily fixed, and the lower or constantly moving, wheels have a common vertical axis of revolution, and as the radial distance of the point in the upper from this axis is the same as that of the contact piece on the lower, it will be seen, while the upper wheel remains motionless, electric contact accompanied by a simultaneous flash, if we desire it, at the transit lantern or elsewhere, will be made at equal and uniformly recurrent epochs, the interval between which depends only on the adjustment of the pendulum. If the upper wheel be rotated forward by hand, through a small distance, and then left, the next contact will still occur, but at a later epoch, owing to the lower wheel's having to complete more than one revolution to make contact, but after this the contact and simultaneous flash will recur at the same intervals, and with the same regularity as before. If the upper wheel be moved backward, the flash will occur once, earlier, and thereafter with regularity. Moving the upper wheel, then, changes the epoch from which any series of such flashes dates, and adjusting the pendulum bob fixes the interval between subsequent flashes. In practice the lamp is removed from the transit lantern, and the two terminals of a battery or induction coil in its place cause the flash to be thrown upon the wires, whenever the mercury drop is in contact with the point, and at the same instant a mark is made automatically on the chronograph and interpolated in the regular record of the beats of the sidereal clock, which go on in the usual way quite independently of any reference to the apparatus just described.

The mode of observation will be anticipated. Before the transit of any star the observer adjusts the conical pendulum beside him (this is the work of but a few seconds), and then seats himself at the instrument holding the cords in one hand like the "reins" of an equatorial. If a flash occur just as a star is crossing the first wire (which is most unlikely) he has nothing to do, except possibly to note which was the middle wire, for each records itself on the chronograph without any intervention of his. But if the star be, for instance, two thirds of the way from the first to the second wire at the first flash, he will draw one of the cords, accelerating the flash and thus causing the star to appear nearly coincident with the second wire when the next spark comes, and repeat the adjustment by the light of subsequent flashes, till the bisection is perfect. Three or four trials are in practice found to yield a bisection which will satisfy a fastidious eye, and when a satisfactory one has been once made, the effect is automatically repeated.

Under the general conception, then, of the possibility of diminishing to any limit personal error, by employing brief views of the star or wire and utilizing the phenomena of persistence of vision, the particularly described device assumes to dispense with the observer's record upon the chronograph altogether, and to substitute a purely automatic one giving the same virtual result as though the image of the star were a tangible object, itself making electric contact with each wire. The share of personality in any observation is relegated to the prior act of bisecting a star, virtually motionless with relation to the bisecting wire, so that if (as seems to be the case) this act is independent of quickness or slowness of perception, of the time of cognition, or of the speed of nerve transmission; personality, in the technical sense, appears not to intervene at all.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the *SCIENTIFIC AMERICAN*. We are prepared to get up first-class wood engravings of inventions of merit, and publish them in the *SCIENTIFIC AMERICAN* on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW HOUSEHOLD INVENTIONS.

IMPROVED SAD IRON AND FLUTING IRON COMBINED.

Christopher C. Burke, Cuthbert, Ga.—This improvement consists in forming the iron in box form with four smoothing faces, two large ones and two smaller ones, and combining it with a handle in such a manner as to be reversible, and with a heating plug or block to be inserted in the hollow iron which has four faces, corresponding to the four faces of the iron. It also consists in the particular means for connecting and disconnecting a plate carrying one of the ironing faces, to admit the insertion or removal of the plug or block, and the adjustment of a fluter.

IMPROVED RECIPROCATING CHURN.

Allen D. Ferris, Blakeley, Minn.—This invention relates to oscillating churns; and the nature of the invention consists in combining, with a semi-circular cylindrical oscillating churn box, a removable rectangular frame, having slats arranged in it in such manner that when the box is rocked rapidly the milk in it will be violently agitated, the currents being directed upward and downward by reason of the position of the dashers or slats. The slats on one side of the frame are inclined in an opposite direction to those on the other side of the frame, and the angle of inclination of the slats is such that the milk is directed both upward and downward by the same slats at each oscillation of the churn box. The currents are thus opposed to each other, and a violent agitation is produced which greatly shortens the operation of churning. The slats also serve to gather the butter when it comes.

IMPROVED COMBINED LAMP REST AND SHADE HOLDER.

Patrick J. Clark and Joseph Kintz, West Meriden, Conn.—This invention relates to an improved lamp rest and shade holder combined, by which the shade may be readily swung out of the way, and securely retained in raised position while the fount is taken off for refilling and other purposes, the fount being securely applied to the fount plate or basket, and any danger of upsetting or dropping the lamp effectually prevented. The invention consists in the connection of the lamp fount, having a central cavity, with a spring wire holder or clamp that screws the fount or basket tightly to the bracket or chandelier; and it also consists in the connection of a fount plate or basket with an adjustable rod carrying the swinging shade holder. The fount when placed on the spring wire holder is rigidly retained on the plate or basket without danger of being thrown off or detached from the same in accidental manner. The wire holder admits at the same time the ready sliding of the fount when lifted in vertical direction, for cleaning, refilling, etc., and the instant replacing by pressing the fount down on the holding device. The shade or chimney is swung back on the fount as soon as the same is placed in position on the holder, being securely supported in raised position as to remove and replace the fount and light the lamp in convenient manner.

IMPROVED BROILER AND TOASTER.

Andrew C. Bolton, Greenport, N. Y.—This invention consists of two light wire frames hinged together, and provided with a spring fastening and with a wooden handle. The object of the invention is to provide a simple and efficient device for holding meat or bread over the fire while broiling or toasting. The frame is formed by bending a wire into a rectangular form, and twisting it together at the center of one of the sides of the frame. This frame is stiffened and supported by two wires which pass through the first twist of the wire that forms the frame. The wires that diverge from this point and pass under the transverse wires which are fastened to the frame, and are attached to the end of the frame opposite that in which the twist is formed. The wires and the ends of the wire that forms the frame are parallel outside of the twist, and are placed in a wooden or non-conducting handle.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED THILL COUPLING.

Francis E. Justice, Marysville, O.—The object of this invention is to provide a simple means for preventing the detachment of the thill iron except when the thills are raised to a vertical position, and also for supporting the thill ends off the ground when the carriage is not in use. The said means consists of a horizontal bar attached to the under side of the eye of the thill iron, so as to come in contact with an elastic block which is secured in the socket of the clip in such position as to act as a buffer for the said bar when the thills are lowered.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED SCROLL-SAWING MACHINE.

William Hinchliffe, Nashville, Tenn.—The object of this invention is to provide a simple easy-running scroll saw, that maintains an even tension on the blade at every portion of the stroke. The table, similar to an ordinary sawing machine table, in which the shaft of the driving wheel is journaled, and in the lower part of which is pivoted the treadle which is connected by a pitman with the crank formed in the shaft of the wheel. The saw blade is clamped to the bars by means of the clamping screws, and the position of the saw in the clamping device is determined by a pin that projects from the side of each head. The machine is operated by working the treadle, and more or less tension is given the saw by turning a screw, and by turning another screw the table may be pitched or inclined. The arrangement of the spring is such that the tension on the saw is always the same in all parts of the stroke.

IMPROVED DEVICE FOR SUPPLYING LOCOMOTIVE TENDERS WITH FUEL.

Will C. Hamner, Water Valley, Miss.—The object of this invention is to furnish an improved device for supplying locomotive tenders with coal or which shall be so constructed as to discharge the required supply into the tender at once, so as to avoid the delay which is unavoidable when the tenders are supplied in the usual way. The invention consists in the employment of a pivoted or tilting box for supplying locomotive tenders with fuel. To the platform of the railroad track are attached two posts, to the upper ends of which is pivoted a box. The box is made of such a size as to contain the quantity of coal or wood to be supplied to a tender at a time. To the side of the box is pivoted a hook latch to catch upon a pin attached to a post secured to the platform. The latch is held forward by a spring attached to the box, and its forward movement is limited by a stop pin also attached to said box, so that the latch will always be in position to catch upon the pin automatically when the box is swung back into place after being tilted to discharge its contents.

IMPROVED SAND CONVEYOR.

Rufino C. Garcia, San Antonio, Texas, assignor to himself and Aug. Robin.—This invention relates to a machine constructed for taking up and conveying sand into a suitable receptacle. The machine may be pulled by hand or horse power over the sandy ground, the same being first loosened by a series of detachable teeth. A drum is provided with a number of circumferential cutting knives, and constructed of sufficient weight to sink them into the sand, and pack the same tightly in the spaces or sections between the knives, and is retained in the sections and carried up between the knives to scrapers, passing them over to an inclined plate that is secured rigidly on side supports of the tongue frame, and over a hinged apron to a suitable receiving box, which is supported on the tongue of the machine, and is readily dumped or removed when filled with sand. In this manner sand for various purposes is readily taken up and collected in cheap and effective manner, requiring only one attendant, either for driving the horse or pulling and discharging the machine.

IMPROVED GAS-WASHING APPARATUS.

William M. Cosh, Conshohocken, Pa.—The form of this apparatus is similar to the ordinary gas-washing box, and has an inclined longitudinal partition, which, in a transverse direction, is horizontal. A shelf or partition extends from a point near the outlet gas pipe near to the opposite end of the washing box. Plain transverse ribs or brakes project downward from the under surface of the shelf, and notched transverse ribs are placed between these ribs and project in the same direction. An inlet gas pipe leads from the gas generator, and projects downward through the partition, and an outlet gas pipe leads from the washing box. There is an overflow pipe, through which the water may escape; and a blow-off pipe for removing the water when required. A door is hinged to the lower end of the shelf, and is capable of being thrown against the end of the box by gas pressure. The operation is as follows: The box is filled with water, so as to completely cover the inclined shelf, and the supply is maintained by a spring tube, in the usual way. Gas is forced in through the pipe and follows the under surface of the shelf or partition toward the outlet pipe. In its passage it is deflected by ribs, and thrown down a number of times before reaching the upper end of the partition. By this means the gas is brought into contact with a greater surface of water than in boxes of ordinary construction.

IMPROVED VALVE GEAR FOR STEAM ENGINES.

James H. Davis and William White, Winnsborough, Tex.—The object of this invention is to furnish an improvement in steam engines which shall be so constructed as to give a full application of the steam and a free exhaust at regular intervals, which will enable the engine to be easily reversed, can be easily attached to any engine, which will enable an engine to be worked by water pressure, will run smoothly and with very little friction, and will be very durable. The crank wheel is made with a projection rim, to the inner surface of which is attached, or upon it is formed, an oval or double inclined projection or cam. The projection or cam at each half revolution of the wheel strikes against one or the other of two pins, which have rollers placed upon them to diminish friction, and are attached to a sliding bar at such distance apart that they may be struck alternately by the projection, to give a reciprocating movement to the bar. The bar slides in the bearings in the supports, and to it is attached the stem of the inlet valve, which slides in the steam chest and admits steam into the ends of the cylinder alternately. The end of the bar is pivoted to the end of an arm rigidly attached to an upright rock shaft, which is provided with two rigid arms projecting in opposite directions, and at right angles with the arms. To the ends of the arms are pivoted the outer ends of the stems of the outlet or exhaust valves, which are placed at the ends of the cylinder, and from which the exhaust steam passes directly down into the heater. The rock shaft is provided with a handle to enable it to be turned to reverse the engine.

IMPROVED TIME LOCK.

John B. Overmyer and James A. Huston, New Lexington, O.—The object of this invention is to so improve the time lock that the setting of the lock is facilitated and accomplished in a simple manner without interfering with the time pieces that work the bolt-releasing mechanism, and also the stop mechanism, arranged to be thrown at a certain fixed time in automatic manner. The invention consists of a time lock in which the releasing nut is moved by time mechanism to throw out the lever stop and release the bolt at the proper time, the nut being reset by a toothed drum gearing with the toothed nut. The lever stop is retained in position by the bottom arm of a pivoted lever that is automatically worked by the pointer of the nut engaging an adjustable disk of the retaining lever. To secure the reliable working of the lock, two or more time movements and releasing devices may be arranged, so that in case one timepiece should stop the other would release the bolt. By a proper adjustment of the disk the bolt may be thrown, while the stop is retained in raised position by an arm until the pointer, bearing against the disk, carries the arm back and allows the stop to drop. Thus the additional facility of the automatic throwing of the stop of the time lock at a certain fixed time may be accomplished, which adds greatly to the usefulness and convenience of the lock.

IMPROVED HYDRAULIC ELEVATOR.

George Ball, Springfield, Ill.—This invention is designed to furnish an apparatus for removing iron piles, steel ingots, and other heavy pieces of iron or steel from heating furnaces; also for removing, in packing-houses, dead animals from scalding vats, and for other purposes; and the invention consists of a steam or hydraulic ram, connected by suitable transmitting pulleys and ropes with standards of the different furnaces, the ram being operated by starting cords connected to the steam entrance valve, and provided with devices for exhausting the cylinder and cushioning the ram piston. For the purpose of removing a pile or other body from the furnace the cushioning and exhaust rod tappets on the ram are adjusted to give a stroke equal to one half length of the distance to which the pile is to be moved. The buggy is placed under the fore plate of the furnace door when the heater's helper takes the tongue attached to the chain, introduces them into the furnace, and grasps the pile. The helper assumes a position near the starting rope, and, when all is ready, pulls the same, at first gradually, to take up the slack of the same. Steam is thereby admitted into the cylinder of the ram, the piston propelled upward, the line of rope taken up, and the pile delivered on the buggy in good shape. The starting rope is then released by the helper, so that the spring of the lever shuts off the steam, exhausting that in the cylinder, and causing the piston head to return to its original place, ready for the next pull. In case the spring should fail to work, the whole stroke is made by the piston, until the crosshead strikes the exhaust tappet, accomplishes the exhaust, and shuts off the steam, bringing the piston back to rest.

IMPROVED GIN SAW PILING MACHINE.

Albert S. Eastham, Navasota, Texas.—This invention relates to improvements in machines for filing the saws of cotton gins in a reliable, rapid, and uniform manner; and the invention consists of a revolving circular file, that is withdrawn by suitable mechanism to admit the intermittent feeding of the gin saw one tooth, which is accomplished by a feed hand and drag or check pawl. The edges of the saw teeth are sharpened by means of reciprocating files at both sides of the saw. The rotary file is thrown out of the teeth of the saw when the saw-feeding device moves the saw, being again raised to filing position in the next notch. The file lever is weighted in suitable manner, so as to carry the rotary file back into filing position as soon as the lever is released by the rear arm of the rock lever. The rotary file is pressed against the saw with equal force, whether the same is in or out of circle, by the weight of the file lever, which weight is moved back or forward thereon to obtain the desired pressure of the file on the saw. All the saws on the cylinder can be brought to the same diameter and in circle by placing the circular file to the saw most out of circle,

and to that part of the saw nearest to the center of oscillation, and passing a pin through the rear end of file lever and the rear guide post of the same.

IMPROVED TRACTION ENGINE.

Leander Walker, Dallas, Texas.—This invention has relation to traction engines for running on common roads and rails, and to be used for drawing plows, and as a motive power generally. The nature of the invention consists mainly in transmitting motion to the driving and transporting wheels by means of the friction of a long rotating shaft inclosed inside of elongated hubs of said wheels. The invention further consists in combining friction pressure wheels with the hubs of the driving wheels for increasing the friction on the latter, as will be explained. By means of the screws the wheels can be very forcibly pressed against the hubs, and any desired degree of friction produced. The power which drives the wheels acts through the medium of the axle, which may turn faster than the wheels; consequently the amount of friction can be so regulated that the wheels cannot slip on the ground, however great may be the power applied to turn the axle.

IMPROVED CANAL BOAT.

William P. Fest, Chicago, Ill.—The object of this invention is to furnish a new construction of canal boat, and improved system of propelling the same, by which the water is not agitated in the least, and the washing of the banks prevented, the propelling mechanism being arranged with equal facility in new or old boats, so as to enable them to travel at considerable speed and in either direction. The invention consists of a canal boat having a central water channel extending at the bottom of the boat from the bow to the stern, and admitting and discharging the water through apertures of equal size in the hull of the vessel. A spiral propelling screw is arranged inside of the water channel at the center of the boat, and the channel divided into arms or branches back of the same, that unite to a single channel before the water leaves the boat. The boat may be propelled with considerable speed in forward direction, and also reversed, as the screw works equally well in either direction; but when the boat is required to be regularly propelled in both directions, a second set of branch channels has to be arranged at the front part of the boat, in connection with side and lateral gates, for establishing either communication with the central channels or with the branch channels. The entire propelling apparatus of the boat takes up but a small space at the bottom of the boat, and may be built at comparatively small cost, furnishing thereby a canal boat that may be run as a towboat or as a regular canal steamer, which, by the perfectly still state of the water at the discharge opening of the stern, has not the least injurious influence on the canal banks.

IMPROVED CAR BRAKE AND STARTER.

Alexander Winston, Fayette, Iowa.—The object of this invention is to provide for street cars and other purposes an improved rotary cumulative brake, by which the power lost in stopping the car is stored and utilized for starting the same; and the invention consists of friction wheels worked by contact with the car wheel when applied by the brake lever, producing the winding up of one or more springs, and the locking of the same by pawl and ratchet devices on the shafts of the friction wheels until the pawls are released by a treadle, and the power stored up in the springs applied to the wheels for starting the car. The brake mechanism may be used in either direction, the friction wheel shafts sliding in guide slots of the car frame. As soon as the car is desired to be started the brake lever is held in backward direction, so as to press the friction wheels against the car wheels, but at the same time a treadle, operated by the foot, lifts one pawl out of the ratchet, said pawl releasing, by its pivot joint, the second pawl, so as to throw the joint power of the springs on the friction wheels, and by the same on the car wheels, assisting thereby materially in starting the car. The springs of one shaft coil in opposite direction to that of the other, so as to admit the cumulative working of the brake and starting device in either direction.

IMPROVED ENGINEERS' PLOTTING TABLE.

Albert R. Crandall, Lexington, Ky.—The object of this invention is to furnish for engineers and surveyors an improved plotting table, by which the field notes may be plotted in rapid and accurate manner at a saving of time, and without taxing the eyes to injury in the least; and it consists of a sliding and slotted table carrying the plotting paper, in connection with a base disk and the foot or clamp of the protractor and retaining weights. The foot or clamp and the protractor are arranged on a shaft vertically above the center of the base disk, the shaft having a prick point at the lower end for marking the stations. A suitable lever arrangement raises alternately the weights from the paper, and lowers the foot clamp of the protractor, or raises the foot clamp and lowers the weights, which adjust themselves by pulleys on the concave arms. The protractor turns the paper, and is adjusted by hand, and by a tangent screw and spring clamp, to the vernier. The foot clamp carries a thread, adjustable by screws, in line with the zero points of the protractor, to set the paper by and to detect errors in case any should occur. The sliding table is operated by a micrometer screw, whose head is divided at the circumference, being arranged to turn freely on the shank of the screw, and also to be clamped to a fixed head by a thumb screw, so that each measurement may start from the zero point of the head.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED FIRE ESCAPE LADDER.

Henry B. Walbridge, Brooklyn, N. Y.—The object of this invention is to provide a portable and convenient ladder, more particularly designed for use as a fire escape, but which may be used for other purposes. In construction there is a pole, having a disk or bridge piece at or near its center, over which the stay rods are stretched, which rods are fastened to the pole near its ends, and serve to stiffen and strengthen it. In one end of this pole there is a pulley, and to the other end a crosstree is attached, which is provided with two spikes or points. This pole in the present case is hinged or pivoted to a truck. A jointed or rope ladder is attached to the crosstree by means of ropes or chains, and to the free end of the said ladder a rope or chain is attached, which runs over the pulley and downward toward the foot of the ladder, and is operated by hand or by means of a suitable windlass. A brace is pivoted to the pole which is inserted in the first joint of the ladder, to keep it the proper distance from the pole. In a case of fire, when invalids or timid persons are to be removed from upper parts of buildings, a box or basket is provided, which is secured to the ladder by means of a hook. This box, together with the ladder, may be raised and lowered by means of the rope or chain.

IMPROVED LAMP.

John T. Poole, Benton, New Brunswick, Canada, assignor to Samuel J. Parsons.—The object of this invention is to furnish an improved device for securing the block to the last, which shall be simple in construction and reliable in use. This last is so constructed that when the block is pushed down into place in the recess in the last a hook and catch will engage with the rear and forward edges of a plate and fasten the bar securely. When the block is to be withdrawn, a hook is inserted in the hook hole in front of the upper arm of the catch lever, and as the hook is drawn upon the catch will be raised, which will allow the hook to be withdrawn from the plate and the block to be removed.

IMPROVED STIRRUP FOR OIL-WELL MACHINERY.

Frans A. Segerdahl, Karns City, Pa.—Stirrups as ordinarily constructed for oil pumps are liable to breakage, and are a constant source of trouble and expense. The object of this invention is to provide a stirrup which shall obviate these difficulties. The side pieces of the stirrup and the bar receives the strap from the walking beam. Shoulders are formed by drawing in the side pieces to receive the pitman. Stays or braces are

formed on the stirrup, that extend from the lower end of the side pieces above the shoulder. The eyes thus formed are filled with wood or other suitable material, and the sides of the stirrup are drilled to receive bolts having beveled heads. Beveled washers having flanges that embrace the sides of the stirrup are placed under the nuts of the bolts. Stirrups as commonly made are not provided with the braces, and are constantly breaking at the shoulders. By means of this improvement this difficulty is entirely obviated.

IMPROVED ARTIFICIAL LEG.

Cornellous Collins, Albion, Iowa.—This invention consists in a novel construction of the ankle joint, whereby a perfectly free articulation is allowed without noise. The lower end of the block forming the lower portion of the limb is curved, leaving a reduced bearing, which will allow a free motion of the foot forward and backward as well as laterally. The front concave surface of the block rests upon a cushion, and is held down thereon by means of a joint formed of two bolts. The joint thus formed will allow free play, and the cushion will prevent shocks in walking. In rear of the joint is a hook, which is connected by an eye joint with a bolt fixed into the block. The hook enters a recess made through the foot section and engages loosely with a pin fixed into this section. This hook joint also allows the foot to articulate forward and backward, as well as laterally. The bottom of the foot is arched out and the space filled with hair, or some other suitable material which will prevent noise in walking and afford elasticity. The cushion thus formed is covered with a piece of leather, which forms the joint for the front section of the foot. This knee spring is a strong strip of India rubber, fastened in such manner that it will act to strengthen the leg when fixed.

IMPROVED CIGAR-BUNCHING MACHINE.

Charles H. Schneider, Cold Spring, N. Y.—This invention relates to an improved machine for making cigar bunches in rapid and uniform manner, so as to facilitate and expedite the manufacture of cigars; and the invention consists of a crank roller, a sliding roller, moving along brackets, with inclined parts and recesses, a lower adjustable roller, and of an endless band or apron, that passes around the rollers and revolves with the same. For working the machine, the binder is first placed upon the band or section of the apron between rollers, the sliding roller having been placed in-to forward position against the shoulders of the brackets. The filler, of any size, is then placed upon the binders, the fingers readily determining when the required quantity of tobacco is therein. The binder and fillers are then gradually pressed down between the two rollers, the sliding roller being brought forward on the inclines of the brackets until it comes into contact with another roller, when it drops into a slot and remains in fixed position therein. After the whole series of aprons has thus been filled the crank roller is revolved three or four times, and the bunches then taken out, being ready for the moulds. By arranging a number of aprons and rollers in one machine, the operator passes first along the entire series of aprons, and changes the same with binders and fillers, and turns finally the crank, forming the bunches, and throwing them out by a slight backward turn of the crank, enabling thus the turning out of a large number of uniform bunches in quick and economical manner.

IMPROVED GAME APPARATUS.

James F. Spence, Brooklyn, N. Y., assignor to himself, Calvin E. Davis, and Royal P. Wilkins.—This invention relates to games which are played with balls; and the nature of the invention consists, first, in a circular table having a central conical depression, surrounded by an inclined shelf and inclosed by a rim or guard, which is of convolute form, with one or more gates or openings leading upon the shelf, the said central conical depression being provided with radial channels flaring outwardly and adapted to receive the balls which are projected on the table, and to indicate by figures the different amounts won by the players; second, in a blowpipe of novel construction, which is provided with a spring in its enlarged end, and adapted for propelling the balls upon the table by blowing through the pipe with the mouth.

IMPROVED HAIR CRIMPER.

John Leeming, Poughkeepsie, N. Y.—The object of this invention is to provide an inexpensive, efficient, and convenient device for crimping hair. It consists of a hairpin, similar to those in common use, differing only in having the bent part that unites the two prongs straight. Around this portion a wire is wound several times, and its ends are twisted together, forming a tongue, which is a little longer than the hairpin. This wire is made of flexible material, preferably of copper. The hair is interwoven with the prongs of the hairpin in the usual way, and the wire is bent around it. This device is small and light, and quickly and easily applied, and the hair may be crimped near its roots, and without the use of clamps.

NEW AGRICULTURAL INVENTIONS.

IMPROVED HAY ELEVATOR.

Julius L. Malcolm, New Athens, O.—The object of this invention is to facilitate the hoisting of the hay from the wagon to the mow in quick and convenient manner, the carriage being returned and locked after the load is dropped to the starting point above the wagon; and the invention consists of a track beam of inverted T-shape hung from the rafters of the barn and supporting the wheeled carriage. The pulley over which the hoisting rope passes has side projections, which are engaged by a fulcrumed lever with end catches for supporting the load. The catch lever has a pendant stirrup that is raised by the sheave of the fork, so as to release the catch lever from a stop block of the track, and drop the same on the projections of the pulley, to retain load below the carriage until it arrives at the point where it is to be dropped. The catch lever is released from the recessed and curved stop block of the track by the contact of the sheave of the hay fork when the load is hoisted up to the track. The sheave raises the pendant stirrup of the catch lever, and throws the same out of the stop block, so as to clear the same and admit the forward motion of the carriage along the track. The catch lever engages then the catch pulley, and suspends thereby the load below the carriage. When the load arrives at the point where it is to be dropped, the trip cord is pulled and the fork opened. The carriage returns then along the inclined track, or by the action of the weighted cord, to its place above the wagon, where the catch lever is raised from the projections of the pulley by passing along the curved stop block, so as to release the pulley and admit the lowering of the fork to the wagon to be released and hoisted as before.

IMPROVED GRAIN CRADLE.

George E. Clow, Seymour, Ind.—This improvement relates to providing a socket for the post of the cradle head, and to the construction whereby said socket is made adjustable and detachable, the object being, first, to enable the angle of the cradle head to snath and scythe to be changed at will, and second, to enable the parts composing the cradle to be separated for shipment.

NEW TEXTILE INVENTIONS.

IMPROVED CLOTH-MEASURING MACHINE.

William D. Porter, McComb, O.—This invention relates to a machine or apparatus in which cloth or other kind of fabric can be measured while being wound upon a roller. The board forming the center of a bolt of cloth or other fabric is clamped endwise between two aligned and axially adjustable rotary shafts, and as the cloth unwinds it passes over a reel, by which its length is measured, and is then wound upon a roller arranged parallel to the reel. In being unwound from said roller, it passes between two rolls and is thereby pressed and smoothed before being rowound upon the board.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion.

"Little All Right," the smallest and most perfect Revolver in the world. Radically new both in principle and operation. Send for circular. All Right Firearm's Co., Lawrence, Mass., U.S.A.

S. B., Niagara Falls, N. Y., wishes to procure a family Ice Machine. Address as above.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

George S. Boutwell, Counsellor in Patent Causes, 150 Devonshire St., Room 62, Equitable Building, Boston, Mass.

Patent Salesmen Wanted.—We will employ a number of men recommended as to character and ability, who have had experience in selling patents by counties—good pay to good men. F. F. Adams & Co., Erie, Pa.

Wanted.—A position as Mechanical Engineer or Draughtsman, by an inventive man, for a moderate salary. Address Otto Schrott, Hartmann's Hotel, 45 and 47 Bowery, N. Y.

Estimates wanted for sinking a well about 100 feet deep, or would buy the necessary tools for doing the work if they can be had cheap. Address F., Carlstadt, Bergen county, N. J.

For Sale.—Lathes 15 in. 6 ft., \$135; 19 in. 8 ft., \$165; 23 in. 10 ft., \$180; 25 in. 12 ft., \$205; 29 in. 8 ft., \$125. Planer 7 ft. 24 square, \$230. Drills, 44 in. B. G., \$325; 35 in., \$100. J. D. Shearman, Indianapolis, Ind.

Shaw's Noise-Quelling Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quells all the noise of high pressure escaping steam without any detriment whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

Syrax, Oak, and Black Poplar (almost equal to Walnut) sawed to order, for cabinet makers and wheelwrights. Address G. B. Lartigue, Blackville, S. C. R. R.

For best and cheapest Cider and Wine Presses, address H. Sells & Son, Port Huron, Mich.

Split-Pulleys and Split-Collars of same price, strength and appearance as Whole-Pulleys and Whole-Collars. Yocum & Son, Drinker st., below 147 North Second st., Philadelphia, Pa.

Screw cutting Foot Lathes, W. E. Lewis, Cleveland, O. Nickel Salt and Anodes of superior quality at lowest market prices. L. Feuchtwanger & Co., 16 Dey st. N. Y.

600 New and Second-hand Portable and Stationary Engines and Boilers, Saw Mills, Woodworking Machines, Grist Mills, Lathes, Planers, Machine Tools, Yachts and Yacht Engines, Water Wheels, Steam Pumps, etc., etc., fully described in our No. 12 list, with prices annexed. Send stamp for copy, stating fully just what is wanted. Forsyth & Co., Machine Dealers, Manchester, N. H.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J. For Best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay Sts., Brooklyn, N. Y.

Lead Pipe, Sheet Lead, Bar Lead, and Gas Pipe. Send for prices. Bailey, Farrell & Co., Pittsburgh, Pa.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 479 Grand St., N. Y.

Solid Emery Vulcanite Wheels.—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 39 Park Row, N. Y.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Best Pulleys and Couplings made; secured to shafts without keys, set-screws, bolts, or pins. Send for catalogue. Taper Sleeve Pulley Works, Erie, Pa.

Skinner Portable Engine Improved, 2 1/2 to 10 H. P. Skinner & Wood, Erie, Pa.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y. More than twelve thousand crank shafts made by Chester Steel Castings Co. now running 8 years constant use prove them stronger and more durable than wrought iron. See advertisement, page 174.

Emery Grinders, Emery Wheels, Best and Cheapest. Hardened surfaces planed or turned to order. Awarded Medal and Diploma by Centennial Commission. Address American Twist Drill Co., Woonsocket, R. I.

Notes & Queries

(1) N. W. asks: How can I put a good and durable finish on walnut wood? A. Rub the work over with boiled linseed oil, and when nearly dry, rub it over with a stiff brush. Take a strip of woolen cloth about two yards long, roll it up into a hard roll. Dip one end into the boiled oil and add a few drops of shellac varnish, and rub the work previously oiled with that until a fine polish is obtained.

(2) C. H. P. asks: How many pounds will a leather belt 16 inches wide, of the strongest kind, sustain before breaking? A. The strength of a good leather belt is about 3,000 lbs. per square inch of section. From this you can readily calculate an answer to your question.

(3) G. C. P., Jr., asks: What ingredients are used in making kalsomine for walls, and the proportions? A. Kalsomine is composed of zinc white mixed with water and gline sizing. To 1 lb. gline use 15 lbs. zinc white. Soak the gline over night, and the next morning prepare as for gline wood. Put the zinc white in a vessel and pour on hot water, stir until it appears like thick milk. Mix with the liquid gline and apply to the wall with a brush. If too much gline, the material cannot be laid on smoothly. Stir frequently while applying.

(4) J. H. W. asks: 1. How to make a good waterproof leather cement for shoemaker's use? A. Dissolve gutta percha in chloroform to the consistency

of honey. Heat the surfaces to which it is to be applied, and press together. 2. Also how to make a rubber cement? A. Gutta percha 3 parts, pure India rubber 1 part, cut small, pyrogenous oil of turpentine or bisulphuret of carbon 8 parts. Mix in a close vessel and dissolve by the heat of hot water. Heat the cement gently before using.

(5) A. R. B. says: In the summer time I see the sun, as it rises, shining into my north window; now as the sun never gets as far north as the latitude in which I live, I would like to have explained how it is that its rays can come from a northern direction? A. The rays, from your statement, shine obliquely into the north window, which would not require the sun to be as far north as the latitude in which you live.

(6) J. W. H. says: 1. I am building an engine 3 x 5 1/4 inches cylinder for a launch 20 feet long. Is it large enough to drive it 10 knots in still water? A. No. 2. With a 22 inch propeller, had I better place the shaft near the bottom of the boat, allowing the propeller to work below the keel? A. Yes. 3. With a 3 feet pitch the propeller would have to make over 400 revolutions to drive a boat 10 knots; is that too fast to run the engine? A. If the engine is well designed and built, it can be safely run at this speed.

(7) F. M. T. says: What size boiler and what size engine should I have to use to propel a boat 15 feet long, 30 inches beam, and 6 inches draught? I cannot use a screw, and with side wheels would it be better to have the connecting rod on the shaft of the wheels, or have gearing? A. You might use a geared engine 2 1/2 x 4, with a boiler 20 inches in diameter and 3 feet high.

(8) T. S. L. asks how to kill those small wrigglers that appear in cisterns; also directions for making a filterer? A. The best plan will be to clean the cistern. You can filter the water by passing it through sand and gravel, arranged in layers.

(9) J. M. B. says: Can anything be added to glue, that will make it slightly elastic or tough when dry, without much impairing its strength? A. Try the addition of a little glycerin.

(10) A. McC. W. asks: How may grapes be preserved, in their natural state, through the winter? A. Select sound bunches, being careful not to bruise or crush them or start them from the stems, and keep in a cool, dry place.

(11) R. L. says: I wish to make about 1,000 moulds with hard glossy surface, averaging 2 inches in diameter by 1 1/4 inches in height, to be used for wrapping paper on in rings to give these rings shape when dry? A. You might use papier maché, as described on p. 28 (40) present volume of the SCIENTIFIC AMERICAN. The surface might be perfected by means of a hard japan.

(12) H. W. S. says: In the issue of August 4 is an article headed \$20,000 prize for a new sugar extraction process. Where is the proper address to write the parties who make this offer? A. "Director of the Interior," Basse Terre, Guadeloupe.

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

J. W. F.—The clay is of fair quality—it contains some free silica, organic matter, and a little iron besides the alumina silicate. If properly washed it might find a market, or be used in the locality where mined in manufacturing pottery, etc.—E. S. W.—It is tourmaline—composed of silicic and boracic acids, potash, soda, alumina, lithia and iron oxide.—H. C. G.—There are no positive indications in the rock of any notable qualities of valuable metals or minerals. The particles of metal-like appearance are pyrites.—Box marked L. P. contains fine specimens of fluorspar—calcium fluoride. The white uncrystalline fragment is chiolite—soda alumina fluoride. The substance in paper is simply quartz sand colored by iron oxides.—A. C. A.—The alloy seems to consist of tin, lead, bismuth, a little antimony, nickel or iron, and zinc. We cannot make a complete analysis of it for you.

COMMUNICATIONS RECEIVED.

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

On the Manufacture of Rubber Hose. By H. T. M.
On Carrying a Bar of Iron. By S. B. E.
On a Mathematical Problem. By P. J. D.
On an Explosive Bullet. By P. M.
On a Rare Caterpillar. By F. W. S.
On Powder Mill Explosions. By C. H. R.
On Some Insects. By C. F. S.
On Education of Parrots. By W. B. C.
On the Locusts in Kansas. By C. V. R.
On a New Keely Motor. By M. A. J.
On Working Men and Rev. H. W. Beecher. By A. B. W.
Also inquiries and answers from the following:
W. M.—G. S. B.—J. M. F.—B. T.—T. C.—H. G. W.—F. J. T.—L. R.—E. S. G.—H. O.—L. H. P. & Co.—J. B. B.—S. A. R.—J. M. McC.—J. F. W.—J. J. P.—S. S.—E. M. W. & Co.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

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

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

Hundreds of inquiries analogous to the following are sent: "Who builds road engines suitable for thresh-

ing wheat, and for other farm operations? What is the best institution for obtaining instruction in mechanical and civil engineering? Who sells good books on steam engineering?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL. INDEX OF INVENTIONS FOR WHICH Letters Patent of the United States were Granted in the Week Ending August 7, 1877, AND EACH BEARING THAT DATE. [Those marked (r) are reissued patents.]

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

Adding machine, M. M. Cram	193,833	Hay rake, J. H. Thomas	194,013, 194,014
Agricultural steamer, J. T. King	193,966	Hemmer, J. P. Ioor	193,873
Ammonia salts, S. Cabot, Jr.	193,920	Holting, clamp for, T. Maxon	193,962
Axle lubricator, L. Johnson	193,962	Holting tackle, T. A. Weston	194,019
Bale tie, A. F. Dietz	193,808	Holback iron, S. E. Winalow	193,839
Bale tie, cotton, H. Hamilton	193,946	Horse power, Kramer & Boke	193,820
Ballot box, Fricker & Selneck	193,862	Horseshoe, J. A. Conkey	193,807
Barrels, W. McMurtrie	193,826	Horseshoe, T. Henry	193,953
Beehive, Deardoff & Stutzman	193,856	Horseshoe nails, D. B. Loring	193,975
Beehive, J. Heffner	193,869	Hose coupling, T. W. Eccleston	193,810
Beer pump, E. Stewart	194,010	Ice plows, N. P. Nelson	193,628
Bell, call, F. Ratcliff	193,996	Ink, N. T. Tilman	193,628
Bell, door, W. Winkle	194,023	Iron, dividing cold rolled, J. S. Atkinson	194,015
Bell, door and alarm, J. G. Wiggins	193,903	Jacquard machinery, W. P. Jennings	193,812
Bellows, J. Agnew	193,907	Journal boxes, D. A. Hopkins	193,874
Belts, etc., W. Eppelsheimer	193,939	Kettle, J. I. Burr	193,818
Berth for ships, etc., J. C. Thompson	193,837	Kitchen boiler, E. H. Frazier	193,804
Bessemer converter bottom, W. H. Haws	193,949	Lamp extinguisher, S. N. Long	193,860
Beton or concrete, J. C. Goodridge	193,865	Lathe, G. S. Rix	193,882
Boat, F. D. Graves	193,814	Lathes, C. A. Cooley	193,834
Boller head machine, R. C. Nugent (r)	7,834	Leather, etc., H. R. Cassel	193,922
Boot and shoe machine, Kimball & Merritt	193,965	Lifting jack, S. & D. Barrow	193,844
Boots and shoes, D. A. Sutherland	194,011	Lifting jack, T. R. Day	193,931
Bottle closing device, W. H. Hicks	193,870	Lightning rod, W. H. Patterson	193,901
Brake, wagon, T. C. Lawrence	193,878	Lumber, compound, etc., C. F. Ritchel	193,833
Bridge, draw, M. McGrath	193,825	Match box, H. Ellig	193,859
Burglar alarm, Wildrick & Darling	193,905	Moccasins, S. Berry	193,914
Burner, T. R. Almond	193,795	Mold for plaster casts, J. Borden	193,917
Button, J. Keats	193,964	Motor for light machinery, A. J. Hood	193,956
Button fastener, F. W. Ludwig	193,976	Movement, mechanical, A. E. Hotchkiss	193,871
Button machinery, E. A. Sherwood	194,005	Mower, C. Lindbom	193,881
Canal lock, W. L. Marshall	193,885	Nail plate feeding machine, E. J. Couch	193,926
Cap, S. & W. Katz	193,875	Nail machinery, J. M. E. Bauckes	193,910
Car axle box, R. B. Eason	193,858	Organ stop, A. Trowbridge, Jr.	194,017
Car bell, street, C. Keppeler	193,876	Ornamental articles, etc., Bliss & Badger	193,846
Car coupling, J. Rockville	193,896	Paint, W. Longman	193,974
Car platform, R. A. Cowell	193,851	Palette, W. F. White	193,904
Car spring, G. F. Godley (r)	7,832	Paper bags, F. H. Melville	193,888
Carbon paper, A. B. Simonds (r)	7,837	Paper box, G. A. Denison	193,932
Carburetor, D. E. Bangs	193,911	Paper, waxing, S. Hammerschlag	193,867
Carpet fastener, J. Failing	193,940	Pencil, artist's, O. P. Gash	193,813
Carriage, child's, C. H. Bush	193,919	Pianofortes, T. S. Gould	193,943
Carriage, child's, C. G. Macht	193,930	Pictures, stereoscopic, H. A. Reynolds	193,908
Cartridge, I. Davis	193,855	Pillow shams, J. R. Cross	193,854
Center board for vessels, W. W. Palmer	193,829	Pipe coupling, H. Pennie	193,923
Chair, folding, H. Closterman, Jr.	193,925	Pipe, A. W. Morgan	193,827
Churn, J. & J. S. Weider	193,902	Planter, S. Lyon	193,978
Churn, Brown et al.	193,918	Planter, L. Scofield	194,004
Churn, E. Buell	193,803	Planter, A. M. Southard (r)	7,838
Clamp for carpenters, W. Heckert	193,951	Plow, B. F. Chandler	193,923
Clothes and fruit dryer, G. J. Curry	193,928	Plow, J. F. Mead	193,983
Corn-shelling machine, C. P. S. Wardwell	194,018	Plow, T. E. Smoot	194,007
Cotton harrow, J. F. Price	193,830	Plow, A. H. Gale	193,941
Cultivator, D. Stanchfield	194,009	Plow, G. H. Smith	193,899
Cultivator, W. G. Barnes	193,912	Printing press, J. B. Rankin	193,906
Cultivator, E. M. & M. L. Kissell (r)	7,833	Printing presses, W. F. Widmayer	194,022
Currier's knife, H. E. Cherrington	193,806	Propeller, M. D. Nelson	193,989
Cut-off gear, F. F. Hemenway	193,952	Pump, J. W. Lemon	193,822
Cut-off, water, J. G. Diem	193,857	Pump, J. A. Parsons	193,891
Derrick step, F. Locke	193,824	Quilting machine, J. J. Crall	193,852
Ditching machine, J. A. Grove	193,815	Radiator, steam, J. J. Lawler	193,877
Divider and siding hook, H. Sherman	193,808	Rein holder, D. C. Montgomery	193,886
Door bolt, S. Sargent	194,000	Roll grinding, T. H. Savery	194,001
Egg, nest, D. M. Livingston	193,823	Roll grinding, J. Megaw	193,984
Elevator, H. Davies	193,929	Roofs, snow guard for, P. A. Dugan	193,809
Etching glass, W. Campbell	193,921	Sand pump, W. H. Birge	193,915
Evaporating pan, W. M. Dixon	193,934	Sash fastener, window, L. Patterson	193,892
Fan, M. R. & Blasi	193,886	Saw, circular, D. B. McFae	193,985
Fare register, W. H. Hornum	193,958	Sawing metal bars, W. R. Jones	193,963
Faucet, T. A. Andrews	193,840	Scraper and ditcher, J. Rice	193,863
Feather renovator, H. M. Sinclair	193,833	Seythe, G. Bishop	193,916
Feed water heater and filter, W. J. Austin	193,843	Seeder and cultivator, D. Mack	193,883
Felted fabrics, J. F. Green	193,945	Seeding machine, Van Brunt et al. (r)	7,839
Fence, J. Brinkerhoff (r)	7,830	Shirt pattern, H. Dyer	193,936
Fence, Green & Knapp	193,944	Slicer, J. B. Howard	193,939
Fertilizer, C. F. Panknin	193,890	Smoking sign, H. J. & W. D. Davies	193,930
Fetter, Ladd & Parker	193,908	Snap hook, W. Heath	193,950
File, bill, W. L. Woods (r)	7,840	Soap, R. E. Whittemore	194,024
Filter, water, Tittle & Nolte	194,016	Spark arrester, J. A. Pae	193,990
Firearm, W. M. Wood	193,906	Spinning mule, P. McGovern	193,887
Firearm, J. Lee	193,821	Spinning mule, J. Martin	193,884
Firearm, D. Smith	193,826	Stalk cutter, M. W. & P. Besser	193,937
Fire escape, T. A. Andrews	193,841	Steam boiler, H. S. Coleman	193,845
Fire escape, B. F. Frank	193,861	Steam trap, D. Edwards	193,908
Fire escape, B. A. Richardson	193,895	Stench trap, O. M. Rice	193,851
Fire escape, G. J. A. Taggart	193,901	Stove, O. Edwards	193,867
Fire escape and extension ladder, W. A. Hoyt	193,960	Stove pipe elbow, G. Choate	193,847
Fire extinguisher, C. T. Holloway	193,950	Stove pipe elbow, J. M. Lauby	193,970
Fire extinguishing apparatus, A. Tenner	194,012	Straw cutter, W. H. Sullenberger	193,900
Flour, bolt, J. L. Detwiler	193,933	Suspender clasp, F. Eckermann	193,811
Flower pot, J. F. Alt	193,906	Suspender end, J. H. Murley	193,889
Foo, canning, W. K. Lewis	193,880	Swing, E. Schlueter	194,003
Fruit, dryer for, G. Harris	193,947	Tablet, writing, H. Laurence	193,971
Fruit dryer, Church & Perkins	193,924	Target, flying, E. M. Leavitt	193,879
Fuel machine, M. E. Cotter	193,912	Tea, coffee, etc., strainer, etc., H. C. Rice	193,994
Furnaces, etc., H. A. Stadler	194,008	Telescopes, E. Gundlach	193,816
Garter, J. L. Moore	193,987	Thill coupling, Gandy & Wilson	193,853
Gas burner, W. & W. S. Bedell	193,845	Thill coupling, J. A. Whipple	194,020
Gas retort, A. W. M. Maas	193,979	Thrashing machine, J. P. & J. W. Gordon	193,868
Gate, J. M. C. Bennett	193,913	Thrashing machines, side gear for, Kramer & Boke	193,819
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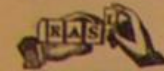
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[NEW SERIES.]

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THE MANUFACTURE OF COVERED BUTTONS.

There is nothing particularly intricate in the construction of a button, one of the ordinary cloth-covered type for instance, such as is on everybody's coat, to suggest the idea that the manufacture involves any very extensive preparation. But on the other hand, when it is remembered that every one wears buttons, that every man has perhaps a dozen or two constantly about him, and every woman, now that Dame Fashion has decreed that a multiplicity of buttons is an appropriate ornament, displays as many dozen as she conveniently can, it will be seen that the button must be the basis of a great industry. Besides, buttons are like pins, millions are made and nearly all containing in some portion metal which is virtually indestructible, and yet they disappear and no one knows whither. No wonder, then, that the factories at Waterbury, Conn., and Easthampton, Mass., alone produce buttons to the value of over \$250,000 a year, and that according to the last census the annual product of all the button-making establishments in the country is valued at nearly \$2,000,000.

We shall reserve the consideration of metal buttons to some other occasion, when an opportunity offers to enter into the details of the machinery used. For the present we propose to examine the commonest button of all, the cloth-covered object which the reader, if so disposed, may cut from an old coat and proceed to dissect while he reads the following description of its anatomy. After removing the outer epidermis of cloth, he will encounter the skeleton or metal shell; this off, the inner viscera or paper filling, and beneath that the tuft piece of cloth, are exposed, and last of all is the metal collet or under ring. Any one disposed to class the button zoologically may refer it to the turtle family of *trionychidae*, "body enclosed between two or more or less

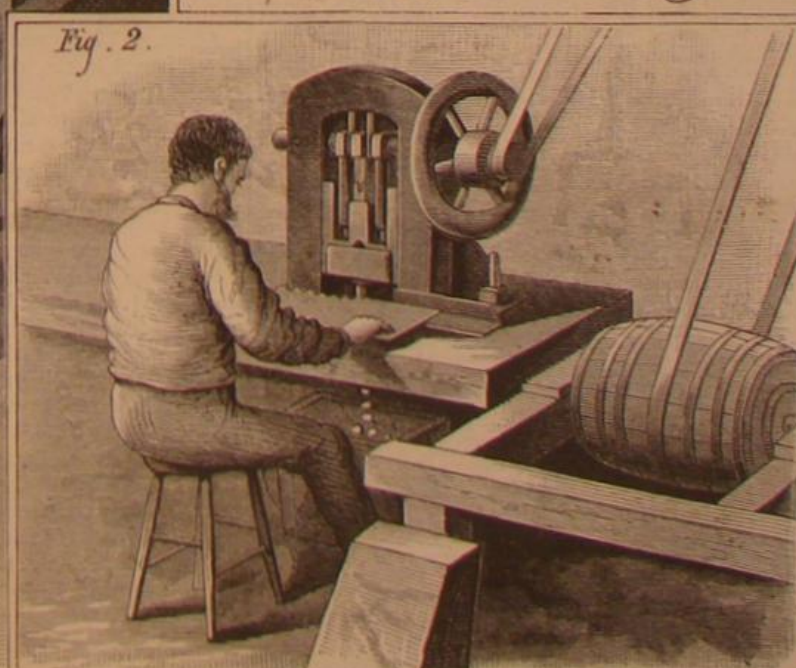
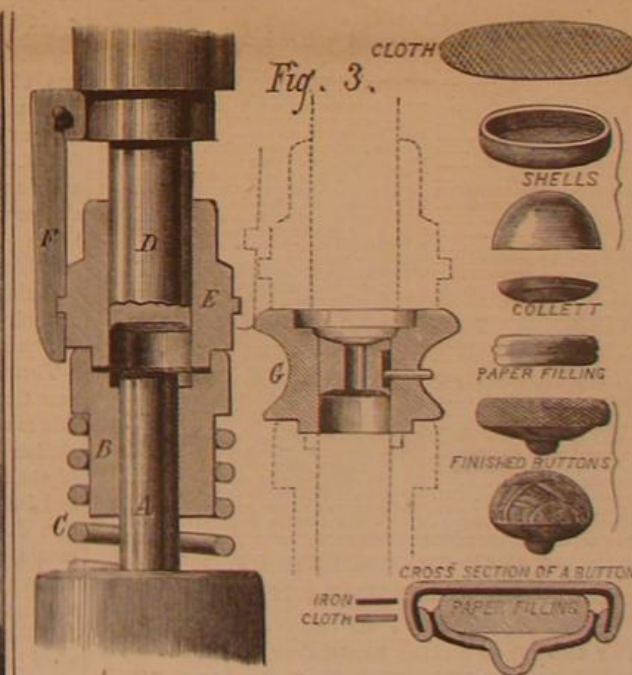
shields, which are usually covered by a leathery skin. The carapace (upper shield) and plastron (lower shield) are more or less united along the sides." The construction of the button being thus understood—and to make it clearer we have engraved the parts dissected, as well as joined together, in Fig. 3—it remains to explain the ingenious way in which it is produced.

The first covered buttons were made on wooden moulds turned of wood in the lathe, the cloth being simply stretched over and sewed on the back. This is the home-made fashion of making buttons now, as our fair readers are abundantly well aware; but it is altogether too slow a process for the manufacture of the millions of buttons required for commerce, not to mention the fact that the finished work is unnecessarily clumsy. With the introduction of button-making machinery wooden moulds departed and iron shells took their place. Thin sheets of metal, known as "tagger's iron" (thickness No. 36 to No. 38, and quality according to the more or less fine grade of button to be made), are carried by hand rapidly under a descending punch, Fig. 2. This punch is double, the outer portion cutting out a circular blank of the proper size, while an inner punch descends and forces the blank into a die, so that its periphery is turned upward, or so that the entire blank is rendered hemispherical in shape. These two forms of shells are shown in Fig. 3. One machine, driven by steam power, will easily form 50 gross of shells per hour.

The shells are next annealed in an ordinary furnace, and then are conveyed to a horizontal revolving barrel, Fig. 2, where they are tumbled with sawdust until they are thoroughly cleaned from all dust and grease. The other part of the skeleton of the button is known as the collet. Inasmuch as the under side of this is exposed, one face of the

iron plate is japanned. The piece, by a somewhat similar arrangement of punches to that already described, is first cut out in the form of a circle and then its inner part is punched out, leaving it in annular shape. There are still three more portions, namely, the cloth cover, the canvas tuft piece, which rests above the collet, and a portion of which protrudes through the central opening in the latter to furnish a tuft by which the button is sewed on the garment, and the inner filling. The last is made of specially prepared paste-board, and in common with the other portions mentioned is simply punched into shape.

The grouping together of these various parts is effected in two operations. By the first, the collet and tuft piece are fastened. The tuft piece is laid in the collet under a press, which, descending, forces the fabric, as already stated, through the aperture in the metal, producing the nipple of cloth in the rear. The paper filling is then inserted, and the button is then ready for the final assembling. The machine for this purpose is represented in Fig. 1, and the details of its press in Fig. 3. A is a fixed mandrel. B is a sleeve thereon, supported by a spring, C. On the upper mandrel, D, is another sleeve, E, which is sustained by the catch, F. The lower face of the mandrel, D, is hollowed, and a projecting annular portion of the upper sleeve enters a corresponding portion of the lower one, E. In using the machine a shell is placed over the lower mandrel, and above it is laid the covering fabric. The operator then causes the upper mandrel to descend. The cloth is thus pressed down around the shell, and on the return upward movement both cloth and shell are carried up inside the sleeve, E. The operator now inserts the annular piece, G, in which there is a suitable cavity to receive the combined collet, tuft piece, and filler, the last being uppermost. The upper mandrel is again brought



THE MANUFACTURE OF COVERED BUTTONS.

down and the shell is thus forced upon the collet, filler, etc., the cloth cover being at the same time turned under. Reference to the section of the finished button in Fig. 3 will make this clear. Nothing further remains but to attach the buttons by dozens to cards, or make them up for the market in any desired attractive way.

There is another variety of button belonging to the same class as the above, but termed "silk back" in contradistinction to "iron back." The face consists of shell and cover, while the back is composed of four layers, namely, a concave circular piece of tagger's iron, somewhat smaller than the shell, a pasteboard blank, a canvas blank, and, lastly, a silk back. These are put together in manner similar to that already described, and then by means of a press a nipple for purposes of attachment is formed on the back.

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NEW YORK, SATURDAY, SEPTEMBER 22, 1877.

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THIERS AND CONTEMPORARY SCIENCE IN FRANCE.

To have it said that the period of his life marks an epoch in the history of his country, is perhaps as high fame as any man can hope to attain. Such, however, will be posterity's verdict in recording the biography of Louis Adolph Thiers. Born on April 16, 1797, of humble parentage, the lapse of the first twenty-five years of his life found him not merely unknown, but struggling for bare existence. His abilities, it is true, had shown themselves in literary contests, but his political proclivities, at a time when such opinions overshadowed all else, barred his advancement. The period of his progress dates from his entrance into journalism. From the editor's chair he passed to that of the historian; from the historian to the statesman is but a step, and on the accession of Louis Philippe, he became a cabinet minister. With his political life thence forward, which culminated in his being chosen President of the French Republic in 1871, it is not our province to deal.

The interval of eighty years (ending on the 30th of the present month), over which M. Thiers' existence has extended, will be remembered in the history of the French people, not alone as one of unexampled political changes. Despite the instability of governments, and in marked contrast therewith, the march of science in France has continued onward as unswervingly as in other countries the internal peace of which scarcely has been broken; and to contemporaries of the great statesman now deceased, with whose labors he was in full accord, whose friend, associate, and upholder he was, is owing the present leading place which France now holds among scientific nations. To recall the names of these men and their work is to review some of the grandest achievements in human progress. It brings before us Arago's magnificent investigations in magnetism and the polarization of light. Becquerel the elder's discovery of the relation between electricity and chemical affinity; that first step made by Becquerel the younger toward color photography; the demonstration of the influence of light on chloride of silver in the daguerreotype; the labors of Daguerre and the Niepces de St. Victor (of the last name, father and son), which, as all the world knows, resulted in the art of photography; Berthelot's discovery of acetylene and synthesis of alcohol; Balard's extraction of bromine from sea water; besides the splendid chemical work of Thénard, Despretz, Cagniard de la Tour, Berthollet, Pérouze, and Dumas. France still possesses Pasteur, first of living biologists and the uncompromising opponent of the spontaneous generation theory. The past labors of her modern physicists have included those of Gay Lussac, whose investigations extended over the whole field of science, but whose discoveries in the properties of air and other gases are of inestimable importance. In the same field belongs the work of Dulong, discoverer of the most violent of explosives, chloride of nitrogen, of Petit, and of Regnault. In Leverrier, discoverer of Neptune, and weigher of other worlds, France possesses the greatest of contemporary astronomers. In Cuvier and Geoffroy St. Hilaire, the one the founder of the science of comparative anatomy, the other his no less able opponent and critic, she possessed naturalists whose fame can never be diminished. Such were a few of the men of science who have had in Thiers a friend who despite the engrossing activity of a turbulent political career, found time to master the results of their labors and to enrich therewith his already vast store of almost encyclopædic knowledge.

Throughout all Thiers' history—although it does not appear that he was himself intimately connected with scientific men—there can be traced the consequences of his association with scientific men, and his substantial appreciation of their merits. When he became Minister of Commerce and Public Works in 1833, procuring a grant of twenty million dollars, he carried out a system of internal improvements, which have been to France of incalculable benefit, while at the same time he encouraged national industries in a manner that infused new life into their every department. In 1833 he was elected to the French Academy, and soon after he became a member of the Academy of Moral and Political Science.

Although Thiers was not a scientist in one acceptance of the term, yet in the widest sense he merited the title in the highest degree. There is no science grander and nobler than the science of governing—the science of leading and directing others so as to secure the most good for all—and in that science Thiers stood preëminent.

SARGENT'S CASE.

Some very interesting and novel questions in relation to interference controversies, and of great importance to inventors, have lately arisen before the Patent Office, in the case of James Sargent.

This gentleman, in February, 1874, filed an application for a patent for an improvement in time-locks; but this application being defective, he withdrew the same, and, on the 12th of March, 1875, substituted for it a new application. Three days later, Emory Stockwell, assignor to the Yale Lock Manufacturing Company, filed, on behalf of said company, an interfering application. The interference thereupon declared was decided by the Examiner of Interferences in favor of Sargent, and from this decision no appeal was taken.

On the 2d day of June, 1875, John Burge, assignor to the said Yale Lock Manufacturing Company, filed on behalf of said company, an interfering application. An interference was accordingly declared between said applications, and a large amount of testimony was taken on both sides. The

decision of the Examiner of Interferences was again in favor of Sargent. From this decision the unsuccessful party appealed to the Board of Examiners-in-Chief, who affirmed the decision of the Examiner below; and from this decision an appeal was taken to the Commissioner of Patents in person. In April, 1876, the Commissioner rendered his decision, affirming those of the Examiner of Interferences and of the Board of Examiners-in-Chief, in favor of Sargent.

Interfering applications with Sargent's were also filed by Pillard, August 13, 1875; by Lillie, April 28, 1876; and by Little, June 6, 1876. In all of these three last mentioned cases, the Examiner of Interferences decided the question of priority of invention in favor of Sargent. Pillard and Lillie did not appeal. Little appealed successively to the Board of Examiners-in-Chief and the Commissioner of Patents in person, and on both appeals the question of priority of invention was decided in favor of Sargent. The decision of the Commissioner in this last named case was rendered on the 9th day of July last, after which, every pending interference with Sargent's application having been finally disposed of, Sargent paid the final government fee, and demanded the issue of a patent.

Meanwhile, on the 4th day of June, 1877, John Burge, before mentioned, had commenced a suit in equity in the Supreme Court of the District of Columbia, under section 4,915 of the Revised Statutes, against Sargent, praying to be adjudged to be entitled to a patent for the invention which had been the subject-matter of his interference with Sargent, and praying also for an injunction restraining Sargent from taking out the patent until the determination of said equity suit. Immediately after the decision of the Commissioner in Little's case, a motion was made on behalf of Burge, before the Commissioner of Patents, to suspend the issue of a patent to Sargent until the determination of said equity suit.

This motion was fully and ably argued before the Commissioner. On the part of Burge, it was insisted that so long as a party to an interference was pursuing such remedies as were secured to him by express statutory enactment, his adversary should not be permitted to obtain, by the issuance of a patent, *prima facie* title to the very matter concerning which the entire interference controversy had been made; in other words, that the corpus of the litigation should be preserved throughout until the dissatisfied party had exhausted all his just legal remedies, or until, by his inaction, a conclusive presumption of abandonment of the contest should arise against him.

Sargent maintained, in opposition to this view, that, when a final judgment and award of priority is made by the Commissioner, the right of the successful party to an immediate grant of letters patent against his opponent is complete, and that this right could not be affected by the result, whatever it might be, of the equity suit.

The Commissioner rendered his decision upon this motion on the 24th of July last. He held that power was vested in him by section 4,904 of the Revised Statutes, to withhold the issue of a patent to a successful interference contestant, after final award in his favor by the highest tribunal within the Office, pending the result of an equity suit brought by his opponent; and that the occurrence of the word "may" in the phrase of such section, "may issue to the party adjudged the prior inventor," instead of the mandatory "shall," was not without significance in this connection, and reposed a discretion in the Commissioner as to the issue of the patent. He therefore suspended the application of Sargent pending the result of the equity suit.

From this order of the Commissioner of Patents, suspending the issue of letters patent, Sargent, on the 30th day of July last, presented his petitions in the form of a motion for the revocation of the order, to the Hon. Carl Schurz, Secretary of the Interior.

Sargent's counsel insists in the first place, that under this order of the Commissioner, Sargent suffers a very grave injury. That owing to the voluminous testimony to be taken, the equity suit cannot reasonably be expected to be carried through the Supreme Court of the District of Columbia in less than two years, and that if an appeal be taken to the Supreme Court of the United States, three more years will be consumed, and that thus Mr. Sargent's patent is liable to be suspended for at least five years longer, and that in the meantime the demand for time-locks will have become so fully supplied that his patent will be of little or no value.

They urge, in the second place, that the Secretary of the Interior has power to redress this injury. This argument rests mainly on three sections of the Revised Statutes.

Section 441 declares that "the Secretary of the Interior is charged with the supervision of the public business relating to the following subjects; the fifth of which, in numerical order, is 'Patents for Inventions.' This, Sargent's counsel claims, makes it one of the primary duties of the Secretary of the Interior to oversee and give orders how and where patents for inventions shall be delivered.

Section 481 provides that "the Commissioner of Patents, under the direction of the Secretary of the Interior, shall superintend or perform all duties respecting the granting and issuing of patents directed by law." This, counsel argue, imports the order and command of the superior officer.

Section 483 provides that "the Commissioner of Patents, subject to the approval of the Secretary of the Interior, may from time to time establish regulations not inconsistent with law, for the conduct of proceedings in the Patent Office."

That the order in question amounts to nothing more or

less than a "regulation," Sargent insists is manifest from the fact that it does not assume to decide any question of right, but merely relates to a matter of purely executive or administrative practice. That it is an order which must be made in every case where a defeated party in an interference files a bill in equity under said Section 4,915, for in this case not a single fact was even alleged in support of the motion, except the naked fact of the filing of the bill. It therefore amounts, in the strictest sense, to a rule or regulation applicable to all similar cases, and it therefore becomes the duty of the Secretary of the Interior, when his attention is called to it, either to approve or disapprove and annul it. This in brief is the argument of Sargent's counsel.

As the practice of the Patent Office has heretofore been to allow the successful contestant his patent immediately upon a final determination of the interference, the action of the Secretary of the Interior upon the order of the Commissioner will be awaited with great interest.

NEW PROCESS FOR ELECTRO-PLATING.

Professor A. W. Wright, of Yale College, New Haven, Conn., has discovered a new and brilliant method of electroplating, which promises to be of great utility. Taking advantage of the fact that the various metals may be volatilized by the electrical current, he provides a hollow vessel, from which the air is partially exhausted; within this vessel he arranges opposite to each other the two poles of an induction coil; the article to be electroplated, a bit of glass for example, is suspended between the poles; to the negative pole is attached a small piece of the metal that is to be deposited on the glass. From three to six pint Grove cells are employed, yielding, by means of the induction coil, an electrical spark from two to three inches in length. Under the influence of this spark a portion of the metal of the electrode is converted into gas or volatilized, and condenses upon the cooler surface of the suspended glass, forming a most brilliant and uniform deposit. The thickness of the plating thus produced may be regulated at will, by simply continuing the action of the electricity for a longer or shorter period. That the metal is actually volatilized is proven by examination with the spectroscope during the progress of the operation, the characteristic lines of whatever metal is used for the electrode being fully revealed. This may be classed as the discovery of a new art, and is certainly very interesting and remarkable. In brief, it consists in plating the surfaces of substances with metals, by exposing such surfaces to the hot vapors of whatever metal it is desired to plate with.

Professor Wright has already made a number of valuable practical applications of his discovery. He produces mirrors with silver, platinum, iron, and other metals, of the most pure and resplendent character. He deposits gold in a layer so thin that it is only 0.000183 mm. in thickness, or approximately only one fourth the wave length of a red ray of light. He obtains curious colors in the metals, varying with the thickness of the deposits, and opens up a new field for investigation into the nature of metals and other volatilizable substances, and perhaps of light. He shows that his electrically deposited metals have improved qualities; that telescopic and heliostatic mirrors, for example, of platinum deposited on silver, by his process, will be unalterable; and the promise is that we shall before long be able by this new art to produce telescopes and other scientific instruments of greatly improved character.

THE ELECTRO-SILICIC LIGHT.

M. Gaston Planté has recently called attention to the brilliant luminous effects obtained by causing one of the poles of a powerful secondary battery to touch the side of a glass vessel or porcelain vase containing a saline solution. In another experiment, by means of which he exhibited the aspiration produced by the electric current around a platinum wire traversing a capillary tube, it was also observed that, if the current exceeded a certain intensity, the limit of which depends on the nature of the saline solution used, the glass then fuses, even in the liquid, and gives forth a bright light. The extremity of the platinum wire, which is made in ball-shape, becomes enveloped in a mass of melted glass, and the light is maintained brilliant during the discharge of the secondary battery, until the glass, cooling around the electrode, completely isolates it from the liquid.

When a solution of rock salt is used in the voltameter, this luminous effect requires for its production the reunion of from 250 to 300 secondary couples; but if a nitrate of potash solution is employed, the light is obtained with 60 secondary couples, the intensity of which correspond nearly to that of 90 Bunsen couples. The manner in which saline solutions act, in connection with glass silex brought to a high temperature by the electric current, is varied, because of the greater or less degree of fusibility of the silicates formed, as M. Carré has noted, by combining various salts with the carbons used for the ordinary electric light. The vitreous light may be produced either at the positive electrode or at the negative one, placed successively in contact with a tube or glass surface. A greater energy is required for its manifestation at the positive pole; but it is there less noisy than at the negative electrode, where it is attended by notable crepitation. At the moment when the light appears, a thick and abundant white vapor is disengaged, which gives a light alkaline reaction. At the same time the glass is strongly attacked and devitrified.

The brilliancy of the light may at first be attributed to the lime combined with the silex in the glass; but if the spec-

trum be examined, it will be seen to present few appreciable rays, except some traces of those of sodium. On the other hand, a fragment of calcareous spath placed in the same conditions, while also giving a very brilliant light, has a continuous spectrum which shows the characteristic rays of calcium.

In both cases the spark, formed at the negative pole above the nitrate of potash solution goes, gives, before the contact of the electrode with the glass or spath, the potassium lines; but these lines disappear as soon as the most brilliant light from either glass or spath is produced. The silicium lines, according to M. Kirchhoff's investigations, being faint, it is evident that they do not appear because of the luminous intensity of the spectrum formed, just as the carbon lines are not perceptible in the spectrum of the incandescent carbons of the voltaic arc.

The silicic origin of this light is also proved by the fact that it is manifested on contact of the electrode with pure silex in the state of crystals of hyaline quartz. In this case, however, about 100 secondary couples are necessary for its production. As the silex itself may be decomposed by currents of great tension, the luminous effect probably, says M. Planté, results from the incandescence of the silicium, between which and diamond and graphite, MM. Déville and Woehler have shown remarkable analogies to exist. In order to distinguish the light from that produced between the carbon points, M. Planté designates it as the electro-silicic light.

PROGRESS OF HARDENED GLASS MAKING.

About two years ago M. Royer de la Bastie produced his tempered glass. It will be remembered that the Bastie process consists in heating the glass object to a red heat in a furnace, and plunging it while in this state into a cooling bath. This method, in common with some others of later date, and based on the same principle, requires that the object shall be completely formed before the hardening operation, and this, besides producing other disadvantages, tends to enhance the cost of manufacture. The glass, when heated to the necessary temperature, becomes so softened that it is almost impossible to transport the object from furnace to bath without some deformation taking place, and to this cause are due the irregularities so often noticeable in tempered glass articles, and notably the departure of window panes from a true plane. There are other disadvantages due to the bath, which is composed of oil or other greasy material heated to a temperature varying between 392° and 572° Fah., according to the quality of glass to be tempered. When the red hot article is plunged in, the oil easily takes fire. This can, of course, be avoided by proper precaution, but it is obviously a source of danger. There are, besides, the disagreeable odor arising from the bath, the large expenditure of oil, which decomposes on contact with the hot glass, and finally the fact that each special composition of glass requires a different temperature of the bath, and it is very difficult to maintain exactly this temperature during the operation. It will thus be clear that in the bath is the weak point of M. de la Bastie's process.

Herr F. Siemens, who has devoted considerable attention to the Bastie plan with the hope of overcoming some of its practical difficulties, appears to have become convinced that the invention is inapplicable to the fabrication of certain forms of glass, among which are included window panes. To these last any hardening process probably finds its most important application. After some experiment Herr Siemens reached the conclusion that solid bodies, or rather molds, could be substituted for the cooling bath. His first attempts, made with the object of hardening small squares of glass between plates of baked earth, showed clearly that the idea was practicable. This was eighteen months ago, and during the subsequent interval up to the present Herr Siemens has achieved constantly improving and successful results.

The *Deutsche Industrie Zeitung*, whence we take our facts, states that the method of fabrication of the compressed glass is not merely a glass-hardening process. It constitutes at the same time a veritable method of glass making. Tempering, blowing, and molding are all accomplished in one and the same operation.

It will be perceived, however, that all objects in glass cannot be made by this process, and that its application is restricted to such as can be pressed between two simple forms. To this category, however, belong window panes, to which at present Herr Siemens proposes to restrict his manufacture. In brief, the Bastie and Siemens methods may justly be regarded as each having its peculiar sphere. Bastie's plan is especially suited for cylinders, hollow glass, and other articles of complicated form, while Siemens' system, as already stated, is best applied to simple figures. The resistance of the Siemens glass to shock is stated to be ten times that of common glass, but its cost is about 50 per cent higher, except in case of curved window panes, when it is the cheaper. It is said to be harder than other tempered glass, and to present a fibrous instead of a crystalline fracture. It may be polished or pierced without the rupture which occurs in the Bastie glass. Herr Siemens is engaged upon still further improvements, which it is believed will tend to decrease the cost.

At the Lyons Industrial Society, recently, M. Leger proposed tempering bottles and similar glass objects by steam. The tensile resistance of the glass thus prepared, he states, is about equal to that of cast iron. No details of the process are given.

IS LIFE A MODE OF MOTION?

It can be demonstrated that motion is all-pervading; that absolute rest is inconceivable and that, in whatever form motion may appear, whether as motion or as light, heat, chemical affinity, magnetism or electricity, all are but phases of but one and the same great force. Science however does not stop with the enunciation of this truth, but following the same pathway onward is now brought face to face with the greatest problem within the ken of human conception, the question of the nature of life itself. There is something startling and overwhelming in the recognition of the fact that perhaps the greatest scientific minds on earth are keenly pressing forward toward the resolution of the mystery, not as speculators or dogmatists, nor as metaphysical advancers of abstract hypotheses; but progressing step by step, proving and reproving, leaving no by-path unexplored, no thread loose or weak in the wonderful fabric of facts which are slowly being interwoven. If Bastian and the believers in spontaneous generation are right, then life is the legitimate consequence of chemical affinity, for they claim to have substantiated by the clearest experimental proof that organisms in certain solutions previously free from life are due wholly to the proper chemical composition of such solutions. If this be true, then life must stand in the same category as heat and light and other sequences of chemical affinity—it is a mode of motion into which other modes of motion are convertible, and reciprocally it would follow that life itself is transformable into other phases of the all-pervading force.

THE TORPEDO DEFENSE QUESTION.

Despite the fact that the attention of inventors the world over is now directed to the problem of defending ironclads against torpedo attacks, progress toward its solution is slow. Captain Morton Singer, R. N., has been carrying on a series of experiments in the capacious repairing basin at Portsmouth, in order to find out the best form of netting to oppose to the Whitehead torpedo. It is now generally conceded that the netting system, although it in some measure acts as an impediment to the vessel's movements, is better than the proposed plan of fast small launches to be kept outside the vessel to head off torpedoes. Captain Singer has found that a chain net $\frac{1}{2}$ inch thick is easily perforated by the Whitehead torpedo, and he has obtained the best results from a wire grummet matting composed of wire strands about $\frac{1}{4}$ inch in thickness rove into open meshes. This yields gradually when struck and on recoiling throws off the torpedo.

A new submarine armor for vessels has been submitted to the Admiralty, and is intended to resist torpedoes. It is said to be so constructed that, while normally carried on the vessel's side out of the way of the guns, it may be drawn down over her bottom in five minutes. It is difficult to see how any device of this sort can be efficacious, as the explosion of a torpedo occurs along the line of least resistance, and it is hardly to be conceived that a vessel can be rendered so strong as to oppose more resistance than several feet of water tampering.

DR. THOMSON ON EMBRYOLOGY AND EVOLUTION.

The address of Dr. Allen Thomson, President of the British Association, which recently convened at Plymouth, Eng., and, is not one to excite the attention which scientific men, the world over, are wont to bestow on the discourse which yearly emanates from the chair he occupies. It is lengthy and technical—perhaps the latter was to be expected from so eminent a specialist—but the technicalities of biology are fully comprehensible to so limited a class that, without derogating from the scientific excellence of the address, we can scarcely think their introduction happy, especially as the discourse is usually understood to partake somewhat of the nature of a popular exposition.

The general tenor of the more important part was to set forth the parallel between the development of kinds, as conceived by the Darwinian naturalist, and the embryonic development of the individual as exhibited in any of the higher animals from the microscopic ovum upward. According to the evolution hypothesis, every such stage is the record of a condition once present in adult ancestors of remote generations—whence an explanation of the phenomena of embryonic life otherwise unaccountable. Dr. Thomson pronounced his opinion that the evidence of embryology in favor of the continuous development of species is conclusive; and considered that no theory which does not include the leading ideas of evolution, namely, variability, adaptation, and hereditary transmission, can bring the facts of embryology within a general law. The student of Haeckel will find the same argument brought forward by that writer with a wealth of illustration, so that the address was rather an endorsement of theories already formulated than a means of placing before the world any original hypotheses.

JOHN C. GRAHAM, of Grandville, Mich., contributes the following rule for estimating shingles for roofs: Divide 3,600 by the number of inches to be laid to the weather, and multiply this quotient by the number of squares to be shingled, and the product will be the number required.

VERY little is known of the first introduction of toothed wheels and toothed gearing. Two centuries before the Christian era, Hero, of Alexandria, spoke of toothed wheels in a manner that would indicate that he was conversant with this mode of transmitting motion.

IMPROVED VERTICAL GAS ENGINE.

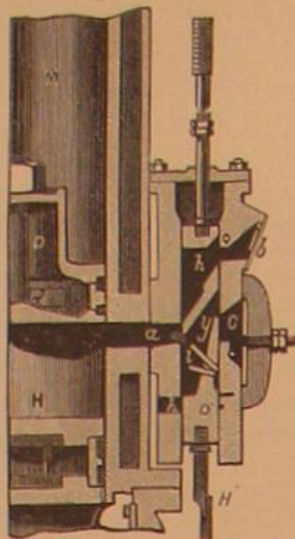
We illustrate a new gas engine which is being manufactured by Messrs. Louis Simon and Sons, of Nottingham, England, and is known as the Humboldt and Gilles' vertical gas engine. The illustrations, Figs. 1 and 2, show an elevation and section of the engine, and Fig. 3 gives the valves and parts of the piston in detail. The cylinder is fitted with the working piston, H, and the upper piston, D, the former being connected by a connecting rod to the crank, K, on the fly wheel shaft below; on this shaft is the cam, O, which works the gas slide, D', and also a cam which releases the clamp of the upper piston rod. The slide, D', has in it a cavity, p, and a sloped passage, y, and the slide jacket has ports, b' and c', for the admission of gas and air; i is a burner for admitting the kindling flame to the passage, y, which communicates also with an air port, h. The passage, a, into the cylinder in one position of the slide admits the mixture of air and gas supplied to the cavity, p, and during the rapid movement of the slide admits the kindling flame which ignites the mixture in the cylinder; a smaller passage is placed below the passage, a, so that when the latter is stopped by the loose piston head, d, the products of combustion still inclosed between the two pistons can only escape very slowly owing to the screw, F, it thus acting as an air buffer, preventing concussion of the two pistons. The passage, a, governed by the valve, b, permits the products of combustion to issue from the cylinder, the valve, b, closing to prevent ingress to the cylinder. In connection with the gas valve is a regulating pump, which is worked by the cam, O. The piston or sucker draws in and expels at each revolution a small amount of liquid. If the revolutions follow one after the other in too rapid succession, all the liquid cannot be expelled; this causes the lever attached to lift and hold stationary the bar, H', thus preventing a new charge of gas being given until the speed has diminished. The apparatus for clamping the rod of the upper piston, and preventing it from descending till the grip is relieved, consists of four levers, K, Fig. 1, pressed down by springs. The ends of the four levers, K K, Fig. 1, are rounded, and enter notches in a pair of clamps, N, which consist of a bush made in halves inclosing the piston rod. The levers, K K, are a little inclined upwards, so that, as they tend to come down to a horizontal position, they press the sides of the clamp, N, firmly against the piston rod, and grip it, thereby preventing it from descending until the eccentric, O', connected to the lever, m, top of Fig. 2, is brought round to such a point in its revolution as to raise the inner end of the lever, m, pushing upwards the clamp, N, and so relieving the piston rod and allowing the piston, D, to descend.

The operation of this engine is as follows: Assuming that the working piston is at the extremity of its stroke inwards, the loose piston being close to it, the former by rotation of the crank is drawn outwards; and the loose piston, having on its opposite side the pressure of the air entering by the top, follows the working piston till it is stopped by the collar on its rod meeting the buffers provided on the cylinder cover. The working piston, continuing its movement, creates a partial vacuum behind it in the space between it and the loose piston. The cam having moved the gas slide so as to admit into this space the mixture of air and gas, admits the kindling flame whereby the mixture is exploded. The pressure produced by the explosion drives forward the working piston, and at the same time causes the loose piston to make a rapid stroke in the opposite direction, the air in the space beyond it being discharged through the space in the top cylinder cover. When the projecting upper head of the loose piston closes this space, the remaining air slowly escaping by a spring valve serves as a cushion to arrest its movement. The working piston having made its outward stroke, and the loose piston having also made its outward stroke, and the gas slide having closed, the space in the cylinder between the two pistons remains charged with the products of combustion at a pressure considerably below that of the atmosphere. The atmospheric pressure, therefore, tends to force both pistons inwards. The working piston moves inwards in obedience to this pressure, but the loose piston is held near the extremity of its outward stroke by the friction cheeks.

When the working piston is approaching the extremity of

its inward stroke, the friction cheeks are slackened off the rod of the loose piston by the action of the eccentric, and the air slide is opened. The loose piston thereupon makes a rapid stroke inwards till it nearly meets the working piston, and the products of combustion, thus compressed between the two pistons, are forced out by the discharge valve on the side of the cylinder. The action is then repeated. From the above it will be seen that the engine is double-acting, a portion of the outward stroke of the working piston being effected by the pressure of the explosion, and the whole of its inward stroke by the excess of the atmospheric pressure over that of the products of combustion. The cylinder being open at both ends, no water is required to cool it; and the application of the principle of using gas explosion principally to produce a vacuum has produced what promises to be a successful engine.

Fig. 3.



The Triple Conjunction of Mars and Jupiter.

The present year is distinguished by the triple conjunction and long-continued proximity of these two planets, which, though it may not afford any very striking spectacle, possesses considerable interest for those who follow the motions of the planets in the heavens. Both planets were in conjunction on July 27, Mars in its forward motion passing Saturn in right ascension. Mars afterwards reversed its apparent motion, and repassed, in its retrograde course, Saturn on August 15, and will, on November 3, pass a third time, and this time close to Saturn. There has been no triple conjunction between the two planets since 1779, and the next one will not occur till the year 1946. In the course of six centuries, from the year 1400 to 2000, ten such triple conjunctions may be counted, including that of the present year, which, though triple in right ascension, is not triple in longitude. During the same six centuries the number of triple conjunctions between Mars and Jupiter is six

Fig. 1.

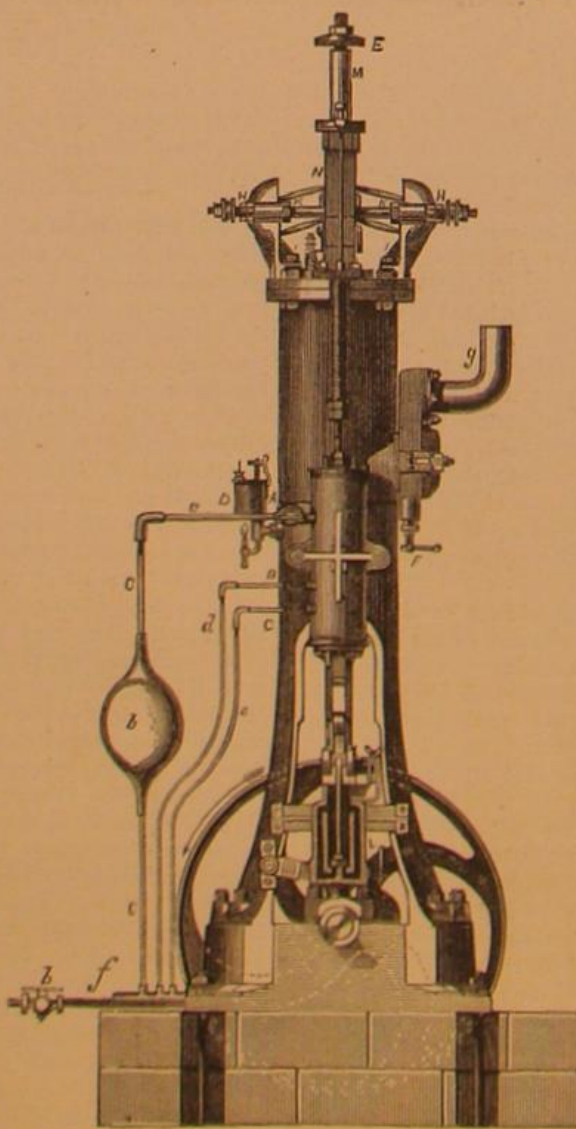
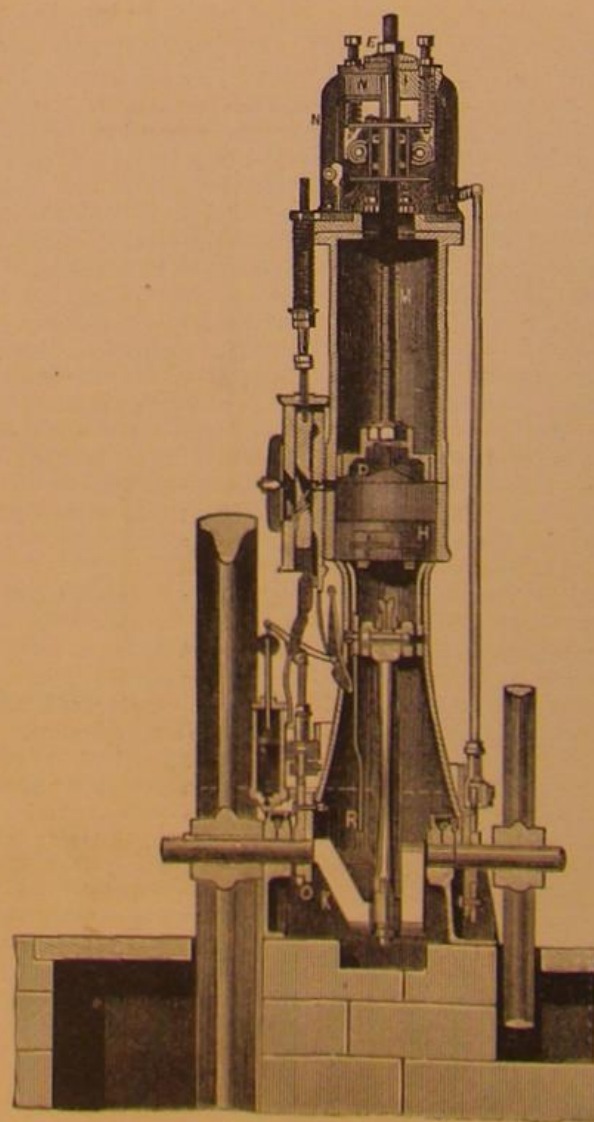


Fig. 2.



HUMBOLDT & GILLES' VERTICAL GAS ENGINE.

and between Jupiter and Saturn three, the latter occurring in 1425, 1682-83, and 1840.

Mixed Animal and Vegetable Fibrous Fabrics.

It has hitherto been the custom in manufacturing fabrics composed of wool and cotton or other vegetable fiber, either to card both raw materials separately, in order to subsequently mix them up and spin the two into yarn known as

merino or angola, or to mix up the animal and vegetable fibers before carding. However, the spinners so prepared share the common defect of showing a quantity of small knots or irregularities on their surfaces, so deteriorating the quality of the yarn very much. By a newly patented process, the cotton and wool, or other vegetable and animal fiber, are each carded separately in a carding-engine best suited to the particular fiber in question. These cotton and wool cardings are then laid one on the other, and so passed through another carding-engine, which thoroughly mixes up the two fibers together, when they are spun into yarn in the usual manner.

The carding-engine used for mixing up the two fibers together must be set, to prevent the fibers entering the card teeth further than is necessary to ensure their parallel laying. The yarns prepared after this manner are quite free from knots, and of a better quality than heretofore obtained.

A Worm Farm at Nottingham, England.

When at Nottingham a few days ago, I was much pleased at the discovery of an entirely new industry, namely, the rearing and education of worms for the purposes of anglers. Mr. Wells, fishing-tackle maker, of Sussex street, Nottingham, carries on a business and trade in worms. He has several people in his employ who collect worms every favorable night during the year. He sells the following kinds of worms, namely, the lob or dew worm, the cockspur, and the ring-tailed brandling. In dry weather worms are very scarce; the men have to water the ground for them. In wet weather the worms are better and heavier. They are caught in the meadows and pasture lands in the neighborhood; the supply is not failing.

The worms are sold by the thousand or the quart. In a warm, moist night from two to six thousand worms are brought in by the collectors. Some people can collect worms much better than others. The worms are very cunning, and are apt to pop back into their holes if the person treads heavily.

When the worms are brought in, Mr. Wells at once begins his training operations by placing them in properly selected moss. Stag's horn moss will not do at all, it is too harsh. Grass is bad. Field moss is the best. The worms are put into the moss to scour. A fresh-caught worm is very delicate and tender, and easily breaks up when put on the hook. When a worm is properly educated he is as tough as a bit of india rubber, and behaves as a worm should when put on a hook. The way to test a worm is to take him up and pass the finger gently down the length of him. If anything comes out of him he is not fit, and is put back for further training. The meaning of this is that the wild worms contain, more or less, food undergoing digestion. When put into the moss this food disappears. The moss in some way facilitates this operation, but I cannot quite see how this is, unless the worms disgorge all their former food, and practically become very little else than skin.

The keeping of worms depends very much upon the weather. They will not keep well above a week. Mr. Wells has a supply of worms ready for his customers all the year round. He goes over his moss very frequently, picking out the mauled and mashed worms, and only sending to market the plump and healthy ones, which are packed up for market in moss; the bags used are of light canvas.

Not only does Mr. Wells collect worms, but he also breeds them in considerable quantities. In his garden is a special heap made of vegetable matter, expressly for the purpose of breeding worms. I shall not, of course, say what substance for worm-breeding is most favorable: this is a professional secret. On turning the heap over where the worms are bred, it was very interesting to see the worms in various stages of growth. Mr. Wells knows from experience pretty well what the age of a worm is.

I had the pleasure of pointing out to him the eggs of the worm. These are about three lines long, and somewhat oval. They had a sort of lid at each end, which opens when the young are liberated. I believe that two young are sometimes produced from the same egg.

The business of worm selling has been going on some ten years and is gradually increasing.—Frank Buckland, in *Land and Water*.

NEW REGISTERING THERMOMETER.

The annexed engraving, extracted from *La Nature*, represents M. Hervé Mangon's new registering thermometer. The instrument is composed of two parts, (1) the thermometer and the balance which serves to weigh the differences of weight which are the consequence of variations in temperature, and (2) the registering apparatus.

The thermometer, the mercurial column in which is amplified in diameter in our engraving in order to show it more clear, is composed of a very fine tube, R, so as to present large surface while really containing but a small volume of mercury. This tube, R, is sustained by an iron standard and enters the bell glass, V. Its extremity, drawn out very small, enters a small cup, g', which contains mercury, and is placed on one of the pans of the scales, B. The latter is an ordinary accurate balance. Above the beam it carries a small disk which causes contact at C whenever equilibrium is broken owing to augmentation of temperature. The second scale pan also carries a cup, g, in which is glycerin. A glass tube, T T, connected with the registering device, plunges into this liquid and also connects with another and larger cup, G. The bell, V, covers the balance and protects it from the air. To adjust the instrument it is necessary simply to see that the end of the mercury tube enters the cup, g', and then to equilibrate the balance by placing weights on the other scale pan. The registering apparatus consists of two clockworks, M and M', which travel in opposite directions and which rotate very delicate fly wheels with great rapidity. They are interconnected by a differential train, the axle of which carries a double-scored pulley, A. Between the two wheels a needle oscillates, one of the extremities of which serves alternately to stop one of the wheels. At the other end of the needle, a, is a small piece of soft iron on which the electro-magnet, E, acts whenever a contact of the balance occurs at C. The needle is mounted on an axis which allows it to oscillate in either direction according as it obeys the electro-magnet or an antagonistic spring.

The double scored pulley carries two wires, one attached to the pencil holder, K, and terminated by a stretching weight, Q, the other carrying a small cylinder which plunges in the cup, G, which contains glycerin, and which is, as already explained, connected with the cup, g. A cylinder, H, operated by a clock train, carries the paper on which a second pencil, K', serves to trace a mark by which the movement of the train, L, is regulated.

The operation is as follows: Suppose the temperature to augment, the weight of mercury in g' will increase, equilibrium will be broken, and the contact, C, will be established. The electro-magnet, E, will then attract the end, a, of the needle, and the wheel at M' will be free. The pulley, A, will then turn to the left, the cylinder will then sink in the cup, G, and the pencil will be directed toward K'. The float in G, descending, elevates the level of the liquid in that vessel and in cup, g, and hence will augment the weight in the scale pan on which said cup, g, is disposed, and thus up to the time when equilibrium is re-established and the contact, C, broken. The end, a, of the needle, now being no longer attracted by the electro-magnet, would be moved by the spring and would disengage the other fly wheel at M, when the pulley, A, turning to the right and drawing the pencil, K', towards K, causes the rising of the float in the cup, G, and hence diminishes the weight in cup, g. This loss of weight again destroys the equilibrium of the balance, contact at C is re-established, and the parts resume their primitive positions. In this way a zigzag line is produced on suitably ruled and marked paper, from which the variations and changes of temperature may be noted.

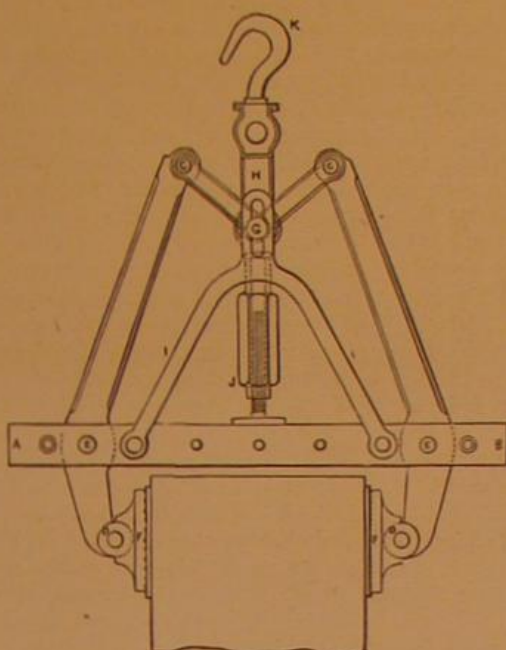
A New Explosive Bullet.

Captain C. S. O'Hara, of New Orleans, La., lately made some experiments at the Crescent City Rifle Park with his new explosive and igneous bullet. A large chest made to represent the caisson of field artillery, was charged with powder and set on tressels. At a distance of one hundred yards a bullet was fired into the chest, which was blown up. Shavings and wood, in which there was no powder, were set on fire by being fired into. A post was rigged as a ship's mast, with a yard or sail furled. This was shot at and partially burned, the canvas readily igniting by the explosion of the bullet.

The inventor claims that shells or bullets of any size may be made on the same principle, and that the material with which they are charged may be handled with as much safety as gunpowder, and that time and climate will have no deteriorating effect upon it.

NEW HOISTING CLAMP FOR BUILDING STONE.

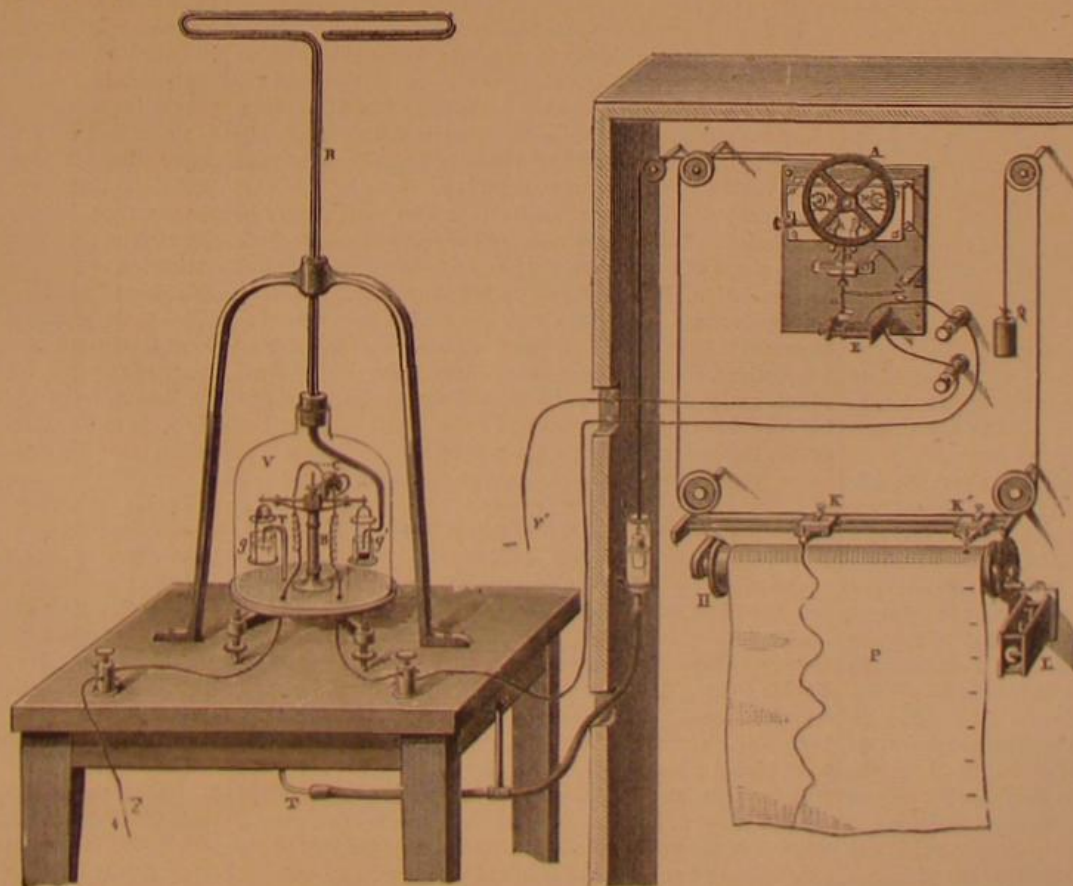
We extract from the *Bulletin de la Société d'Encouragement pour l'Industrie Nationale* the annexed engraving of a new apparatus for hoisting building stones while the same are being hoisted into position. In principle the weight of the



stone itself is used to act upon levers so that the block is tightly grasped as it were in pincers. C D and C' D' are arms pivoted at E in the piece, A B. To the lower ends of these arms are attached the clamps, F, and to the upper extremities are pivoted short arms which form a V at the point, G, in the vertical piece, H. To the latter is secured the hook, K. J is a screw which serves to elevate the point, G. In using the apparatus the clamps are placed on the sides of the stone, as shown, and the screw, J, is elevated. By this means the outer ends of the arms, C D and C' D', are forced apart and the clamps pressed against the block. When the whole is lifted by the hook the tendency of the V arms, C G and C' G, is to open, when the weight of the stone itself causes the clamps to be forced the more tightly against it. The holes in the piece, A B, serve to adjust the pivot points, E, of the large arms to any size of stone.

How to Test Boiler Steel.

In a paper in the September number of the *Metallurgical Review* Mr. William Metcalf, a Pittsburgh steel manufacturer, says: "Perhaps the greatest development of steel for structural purposes up to this time may be found on rail-



MANGON'S NEW REGISTERING THERMOMETER.

roads. The question of steel rails may be regarded as settled; also of steel tires, crank pins, guide bars, connecting rods, etc. In case of axles and boilers there seems to be some discussion, but no close observer can doubt the ultimate result. In boiler steel the only danger to be apprehended is that there may be enough carbon in the steel to cause hardening in use, although the sheets may have been annealed so as to endure all the cold bending, twisting, punching, and flanging tests successfully. That such annealed sheets will harden very hard in use is well known. A very simple preventive may not be so generally known. "Let a piece from each sheet be heated white hot and

quenched in cold water or brine. If, after this treatment, it will double over cold, punch, twist, flange, etc., it will never harden in use, simply because it has not enough carbon to cause it to harden under any circumstances. There are instances of boilers that have been in active service for nearly ten years, when only 20 per cent of a large number have required any repairs, and all are reported in good working condition. It is evident that the life of a boiler must be very long under fair treatment, after it has run for about nine years subject to ordinary wear and has not required any repairs whatever."

SCIENCE AT THE BRITISH ASSOCIATION.

The papers read at the recent session of the British Association at Plymouth, England, are quite rich in new scientific ideas. Their lengths precludes our touching on more than their salient points—but these will suffice to exhibit the wide and interesting range of the subjects discussed.

LIFE FROM OTHER WORLDS.

Sir William Thomson revived that curious paradox of the possibility of life coming upon our earth directly from other worlds—the vehicle being a meteorite. Biologists at present are not in accord as to what temperature is fatal to germ life; and it is believed that some germs come safely through extremes of temperature that are fatal to the species in a more advanced stage. On this rather doubtful foundation, Sir William bases his idea that a germ might hide away in a crevice of a meteorite, so that the intense heat of the exterior might not reach it, and hence it might remain alive after the wandering mass had come to rest on the earth. One objection at least to this theory will suggest itself to the readers of Mrs. Ingram's interesting essay—read before the American Association, at Nashville, Tenn.—and that is, if that fair scientist is right about concussion being fatal to germ existence, then the shock of the meteorite striking the earth, if not due to its contact with the atmosphere, would be quite sufficient to destroy the traveling organisms.

THE INDUSTRIAL VALUE OF SCIENTIFIC RESEARCH.

Professor Abel made a capital review of the operation of purely scientific research in developing important branches of industry. He instanced Perkins' researches in the coal tar colors, and more especially referred to the recent improvements in the steel manufacture. He pointed out that the success which has attended the addition of silicon in combination with iron and manganese to the steel before casting in the preventing the formation of blow-holes, and in contributing at the same time to the production of the particular character of steel required, bids fair to be of special importance in connection with the application of steel to the production of projectiles for use against armor plates and of castings which will compete successfully with carefully forged metal, or even with the Whitworth compressed steel.

He also alluded to the advantages of steel armor over iron, and stated that promising results have recently been obtained at Shoeburyness with a new system of applying steel in conjunction with malleable iron, by which a perfect union of the two materials at one of their surfaces is obtained by the aid of heat. Reference was also made to the late investigations into the physical nature of gunpowder, which among other things have demonstrated that modifications in composition, not unimportant from an economical point of view in dealing with the very large charges now employed, may materially contribute to render the storing of the maximum of work in the projectile, when propelled from a gun, compatible with a subjection of the gun to comparatively very moderate and uniform strains.

WAVE ENERGY.

Professor Osborne Reynolds demonstrated mathematically that, in waves on deep water, the rate at which the energy is carried forward is one half the energy of disturbance per unit of length multiplied by the rate of propagation. When the waves enter shallow water the motion of the particles becomes elliptical, the eccentricity depending

on the shallowness of the water; and it may be shown that under these circumstances the rate at which energy is transmitted is increased, until when the elliptic paths approach to straight lines the whole energy is transmitted, and consequently it follows that the rate of speed of the groups to the speed of the waves will increase as the water becomes shallower until they are sensibly the same.

It is claimed, though the fact does not rest on sufficient authority, that the organ is the invention of Archimedes, about 200 years B.C. The invention is also attributed to a barber of Alexandria, named Ctesibus, about 150 years B.C.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

The second extension case, that of H. Voelter, wood pulp machine, authorized by Congress, as mentioned in my last letter, has been decided in favor of the applicant, provided he will enter a disclaimer to the third claim of his patent, as re-issued June 6, 1871. It appears from the papers in this case that the present rate of manufacturing pulp by the machines covered by this patent is about 60 tons daily, with a steady increase in prospect, as paper made from pulp so manufactured is found to be peculiarly suited for the web newspaper presses. The evidence presented by the applicant shows that this pulp is manufactured at from 24 to 3 cents per pound, while similar pulp from rags would cost 6 cents. As there were 75,000 tons of Voelter pulp made last year, at a cost of \$4,500,000, and the same quantity of rag pulp would cost \$9,000,000, it follows that one half of this amount, or \$4,500,000, was saved by this process last year, to say nothing of the increase of the price of rag pulp which would result if the competition of the wood pulp were withdrawn; for before this process of wood pulp making was introduced, rag pulp was worth 10 cents per pound—part of this decrease, however, is probably chargeable to the general shrinkage of values.

Our Consul at Liverpool has sent to the State Department a dispatch, which should be considered as a strong warning to American mechanics against going abroad for employment unless under contract, and even then they will find themselves in the disagreeable position of taking the places of men who have struck for wages which are barely sufficient to enable them to maintain themselves and families in comfort, as is the case with the thirty-five carpenters who recently landed in England, who were simply brought over to fill the places of English carpenters on strike. Referring to these men, and to the published statement in some American newspapers that fewer men are out of employment in England than in the United States, the Consul particularly warns our mechanics against the danger and loss of putting these statements to the test, which reports have induced many American mechanics to leave their country to better their condition, and the result has been a large amount of suffering and destitution. To avoid any further augmentation of this suffering, the Consul requests that public warning be given to American workmen not to go to England unless under positive contract with responsible parties. Able-bodied American mechanics are calling upon the consulate daily for relief, and are greatly disappointed when they learn that consuls have no money for such relief purposes. Under these circumstances the Consul deems it his duty to inform the Department that neither skilled nor unskilled laborers who come from abroad can readily find employment in England, except in cases where they are engaged to fill the places of British workmen while on strike.

A dispatch has been received by the Secretary of State from the United States Chargé d'Affaires, at Paris, announcing that the immense exhibition buildings on the Champ de Mars and the Trocadero are nearly completed, and the foreign commissioners are about to take possession of the positions assigned them. It is stated that great solicitude is felt by the administration of the exposition in regard to the intention of the United States Government, no official notice having been received as to whether any commission will be sent to Paris or not. The legation is in daily receipt of letters from the United States, applying for information as to space, etc. The Chargé d'Affaires has been assured by the Commissioner General that the portion reserved in the original designs for the United States will be still retained to last possible moment, but that the time is rapidly approaching when the commissioners must know whether the United States will do anything in the matter or not.

There seems to be considerable doubt here about the Administration taking any steps to have the United States represented officially at the exhibition, except in response to a direct order from Congress, as it is stated that many persons of influence, having an interest in a full representation of American industry at Paris, have called upon the President and Secretary Evans, and desired them at least to appoint a provisional commission, but no steps have been taken to do even this much, nor do they appear likely to be. This, it is stated, may be owing to circumstances connected with the Philadelphia exhibition, in which neither the action of the French Government nor its exhibit was such as the United States Government had a right to expect. Instead of sending, as other nations did, special commissioners of high rank and experience, France entrusted her exhibit to subordinate attachés of the French Legation, one of whom was so objectionable to President Grant that he is said to have refused to accept an invitation to a public dinner at Philadelphia until he was assured that this person would not be present. The letters attacking the United States, which caused so much stir, although disclaimed by the supposed author, were believed to have been written by one of them. In addition to this, certain of the French exhibitors were found attempting to defraud the revenue, which made it necessary for our customs officials to submit all foreign exhibitors to very annoying restrictions. But independent of these minor matters, the character of the exhibit itself was not what might have been expected from France, and this was believed to be caused by the lack of interest, if not opposition, of the French Government. Secretary Fish, therefore, when the invitation to participate in the exposition

was received, transmitted it to Congress without recommendation; and it is reported that he gave substantially the above reasons to the Committee on Foreign Relations, when consulted on this subject, why he was unwilling to urge Congress to accept the invitation. This feeling is believed to be shared to some extent by the present administration, and may explain why it has been unwilling to assume any doubtful authority for the purpose of securing the representation of the United States at the Paris Exposition. Notwithstanding this, it is thought that the matter will be brought before Congress at an early day, as so many American manufacturers are desirous of exhibiting specimens of their wares; and in the present depressed condition of our industries, the administration wishes to do all it can to open new markets for our productions.

The United States Consul at Munich has forwarded to the State Department circulars announcing an exhibition of hops, and of tools and implements used in their cultivation, to which all nations are invited to contribute. The exhibition will be held in Nuremberg, from the 7th to 15th of October, and may possibly help to open a market for many of the appliances connected with hop growing that have been patented of late.

From a letter just received in this city from our Chargé d'Affaires at Madrid, it appears that Spain has reduced her tariff on imported goods, but has excepted England, France, and this country from the benefits of the reduction, so that hereafter English, French, and American manufacturers who send goods to Spain will have to pay from 30 to 50 per cent more than those of Germany, Switzerland, and other European nations.

Commander Rodgers, of the United States steamer Adams, reports to the Navy Department that he has discovered a bank of considerable extent in 17° 6', south latitude, and 36° 44', west longitude. It is situated about 135 miles east of the coast of the province of Espirito Santo, Brazil, and 130 miles northeastward of the Island of Abrolhos, in the South Atlantic Ocean. It is right in the course of vessels bound southward and northward from Rio de Janeiro. One of our papers here expresses a hope that it will be a long time before there is a run on the bank.

Washington, D. C.

OCCASIONAL.

Reforms Needed in Railway Bridge Construction.

To the Editor of the Scientific American:

It seems as if the recent railway accidents, and particularly the one near Des Moines, Iowa, might call attention to some of our engineering mis-constructions. In this case a masonry culvert is built on short piles. The water washes away the earth that holds the piles in an upright position, and they go down like a row of bricks. To simplify it, drive your cane in the earth three inches, put your hat on the head of the cane, dig or wash away the earth at the bottom of the cane, and it falls. Short piles may be a handy method of holding a structure up, but it is a sure method of letting it down in a water way. At the ditch to which these short piles are driven a concrete foundation can as easily be laid (or at least concrete can be put around the piles, holding them together). On such a foundation masonry can be securely built, or, what is better, make the whole structure a monolith of beton. The structure then holds itself securely together, there is no thrust. If a part is undermined, the rest supports it. The weight may be distributed over a large surface, or the culvert may be made in the shape of a pipe, forming its own invert which becomes its foundation. In a thousand years there seems to have been no improvement in masonry structures. We have copied to an extent the old superstructures, and have gone without foundations. The Washington monument is a sad specimen of our national skill as engineers, and the cracking and falling specimens of architecture in New York city are evidences that we should begin at the bottom.

JOHN C. GARDRIDGE, JR.

Operating Canal Lock Gates.

To the Editor of the Scientific American:

The subject of opening and shutting canal lock gates is being considerably discussed here owing to the aggravating interference of drift, mud, etc., with the working of the machinery of the lower gate of the Des Moines Rapids Canal. I would suggest an effective and simple means of accomplishing the opening and shutting, namely, to employ a strong jet of water through two way nozzles, to be placed permanently in the toe of the gates, and there may be other jets along the foot of the gates to clear away mud, drift, etc., in the passage of the gates, while a greater number of the nozzles playing from the opposite side of the gate would propel it in the required direction.

Keokuk, Iowa.

ALEX. BLACK.

Defective Rubber Hose.

To the Editor of the Scientific American:

N. D. in your issue of August 18 complains of the inferior quality of rubber hose as at present made. He thinks that, with more care in its manufacture, its value would be at least double what it is. I beg to inform him that though the greatest care is taken in its construction it will remain in its present defective state just so long as it continues to be handmade. Let us review the process of making hose, and in doing so I think I can show plainly where its weakness lies. Any one acquainted with the nature of rubber is aware of its great expansion during the process of vulcanization. To control this expansion within proper limits is to

add strength, to be unable to control it is to weaken it. A long hollow mandrel or pole is taken and around it is wrapped a thin coat of rubber in sheet form. This constitutes the inner lining. Then a strip of cotton duck saturated with rubber is wound around, one, two, three or more times, according to the number of ply required. A coating of rubber like that used on the interior is then put on the outer side. It is wrapped up in cloth, vulcanized, and the hose is made. When it comes to putting the wrapper around, if one twist is slacker than another or one edge does not evenly overlap the other, when the expansion takes place at that place there will be a loose spot or blister; after a short time in use the continual bending backwards and forwards will further rupture these already weak spots. From its imperfect make, it permits the water to circulate between the layers of cotton duck which soon becomes rotten.

Cleveland, O.

H. J. MERREUS.

A Reply to the Question of Axial Change of the Earth.

To the Editor of the Scientific American:

The earth's axis and its inclined position seem to depend upon attraction of gravitation, or magnetism in the direction of the north star. Such an attraction to be permanent must be exerted upon the mineral portion of our globe, and we find the greatest amount of land in the northern hemisphere; but the corroding agencies before alluded to are gradually wearing it away, and, in obedience to the law of centrifugal force, this debris is gradually finding its way to the periphery or equator; hence we find our northern shores rock bound coasts, and as we approach the equator, sandy flats. The same peculiarity exists in the southern hemisphere. The diameter of the earth at the equator is 20 miles greater than at the poles. The water exhibits the greatest parts of this distention, and forms a belt from 5 to 10 miles in depth around the earth at the line. To what extent the mineral deposits have accumulated there we cannot tell; but whenever they shall have accumulated to such an extent at any point of the equator as to exceed that in the northern hemisphere, that part will gravitate toward the north or polar star, opposite points on our present equator will become the new poles, or axis in doing so, this great belt of water in finding its new position will sweep over one half the globe, a quarter upon each side, thus causing another deluge, throwing up new mountain ranges, burying continents and elevating others, bringing arctic regions into tropical climes and portions of our present equator into arctic frosts. This, like all the preceding revolutions of our planet, will be sudden and violent.

Philadelphia, Pa.

ALEXANDER BOND.

ANCIENT LIFE IN AMERICA.

Professor O. C. Marsh, of New Haven, recently delivered before the American Association for the Advancement of Science an address on the "Introduction and Succession of Vertebrate Life in America." According to present knowledge, he stated, no vertebrate life is known to have existed on this continent in the archæan, Cambrian, and silurian periods, yet during this time more than half the thickness of American stratified rock was deposited. Fishes are known in the upper silurian of Europe, however, and there is therefore a probability that they will be yet discovered in our strata of the same age, if not at a still lower horizon. Passing through the various geological periods, Professor Marsh noted the extinction or increase of various orders of fishes, and then, referring to the amphibians, stated that the latter are so nearly allied to the ganoid fishes as to leave little doubt of their descent from some member of that group. The earliest evidence of their existence on this continent is in the sub-carboniferous, where footprints have been found which probably were made by labyrinthodonts, the most ancient representatives of the class.

ORIGIN OF THE BIRDS.

During the mesozoic period some of the strangest forms of reptilian life made their appearance and became extinct. Then came the dinosaurs, true reptiles, yet having characteristics peculiar to birds of the ostrich order, so that it is possible that they were the parent stock of all birds. Professor Marsh's account of the great saurian monsters of the cretaceous strata is wonderfully interesting. He told of vast lizards, some sixty feet in length, which inhabited the inland cretaceous sea when the Rocky Mountains were just beginning to rise above the waters. In a valley of this old ocean bed he had seen seven different skeletons of these monsters in sight at once. There were also the huge pliosaurs, the veritable dragons, having a spread of wings of from ten to twenty-five feet, and one colossal dinosaur, when erect, stood thirty feet in height.

BIRDS WITH TEETH

existed in that strange world. The aquatic hesperornis, nearly six feet in height, had teeth set in grooves in its jaws. It was a carnivorous, swimming ostrich. The ichthyornis, a small flying bird, had teeth set in sockets, while strange enough, the companions of these ancient toothed birds were pterodactyls, without teeth.

There came a period at last when the dinosaurs and other mesozoic vertebrates disappeared, and mammals henceforth became the dominant type. Then lived a great sloth, which, after the elevation of the Isthmus of Panama, crossed over from the northern to the southern continent of America, there found a more congenial home, and there in time became extinct. In the middle eocene, west of the Rocky Mountains,

THE DINOCERATA.

a remarkable group of ungulates, made its appearance. Nearly equalling the elephant in size, this animal had shorter limbs, while arming its skull were two or three pairs of horn cores, besides enormous canine tusks. In the lower eocene appeared the progenitor of the horse, the eohippus, about the size of a fox and having well developed toes. In the lowest eocene appear the artiodactyles, the ancestor of the pig, and in the upper eocene comes the oromeryx, whence probably sprang the deer.

THE PRIMATES AND MAN.

We come now to the highest group of mammals, the primates, which includes the lemurs, the apes, and man. This order has a great antiquity, and even at the base of the eocene we find it represented by several genera belonging to the lower forms of the group. In considering these interesting fossils, it is important to have in mind that the lemurs, which are usually regarded as primates, although at the bottom of the scale, are only found at the present day in Madagascar and the adjacent regions of the globe. All the American monkeys, moreover, belong to one group, much above the lemurs, while the Old World apes are higher still, and most nearly approach man.

In the lower eocene of New Mexico we find a few representatives of the earliest known primates, and among them are the genera *lemurinus* and *limnotherium*, each the type of a distinct family.

The oldest known remains of man on this continent differ in no important characters from the bones of the typical Indian, although in some minor details they indicate a much more primitive race. These early remains, some of which are true fossils, resemble much more closely the corresponding parts of the highest Old World apes, than do the latter our tertiary primates, or even the recent American monkeys. Various living and fossil forms of Old World primates fill up essentially the latter gap. The lesser gap between the primitive man of America and the anthropoid apes is partially closed by still lower forms of men, and doubtless also by higher apes, now extinct.

The real progress of mammalian life in America, from the beginning of the tertiary to the present, is well illustrated by the brain-growth, in which we have the key to many other changes. The earliest known tertiary mammals all had very small brains, and in some forms this organ was proportionately less than in certain reptiles. There was a gradual increase in the size of the brain during this period, and it is interesting to find that this growth was mainly confined to the cerebral hemispheres, or higher portion of the brain. In most groups of mammals the brain has gradually become more convoluted and thus increased in quality as well as quantity. In some, also, the cerebellum and olfactory lobes, the lower parts of brain, have even diminished in size. In the long struggle for existence during the tertiary time the big brains won, then as now; and the increasing power thus gained rendered useless many structures inherited from primitive ancestors, but no longer adapted to new conditions.

Another of the interesting changes in mammals during tertiary time was in the teeth, which were gradually modified with other parts of the structure. The primitive form of tooth was clearly a cone, and all others are derived from this. All classes of vertebrates below mammals, namely, fishes, amphibians, reptiles, and birds, have conical teeth, if any, or some simple modification of this form. The edentates and cetaceans with teeth retain this type, except the Zeuglodonts, which approach the dentition of aquatic carnivores. In the higher mammals, the incisors and canines retain the conical shape, and the premolars have only in part been transformed. The latter gradually change to the more complicated molar pattern, and hence are not reduced molars, but transition forms from the cone to more complex types. Most of the early tertiary mammals had forty-four teeth, and in the oldest forms the premolars were all unlike the molars; while the crowns were short, covered with enamel, and without cement. Each stage of progress in the differentiation of the animal was, as a rule, marked by a change in the teeth; one of the most common being the transfer, in form at least, of a premolar to the molar series, and a gradual lengthening of the crown. Hence, it is often easy to decide from a fragment of a jaw to what horizon of the tertiary it belongs. The fossil horses of this period, for example, gained a grinding tooth, for each toe they lost, one in each epoch. In the single-toed existing horses, all the premolars are like the molars, and the process is at an end. Other dental transformations are of equal interest, but this illustration must suffice.

The changes in the limbs and feet of mammals during the same period, were quite as marked. The foot of the primitive mammal was doubtless plantigrade, and certainly five-toed. Many of the early tertiary forms show this feature, which is still seen in some existing forms. This generalized foot became modified by a gradual loss of the outer toes, and increase in size of the central ones; the reduction proceeding according to systematic methods, differing in each group. Corresponding changes took place in the limb bones. One result was a great increase in speed, as the power was applied so as to act only in the plane of motion. The best effect of this specialization is seen to-day in the horse and antelope, each representing a distinct group of ungulates, with five-toed ancestors.

THE sharpening angle of ordinary soft wood planing machine irons should be about 35 degrees, and for hard wood tool cutters, 50 to 55 degrees.

The Uses of Fish Skins.

Although the skin of some marine mammals, such as those of the seal, walrus, and the white whale or beluga (known as porpoise leather), have long been commercially employed, it is only lately that attention has been more generally directed to the utilization of fish skins on an extended scale. Their employment hitherto has been very limited. Eel skins have been used for the thongs of whips and the attachments of flails, dried sole skins to clarify coffee, and some shark and ray skins by workmen to smooth and polish substances, and also to make a kind of shagreen leather.

At the Maritime Exhibition held at the Westminster Aquarium this year Mr. G. Kent, of Christiania, Norway, exhibited a variety of tanned skins, among which were:

1. Whale skins tanned; the size ranges from 12 inches broad by 60 feet in length, suitable for wheel bands, for driving machinery, etc.

2. White fish, for upper leather, which can be prepared in pieces of 12 feet by four feet.

3. Skins of various flat fish, dressed and prepared for gloves. Fine upper leather can be made, often to be had in sizes up to 3 feet square.

4. Skins of soles, dressed and tanned suitable for purses, etc.

5. Skins of thornbacks, suitable for cabinet makers instead of sand paper, and very much more durable.

6. Skins of eels, dressed and dyed, suitable for braces and other purposes.

In Mon. Chas. Vary's "Scientifique Correspondence" from Paris, of August 7, mention is made of an industry carried on at Colburn, in Canada, in the skins of species of silurids for glove making, and this is to be prosecuted on a larger scale, both for the flesh for salting and the skin for currying.

Shoes have been made in Gloucester, Massachusetts, from the skins of the cusk or torsk (*Brosmus vulgaris*), the use of which has been patented. If this material for shoes proves what it promises, it will open up a new market for fish skins, which will no doubt be highly profitable. In Egypt, fish skins from the Red Sea are used for soles of shoes. In the Animal Products Collection at the Bethnal Green Museum there are some tanned sole skins shown. The skin of the loach or burbot (*Lota maculata*), cleansed, stretched, and dried, is used by country people in many parts of Russia and Siberia to trim their dresses, and instead of glass for the windows of their dwellings, being as transparent as ciled paper. It is also utilized by some of the Tartar tribes, as material for their summer dresses, and the bags in which they pack their animal skins. The inhabitants of the eastern coasts of the middle of Asia clothe themselves with the tanned skins of the salmon. It is asserted that it makes a leather as tough as wash leather. The scale marks give a very neat pattern to the leather.

W. Brozowsky, in his "Waarenkunde," Vienna, 1869, under "Fish Skin," says it is obtained from the sea angel (*Squalus squatina*, Lin.; *Squatina levis*, Cuv.), the thorny shark (*Squalus acanthias*, *Sq. carcharias*), the tigered shark (*Sq. canicula*), and some skates, as the angel skate (*Raja rhinobatis*) *Raja sephen*, etc. The skins of these skates and sharks have spines of different sizes instead of scales. The skins are used for polishing, and, after the star-formed spines have been smoothed down with sandstone, for covering boxes and cases, etc.

The "Waaren Lexicon" of T. C. Schedel enumerates the following fishes: Sea dog (*Squalus blainvelleri*, Riss, Aiguillat, Blain), *Sq. aranthias*, and other small sorts, *Sq. carcharias*, Lin., *Sq. canicula*, and *Sq. catulus*.

Guibourt (sixth edition, by Dr. G. Planchon, 1870-71, vol. iv.), says, "The sephen of the Red and Indian seas, belonging to the genus *Trygon*, produces the tuberculous and hard skin called galuchat, after the name of a Paris workman who employed it first. The greater part of the selacians, namely, the roussettes, sharks, humantins, aiguillats, leiches, etc., have a rough skin, which is used for covering boxes, and also for polishing wood. The greatest confusion exists among merchants as to the names given to the different skins. Each tradesman applies, according to his fancy, the name of *peau de requin*, *peau de chien de mer*, *chagrin*, and even *galuchat*. I endeavored to obtain specimens of the various skins, in order, if possible, to determine the species.

"1. Shark skin, from a young shark; small, imbricated scales, somewhat translucent, with longitudinal lines, the borders or edge entire and circular. The edge is free on the body, but attached on the fins. The skin serves for covering cases, etc., but is not rough enough for polishing.

"2. Skin of mottled roussette (*Seyllium*, Cuv.). Tuberculous, imbricated, horny, fine and hard scales, very near one to the other, and transparent, each triangular. Skin much used for polishing. Some persons state that 'false galuchat' is made of it by rubbing off the scales, which leaves a square figure that becomes very showy when the skin is applied on a green paper. I rather believe (continues M. Guibourt) that the false galuchat is made with the skin of the aiguillat.

"3. *Peau de leiche* (*Seymus*), sold to cabinet makers under the name of *peau de chien de mer*, is covered with nearly rhomboid tuberculous semi-transparent scales, arranged one near the other in quincunxes.

"4. *Peau d'aiguillat* (*Spinax acanthias*, Cuv.). Viewed with a magnifying glass, this skin appears covered with small square opaline scales, not rough like the preceding, but much used by the 'gainiers' or sheath makers, for its glossy nacreous aspect.

"5. *Peau de sagri* (*Spinax niger*, Cuv.). Same uses as the preceding. The word *Sagri* is Persian; *Sagher*, Turkish, from its resemblance to the dressed leather made from the mule and ass, whence our word shagreen.

"6. *Galuchat* or *sephen* skin, from the back of the *Trygon sephen*, Cloq. It has numerous round tubercles, which become white by rubbing down, and in the interior opaque and nacreous. The skin is sometimes dyed for different colors, but it is often preferable to leave it the natural color by only half polishing it."

The quantity of ray skins, dried or salted, imported into France in 1863 was about 18,000 lbs. weight, principally from Portugal. Formerly they used to fetch as high as 7 francs the pound, now they may be had for 1s. a pound.

The best galuchat, or what we should call shagreen, is made from the skin of the sephen, which abounds in the Mediterranean Sea, and is also met with in the Red Sea and the Indian Ocean. This skin is remarkable for the size of the osseous protuberances. There are however two kinds of these rays, one with rough skin and the other with smooth.

From a certain portion of the skin of the angel shark (*Squatina angelus*) the Turks make the most beautiful sea-green watch cases. These sharks, which form a connecting link between the genera of rays and sharks, are found in the Mediterranean principally, and the German Ocean sometimes. The skin being very rough, it is employed to polish wood and ivory, as well as for other uses in the arts.

Turners, ebonists, and carpenters in Europe use the rough skin of the blue dog fish (*Squalus glaucus*, Linn.) like emery paper, for smoothing their work and preparing it for polishing. This shark skin is also used by the native workmen of the East for polishing wood and ivory, and it is made into shagreen. The best is that obtained from the *Rai sephen* of India and the Red Sea. That most used now seems to be the skin of the ray (*Hypolophus sephen*) which is very common on the Malabar coast, and an extensive commerce is now carried on in them in the Indian Ocean; they are found in the Sea of Oman, and also taken at Mahe. The house of Giraudon, 48 Rue Molière, Paris, makes excellent use of them for morocco and tabletterie.

Peau de Roussette (*Squalus catulus* and *caniculus*, Lin.). This fish, called *chat* at Marseilles, and *erin* in Catalonia, is smaller than the angel fish. The skin, reddish and without spots, is of a uniform grain, flat, and only used to make cases and other articles known as shagreen. These skins come from the Mediterranean, and are imported in bundles by the sailors, selling, according to size, from 30s. to 36s. the dozen.

Peau de chien de mer is another name given in France to some species of *Squalus* or *requin*. That usually found on the French coasts is known under the names of *chien marin*, *chat marin*, *roussette tigrée* (*Squalus catulus*, Linn.). Turners, cabinet makers, and carpenters use the skin for scraping and smoothing their work before polishing; metal workers and others also use it. This skin, when worked up with the tubercles with which it is studded, takes the name of galuchat, and is ordinarily dyed green, to cover cases, sheaths, and boxes. Under the name of *chagrin* these skins used to be much employed in Turkey, Syria, Tunis, and Tripoli. That made in Constantinople was considered the best. It was colored black, green, white, and red.—By P. L. Simmonds, in the *Journal of the Society of Arts*.

Rules for Calculating the Speed of Pulleys.

The diameter of the driven being given, to find its number of revolutions:

Rule—Multiply the diameter of the driver by its number of revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven.

Ex.—24 inches diameter of driver $\times$ 150, number of revolutions, = 3,600 $\div$ 12 inches diameter of driven = 300.

The diameter and revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time:

Rule—Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of required revolutions of the driven; the quotient will be its diameter.

Ex.—Diameter of driver (as before) 24 inches $\times$ revolutions 150 = 3,600. Number of revolutions of driven required = 300. Then 3,600 $\div$ 300 = 12 inches.

The rules following are but changes of the same, and will be readily understood from the foregoing examples.

To ascertain the size of the driver:

Rule—Multiply the diameter of the driven by the number of revolutions you wish to make, and divide the product by the required revolutions of the driver; the quotient will be the size of the driver.

To ascertain the size of pulleys for given speed:

Rule—Multiply all the diameters of the drivers together and all the diameters of the driven together; divide the drivers by the driven; the answer multiply by the known revolutions of main shaft.

FILLING FOR CRACKED CEILINGS.—Whiting mixed with glue water or calcined plaster and water makes a good putty for filling cracks in plastered ceilings.

BLACK WALNUT STAIN.—Asphaltum thinned with turpentine will stain a beautiful black walnut color. It must be varnished over.

IMPROVED BALL CHECK VALVE FOR SEWERS.

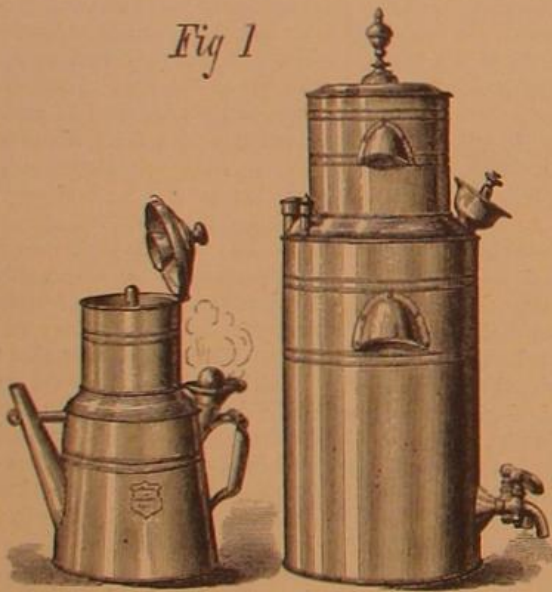
The invention herewith illustrated consists in providing the valve case or body, in rear of the valve seat, with a diverging channel into which the valve passes when it leaves its seat and through which the reflux water passes to carry the ball to its seat again. When the ball is back the water is allowed a direct unobstructed passage, but when the reverse movement of the water begins the valve is quickly closed.

The engraving represents a horizontal section of the case, placed with an inclination downward from right to left. It is also inclined so that the diverging channel, A, is lower than the body. B is the valve seat, and at C, in the diverging channel, are placed four button-shaped projections on which the ball rests until moved back by reflux water. It will be observed that, while the flow is passing from right to left, the ball is carried down into the channel, A, and there remains so that the water passes out directly through the main bore. The instant, however, a back current begins, then the water, entering the opposite and lower end of channel, A, drives the ball against its seat, B, so that it at once cuts off any return of water. The ball is intended to be of hollow rubber and is inserted through a hand hole.

Patented July 31, 1877. For further information address Hay & Bassett, 182 Fulton street, New York city, P. O. Box 4825.

SHERWOOD'S AUTOMATIC TEA AND COFFEE POT.

We illustrate herewith an improved apparatus for making tea and coffee. Its action is automatic, and may be regulated by a simple device which forms one of the novel features of the invention. The interior construction of a large-sized vessel adapted to the uses of hotels, etc., is exhibited in Fig. 2; but smaller pots are manufactured, as shown in Fig. 1, on the same principle, which are excellently adapted to family employment.

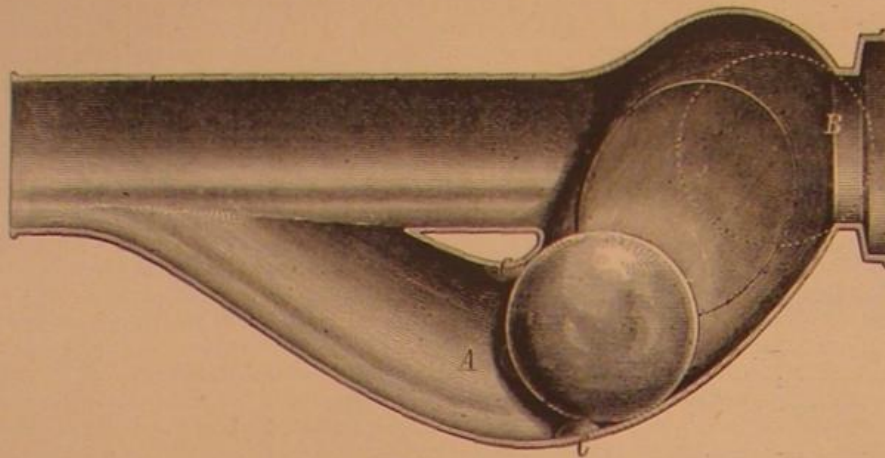


In common with other coffee pots in which the beverage is made by filtration through the ground berry, this apparatus has two principal portions—a water receptacle below and a detachable compartment above, in which the coffee is placed. The lower division is double, a receiver, A, for the made infusion being inserted in the water vessel, B. Communicating with the latter and extending up through the receiver and into the upper compartment, is a tube, C, having a detachable perforated cap. Surrounding the upper portion of the tube is a conical piece and another funnel-shaped portion, attached to the cover, surmounts the perforated cap. The bottom of the upper compartment, on which coffee is placed, is perforated, and below this is a ring on which a piece of flannel is stretched, said ring being detachably held in place by hooks.

When the water in the vessel, B, is boiled, the steam generated forces it up through the tube, C. Escaping at the upper end of said tube and being deflected downward by the conical portions, the water passes down through the coffee and sieves, and the infusion is collected in the receiver, A, whence it is drawn off as desired, by a faucet communicating with said receiver. Another faucet is provided for drawing the water in the outer receptacle, and in order to prevent access to these faucets by unauthorized persons, the handles of the same may be padlocked together, as shown in the exterior view of the apparatus in Fig. 1. The water pot is provided with a filling opening, which is closed by a cap with a spring safety valve, D, said valve being opened or closed by a set screw applied to its stem. On opening the valve, the steam in the boiler may be allowed to escape whenever it is desired to interrupt the coffee-making process. Also in connection with the receiver is a tube in which is a quadrated indicator, E, to which a float is attached, and which seems to show the quantity of coffee made. Heat may be applied directly to the water vessel, or a perforated tube, F, is inserted, which pipe from a steam generator may be attached, to facilitate heating by steam. When this pipe is not used it is closed by a screw cap. The

object of making the upper portion of tube, C, detachable, is to allow of cleaning it out in case of its becoming clogged; and the flannel and ring filter may be removed for like purpose.

The smaller sized family pot, represented in Fig. 1, differs in construction from that described, in having, instead of the spring safety valve, a metal ball attached to the filling funnel by a chain. This prevents the escape of steam until a sufficient pressure is generated to lift it.

**BALL CHECK VALVE FOR SEWERS.**

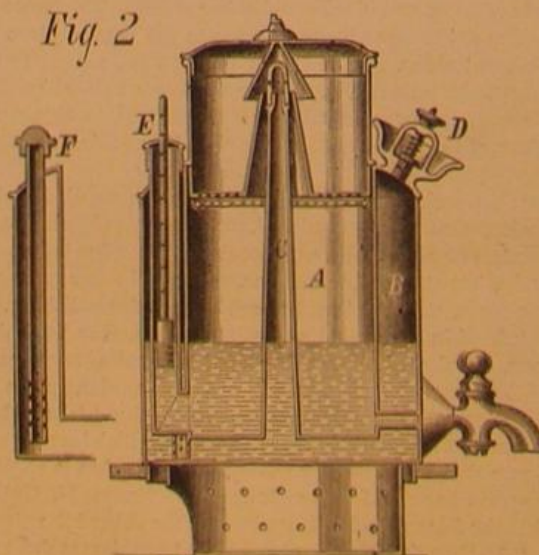
Patented through the Scientific American Patent Agency, May 22, 1876, June 27, 1876, and July 10, 1877. For further information, address Willis H. Sherwood, patentee and sole manufacturer, St. Joseph, Mo.

Water for Fire Extinguishment.

Several months ago the Metropolitan Board of Works, of London, directed Sir Joseph Bazalgette, in conjunction with Messrs. Bramwell and Easton, to carry out a series of practical experiments upon the question of fire jets, which should put beyond all doubt the engineering points involved. The result of these experiments is recapitulated as follows in a paper prepared by the last two engineers, and recently read before the British Association at Plymouth:

With a very low jet, say of some 30 feet, about seven eighths of the head or pressure effective at the orifice of the jet will be obtained, as the height of the column of water—that is to say, 40 feet of head at the orifice would give a jet of about 35 feet in perfectly still air; but as the heights of jets are increased, and increased they must be, if they are to be of any service in extinguishing fires in modern buildings, which are so lofty, the percentage which the column of water produced bears to the effective pressure producing it becomes less and less, so that for a jet to rise to the height of 80 feet there must be, roundly, a pressure equal to 128 feet. To rise to a height of 100 feet there must be an effective pressure of about 180 feet. Moreover, the higher the jet the greater must be the diameter of the column of water.

The following is a fair average jet required for London purposes: A jet that would rise 80 feet in still air, if of 1 inch in diameter, would deliver the 150 gallons per minute, and would demand an effective pressure, as has already been said, of 128 feet at the very orifice of the jet; and it might be thought, therefore, that if a pressure could be maintained in the pipes equal to 128 feet of head, when the water was flowing, that all that was desired would be provided. But this is not so. There is the very striking, and to many people very unexpected, consideration of the friction of the water through the hose to be taken into account; and the section may, perhaps, little expect to be told that every foot of the usual size of hose employed by the London Fire Brigade, when conveying 150 gallons of water per minute, requires a pressure of a little over 3 inches to drive that water through.



SHERWOOD'S AUTOMATIC TEA AND COFFEE POT.

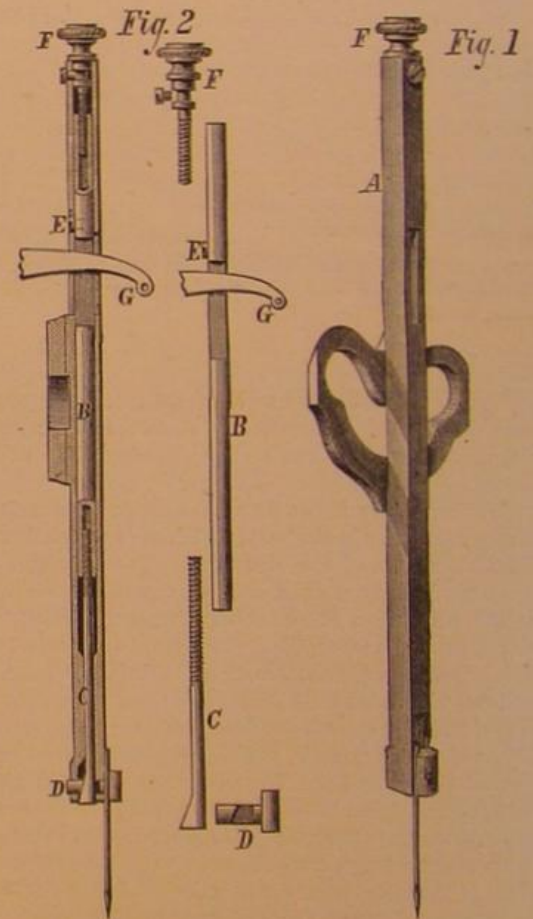
As a matter of fact, the 200 feet of hose demands 53 feet of pressure to get 150 gallons per minute through them. Therefore, to obtain a jet of 80 feet high, expending 150 gallons per minute at the end of 250 feet of hose, there is needed a pressure of 181 feet, and this pressure must be maintained while the water is flowing.

A Revolving Shell Gun.

A correspondent with the Turkish fleet writes: "In speaking of the armament of the Arsari Tefyk, I should mention that a most valuable addition has lately been made in the shape of a revolving shell gun. It is the invention of a Frenchman, and, in connection with the electric light, may be considered as the very best defence yet brought out against torpedo boats. It throws a one pound shell with a pointed steel head capable of piercing the plates of which the Thornycroft is constructed, and has a range of something like 3,000 yards. Briefly described, it is a Gatling gun on a large scale, having five revolving rifled barrels instead of ten, the said barrels being about 3½ feet in length, and 1½ inches bore at the muzzle. The loading and firing arrangements are similar to the Gatling, only, instead of a cylindrical case being placed on top of the breech, the cartridges are arranged in flat cases of five, which are fixed in an inclined position at the side. The turn of a handle causes one of the cartridges to slip into the chamber, when it is thrust forward into the barrel and fired. This weapon is fixed on a pivot at the stern, while a Gatling gun at each end of the bridge, and one on the fore-castle, are also always ready for giving a warm reception to any of the enemy's boats which may attempt to approach the Turkish flagship while at anchor.

IMPROVED NEEDLE CLAMP FOR SEWING MACHINES.

The advantages claimed for the improved needle clamp illustrated in the annexed engraving are that it fastens the needle without the aid of wrenches or screwdrivers, and as the hands are separated by the length of the needle-bar, more space is afforded for handling and adjusting the needle, sufficient force can be applied to clamp the needle securely by anyone, however weak in the hand or wrist.



A, Fig. 1, is the needle-bar, which is boxed longitudinally to receive the rods, B and C, Fig. 2. On the lower end of rod, C, is a wedge-shaped projection, which is fitted in a slot in the bolt, D, said slot being widest at its lower side. The bolt, D, has a head, and enters a hole bored transversely through the lower end of the needle-bar. The rod, C, screws into the rod, B, which is of larger diameter, and is provided with a screw, E, which passes through a slot in the needle-bar, to prevent it from turning. F is a milled screw that engages a thread cut in the upper end of the rod, B, and which is designed to draw the rods, B C, upward in the bar. The check lever, G, passes through a slot in the needle bar and rod, B, and is regulated by screwing the rod, C, more or less into B.

The operation of clamping the needle consists in placing it under the head of the bolt, D, and turning the screw, F, until said head is drawn by the action of the wedge against the needle with sufficient force to retain it.

Patented through the Scientific American Patent Agency May 29, 1877. Parties desiring to manufacture or adopt the device may address the inventor, Mr. Joseph V. Morton, Winchester, Clarke county, Ky.

Carrier Pigeons as Smugglers.

Carrier pigeons have recently been used in France to smuggle tobacco over the border. One individual employed eighty birds, each one carrying from a third to a half ounce of tobacco as its load per trip. It happened that one of the pigeons became injured and fell into the Seine near Paris, and on its being picked up, the fraud was discovered.

THE WOODRUFF SCIENTIFIC EXPEDITION STEAMER ONTARIO.

We present herewith an engraving of the steamship Ontario, in which, we are informed, the Woodruff Scientific Expedition is to embark during October next, on a voyage around the world. The Ontario is 390 feet long, 46 feet wide, and 40 feet deep; and is to be provided with all the accessories necessary to secure the comfort of her passengers, and to adapt her for the especial objects in view. Saloons, it is stated, are to be arranged for lecture rooms, etc., a library is to be furnished, improved ventilating apparatus will maintain a constant supply of fresh air between decks, and scientific instruments will be supplied for the investigation of all natural products and phenomena that may be deemed desirable. The projectors of the expedition, Messrs. Woodruff and Macauley, also state that the ship will be navigated by Commander J. W. Philip, U.S.N., aided by naval officers and a crew of picked seamen.

As we have already had occasion to state, the object of this expedition is to visit points of general and special interest on a route around the globe, to study the arts, archaeology, and present condition of the better known countries, and the geology, geography, fauna and flora, as well as the history and character of the people of those less known, and to make collections in the various departments of the science. The scientific work is, we are further informed, to be under the supervision of Professor Burt G. Wilder, Cornell University, aided by other scientific gentlemen now belonging to various colleges. From the itinerary in the prospectus, we learn that the route is to be along the Atlantic coast of North and South America, stopping at the West Indies and other important points, and reaching Magellan's Straits in December. Thence the journey will extend to Valparaiso, and from thence the course will lie to the islands of the Pacific—Japan, Shanghai, and Nankin. During this portion of the voyage, and while the ship is visiting China and Japan, a portion of the passengers are to explore the Islands of Formosa. Hong Kong, Canton, Manila, Borneo, Java, and Calcutta will be visited, and thence the expedition will proceed in succession to Ceylon, Bombay, Babylon and Nineveh, Egypt, the Holy Land, Greece, Italy, and Spain. At all comparatively unknown stopping places, it is proposed to organize exploration parties, and facilities are to be afforded for visiting inland cities in civilized countries. The vessel is to leave Plymouth, England, in 1879, and to return thence to New York via the Azores Islands. The total cost of the trip is to be \$2,500. Further particulars as to terms of payment, etc., may be obtained by addressing Gen. Daniel Macauley, St. Nicholas Hotel, New York city. See advertisement in another column.

HOW TO PREVENT GRASSHOPPER RAIDS.

Professor C. V. Riley, in his new book on the Rocky Mountain locust, gives a number of practical hints as to the best method of preventing incursions of the insects into States other than those now annually invaded. The various suggestions we have condensed into the following brief form:

1. Encourage game birds and native locust-feeding species.
2. Professor Thomas suggests that inducements be offered to the Indians to collect and destroy the eggs and young along the west side of the plains.
3. Some system is wanted for preventing the extensive prairie fires in the fall that are common in the country where the insect naturally breeds, and then subsequently firing the country after the young hatch, and before the new grass gets too rank.
4. Locusts are particularly fond of tansy, cocklebar, amarantus, and timothy—these might be sprinkled with Paris green water or powder. A strip of poisoned timothy around a wheat field might save it.
5. Irrigation is the best preventive; inundate the land and drown the young locusts out after hatching, or use kerosene in the ditches.
6. Hogs and poultry delight to feed on the young hoppers and will grow fat on them.
7. When, in the spring, the young locusts hatch out in threatening numbers, delay the planting of everything that cannot be protected by ditching until the very last moment. The idea is to let the locusts devour all they can find and then to let them starve before any crops grow for them to feed on.
8. Grain should be sown in "lands" or strips 50 to 100 feet wide, to permit of ditching between them, and those who have fall wheat up and doing well, where the eggs are thickly laid, should make ditches at intervals through the field, to facilitate the saving of the grain in the spring.
9. As the disastrous swarms which reach the southeastern country come from the extreme northwest, it is proposed that the number of United States signal stations be increased in that region. The movements of swarms might thus be daily recorded, and the farmers of the east and southeast be apprised of their probable coming for weeks in advance.
10. Professor Riley thinks that the army might "be utilized to destroy locusts instead of Indians. A few regiments," he says, "armed with no more deadly weapon than the common spade, sent out to sections of country that are suffering from locust ravages, might in a few weeks measurably rout the pigmean army, and materially assist the farmer in his ditching operations."

Cleansing Fluid.

For washing alpaca, camel's hair, and other woolen goods, and for removing marks made on furniture, carpets, rugs, etc.: Four ounces ammonia, four ounces white Castile soap, two ounces alcohol, two ounces glycerin, two ounces ether. Cut the soap fine, dissolve in one quart water over the fire, add four quarts water. When nearly cold add the other ingredients. This will make nearly eight quarts and will cost about 75 cents. It must be put in a bottle and stoppered tight. It will keep good any length of time. To wash dress goods, take a pail of lukewarm water, and put in a teacupful of the fluid, shake around well in this, and then rinse in plenty of clean water, and iron on wrong side while damp. For washing grease from coat collars, etc., take a little of the fluid in a cup of water, apply with a clean rag, and wipe well with a second rag. It will make everything wooden look bright and fresh.—Chicago Tribune.

The Formica Pennsylvanica.

There is a general notion that only tropical countries are infested with ants that are capable of doing serious damage. This, it appears, is a mistake. There is a black "carpenter ant," whose name, *Formica Pennsylvanica*, indicates its residence, that is capable of effecting much destruction in woodwork. The Rev. Dr. McCook has seen a rafter which these ants penetrated to an extent of five or six feet of its length, completely honeycombing it. The rafter was in the roof of a porch. The attention of the Philadelphia Academy of Sciences was called to the matter, as it is evident that such penetration of wooden structures, and especially bridges, might cause their unexpected fall. Wooden bridges need at least as frequent and as thorough inspection as iron structures.

CEMENT FOR LEATHER BELTING.—Take common glue and American isinglass, equal parts; place them in a boiler and add water sufficient to just cover the whole. Let it soak ten hours, then bring the whole to a boiling heat, and add pure tannin until the whole becomes rosey or appears like the white of eggs. Apply it warm. Buff the grain off the leather where it is to be cemented; rub the joint surfaces solidly together, let it dry for a few hours, and it is ready for practical use; and if properly put together, it will not need riveting.

Put a tablespoonful of sulphur in the nest as soon as hens or turkeys are set. The heat of the fowls causes the fumes of the sulphur to penetrate every part of their bodies, every louse is killed, and, as all nits are hatched within ten days, when the mother leaves the nest with her brood, she is perfectly free from nits or lice.



THE WOODRUFF SCIENTIFIC EXPEDITION AROUND THE WORLD.—THE EXPEDITIONARY STEAMSHIP ONTARIO.

THE LONTIN MAGNETO-ELECTRIC MACHINE.

We extract from *Les Mondes* the annexed engravings of a new dynamo-electric machine, made by MM. Lontin & Co. of Paris. Two forms of the apparatus are manufactured, one giving direct and continuous currents, and hence adapted for galvano-plastic operations, the other affording alternating currents for the production of the electric light.

Fig. 1 represents the continuous current machine, which is composed of an ordinary electro-magnet, A A', before the poles of which turns the piece, P, called "induction wheel." This wheel is composed of an iron cylinder on which are formed iron teeth, or induction coils enveloped in copper wire, D. The wire which forms the coils is continuous, passing on from one tooth to another, so that a completely closed circuit is formed. The currents produced in each coil are united at a single point, C, on the axis of the cylinder, whence they pass to the immovable conductor wires, a a, placed perpendicular to the line, X X, of the magnetic poles.

The induction wheel, P, being rotated, the residual magnetism of the electro-magnet, A A', produces feeble currents in the coils, which currents are conducted by the wires, a a, to the electro-magnet, the energy of magnetization of which increases in ratio of the production of these particular currents. The line, X X, of the magnetic poles, divides the coils on the wheel into two equal series, five above and as many below. Now, if the electricity furnished by the upper coils is of contrary name to that furnished by the lower ones, then there will be on the line, X X, on one side a double pole of positive electricity, and on the other a double pole of negative electricity; and if contact be established on this line by means of two copper wires, there will be the two poles of one electrical source. This will be more clearly understood by imagining (as indicated in Fig. 2) two batteries, each of five elements, connected by their poles of the same name. This would evidently produce a battery of five elements in tension and two in quantity.

By using all the electricity produced to excite the magnetic energy of the electro-magnet, the radius acquires so high a resistance to rotation, that it is scarcely possible to move it without causing injury. But if, breaking the circuit, work to be done is interposed (a galvano-plastic bath for example), the machine operates excellently, and, according to *Les Mondes*, gives good results.

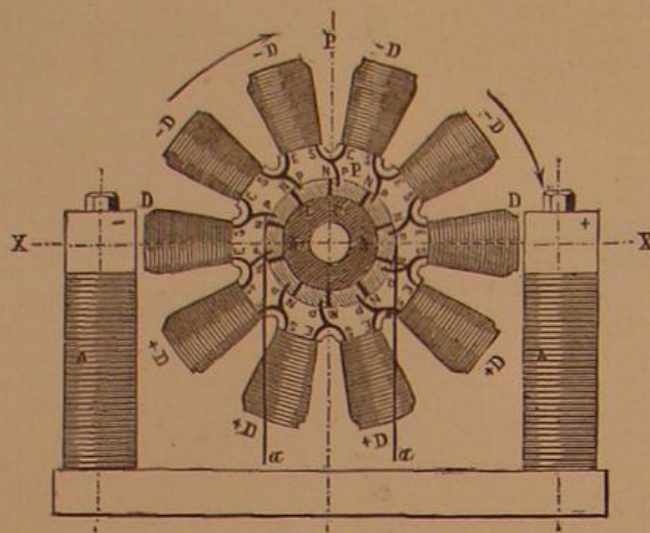
The alternating current machine, especially adapted for the production of the electric light, is represented in Fig. 3. It consists of 24 inducing electro-magnets, A, fixed on a shaft, and concentric with the same number of coils, B, attached within an iron ring, b b. The wires which envelope the inducing electro-magnets are connected so as to form but a single circuit, the extremities of which are attached at f to two friction rings, a a, attached on each side of the drum and completely isolated. The attachment of the wires is so disposed that, inverting the polarity of the cores from one bobbin to the other, the rotation of the drum presents successively a magnet of different pole before the cores of the induced coils, whence result, in the latter, polarizations alternately reversed.

The current which circulates in the inducing electro-magnets of the drum, is produced by a small auxiliary machine, similar to that above described. It enters by the rubbers, F, to which are attached the wires which form the circuit of the auxiliary machine. The circuit produced by all the inducing coils of the drum may be divided proportionately to the current obtained in the auxiliary apparatus. The wires which surround the induced cores, B, terminate the one at the manipulator, M, the other at N.

The manipulator is divided into as many parts as the machine can furnish currents capable of producing a light, and this number naturally depends on the number of induced bobbins. Thus, in a 24 coil machine, twelve currents may be produced, as two coils are required for each current. There are, therefore, twelve partial manipulators, each comprising two binding keys, M M', one of which, M, receives the wire from the machine, the other the wire which leads to the lamp regulator; the interrupter, I, interrupts or re-establishes the passage of the current between these two wires. All parts of the manipulator are, besides, provided with interrupters which connect said parts together so as to produce instantaneously the coupling or separation of the partial currents. Thus, with a 24 coil machine, twelve lamps may be supplied, and then, on eleven being extinguished, the one remaining continues with no variation. At the same time, by means of the interrupters, the currents may be concentrated in one or more lamps, so that each may have double, triple, or quadruple intensity, as desired.

The entirely novel application which M. Lontin has made on his regulator, of the dilatation of a metallic wire by the heat produced by the passage of the current in order to obtain the separation of the carbons and to maintain the same rigorously constant, has enabled him to avoid the use of electro-magnets (the resistance of which, interposed in the circuit, was the cause of a notable increase in expenditure of electricity) and to regulate with accuracy the length of the arc.

The approximation of the carbons is obtained by a resistance coil which contains an easily movable rod which acts as a stop for the motor which brings the carbons together for the proper distance. If, however, the separation augments, part of the current passes into the core and renders it active. The movable rod is then drawn back, and the motor, freed from its stop, operates to move the carbons forward until the correct interval is attained. The solenoid then ceases its work, and the rod again stops the motor. The latter having nothing to do but to move the carbons is exceedingly simple. It is of no consequence how the regulator is placed, as it works well in any position. The editor of *Les*

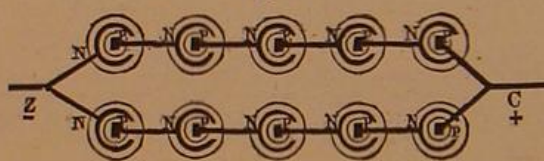


NEW ELECTRICAL MACHINE.—Fig. 1.

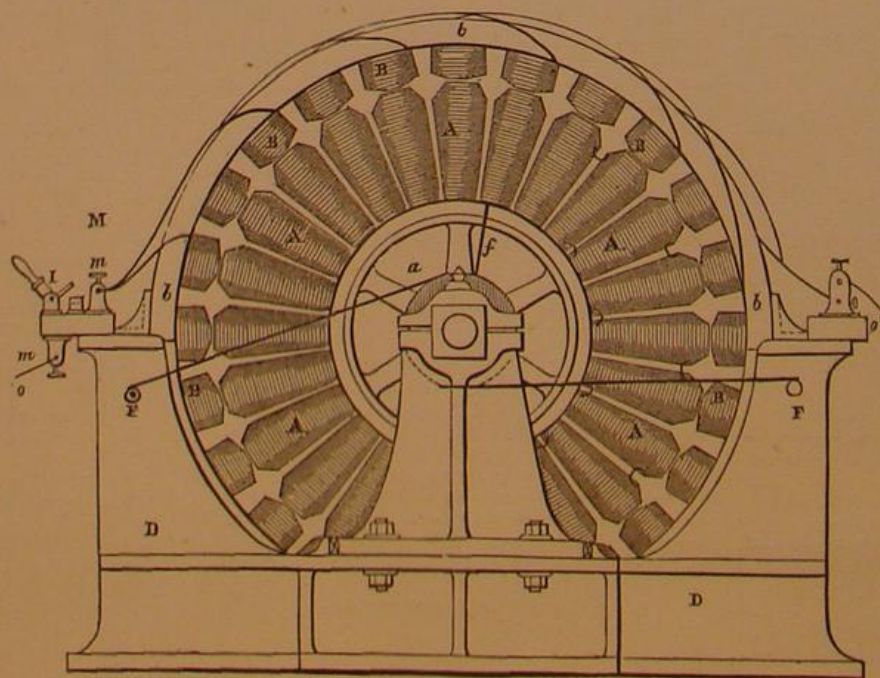
Mondes states that it operated with perfect uniformity when suspended from a cord, swung about, and subjected to violent shocks.

The machine, says our contemporary, has been tested under a variety of conditions. Aboard ship one single apparatus is capable of supplying the three electric lights usually carried, and it is unaffected by any motion of the vessel. For lighthouses, instead of using two carbons, through

Fig. 2.



which all the current passes, M. Lontin employs several, radiating one from the other, and in number proportioned to the power of the currents produced by the machine. Each carbon receives two currents, and these currents pass from one carbon to the other, so that the arcs are produced laterally. Thus, with a machine of 1,240 burners, six carbons are used, so that six arcs, equal to 200 burners each, are employed, forming a hexagon of light. This disposition has the advantage of affording a more powerful light, and at the same time one perfectly fixed.



MAGNETO-ELECTRIC MACHINE.—Fig. 3.

The apparatus represented in Fig. 1 may also be used as an electro-magnetic engine. If a current be passed into the electro-magnet, A A', and thence to the induction coils on the wheel, the magnet will have two poles of opposite name, and in the coils the two halves will also be oppositely magnetized. So that, the five upper cores, for example, constituting the negative pole, the five coils below will form the positive pole. The negative pole, A, of the electro-magnet will then replace the upper negative pole of the wheel, while the latter will be attracted by the positive pole, A', of the electro-magnet. The effect will be the same below, and a rotation of the wheel will be caused. We find it stated that a single machine, of the size mentioned in the beginning

has been applied to the production of a fine light and at the same time has lifted a weight of 42 lbs. by means of a pulley.

AMERICAN BORAX PRODUCTION.

The principal industrial utilization of borax is in glass making and the ceramic arts, as it possesses the property, at a high temperature, of dissolving the metallic oxides and forming transparent glass, the color of which depends upon the metal used. It is also largely employed in the manufacture of enamels, glazings for earthenware, and strass. In the large glass and porcelain factories of Europe its utilization has only been limited by the high cost of the product, chiefly obtained from Italy; but the discovery of the immense borax deposits in our western territory has materially removed this restriction, so that at the present time its employment is rapidly extending, and the export of the salt from this country bids fair to become a very important branch of our commerce.

Some interesting information relative to the mode of working the borax deposits of California and Nevada is given in a report recently made by Mr. Emile Durand, who has had several years experience in the extraction of the material, to the French Society for the Encouragement of the National Industry. The various compounds of boric acid commonly found are the borate of soda, various borates of lime, hayesine or ul-exite, cryptomorphite and datolite. Tourmaline may be added to this list, although it is quite rare, except in the tin mines of San Jacinto, where it forms the gangue of the ore.

The principal deposits form a kind of band in the ancient volcanic soil, which surrounds the Sierra Nevada at the north and east. This region is rich in hot springs, some sulphurous, and containing in solution in their waters various salts. The borax, which is found in the saline deposits of the valleys, may have been produced by one of two causes, either by deep springs containing boric acid or borax in solution, or by the surface water of a vast basin accumulating in a reservoir and there concentrating over an unknown period. The second hypothesis is considered as the most probable, as the salts which accompany the borate of soda (sulphate, chloride, and other magnesia salts) are found in large quantities in the adjacent mountains.

The borate of lime found in these deposits is formed probably by double decomposition. It appears in crusts on the surface or in masses in the soil. The latter are of all sizes, sometimes weighing over four pounds and containing the borate in long silky filaments, or in an amorphous powder mixed with sand and soda salts. When obtained at the surface the borax is in small crystals, yellowish white in color. It has a slightly sweetish and quite agreeable taste, which is probably owing to organic matters, as it disappears after the refining. A thin steel shovel with a sharp edge for cutting the herbage is used for collecting the salt, which is taken in carts to a platform placed above large wooden vats capable of containing some 3,500 gallons. These vessels are filled with water, heated to boiling by the injection of steam. The borax is thrown in by shovelful until the areometer marks 23° B. This concentration would be too great if only borax were put in, but the impurities (sulphate of soda and rock salt) added, besides the mud and borate of lime in suspension, greatly augment the density. When the above degree is reached, the solution is allowed to rest, the herbage which floats on the surface is skimmed off, and the liquid is carried by long india rubber tubes into the crystallizing vessels. The latter are large tanks 9 feet 6 inches in length, about 6 feet high and 39 inches wide. The liquid cools slowly to a temperature of 77°, occupying about ten days in so doing. A faucet at the lower part of the tank is then opened, and the mother liquor, mud, and large borax crystals which are formed by aggregations of small crystals are removed. These crystals are washed with the mother liquor in another vessel, by agitating them with a rake in a long trough filled with water. They are afterwards kept for refining.

At the bottom of the crystallizing vat is found a deposit of borax sometimes 6 inches in thickness, which is broken up with the pickaxe. The salt is then left to dry on platforms for four or five days, and finally is packed in coffee sacks, the filled bag weighing 165 lbs.

The distance from Columbus, Nevada, the site of one of the principal deposits, to Wadsworth, the nearest station on the Central Pacific Railroad, is about 360 miles over a desert country. The means of transportation is a train composed of three wagons, the pole of one fastened in the axle of the preceding. Twenty-four mules are harnessed to the first wagon. In this way the load of about 30 tons is distributed on the six axles, an important precaution, as the route lies over sandy plains and marshes, where roads are unknown. When a difficult place is reached, the three wagons are separated and the whole force of mules is attached to one vehicle at a time, which is thus hauled over or through the obstacle. Generally the owner of the train conducts it, aided by one or two assistants, and in the last wagon is stored the necessary provision, which includes both food and water, for

men and animals. This journey adds about 1½ cents to the cost of the borax per pound. From Wadsworth to San Francisco the expense of transportation is 1½ cents, and from the latter point to New York it is stated to be 1½ cents additional a pound. The total cost per pound in San Francisco is about 8½ cents. The monthly production of borax in California and Nevada is estimated at 200 tons.

FRAUDULENT USE OF BENZINE.—Benzine is frequently substituted for and mixed with turpentine by unprincipled dealers, but it is far inferior to turpentine for mixing paint.

NEW BOOKS AND PUBLICATIONS.

PERSONAL APPEARANCE AND THE CULTURE OF BEAUTY. By Dr. T. S. Sozinsky. Philadelphia: Allen, Lane, & Scott, Publishers, 233 South 5th street.

Contains chapters on types of male and female beauty which measurements so that anybody in *puris naturalibus* posted before a mirror, tape line in hand, can soon discover whether his or her proportions come up to the standard here set forth. That done, the reader can compare each of his or her features in turn with the ideals described in the successive chapters devoted thereto, and at the same time he or she will get some probably useful ideas as to how to improve portions which are not strictly beautiful. The author offers some suggestions as to dress and in general labors to convince his readers that "the proper study of mankind is man."

THE METALLURGICAL REVIEW. Published by David Williams, 83 Reade street, New York city. \$5 per year.

No. 1 of this new magazine has recently been issued, and we are told that it is to be devoted exclusively to the literature of metallurgy. Professor R. H. Thurston begins the initial number with a treatise on the mechanical treatment of metals; then follows the first of a series of papers by Mr. E. C. Peebin on the New Iron District of Ohio; Siphon Tap in Lead Smelting, by C. Kerchhoff, Jr.; on Steel by W. Metcalf, C.E., besides other valuable articles. We can compliment the publisher on the very handsome dress in which the magazine is presented.

THE LOCUST PLAGUE IN THE UNITED STATES. By Charles V. Riley, Ph.D. State Entomologist of Missouri, etc. Illustrated. Published by Rand, McNally & Co., Chicago, Ill.

A number of Professor Riley's admirable papers on the grasshopper scourge have appeared in this journal, so that our readers are already familiar with the comprehensive and lucid manner in which this and other entomological subjects are treated by him. In the present work, the various articles which have been published by the author in Missouri entomological reports and elsewhere, relating to the Rocky Mountain locust, are collected in compact form, and as all are based upon an extensive personal experience and long study, the work may be pronounced as invaluable to agriculturists whose crops are yearly invaded. The book is copiously illustrated and colored maps are given, showing the territory devastated or visited by the locusts during different years. There is a full discussion of all the practical ways and means for the prevention of locust injuries; and also of the various legislative enactments calculated to encourage the extermination of the insect.

Inventions Patented in England by Americans.

From August 7 to August 21, inclusive.

BALL VALVES.—B. C. Hay, Washington, D. C.
BOXES FOR SHAPING, ETC.—J. Tomlinson, Black Hawk, Cal.
CIGAR HOLDER.—E. S. May, Campbelltown, N. Y.
COMPRESSED AIR APPARATUS.—E. Barr, New York city.
ENAMELLED IRON.—S. C. Quimby et al., St. Louis, Mo.
ENVELOPES.—C. K. Marshall et al., Vicksburg, Miss.
FASTENINGS TO ROPE, ETC.—J. K. Lake et al., Chicago, Ill.
ICE-MAKING MACHINERY.—A. Albertson, Hudson, N. Y.
LUBRICATING AXLES.—W. Y. Selleck, New York city.
MUSIC STAND.—J. F. Walters, Boston, Mass.
PAPER.—W. A. Miles, Copake, N. Y.
POSTAL CARDS.—C. K. Marshall, Vicksburg, Miss.
PREPARING FOOD.—C. Morfitt (of Baltimore, Md.), London, Eng.
PREPARING HAY.—J. B. Laffitte, New Orleans, La.
PREVENTING INCrustATION IN BOILERS.—R. H. Harcourt, Chicago, Ill.
PROMOTION OF CARS.—W. Eppelsheimer, San Francisco, Cal.
REFRIGERATORS.—A. W. Zimmerman, Dayton, Ohio.
STEAM MOTORS.—E. H. Angamier, New Orleans, La.
STUFFING HORSE COLLARS.—B. F. Grayson, Jr., Luray, Va.
TREATING HAIR, ETC.—J. F. Green, Brooklyn, N. Y.
TREATING WOOD.—L. S. Robins, New York city.
WOOD SCREWS.—R. Boeklen, New York city.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the *SCIENTIFIC AMERICAN*. We are prepared to get up first-class *WOOD ENGRAVINGS* of inventions of merit, and publish them in the *SCIENTIFIC AMERICAN* on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED CAR COUPLING.

James Rockwell, Ponca, Neb.—This invention refers to an improved car coupling of that class of couplings which are self-coupling on the approach of the cars, without requiring any one to step in between the same for holding the link; and the invention consists of the arrow-shaped draft hook of one drawhead coupling with fulcrumed hook-shaped jaws of the opposite drawhead, the lower jaw being extended to the rear of the drawhead, and locked by a pivoted and weighted catch into open or uncoupled and closed or coupled position. A loop-shaped lever extends backward through the rear end of the drawhead to admit the throwing forward of the draft hook for coupling, or the drawing back of the same within the mouth of the drawhead whenever it is not desired that the cars should couple. When the draft hook is thrown forward the draft hook, link, and wire loop are securely retained in line and prevented from swinging back into the drawhead. The catch block retains the coupling jaw either in locked position, so as to produce the reliable interlocking of jaws and draft hook, or supports the lower jaw in open and uncoupled position, until, by the entrance of the draft hook, the catch block is released by the raising of the rear end of the lower jaw, and the weighted rear end dropped, and the heel of weighted catch block thrown into the recess of the rear end, so as to rigidly lock thereon.

IMPROVED SAFETY VALVE.

Erasmus B. Kunkle, Fort Wayne, Ind.—This invention has relation to safety valves for steam generators, and especially to valves which have applied to them means for preventing them from being tampered with by improper persons. The tubular box or body of the instrument is enlarged above and contracted below, and constructed with a male thread cut on its lower end, and a number of holes in its largest end, to receive a spanner for screwing it into place on a boiler. A screw thread is also cut on the upper end of the body to receive a perforated cap, which is held fast by a small set screw. In the center of the cap is a tubular hub, which is

screw-tapped inside part of its length, and tapered outside below the top of the cap. Above the interior threaded portion of the hub is a chamber, into which a nut is applied, receiving inside of it a screw. A cone-pointed screw is screwed into the hub, so as to bear centrally on a flanged cup. This screw is grooved to receive the feather on the inside of the barrel of a key, by means of which key and a lever the screw can be turned, and a helical spring compressed more or less, as may be required. After this adjustment a soft metal cap or seal is stamped upon the perforated head of the screw, and the latter locked by means of the jam nut. The top of the cover is slotted for the escape of steam during an alarm, and concentrically cast on the bottom of the cover is another flange, which laps over the largest part or upper end of the valve, and shuts off communication between the interior of the cap and the long spring chamber of the valve, thus excluding everything injurious from the spring chamber.

IMPROVED GRAIN DISTRIBUTER.

Cornelius E. Drake, Avoca, Iowa, assignor to himself and John S. Murray, of same place.—This invention relates to an improved grain distributor for elevator heads, by which any scattering of grain is avoided and the same delivered to as many bins as desired. It consists of a distributor with radial spouts and of an interior revolving cylinder with dish bottom, having exit apertures of a size corresponding with the spout openings. A cylindrical casing or receptacle is provided with any desired number of inclined bin spouts, radiating at the lower part from the same. The casing is secured to the elevator head, and leaves no room for scattering grain. To the interior of the casing is fitted a revolving cylinder, having inclined or dish bottom, forming a spout-shaped aperture that registers with any one of the bin spouts. The bottom is operated by the ordinary index rod, that is attached to the center of the bottom. The connection of spouts and casing with the tightly fitting discharge cylinder prevents the scattering of the grain, and furnishes a stronger, more durable, and cheaper distributor than those at present in use. The spouts are secured to the grain-delivering tubes and the adjustable bottom set to any one of the spouts, as required. The distributor is secured by a top flange to the elevator box, and serves in effective manner for the purpose for which it is designed.

IMPROVED CIRCULAR SAW.

Donald B. McRae, Bay City, Mich.—The object of this invention is to provide for renewing the teeth of large saw plates in a manner not subject to the objections attending the use of what are known as "insertable teeth." The invention consists of a sectional or solid toothed ring attached to the periphery of a plate or disk forming the body of the saw, the ring being "halved" on to the plate when made solid, and tongued and grooved when made in sections, and being riveted in both cases. In practice, the saw plate will be the same thickness at the center as the toothed ring, but will taper or diminish slightly therefrom to the inner edge of the ring, so that the friction will be less than it is in other saws in which the plate is the same thickness from center to periphery. This is an advantage that is made possible by this arrangement of an attached toothed ring, and cannot be had in the common saws, as they cannot be ground in such forms.

IMPROVED TIDE WHEEL.

Walter H. Andrews and Hiram Fuller, Deckerville, Mich.—This invention consists of a wheel placed on a vertical shaft and provided with buckets that open and close by the action of the current. The wheel is journaled in a frame that may be raised out of the water, and a gate is provided for regulating the motion of the wheel. The wheel consists of the heads that are secured to the shaft and the wings that are pivoted between the heads. The operation of the wheel is obvious. It is submerged in the stream and held in place by piles of timbers; and the gate being more or less open, the water spreads the wings and turns the bucket, so that all upon one side of the shaft are acted upon by the current, while upon the opposite side they automatically close or fold together, so as to offer no resistance to the current.

IMPROVED SAW.

Christopher J. Wilson, Macon, Ga.—The object of this invention is to furnish saws which will run easier, and cut faster and smoother than ordinary saws, which may be made of any desired size or kind, and will be applicable to any desired kind of work. The invention consists in constructing a saw with cutting teeth, each of which is beveled on one entire side or face from base to point, which are vertical on one edge and inclined on the other to the length or radii of the saw, according as it is a reciprocating or circular saw. The invention also consists in combining with these cutting teeth clearer teeth, which are of less length, but placed in line with the saw plate, and have a vertical and inclined side, similarly to the cutting teeth. In filling a cutting tooth, very little skill is required, since the file is laid flat against the beveled side, with its lower edge resting upon the inclined edge of the next tooth, which thus serves as a guide.

IMPROVED ROTARY VALVE FOR COMPOUND ENGINES.

Isaac Menden, Bradenville, Pa.—This invention consists in the arrangement of a hub carrying a circular valve that is made in three divisions. The casing of the said valve is provided with four ports, which admit steam into two cylinders, and with two ports connecting with a reversing valve. The object of the invention is to provide a valve that will admit steam to first cylinder in the engine at the boiler-pressure throughout its entire stroke, and conduct steam from this cylinder to the auxiliary cylinder, and from thence to the exhaust passage of the valve casing. The advantage claimed for this invention are, its economy in the use of steam, the facility with which the engine may be reversed, and its simplicity and compactness.

NEW HOUSEHOLD INVENTIONS.

IMPROVED BED BOTTOM.

Frederick P. Edmans, Troy, N. Y.—This invention consists in looped C-shaped springs fixed to and overhanging the head and foot crossrails, in combination with angular hooking blocks fixed to the slats. The free looped ends of the springs are adapted to receive and engage with the beveled ends of angular blocks, which are notched longitudinally and rigidly secured to the bottom of the slats near the ends thereof. The blocks are adjusted on their slats in such relation to the overhanging looped ends of the springs, when the rails are fixed in their places, that the blocks will firmly hold their places without rattling. This is a substantial and cheap bed bottom, which can be easily taken to pieces and put together, and which can be packed away in a very small space.

IMPROVED WASHING MACHINE.

Michael B. Naus, Goldsborough (Etters P. O.), Pa.—The object of this invention is to furnish an improved washing machine, which shall be simple in construction, convenient in use, and effective in operation, washing the clothes with a rolling, rubbing, and squeezing movement, which may be manufactured at small cost, and which may be used in an ordinary wash tub. The machine is designed to be attached to an ordinary wash tub, so that it will not be necessary for the purchaser of a machine to buy also a large tub or box to put it in. The invention consists in washing clothes between two corrugated boards or rubbers made in strips or sections, and the sections moving at different rates of speed and different distance, and the devices for so moving the several parts as set forth.

IMPROVED CARPET FASTENER.

Jesse Failing, Umatilla, Oregon.—This invention has reference to a simple and durable device for fastening carpets along the base board of the room, and taking them up with great facility, the carpet presenting, by the use of this fastening, a smoother and neater surface than when fastened by the common tacks; and the invention consists of a metallic rod running along the base board, and having the edge of the carpet placed around the same and pressed down on studs or pins driven into the floor in front of the rod, which is finally retained by grooved eccentric buttons or cams

bearing on the rod. An iron rod runs along the base board of the room to be carpeted. In front of the rod are driven, at suitable distances from each other, wire pins or studs that project nearly up to the level with the top of the rod. Buttons or eccentrics are screwed to the base board above the rod, two or three feet apart, the buttons being made in the shape of eccentric cams, with a grooved or concave circumference to fit over the metallic rod. The edge of the carpet is folded around the iron rod, pressed down over the pins, and the eccentric buttons are then brought down on the rod by pressing on the levers of the same until the rod and carpet are rigidly and evenly retained along the entire base board of the room. The carpet may be readily taken up by releasing the buttons from the rods and removing them, admitting thus the convenient laying down and taking up of carpets, and furnishing a superior and neater fastening than the common tacks in general use.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED WHIP.

Frank Hopkins, Helena, Montana Territory.—This invention has relation to whips, and the nature of the invention and improvement consists mainly in a snap ring linked to a swivel, which is applied to a ferrule on the end of the whip stock. The whip staff or handle, on which is screwed a ferrule, has a short tube rigidly secured into one end, so as to form a shoulder for the spherical head of a swivel. The swivel consists of a spherical head, a cylindrical spindle or stem, and a ring or link. A snap ring is linked to the swivel, and designed to receive the loop of the whip lash. This ring is constructed with a pivoted section or tongue, held shut by a spring, thus allowing the lash to be quickly applied to, or detached from, the ring. It will be observed that the swivel and snap ring afford a safe and durable attachment for the whip lash, and allow perfect freedom of motion thereto.

IMPROVED FIRE ESCAPE.

Benjamin F. Frank, Colfax, Cal.—The object of this invention is to utilize the slats of a bedstead for a ladder, by means of which persons can escape from the upper stories of a burning building should other means of escape be cut off. The nature of the invention consists in a ladder which is composed of slats connected together by strong ropes, and provided with crosspieces, which are secured at proper intervals apart, and adapted to serve as foot-rests and hand-holds. They should be made sufficiently strong to sustain the weight of several persons, and they may be made of any desired length. The ends of the slats are all connected together by ropes, which are, preferably, passed twice through the ends, and prepared by tarring, so that they will be very strong and durable. To increase the strength of the slats at their ends, and prevent them from splitting when subjected to strain, metal plates are inserted into the ends. For the purpose of affording foot and hand holds, crosspieces are secured to the slats at suitable distances apart. These crosspieces are not in the way when the slats are arranged in a bedstead. On the contrary, they serve to space the slats and hold them in their proper places. When the slats are used for a ladder they are suspended from a hook made fast in the building wall, just below a window sill, and for this purpose a hole is made through the end of the topmost slat to receive the hook.

IMPROVED QUILTING MACHINE.

John J. Crall, Dry Ridge, Mo.—This invention has for its object to manufacture quilts in rapid and convenient manner by means of a sewing machine, running over the fabric stretched in suitable manner. The belt connecting the differential pulley shaft with drive shaft is transferred from a larger to a smaller part thereof, in order to produce a faster feed, and the reverse to get a slower feed. When the carriage has reached the end of its movement the differential pulley is unclutched from the shaft and the carriage run back by hand. For quilting with the machine, the fabric is first wound upon the back roller, the front roller being placed by hand levers close to the needle of the sewing machine. The upper nuts are then screwed down to hold the quilt and roller to the bed plate of the sewing machine, the latter being then passed over the fabric from right to left while the first line of stitches is being made. The fabric is then moved forward by the hand lever as far as required for the next line of stitching, and the sewing machine is run over the fabric as before. The quilted portion is then rolled up on the front roller by releasing the pawls of front and back rollers and moving the quilt forward. The quilt is then thrown back by the hand levers and slide pieces until the front roller comes again close to the needle to bring the next seam at the required distance from the one last made. The quilting is then continued as far as the arm of the sewing machine will admit the rolling up, which is generally one half or more of the quilt.

IMPROVED GAS BURNER.

William Bedell and Winfield S. Bedell, New York city.—This invention relates to gas burners, and the nature of the invention consists in combining a valve which has a guide stem or tail formed on it, with a square seat formed on the upper end of the lower section of a two-part burner, whereby there is a double check to the flow of gas into the upper section of the burner, and a uniform supply of gas, automatically regulated, is obtained. The lower tubular section of the burner receives the supply of gas through a suitable pipe, and is constructed with an external or male screw-threaded portion adapted to receive the upper section of the burner. A ball, which is of less diameter than the internal diameter of the gas chamber, is constructed with a cylindrical neck or guide stem, which is loosely applied inside of the male tubular portion of the lower burner section, and constructed with a flat bottom, although a slight concavity or convexity of the bottom will not be objectionable. This check valve may be made of lead, an alloy of lead and tin, or any other suitable metal. The spherical portion rests upon the angular edge of the flat top of section, and is held down by its own weight and the weight of guide stem. Gas rising through the lower section first impinges against the lower end of the stem and is uniformly spread outward. The gas then rises and is again spread outward all around the ball into the chamber. Thus we have two checks for the gas ascending through the burner, which will render the flow regular, even under varying pressures or heads.

IMPROVED FIRE ESCAPE.

George J. A. Taggart, Parsons, Kan.—This invention has relation to means for affording safe egress from the upper stories of a building which is on fire. A access is made in the wall of the building just below the sill of a window. If desired, this recess may be lined with metal, or a cast iron box may be set into the wall flush with its surface. The bottom of the recess should be inclined downward and outward, so as to form a self-discharging chute for a chain ladder. A trapdoor is hinged at the bottom of the recess, and adapted for closing the same. On the inside of the door is an angular lever bolt, the upper end of which is designed to enter a recess made in the window sill, and to hold the door fast. The lower end of the lever bolt is extended outward through a hole made through the door, and has attached to it a block or blade, arranged so that a stream of water directed upward against it from a hose will unlatch the door and allow it to be forced open. In hotels and other large buildings it is contemplated establishing communication between each one of the trapdoors used and the office either by draw wires or by galvanic battery wires, so that an alarm will be sounded in the office when a trapdoor is opened. Means may be adopted for opening and shutting all of the trapdoors of a building from one fixed point, at the same time each trapdoor may be opened by a person in the room to which the fire escape is applied. A chain ladder, which is attached to the top wall of the recess, and made of sufficient length to reach the curbstone of the sidewalk, where its lower end can be attached to hooks or rings fixed thereto. The lower end of the ladder is attached to a flanged drum or reel, on which it is wound, and put into the receptacle. When the door is opened the reel will fall and unwind.

IMPROVED EGG CARRIER.

Martin A. Howell, Jr., Streator, Ill.—The object of this invention is to provide an improved egg crate or box which shall be adapted to contain and safely transport a larger number of eggs than those of the same size in common use, and which may withal be cheaply constructed. The racks for holding the eggs are provided with perforations and coated with glue (or other adhesive substance), and then covered with hay chaff.

IMPROVED STOVEPIPE THIMBLES.

James Carhart, Pontiac, Mich.—The object of this invention is to provide an improved stovepipe thimble which is securely retained in the wall, readily swung into open or closed position, and so arranged as to firmly retain the stovepipe in the thimble. The invention consists of a stovepipe thimble with swinging cover and ventilator, having cam below pivot, that binds on stovepipe when inserted. The thimble has an outwardly-bent flange at the inner end that locks the thimble, in connection with the face ring or moulding, rigidly to the wall. When the cover is held in position slightly sidewise of the vertical axis, the lug and cover clear entirely the hole and admit the ready inserting of the stovepipe. The cover is then allowed to assume a pendant position, so as to throw a cam, at end of the lug, to the inside of the circumference of the face ring and cause the same to bind tightly on the stovepipe, retaining the same in firm position in the thimble. For taking out the stovepipe, the cover is swung sidewise, so that the cam releases the pipe, which is then taken out and the cover replaced by being locked to the top hook. The thimble is provided at the inner end with an outer flange that binds on the wall of the chimney, while the face ring, which is riveted to the outer end of the thimble, binds on the outer surface of the wall, so as to secure the thimble in rigid position in the stovepipe hole.

IMPROVED SLED PROPELLER.

George F. Shaver, Moorheadville, Pa.—Two bars are connected by a crossbar with front of sled, and at the upper end by another crossbar. The ends of the latter are extended to form pivots on which the propelling bars and their rigidly attached handles are journaled. It will thus be seen that if the handles are worked through the radius of the upper third of the stroke, great speed can be obtained on ice, where there is little resistance, while if the levers are worked at an obtuse angle, or in the radius of the lower third of the stroke, sufficient power is obtained to travel on a level or uphill, where considerable resistance is to be overcome.

IMPROVED MUSIC SUPPORT.

Elan A. Marsh, Battle Creek, Mich.—The object of this invention is to so construct a walking cane that it may be readily and quickly adjusted to form a convenient and substantial music stand, and vice versa. The improvement consists in the construction and arrangement of the supporting legs with respect to a screw plug and the hollow tubular end of the cane forming a containing case, the construction of the rack for holding the music, and the means for securing the rack to the standard.

IMPROVED BOAT-LAUNCHING APPARATUS.

Martin Bourke, Youngstown, O.—The danger incurred by launching life and other boats—more especially during the prevalence of storms or high seas—by lowering them directly alongside the ship is obvious and well known. It is the object of the patentee to avoid such danger by providing a compact but efficient apparatus for launching boats at a distance from the ship's side. This he effects by suspending the boat in a swinging frame pivoted to long bars which are pivoted to the side of the vessel and stand vertical. These bars are lowered by tackle, and the boat then detaches itself and floats free of the swinging frame. The launch may be controlled by the occupants of the boat, or by persons remaining on the vessel. The inventor proposes to use the apparatus in connection with an improved life boat, for which he has also obtained letters patent.

IMPROVED TEMPORARY BINDER.

Paron England, Lincoln, Neb.—It is an improvement in that class of files which have two leaves connected by a flexible fullness of leather, so as to permit said leaves to fold like a book. The object of the improvement is to render the backs of the file automatically adjustable to the increasing contents of the same, and to provide means for removing and preserving the contents in their indexed order. To these ends the invention consists in arranging in one of the backs of the file a spring which is connected with, and exercises a tension upon, a set of cords which run through the index and connect the two backs, and is also connected with, and exercises a tension upon, a flexible strap running to the outer edge of the back and carrying a clasp for fastening the said backs. The invention also consists in the particular construction and arrangement of the index and the file whereby the said index is made easily removable with its orderly arranged contents, so that they may be preserved in this form and a second index substituted for the same in the file.

IMPROVED TAX RECKONER.

George E. Burnett, Harrisburg, Ill.—This computer is chiefly designed for the use of assessors and collectors of taxes. It consists mainly of a cylinder adapted to rotate, and having strips attached on which are inscribed numbers representing values or assessments, also the tax rates, the amounts of the several taxes on the given values or assessments, and the aggregates of the several taxes. The strips are adjustable and detachable, being secured by screw clamps. The cylinder is rotated by a finger wheel and arrested or held by a friction brake arranged in a peculiar manner.

IMPROVED FOLDING LADDER.

Algernon S. Riches, Glenbeulah, Wyo.—This invention relates to an improved folding ladder designed for easy transportation, convenient handling, and compact storage; and especially adapted, by reason of such qualities, to use in stores, shops or dwellings, where the ordinary form of ladder could not well be used. The improvement consists, first, in forming inclined recesses in the inner sides of the side rails, so as to receive the rounds when the ladder is folded, and allow the side bars to be immediately adjacent to, and flush with, each other and the rounds hidden from view, the recesses also forming supporting shoulders when the ladder is disposed for use; secondly, in slotting one of the side bars at its pivot connections with the rounds in order to permit the side bars to be arranged convergently at the top; and thirdly, in the combination with the side bars and the pivoted rounds of a locking brace for holding the ladder stiff and rigid when the same is in use.

IMPROVED FERMENTING VAT.

Christoph Klein, Brooklyn, N. Y.—This invention relates to a new construction of fermenting vat for breweries, distilleries, and similar works; and consists essentially of a vat having vertical walls, made of horizontal pieces, which are bound together by vertical bolts, the corners of the wall and bottom being connected by tongue and groove joints, and the walls firmly encircled by metallic bands or hoops, adjusted by right and left hand screw bolts. The vat may be readily manufactured and shipped in sections, being put up for use in perfectly tight manner by any one by bolting first the side pieces together, and connecting then the bottom and side walls by the outer bands. A fermenting vat of considerable strength, that is not liable to leak, and fully able to sustain the pressure of the large quantity of liquid, is thus furnished, which has the additional advantage that it takes up less room than the round vats, requiring only a small passage between two vats, and allowing, therefore, for a larger number of vats to be set up in a given space.

IMPROVED STREET CAR AWNING.

Frank P. McIntyre, Philadelphia, Pa.—The object of this invention is to provide an awning for street cars, designed to extend over the horses and protect them from the excessive and exhausting heat of summer. The invention consists in a horizontal longitudinal supporting rod arranged in or

upon the top of the car, extending the whole length of the same, and a sufficient distance in front to cover the horses, which rod is hooked at its outer end, and supports a U-shaped marginal rod, the inner arms or branches of which are detachably fastened to the car, which device, together with a transverse brace, constitutes the supporting frame of the awning.

IMPROVED MANUFACTURE OF BOOTS.

Henry Sauerbier, Newark, N. J.—This invention relates to a peculiar crimp, consisting of corrugations or creases formed at the junction of the upper proper with the front of the boot leg, the object being to increase the elasticity and flexibility of the boot at that point, and thereby render it easier to the wearer as well as enable it to be easily drawn on or off the foot.

NEW AGRICULTURAL INVENTIONS.

IMPROVED DITCHING PLOW.

Seth Furnas, Bridgeport, Ind.—This invention relates to certain improvements in ditching plows, and it consists, first, in the particular construction and arrangement of a scoop-shaped plow extended upwardly and rearwardly in the form of an inclined trough, and combined with the beam and handles; and secondly, in the particular construction and arrangement of devices for supporting and adjusting the handles upon the rear extension of the trough.

IMPROVED COLTER AND PLOW STOCK.

Andrew H. Farmer, Oak Level, Va.—This colter is curved slightly forward at its point, and has a serrated cutting edge. Its back edge lies in contact with a bent stock or standard. It is therefore supported by the latter, and is also held in place by its bent arm, which enters the beam, and by lugs or ears formed on the stock itself.

IMPROVED GATE.

Rev. Lewis T. Mason, Ellington, N. Y.—The object of this invention is to provide an improved device for unlatching and opening and for closing and latching a gate in a simple and convenient manner without descending from the vehicle. To this end the invention consists in the combination with the operating levers of two gates connected for simultaneous movement, and arranged to swing the one in and the other out to open the gate way for the vehicle, the said gates being also so geared as to open a single one of the gates a short distance for persons on foot or horseback, without moving the other.

IMPROVED HORSE HAY RAKE.

Edward Huber, Marion, O.—This invention is an improvement in the class of wooden rakes which are prevented from revolving by means of spring catches attached to the front ends of the handle bars and bearing on the front teeth. The improvement relates chiefly to the construction of the device by which the two parts of the rake are pivoted together.

IMPROVED PLOW.

Julius Hartmann, Louisville, Ky.—This invention relates to certain improvements in the construction of reversible or hillside plows, more particularly those in which a double mouldboard vibrates about a horizontal pivot. The objects aimed at are to reduce the weight and cost of such plows without lessening the strength, to increase their durability, and render them easier to handle, and also of lighter draft, by reason of being so constructed as to have a center draft.

IMPROVED HARROW.

Lewis B. Coddington and William W. French, Westfield, N. J.—The object of this invention is to provide a harrow which will yield to inequalities of the ground, and which may be readily moved from place to place. The harrow bars are provided with ordinary harrow teeth, and are hinged on a rod that passes through the end pieces of the frame near its front side. The rear crossbar of the frame is supported a small distance above the end pieces by standards, and between the said bar and the harrow bars springs are placed on rods that project upward from the said bars through the bar. The center bar is arranged at right angles to the axle of the harrow, and the adjacent bars attached to it near its forward end, and extend backward diagonally in opposite directions. The bars, as well as the ends of the frame, are arranged parallel to the bars, so that bars on opposite sides of the center bar diverge. The forward side of the frame is provided with two uprights, that pass through a bar that is hinged to the axle which is supported by wheels. Springs are placed upon the uprights which press against the bar and hold the frame down. Chains are attached to the ends of the frame and are connected with a chain that runs over a pulley at the side of the tongue, and is attached to a sheave formed on the end of the lever, and pivoted to a standard that projects upward from the axle. The arrangement of the bars is such that all of the ground over which the harrow passes is operated upon by the harrow teeth, and, by means of the springs, the teeth are held to the ground with sufficient pressure for ordinary work, while they are permitted to yield to the inequalities of the surface, or to obstructions. By drawing the chains, by means of the lever, the harrow may be held to the ground with additional force.

IMPROVED CORN PLANTER.

William J. Nicholson, Paola, Kan.—The object of this invention is to furnish an improved corn planter, which shall be so constructed that the slide may be operated to drop the seed by the advance of the machine, and which shall be simple in construction and reliable in operation. To the inner side of one of the wheels that support the apparatus are attached arms or blocks, so that the distance apart of the hills may be regulated by varying the number of the said arms or blocks. As the wheel revolves, the arms or blocks strike against the teeth of a toothed wheel and revolve it. The upper end of the journal of this wheel revolves in a groove in the lower side of the axle, and its lower end revolves in a hole in a board which rests in stirrups. To the lower side of the toothed wheel is attached a cam wheel, made with several cams and which enters a recess in a plate placed upon the board, and is so made that the plate may be slid back and forth by the revolution of the cam wheel. To the sliding plate is pivoted the rear end of a lever, which is pivoted to a rod attached to the frame of the machine, and which serves as a fulcrum for the said lever. The forward end of this lever is pivoted to the dropping slide, so that the seed may be dropped by the vibration of the said lever.

IMPROVED FRUIT PICKER.

Jesse C. Stribling, Pendleton, S. C.—This invention consists in a wire frame, which is hinged to a curved wire fork attached to a pole or handle, the said frame being provided with a bag for receiving the fruit and with a cord by which it may be moved, and the fork is provided with a curved pivoted knife, that is connected by a link with the bag frame, and moves across the fork whenever the frame is moved. The manner of using the instrument is as follows: The fork is placed astride the stem which supports the fruit, and the fruit is pulled from its stem and falls into the bag attached to the frame. If it should be desirable to cut the stem, the arm is moved by the spring attached, which moves the knife sufficiently to cut the stem of the fruit. The instrument is light and portable and is inexpensive in its manufacture.

IMPROVED CHECK-ROW ATTACHMENT FOR CORN PLANTERS.

Lewis S. Woodslee, Riverton, Iowa, assignor to himself and Morris S. Sober, of same place.—The object of this invention is to furnish an improved attachment for corn planters, which shall be so constructed as to enable the seed to be planted in accurate check row without its being necessary to mark the ground in any way. The invention consists in the combination of two chains, two pairs of hinged blocks, and wheels or rollers, with the lever that operates the seed-dropping slide, and with the driving wheels and their axles. The wheels are rigidly attached to the journals of the

axle, which revolves in bearings attached to the frame, and is made in two parts, coupled together at their inner ends by lugs and pins, to enable the machine to be turned around without one of the wheels having to slide upon the ground. The forward ends of the side bars of the frame project, and to their forward ends is hinged the frame, to which the tongue, runners, and seed hoppers are attached. The slide by which the seed is removed from the hoppers and dropped to the ground is provided with two dropping holes in each end, so that each end may drop a hill at each movement of the slide. Two rollers are placed upon the opposite sides of the axle, so that the dropping slide may be moved twice at each revolution of the wheels. The circumference of the wheels should be exactly equal to twice the required distance between the hills. To the rim of each of the wheels are attached two cross blocks in such positions as to mark the ground directly over each hill, to serve as guides to the driver and enable him to plant the field in accurate check rows.

IMPROVED TOBACCO AND CABBAGE PLANTER.

John C. Tennent, Aquasco P. O., Md.—The apparatus is mounted upon wheels, and two parallel plates are pivoted toward their forward parts to the side bars of the frame by a shaft. To the shaft, between the plates, is pivoted a wheel, formed of four solid arms and four hollow arms alternating with each other, and the outer ends of all of which are made wedge-shaped. The solid arms are simply designed to keep the wheel revolving by coming in contact with the ground. The hollow arms are designed to receive the plants, carry them to the ground, open holes in the ground, and drop the plants into them. To enable the arms to do this the plates that form the rear face of their wedge-shaped ends are made loose, and to the side edges, near their inner ends, are pivoted the ends of two bars. The bars cross the arms, and are pivoted to them near their forward edges and at a little distance from the inner ends of the forward inclines of their ends. The plants are inserted roots outward in the hollow arms while the said arms are upon the upper side of the wheel, and before the valves have been closed. The soil is pressed in around the roots of the plants by plates which are attached to the lower ends of the standards.

IMPROVED GRAIN TALLY, BAG HOLDER, AND WEIGHER.

Adam C. Lintz, Sweet Air, Md.—The operation of this improved apparatus is as follows: The support is adjusted on the standard to the proper height for the bags to be filled and weighed. A bag is then clasped between curved pieces. Grain is poured into the bag until the required weight is indicated by an index. The curved piece is then raised to release the bag, and at the same time the pawl is carried upward, moving a wheel one notch. The wheel makes a revolution for every fifty bags removed from the apparatus, and every revolution of the wheel is registered by a register wheel. This improvement is designed more particularly for the use of thrashers in measuring grain; but it may be employed for other purposes.

IMPROVED SULKY STALK CUTTER.

Michael E. Rosch, Rolling Prairie, Ind.—The object of this invention is to furnish an improved machine for cutting corn stalks into pieces in the field, so that they may be turned under by the plow, and will not impede or clog it, and which shall be simple in construction, convenient and effective in use, and may be readily drawn from place to place. The cutting plates are inserted in radial slots in the wheels, and are secured in place by pins passed through their inner corners beneath shoulders formed upon the outer sides of said wheels, so that they may be readily detached to be sharpened. To the opposite sides of the tongue are pivoted the upper ends of two rods, the lower ends of which drag upon the ground, and have hooks formed upon them to straighten the stalks, so that they will be cut by the cutter. As the tendency of the draft is to tilt the cutter frame forward, which tendency is resisted by the draft of the sully, and is made to press the cutters into the ground. The machine is adjusted for being drawn from place to place by detaching the reach and running the sully forward until the rear crossbar can be raised and hooked upon the hooks. The forward end of the reach is then placed upon the rear end of the tongue, and the lower arm of the U-bolt is passed through the socket and tongue, and its upper arm is passed above the reach, so as to make the tongue rigid and secure the reach at the same time.

IMPROVED APPARATUS FOR BENDING AND TEMPERING MOULDBOARDS.

Dan Franklin, Tama, Iowa.—The hot mouldboard receives its intended form between dies, its position between them, by which its "twist" is determined, being governed by the position of guide pins which are set in the lower die and enter the bolt holes of the mouldboard. The guide pins may be interchanged to vary such position, or set in new holes, as required. When the mouldboard has been shaped by the dies it is removed therefrom (while still redhot), and quickly clamped in a two-part tempering form, through which water or other tempering mixture is then forced under pressure. The form preserves or restores the curvature previously imparted by the dies, and the mouldboard is tempered in the desired manner. It will, therefore, when removed from the form, retain the exact shape desired, so that it may be applied to a plow frame without the labor, delay, and expense ordinarily attending such operation.

IMPROVED CHURN.

Jacob Weider and John S. Weider, Burlington, Iowa.—This invention relates to rotary churns, and it consists mainly in a dasher of peculiar form, in which fingers projecting downward from a horizontal centrally pivoted bar are employed to stir the cream and to break the oil globules. The cover is made in two parts. The smaller one is provided with a window, and may be removed without disturbing the gearing. The larger part supports the gearing, and may be removed when the churn is cleaned. Both parts are provided with pins that project over the edge of the cover and engage eyes attached to the body of the churn. An aperture for drawing off the milk is made in the side of the churn just above the bottom, and a spout is placed below it. In this improved churn the cream is thoroughly acted upon by the fingers as they are rotated by means of the gearing, so that the greatest possible percentage of butter is produced. By observing the condition of the cream as it is thrown against the window the progress of the churning may be known. After churning, the butter may be washed and worked without removing it from the churn.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED THILL COUPLING.

Alonso Gandy and Henry W. Wilson, Freeport, O.—This invention relates to an improved thill coupling that admits the ready removing and replacing of the shafts, and also the support of the same in raised position, which forms an important feature of this thill coupling, the same combining, furthermore, neatness, lightness, and durability. The invention consists of parallel supports or lugs of the axle clip, of which one support has an eye and extension recess or notch; the other a rigid pivot pin, extending centrally into the eye, and carrying the sleeve attached to the shaft end. The sleeve has a shoulder and fits into the eye, turning on the pivot when inserted into the supporting plates. By allowing the shoulder to rest in the notch the thill is supported in raised position, which forms a very convenient feature of the same, as the shafts may be retained in raised position, and lowered when the horse or horses are harnessed. By pushing the sleeve in so that the shoulder is between the supporting plates, the shaft may be lowered, and is thereby securely coupled. The sleeve turns in the eye around the pivot, which facilitates the coupling, while the front part of the recessed support secures the desired resistance to the draft. The shafts are, by the use of this coupling, easily coupled and uncoupled, and also supported in raised positions when required.

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"Little All Right," the smallest and most perfect Revolver in the world. Radically new both in principle and operation. Send for circular. All Right Firearm's Co., Lawrence, Mass., U.S.A.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Patent Salesmen Wanted.—We will employ a number of men recommended as to character and ability, who have had experience in selling patents by counties—good pay to good men. F. F. Adams & Co., Erie, Pa.

Shaw's Noise-Quelling Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quells all the noise of high pressure escaping steam without any detriment whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

Nickel Salt and Anodes of superior quality at lowest market prices. L. Feuchtwanger & Co., 16 Dey St., N. Y.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

For Best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay Sts., Brooklyn, N. Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Solid Emery Vulcanite Wheels.—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

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Silver Solder and small Tubing. John Holland, Cincinnati, Manufacturer of Gold Pens and Pencil Cases.

Best Glass Oilers. Cody & Ruthven, Cincinnati, O.

For Boul's Paneling, Moulding, and Dovetailing Machine, and other wood-working machinery, address B. C. Machinery Co., Battle Creek, Mich.

Patent Scroll and Band Saws. Best and cheapest in use. Cordesman, Egan & Co., Cincinnati, O.

Chester Steel Castings Co. make castings for heavy gearing, and Hydraulic Cylinders where great strength is required. See their advertisement, page 190.

Reliable information given on all subjects relating to Mechanics, Hydraulics, Pneumatics, Steam Engines, and Boilers, by A. F. Nagle, M.E., Providence, R. I.

Notes & Queries

(1) J. B. asks how to make resin more elastic, that is, overcome the brittleness, without making it expensive? A. Try fusing it with a little oil.

(2) C. B. R. asks for the process of making carbons for battery? A. The fine dust of coke and coking coal is first put into a close iron mould of the shape required for the carbon, and exposed to the heat of the furnace. When taken out, the burned mass is porous and unfit for use, but by repeatedly soaking it in thick sirup of gas tar and heating it, it at length acquires the necessary solidity and conducting power.

(3) C. J. H. asks if the Colorado or potato beetle or bug is the same as the "cantharis vittata" or potato fly? A. No. 2. Has the Colorado beetle similar properties to the cantharides? A. No.

(4) W. A. P. says: I wish a recipe for keeping elder sweet otherwise than boiling? A. Add to it salicylic acid—about 15 grains to the gallon.

(5) C. R. Appingedam, Holland, asks how lard oil is made? A. Lard oil is chiefly obtained as a secondary product in the manufacture of stearin. It is

purified first by agitation with sulphuric acid, and afterwards by steaming it and washing it with water.

(6) T. A. asks: What is the value of sawed pine shingles, as regards durability, when compared with sawed cedar? A. Under ordinary circumstances, cedar shingles are at least 100 per cent more durable than pine.

(7) C. W. B. says that an ounce of alum, added to a pint of flour paste when making it, is an effectual and harmless remedy to preserve it, even during very warm weather.

(8) W. H. H. says: I have a porch laid of pine floor-boards, and had it painted. The heat of the sun has drawn out the pitch or turpentine in large quantities, making it almost unfit for use. Is there any way to remedy the difficulty without taking up the boards? A. Scrape off the pitch and cover the bad places with a coat of shellac varnish, then paint it over again.

(9) A. L. D. M. says: We are troubled in this country with cotton worms, and to prevent their destroying our crops we are compelled to resort to poison. Arsenic proves to be the best remedy yet introduced, but a great many people are afraid it will make the land sterile. Some say it is a fertilizer, while others say it is a sterilizer. A. We do not find that, as usually applied, it has any notable effect in either direction. It would not in any case tend to sterilize the land, unless, perhaps, applied in great excess. In some cases it would doubtless prove beneficial in aiding the plant assimilation, but we would not counsel its use except in cases of necessity—for destruction of insects, etc.

(10) H. C. B. asks: Can india rubber be restored to its original elasticity, which has become hard by several years' exposure to a warm atmosphere? A. No.

Has steam or compressed air power been applied to private carriages? A. Steam has been successfully used. Compressed air has been tried and found inconvenient, owing to the large size of the air chambers required.

(11) M. B. asks how chromo-enameled iron show cards are made? A. They are prepared by dipping the hot metal in the paper pulp, or *papier maché* passing through a bath of alum solution and then through one of soap, alum sized, and hotpressed in the usual manner.

(12) J. M.—Trymethylamine is produced by heating under pressure, in enameled iron vessels, rosaniline, an alcoholic solution of soda or potassa and iodide of methyl.

(13) C. M. says: Not long ago I dug up a few shells from a blue clay bank which were quite soft. After allowing them to dry thoroughly in the sun, I gave them a coat of shellac varnish. They now seem to be covered with a white mould. How can I remove it without injuring the shells, as they are valuable fossils? A. It may be impurities in the varnish, moisture in the shell, or improper mode of varnishing. You can probably remove it with strong, hot alcohol. The varnish should have been made very thin with alcohol, and applied by dipping.

(14) J. H. N. asks how to clean the glass tubes of a fountain which have become muddy on the inside by the deposit of water passing slowly through them? A. It would be better to remove the tubes, if possible, and agitate in them a little water mixed with fine shot, as the dirt would resist most solvents.

(15) C. M. H. says: Please inform me of some recipe for removing superfluous hair? A. Make a strong solution of sulphuret of barium into a paste with powdered starch. Apply immediately after being mixed and allow to remain for ten or fifteen minutes.

(16) E. H. R. asks: Is the following a good recipe for making a good ink, and will it retain its color on books: Copperas $\frac{1}{4}$ lb., brown sugar $\frac{1}{4}$ lb., gum arabic $\frac{1}{4}$ lb., powdered nutgalls $\frac{1}{4}$ lb., rain water 2-gallons? A. Use less sugar and about a third less water. This will afford an excellent black ink if properly made.

(17) B. B. asks: What cement can I put on a leaky piazza roof to make it tight? A. Take 4 lbs. rosin, 1 pint linseed oil, 2 ozs. red lead, stir in fine sand until the proper consistency is secured, and apply warm. This cement becomes hard, and yet possesses considerable elasticity, is durable and waterproof.

(18) C. F. says: I have a lot of books and papers, bound and unbound, into which bedbugs have got. How can I exterminate them? A. Aliberal application of insect powder will no doubt prove effectual or place the papers on a rack in a large close box, and on the bottom of the box place a dish in which burn a small quantity of brimstone.

(19) W. N. R. asks for the solution used for etching on steel and brass? A. For steel, iodine 1 oz., iron filings $\frac{1}{4}$ drachm, water 4 ozs. Digest till the iron is dissolved. For brass, aqua fortis 2 ozs., water 5 ozs.

Is oil of vitriol injurious to leather when used in blacking? A. The amount used is too small to seriously injure the leather.

(20) P. R. H. and C. & Son ask for a japan that will give a good hard black finish on wood? A. Use common black baking japan, to be obtained of the varnish dealers, and when thickly coated on the work bake or dry in an oven or kiln the same as when this japan is put on iron or metal work.

(21) M. C. M. asks: Why is it that a small steam boiler will carry more pressure than a large one? A. Because it is generally stronger.

What simple rule is there for finding the relative value of dollars and pounds sterling? A. Multiply the amount in pounds sterling by 4.83, and the answer is in dollars. Divide dollars by this amount and the result will be pounds sterling. For accurate reduction the rate of foreign exchange and premium on gold over United States currency must be allowed for, for which see early financial quotations in the newspapers.

What is carbolic acid, and how is it made? A. It is a product of coal tar, obtained by distillation.

What is the best filtering material to put in a small

house filter for drinking purposes? A. A sponge answers very well.

(22) G. T. says: We have put up peaches and other fruit in cans which were sealed by soldering. After a few days most of the cans burst open. What was the reason of their bursting? A. The rupture of the cans may have been due either to the fermentation of the fruit, or by the formation of a partial vacuum within through contraction of contained vapor and air on cooling.

(23) W. P. M. says: 1. What length and number of cotton-covered wire shall I use to cover the armature of an electromotor with? A. You may use about 150 feet of No. 16 covered wire. 2. If, after winding one core, shall I continue the wire to the next arm and coil it, or make six separate coils? A. It is better to make separate coils. 3. Is it necessary that the circuit breaker should be insulated from the shaft which is in metallic contact with the magnet cores? Will such an engine, with 10 Grove cells, run a sewing machine? A. Yes.

(24) B. V. H. asks: What can I add to common plaster to make it set quick and hard and be very brittle? A. There is nothing possessed of all these requisite properties. Perhaps soluble alkaline silicates (water glass) may answer your purpose. Plaster made up with alum water instead of water alone, sets very hard, but not quickly.

(25) E. F. asks how to fasten photographs on glass without leaving air bubbles and not have them cleave off? Also how to make them transparent? A. If you refer to a photograph on paper, smooth and dry it perfectly, and coat the face uniformly with a thin balsam. Warm the plate and curl on the paper, letting the middle touch first, and immediately bring down the ends. Or attach one end of the paper and pass a small roller over it so as to place it in smooth contact at one motion. Finally, give the back of the picture a smooth flowing coat of good negative varnish.

How was the bread made that was used at the "dairy" on the Centennial ground? The loaves were about 2 feet long and 3 or 4 inches in diameter. A. See p. 240, vol. 34, of SCIENTIFIC AMERICAN.

(26) J. H. R. says, in answer to W. E. S., paragraph (18): The fulcrum is below the water line, and more or less near it as the ship has less or more ballast. If she is heavily ballasted and unladen the fulcrum will be near the bottom. If her load is near the water line and she has no ballast, the fulcrum will be near the water line.

(27) Subscriber asks: What ought to be the weight of a balance wheel for a foot lathe to turn wood? A. From 80 to 100 lbs.

(28) A. G. W. asks: Would it not be better to ventilate a stable from the top by extending a tube from the ceiling to the peak of the barn for the foul air to escape? Extend another one from some cold room or hayloft above down to within about one foot of the stable floor. Through this second tube the cold air will descend, as, being heavier than the warmer foul air of the stable, it will take the lowest place, and drive the bad air up through the first tube. A. If the room above, from which the fresh air is to be drawn, is tight, the air cannot be supplied from it to a sufficient extent. The varying pressure of the atmosphere, arising from the winds and from barometric changes, would provide a more efficient ventilation in this case, which could be tempered and graduated as experience should dictate; the openings could be provided with graduated registers, or fixed blinds outside of sliding shutters.

(29) B. S. says: I want to paint the joints of some brickwork black. I would like to know what is mixed with the mortar in preparing it for use? A. Coal dust and English drop black are used for coloring. Prepare the mortar and mix in the color until black enough to suit.

(30) Novice, London, Canada, asks how to lay a tile pavement? A. Make a bed for the pavement of broken stones pounded together, over which spread a layer of cement. When dry, spread over this a layer of cement in which the tiles are carefully set.

(31) J. G., of Montreal, asks for a recipe to stiffen felt hats, and how prepared? A. Mix 18 lbs. of shellac with $\frac{1}{4}$ lb. salt of tartar (carbonate of potash) and $\frac{1}{4}$ gallons of water. Put in a kettle and boil gradually until the shellac is dissolved, when the liquid will be clear as water. When cold dip the hats, and when nearly dry dip in a weak solution of acetic or sulphuric acid in order to neutralize the potash and cause the shellac to set.

(32) D. B. H. asks: Does it require battery power to work a telephone on a short line, say half a mile? A. No battery is required. The telephone contains a small electrical device on which the force of the voice acts and produces an electrical current.

(33) C. M. K. asks if there is any difference in testing gas pipe with a mercury gauge, whether mercury or water be used in the gauge? A. Water can be used, but mercury is ordinarily more convenient in the case of an open gauge.

(34) T. P. B. says he has a lot of 1 inch steam pipe, and a four horse engine, and wishes to use the pipe in some way to make steam to run the engine? A. We know of no practical way to use pipe so small to make a serviceable boiler or steam generator.

(35) C. H. W. says: I want a method to prevent scale forming upon polished steel and iron while heating? A. If your steel is sufficiently heated it will scale when exposed to the air. If you wish to merely soften the work, you may prevent scaling by heating it enclosed in a box or tube filled with steel turnings, luting the box or tube with clay, and allowing the steel to cool before removing it.

(36) D. F. asks for information on bleaching hair, human or yak hair? A. Gaseous chlorine is the most effectual agent in bleaching. Clean the hair with a warm solution of soda, and wash thoroughly with warm water. While the hair is moist, put in an earthen jar and introduce the chlorine until the jar is

filled with the greenish gas. Allow to stand for twenty-four hours and repeat the operation if necessary.

(37) B. B. O. says: The waste pipe from my bathtub, located on the second floor, leads down to the basement, where it unites with the waste from the kitchen sink, and both pass out together into a terra cotta pipe, which after running some thirty feet from the house empties itself into a blind ditch about 2 feet or more below the surface. The ditch is made of stones laid in the bottom of the trench to a depth of 8 inches, then comes a layer of rye straw, and on top the earth. A rain spout leads into the terra cotta pipe, and both waste pipes are trapped before they unite. Is the arrangement a safe one against the escape of noxious gases? A. An accumulation of sediment is likely to take place at the blind ditch. It would be advisable to provide a large cesspool there with a movable cover below frost, and so built as to trap and overflow into the ditch—this can be conveniently cleaned out when necessary. The rain water pipe should act as a sufficient ventilator to your drain pipe.

(38) D. C. W. asks for a recipe for the varnish or lacquer which is used on gun barrels? A. Dissolve 1 oz. of shellac and 2 drachms of dragon's blood in 1 quart of alcohol. Filter through blotting paper and keep closely corked in a bottle. When put upon the barrel, and after becoming perfectly dry, rub with a burnisher to make it firm and glossy.

(39) J. J. R. R. asks: What is the greatest pressure per square inch that can be applied to a steel pivot or step turning on a steel surface or bearing, without destroying lubrication? A. About 2,500 lbs. 2. Does friction in turning or sliding surfaces increase with the pressure, and what is the ratio of increase of friction to increase of pressure? A. Some of the latest experiments are described on p. 1200 of the SCIENTIFIC AMERICAN SUPPLEMENT.

(40) F. E. P. says: I have an engine cylinder 2 x 4 inches, also a boiler shell 14 x 24 inches. Will the shell furnish steam for my cylinder? The shell is of $\frac{1}{4}$ inch iron heavily riveted. Can I with safety put in cast heads? How many $\frac{1}{4}$ inch gas pipe flues will I need in said boiler, using it as an upright boiler? A. It will be better to use wrought iron heads. Place the tubes from $2\frac{1}{2}$ to 3 inches between centers.

(41) A. I. P. says: We use a band saw for sawing cane seat chair bottoms. The lumber is seasoned hard wood $1\frac{1}{2}$ inches thick. The shaft makes 475 revolutions. The saw pulleys are iron, leather covered, 30 inches diameter. Saw frame all iron. Sometimes the saws break five times a day, at other times they will run two or three days without breaking. We have tried $\frac{1}{4}$ inch, $\frac{1}{2}$ inch and $\frac{3}{4}$ inch saws of different makes, but with no better results. A. Sudden changes in the speed of the saw, or great variations in the quality of the timber, is probably the cause of the breakages.

(42) C. K. W. says: I have a small music box in which there are small bristles on the under side of the comb to stop the vibration of the same before it is reached by another tooth on the cylinder. What kind of cement can I use to make these bristles stick to the steel comb? A. You can attach them with shellac varnish.

(43) W. F. M. asks: How are chromos mounted? A. It is generally more convenient to attach the cloth to the frame after the picture is mounted. First stretch the cloth tightly on a board, securing it by tacks. Use common flour paste, and saturate the cloth with it. Cover the back of the chromo with paste, and apply it to the cloth, a little at a time, laying it smooth by gentle pressure.

(44) A. F. B. says: Would it be practicable to run a set of wheels and pinions with a weight, as follows: Five wheels of 6 inches diameter, gearing into 4 pinions of $\frac{1}{4}$ the diameter of the wheels, and the fifth 6 inch wheel gearing into a 3 inch wheel, which would thus revolve 2,592 times for each revolution of the first 6 inch wheel? By applying a weight for motor to this first 6 inch wheel, of 400 lbs., what power would I have left for work? A. The loss from friction will depend upon the accuracy of workmanship. With nicely cut gear you may get an efficiency of from 60 to 70 per cent of the applied power.

(45) F. L. S. says: A friend makes the statement that the English Government has a gun capable of throwing a projectile from Dover to Calais. 1. What is the distance in a direct line between the cities? A. Twenty-six miles. 2. What is the greatest distance yet attained by any gun in throwing its projectile? A. About 6 miles.

(46) W. L. F. asks: 1. What is the proper breadth of beam and depth of a boat 16 feet long, clinker built? A. Beam 4 feet and depth 18 inches. 2. How high above the boiler will I have to place a cistern to overcome a pressure of 40 lbs. in order to feed the same by hydraulic pressure? A. About 93 feet.

(47) W. S. says: Supposing a locomotive engine, having one side unconnected, and the crank on the other side at right angles to the dead centers, and at the nearest point to the rails; when steam is admitted into the cylinder, why does the engine go forward when the force is applied in a backward direction? A. Because the rail cannot move backward.

(48) L. M. S. says: How can I make a preparation something like varnish, to dip pencil drawings in to give them a fine appearance and to preserve the paper? A. Dissolve 6 ozs. Canada balsam and 6 ozs. white resin in 1 quart of oil of turpentine.

(49) F. W. K. asks: I have a room 80x30 by 9 feet high, and wish to know about how much pipe it will require to heat it properly? A. The amount of radiating surface depends upon the character of building, number and size of windows, etc. Such a room as you speak of would need under ordinary circumstances from 150 to 175 square feet of radiating surface.

(50) K. Bros. say: Suppose there are 3 cast iron shafts 14 feet long and 8 inches diameter, one having a hole of 6 inches through the middle, the other be-

ing cast solid metal throughout, and the third having a wrought iron shaft 4 inches in diameter cast in the middle the whole length of the shaft: which of the three will stand the greatest weight in the middle, if the shafts are suspended at both ends? A. The third.

(51) C. W. W. asks for a white fusible alloy that will take a fine impression when cast in plaster of Paris moulds? A. Lead 9 parts, antimony 2 parts, bismuth 1 part. This alloy expands as it cools and brings out a fine impression.

(52) G. N. asks for a process by which brass can be kept a bright color? A. In $\frac{1}{4}$ pint of best alcohol dissolve $\frac{1}{4}$ lb. of best seed lac. Warm the work and apply the dissolved lac, with a soft fine brush.

(53) C. L. asks how the process of enameling or glazing is done on cast iron? A. The enamel is made of powdered flints, ground with calcined borax, fine clay, and a little felspar. The mixture is made into a paste with water and brushed over the metal to be glazed, which has been previously cleaned and made bright with dilute sulphuric acid, and washed clean. While the glaze is still moist it is dusted over a mixture of felspar, carbonate of sodium, borax, and a little oxide of tin. The glaze is gradually dried and then fused in a muffle at a red heat.

(54) F. W. W. asks: Can you give me a recipe for making white ink, to write on a black or blue surface? A. With some papers an aqueous solution of bleaching powder with a little gum will answer. A solution of oxalic acid thickened somewhat with filtered dextrin solution has also been used. Or use a solution of gum arabic and sugar in water, through which has been diffused finest precipitated chalk or ground starch.

(55) N. H. says: I bought a piece of corned beef and cooked it. The following night I opened the refrigerator in the dark and the beef lighted up with a phosphorescent light. What was the cause and is the meat healthy to eat? A. The phosphorescence noted was very probably due to the saccharine matter or salts used in curing the meat. A change of temperature, which induces crystallization in solutions of these, often gives rise to the phenomena, after removal from strong light. The meat may be fit to eat.

(56) Mrs. G. W. L. asks for a recipe for canning green corn so it will keep? A. Among fruits, etc., green corn is one of the most difficult to preserve by canning. The following is the method in use by many of the large canning establishments. The corn, after removing from the cob, is filled into the clean cans so as to leave no air spaces. These are placed in a large oven or other airtight vessel, and subjected to hot steam under pressure. The harder the corn the longer the exposure required to thus cure it; it is said that in some cases as much as eight hours is requisite, but usually much less than this. A large vessel of boiling water, in which the cans are immersed, may be used instead of the steam oven, but is not so effective. On removal from the oven or water bath, as the case may be, each can (they must be filled to the cover with fruit) has the cap with a very small hole tapped in its center immediately soldered on. As soon thereafter as the can stops blowing, as the escape of steam and air through the vent is termed, the hole is quickly soldered. This must be done before the air begins to enter. Other fruit is cured and canned in like manner—tomatoes rarely require longer than 15 to 30 minutes steam curing. Where the pits are left in fruit a longer time is requisite to completely destroy all fermentative germs.

(57) J. F. C. asks, 1, for a quick process of bleaching cotton thread? A. In practice the following is found one of the best: The cotton is banded for 8 hours in a lye made from 64 lbs. soda crystals and 2 lbs. 3 ozs. quicklime. After washing out it is passed into a chloride of lime (bleaching powder) solution for two hours, and then at once into weak sulphuric acid for 20 minutes. Use 11 lbs. chloride of lime and 23 fluid ozs. sulphuric acid. These quantities are for 230 lbs. of cotton. The cotton is then washed in running water, and taken once or twice through a hand-warm soap suds, using for the above weight 2 lbs. 3 ozs. palm oil soap. 2. Is there more power in the same quantity of water after night than there is in daytime? A. No.

(58) J. H. D. S., in giving an account of a table knife that was left for a few days in the remains of a water melon, and found nearly eaten up or consumed, asks what acid there is in the melon to cause this? A. Carbonic, and the various vegetable and organic acids rapidly corrode iron or steel in the presence of air and moisture. In substance, over 80 per cent of the common, well-ripened water melon consists of water. In summer weather the decay of broken melon, when once begun, is very rapid, and is accompanied by the formation of carbonic, acetic, and other peculiar organic acids. Under such favorable conditions it is not surprising that the knife was eaten by the melon.

(59) F. W. S., of Toronto, asks how to make a buff wheel for polishing steel? A. Turn up the wooden disk to form the wheel on the mandril on which it is to run. Cover the periphery of the wheel with good glue, prepared as for gluing wood, stretch the leather around and confine it with shoe pegs driven in about two inches apart. When dry turn off true with a sharp chisel. Give the leather a coat of glue and roll it in the emery, so as to make it retain it by being imbedded in the glue. Set the wheel dry until the glue is hard and it is ready for use.

(60) M. D. asks: 1. If limestone was put into a retort, what would be the gas that would pass off if heated red hot? A. Carbonic anhydride, often called carbonic acid; a gas composed of 12 parts carbon and 32 parts oxygen (by weight) in a state of combination. 2. Could one bushel of lime be so prepared as to absorb all of the carbon gas in three bushels of lime? A. No. 3. Would the carbon improve the cementing quality of the lime? A. No. It would have the opposite effect. 4. If charcoal was put into a retort and heated to a red heat, would it give off one quarter as much carbon gas as it would if it was wholly consumed? A. Freshly and thoroughly carbonized charcoal, if heated in a retort, would not yield a notable quantity of gas unless supplied with air, oxygen, steam, etc. With a plentiful supply of the former, carbonic acid would result; with air the same, but mixed with nitrogen; with steam the

principal product would be carbonic acid, hydrogen, and carbonic oxide—the latter gas is very poisonous and inflammable. The amount of gas would be directly proportional to the quantity of charcoal burned. 5. If charcoal was heated red hot and then cooled off, would it regain its carbon gas from the atmosphere? A. Charcoal is capable of absorbing about 35 times its bulk of carbonic acid. This it gives out on heating, and on cooling may absorb again. 6. Is not carbon gas heavier than the air? A. Yes, about half as heavy again. 7. What acids will dissolve carbon? A. It is insoluble in acids, but is oxidized by nitric acid. 8. Will not water boil quicker in a copper dish than in an iron dish, other things being equal? A. Yes, a little.

(61) F. P. asks how to make a faradic battery? A. For faradic currents you will require a small induction coil in addition to the batteries you mention, which are constructed on the correct principle. To make an induction coil, wrap a thick cylindrical penholder back and forth—after the manner of spooled thread—with about a hundred feet of good copper wire, a fifth the size of telegraph line wire, and insulated by winding with silk or cotton. Wrap tightly around this coil a sheet of thin oiled paper, and over this bind, in a manner as before, five hundred or more feet of the finest insulated copper wire obtainable. Then force out the penholder, being careful not to tear the insulation of the wire, and fill its place with a bundle of soft iron wires. Connect the battery wires (one from the zinc and the other from the copper) with the free ends of the thick wire in the coil; then, on making or breaking the battery circuit, temporary induced currents will be caused in the fine wire, and may be utilized by attaching wet sponges to the free ends of the wire and permitting them to come simultaneously in contact with the body while the instrument is working. The batteries must be excited with weak sulphuric acid. A simple interrupter for the primary circuit is a file attached to one end of the coil wire, while the free end (from the battery) is rasped over the rough part of the file. The withdrawal, more or less, of the soft wire core diminishes proportionately the intensity of the secondary currents.

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

L. F.—It is gypsum—a calcium sulphate.—J. M. F.—It is a variety of bituminous coal, yielding considerable ash. The freshly mined shale may be of some value for fuel and gas making.—J. W. E.—Your minerals do not come to hand. Send another specimen.—C. T.—It is mispikite, or arsenical pyrites—a combination of sulphur, iron, and arsenic.—We have a number of packages of minerals, etc., without mark to designate the senders.

COMMUNICATIONS RECEIVED.

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

On the Sea. By D. G. E.
On Engines and Boilers of Screw Tug Boats. By D. L.
On Reforms. By R. H. L.
On Whence Came our Dry Land. By A. B.
On a Combat between a Squirrel and a Snake. By I. E. E.
On the Formation of a Sea in Sahara. By T. M. M.
On Rafts Floating Faster than the Current, etc. By W. M.
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Also inquiries and answers from the following:
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Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

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

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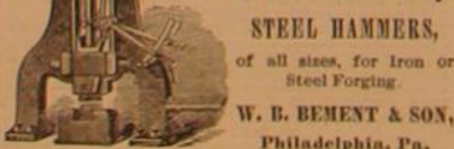
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NEW YORK, SEPTEMBER 29, 1877.

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Self-Acting Car Couplers.

The coupling of cars need not always be effected by the use of a link and pins, but it must be remembered, says the *Railroad Gazette*, that in attaching cars together they must be entirely free, within certain limits, to move up or down or laterally, otherwise the attachments or the cars themselves will be broken. As there are very few mechanical devices which will furnish a secure attachment in one direction, and will yet allow this freedom of movement in others, it will be seen that if the simplest one of them is abandoned a new set of difficulties is encountered.

Now, besides all these, it must also be taken into consideration that the cars to which self-coupling arrangements must be attached vary very much in their construction. The height of their drawbars is not uniform, and their form differs more than their height. In the case of the machine for picking up screws, the latter were all exactly alike, whereas if they had been of different sizes and shapes the difficulty of handling them by an automatic machine would have been immensely increased.

It will be seen, then, that the problem of making a self-coupler, instead of being a very simple one, is in reality very complicated. In addition to this, the fact that the thousand or more inventors who have been engaged in attempts at producing a really practicable self-coupler are, the great majority of them, inexperienced mechanics, have no knowledge of drawing, which is the language of invention, and probably never coupled a car in their lives—when all these considerations are taken in mind, it will be apparent that there is no cause for surprise that nearly, if not quite, all of their work has been ineffective.

If there were a rule in the Patent Office that no application for a patent for a self-coupler would be received unless the inventor would first give proper evidence that he had been engaged for three months in coupling cars, there would then certainly be fewer applications received, and there is no doubt that those sent in would describe inventions of more merit than is possessed by those which are received now. As coupling cars is a dangerous occupation, there would, with such a regulation, probably be fewer inventors of car couplers left alive—a result which, we are inclined to believe, many railroad officers and some editors of railroad newspapers would not regret.

Speaking seriously, however, if inventors would direct their attention more to devices by which cars could be coupled without its being necessary for a

person to go between them, they would probably accomplish more than they have thus far. If, too, car builders would take steps to construct their cars so that a person in between them would be secure from accident and injury, they would do more to preserve lives and limbs than they will by dreaming over self-coupling expedients, although, doubtless, such arrangements, if practicable, are very much to be desired.

Preparation of Oxalic Acid from Parchment Paper.

The waste left after the manufacture of ordinary paper are, as is well known, reutilized for paper making, but the raw material which is used for the fabrication of parchment paper always furnishes after the sulphuric acid treatment a considerable quantity of refuse residue not fit for paper making nor yet suitable as a combustible. As however, the parchment paper is made from pure rags, Mr. C. O. Cech, in *Dingler's Journal*, proposes to use this waste material after lixiviation in caustic potash for the preparation of oxalic acid, for which he considers it better than sawdust or beet pulp.

VERTICAL COMPOUND ENGINE WITH ALLISON'S BOILER.

We give herewith a perspective view, from *Engineering*, of a vertical compound condensing engine, constructed by Messrs. John Fowler & Co., of Leeds, England, for Mr. John Allison, of Lancaster Gate, and a boiler constructed by Messrs. Fraser Brothers, of London, according to the patented designs of Mr. Allison. We also give, in Figs. 1, 2, and 3, page 194, sectional views of the boiler.

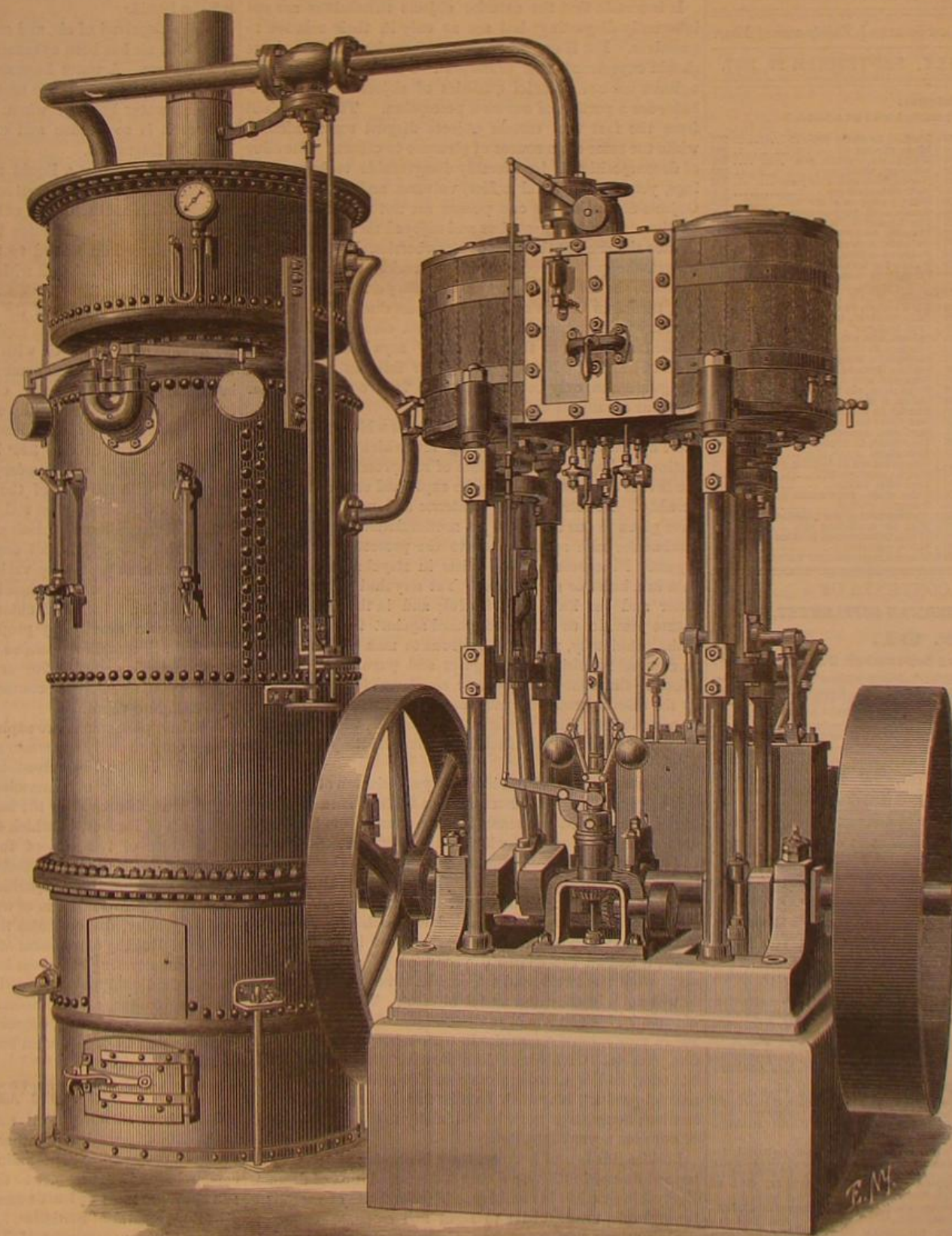
The engine is of the compound intermediate receiver type, the cranks being at right angles. The framing consists, as will be seen from the engraving, Fig. 1, of four wrought iron standards, 2½ inches in diameter, connecting the cylinders and bed plate, these standards being each made square at two points in their height to facilitate the attachment of the stays which carry the guide bars. The cylinders are both steam jacketed, and they are 9 inches and 15 inches in diameter respectively, the stroke of both pistons being 1 foot 4 inches. The engines are intended to be run at a piston speed of 400 feet per minute. The small cylinder is fitted

with an adjustable expansion valve at the back of the main slide, while the low pressure cylinder has a single valve only. The air pump is vertical, and is worked by levers connected to the cross-head of the low pressure piston.

The boiler is of a type designed and patented by Mr. Allison. As shown in the sectional views, the fire is contained in a chamber lined with fire-brick and situated below the boiler, this chamber forming a prolongation of the internal firebox. The air on its way to the fire-grate passes down between the exterior of this chamber and an annular brick pier on which the boiler is supported. Holes are formed in the sides of the furnace chamber for the admission of air above the fire if required. This arrangement of brick-lined furnace is one well adapted to secure good combustion, but we may remark that Mr. Allison does not propose to employ it in all cases, it being intended that the grate should, in the majority of instances, be fitted at the bottom of the firebox in the usual way.

As shown in the vertical section, a series of bent tubes extend from the sides of the firebox to the crown, these tubes being disposed in four rings, as shown. The firebox is surrounded by an annular diaphragm plate for the purpose of separating the upward and downward currents, and thus promoting circulation, while at the upper ends of the bent tubes deflectors are placed, as shown.

[Continued on page 194.]



VERTICAL COMPOUND ENGINE AND BOILER.

Scientific American.

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NEW YORK, SATURDAY, SEPTEMBER 29, 1877.

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DISGUST.

A remarkable and ingenious analysis of the sensation of disgust and the causes to which it is owing, has recently appeared in the *Revue des Deux Mondes*, over the signature of M. Charles Richet. We regret that our limited space precludes notice of the wealth of illustrative instances which the author brings forward to negative the old saying, and to reach a result which shows that, if "there is no accounting for taste," there is at least a very plausible accounting for distaste. The reasoning, however, of which we have prepared the following summary, is well worth consideration:

There exists in nature, for man as well as for all other living beings, certain substances which are alimentary and others which are not. There exists also a special sense which warns us of the nutritive value of different substances. This sense depends upon the sense of taste. Milk, sugar, and meat are aliments, and taste testifies to the fact, inasmuch as it is agreeably excited by all three. Nor could the contrary be true. Nature could not have inspired us with repugnance for that which should and does constitute our nourishment. Moreover, and besides the sense of taste, by a very simple association of ideas, the senses of smell and sight are affected so that these aliments gratify us both by their odor and aspect.

Co-ordinate with taste exists a totally opposite sense, namely, disgust. This is a sort of pain which, if it is too prolonged or too intense, leads to nausea. But if taken in its restricted meaning, it is simply the perception of a disagreeable odor or flavor. Thus bitter and fetid substances produce disgust. If by an effort of the will we eat such bodies, then nausea supervenes. Similarly sight and feeling may also produce in us disagreeable sensations comparable to the foregoing, so that there may be recognized, first, gustative and olfactory disgust, and second, visual and tactile disgust, all of which produce similar effects.

It is certain that the exterior objects themselves are not inherently disgusting; but are so only in their relation to ourselves. For if our organs were otherwise constituted, we should experience other sensations. Fetidity, bitterness, or ugliness are not essential qualities of objects. Such attributes are a portion of our own perception. This is evident from the fact that certain objects disgust some animals, while the same are a source of pleasure to others. The odor of decomposition is insufferably disagreeable to human beings, yet it is delightful to flies, vultures, and carrion crows. Objects disgusting to one person are not necessarily so to another. Laplace ate spiders and enjoyed them. A king of France sickened at the odor of strawberries. Digger Indians eat grasshoppers. A recent Chinese traveler gives an instance of where the inhabitants, while devouring a meal of decayed fish, turned in violent disgust from roast duck. The toad is to many people repulsive. Yet it is not essentially hideous. "The female toad to the male toad," says Voltaire, "is an ideal of beauty." Nothing is ugly or fetid in nature; but things seem so only because they are in a certain relation with our organization.

Despite the mass of contradictory facts which envelope it, there appears to be an underlying law which connects this instinct of disgust to the instinct of self-preservation. How the first is to be acquired is to be explained only as a fact of heredity. The struggle for existence and natural selection have given to our ancestors an accumulation of instinctive sentiments, each appropriated to the protection of certain organs. Bitterness no more exists in strychnine than does pain in a knife or red-hot iron. Yet strychnine seems to be bitter and the knife cut painful; and in these sensations nature provides us with a safeguard against the dangers of both. Similarly, reptiles dangerous to man inspire us with an extreme repulsion. Foul gases and purulent liquids, by affecting the three senses of taste, smell, and feeling, likewise by the disgust produced, warn us of their perils. But instinct is, nevertheless, blind. Quinine, for example, which it recognizes as bitter and distasteful, is often salutary and beneficial.

As a consequence of this hereditary acquisition of instinct, it follows that the substances not met with in nature cannot have any action on our senses if their constitution is totally different from those with which we or our ancestors are or have been familiar. Suppose, for example, that a plant should be discovered containing a dangerous but hitherto unknown alkaloid. As this might have some properties of, and hence the taste of, other alkaloids, such as quinine or strychnine, we should thus be warned; but if, on the contrary, it had all the chemical properties of sugar, then its savor would be sweet, and we could not tell whether it was or was not a healthy and useful aliment. The same is true of artificial bodies: the cyanides and prussic acid are found but in very minute quantities in nature, yet their taste is not disagreeable. Carbonic oxide, a most dangerous gas, is without odor, and is unrecognizable to the senses. It is not a natural product, inasmuch as it is due to incomplete combustion; hence, as it must be artificially made, the ancestors of our race never encountered it.

Besides this law of nocuity, there is another which may be termed that of inutility, as being at the foundation of disgust. Everything useless is revolting. The products of secretion, for example, are repulsive to sight and smell, when the organism rejects them as useless. Milk, on the other hand, is agreeable both in taste and odor.

Disgust, lastly, may be produced by mere recollection, without any actual sensual impression. When we speak of a toad, we think of a toad and the idea may be disgusting; but if, while speaking, we consider the toad from a special

point of view, as, for example, its habits, its physiological nature, its use to the farmer, etc., then the sentiment of disgust vanishes. Similarly, in works of art, where the dominant idea may be one which naturally would cause disgust, yet the idea may be so combined with others that the feeling is not experienced, but, on the contrary, the general impression is agreeable.

To sum up, disgust is an instinctive sentiment of self-protection, variable with the species, and according to the alimentation, habits and education of individuals. It is the consequence of heredity, but it is an imperfect instinct, since it judges simply by form and appearance.

ANOMALIES IN THE TEMPERATURE OF THE BOILING POINT.

It has been observed that the mere contact with certain surfaces retards the boiling. For instance, in a metallic vessel water boils with perfect regularity, and at a temperature properly corresponding to the pressure to which it is exposed; the vapor bubbles which develop on all points of the walls of the vessel are very small and follow one another with perfect regularity. In vessels of glass and porcelain, to the contrary, the vapor bubbles develop only at few points, which are always the same. The bubbles are large, and do not follow one another with rapidity. The temperature of water boiling in glass vessels is also higher, often as much as 2° Fah., than the temperature of water boiling in metallic vessels under otherwise the same circumstances.

The boiling of sulphuric acid takes place in glass vessels only with intermittent impulses. The temperature rises above the regular boiling point, until at the bottom of the vessel a large vapor bubble is formed, the appearance of which is always accompanied by a lowering of the temperature. Such irregularities in the boiling are easily avoided by throwing platinum wire on the bottom of the vessel containing the liquid.

Water deprived of air, and enclosed in a glass tube from which the air has been exhausted, boils only at a very high temperature. A water hammer, which is arranged as described, may sometimes be heated to 275° or 300° Fah. without the water boiling; when, however, the boiling commences it is so sudden and explosive that the glass tube bursts in fragments.

Dufour found that a liquid may be heated far above its normal boiling point without actually boiling when it is surrounded with another liquid of higher boiling point, in which it will not dissolve. If water is gradually poured, drop by drop, on linseed oil heated to 220° to 230° Fah., the drops fall slowly through the oil without showing the formation of any vapor, while this only takes place when they come in contact with the bottom of the vessel, when they boil away violently, and steam passes rapidly upward through the oil. By mixing some fatty oil with a liquid may be obtained, which, when hot, has the same specific gravity as water, and in which globules of water, of various diameters varying from $\frac{1}{16}$ to $\frac{1}{2}$ of an inch, will remain suspended without rising or falling. By careful heating the temperature can be raised to 250° and even to 340° before the water commences to boil. When, however, a drop of water so heated comes in contact with the side of the vessel, or with a solid body, such as a wooden or glass rod, it boils at once away with great violence, almost explosive.

That this property is not confined to water but to other liquids has been proved by various trials. So, for instance, when chloroform, which, when heated by itself, boils at 142°, is poured in a solution of chloride of zinc, brought to the same specific gravity by proper dilution, the chloroform globules will remain suspended and the solution of chloride of zinc may be heated to 200° or 212°, before the chloroform will boil; but also here the contact of any solid body will cause it to flash into vapor.

All these phenomena are explained by the fact that liquids adhere very strongly to certain solids, and more to glass than to metal. But that liquids adhere still more to other liquids, even when they do not intermingle (such as water to oil or chloroform), is proved by the last mentioned interesting experiments of Dufour, in which the water globules suspended in a mixture of two oils of the same specific gravity, also demonstrate the mutual adhesion of the water particles, in the same way that in the experiment of Plateau the suspension of oil globules in a mixture of water and alcohol, of the same specific gravity, demonstrates the mutual adhesion of the oil particles. But the experiment of Dufour is the most remarkable, demonstrating as it does how the effect of heat in separating the liquid particles and changing them into vapor needs the contact of solid bodies to be effective, and may be counteracted to a certain degree by withdrawing the liquid from the contact of any solid body, by supporting it floating in another liquid.

SUN SPOTS AND FAMINE.

It has been surmised that some relation exists between sun spots and prevalent weather on the earth, and the theory has been proposed that periodic variations in climate bear some relation in recurrence to the cyclical periods when the sun spots are most or least numerous. Dr. Hunter, Official Director General of Statistics, has recently directed the attention of the government of India to this alleged connection between the periods of maxima and minima sun spots and the amount of rainfall at corresponding times in the Madras Presidency, where a great famine is now impending. General Strachey, however, in a recent communication read before the Royal Society, after a careful examination of the

recorded rainfalls in Madras, Calcutta, and Bombay for the past 64 years, comes to the conclusion that no real connection has been established between rainfall and sun spots, and shows that, even if such were apparently the case as regards Madras, the same would be true in Calcutta and Bombay, whereas the rain tables of those localities show no such coincidence.

THE AGRICULTURAL VALUE OF WORMS.

In 1837 Mr. Darwin, in a paper read before the British Geological Society, explained how the formation of vegetable mold which forms a covering several inches in depth on the surface of productive land was directly due to the common earth worm. The soil, he stated, was simply the non-nutritious matter contained in the earth originally eaten by the worm and rejected by it, and the accumulated deposits of large numbers of worms produced the extensive layers commonly found. Quite recently Herr Von Hensen has investigated further into this subject and has confirmed Darwin's conclusions while supplementing with many of his own. An abstract of his investigations appears in the XIXth Century.

He states that the adult worms come to surface at night and, with their tails in their burrows, collect the twigs, leaves, etc., which serve as their food. This material is heaped around the orifice of the burrow and is drawn in piece by piece, the leaves in time becoming macerated and decomposed, and thus rendered suitable for the worms eating. The investigations were conducted in a garden having a layer of mold 9 inches deep and a subsoil of yellow diluvial sand. The worm tubes were not easily traced in the mold, but were perfectly clear in the sand, running vertically downwards to a depth of from 3 to 6 feet. On the walls of these burrows the black masses of excrement of the worms were plainly visible. Some tubes were entirely filled with this substance, the black color of which was diffused into the adjacent soil. In about half the inhabited tubes, plant roots had entered, following their course. By extended observations the author states that the roots of annuals can only penetrate into the subsoil through channels opened out to them by earth worms, and he observes that this penetration must be of service to the plant, as the subsoil retains moisture longer than the surface layer of the mold.

In order to ascertain the precise part taken by the worm in making this vegetable mold, two worms were placed in a glass vessel filled with sand, on the surface of which was spread a layer of fallen leaves. The worms set to work at once, and after about six weeks the surface of the sand was found to be covered with a layer of mold nearly half an inch deep, while many leaves had been carried to a depth of three inches. Worm tubes ran in all directions through the sand; some were quite fresh, others had a wall of mold an eighth of an inch thick, others again were completely filled with mold. In short the soil of the vessel was already perfectly well prepared for the growth of plants.

Herr von Hensen finds that, although the earth worm weighs only about 46 grains, it produces in four hours nearly 8 grains of excrementitious matter. On an average he finds about 34,000 worms to an acre of ground. Their combined weight is therefore over 220 pounds and they produce about 37 pounds of mold in 24 hours. Besides this, they produce a uniform distribution of the mold, open up passages in the subsoil for roots, and render the subsoil fertile.

THE INTERNATIONAL RIFLE CONTEST.

The most accurate marksmanship ever exhibited in a public competition was displayed by the American and British teams in their recent contest at Creedmoor. The figures made not only by the American team which won, but by the losing British team, have never before been equaled. On the first day the American score stood 1655, out of a possible 1800, and the British 1629; on the second day the totals were respectively 1679 and 1613, giving, for full scores, Americans 3334 and British 3242. The Americans beat their own winning score of last year, over the Scotch, Irish, Canadian, and Australian teams, by 208 points.

The ranges were as usual 800, 900, 1,000 yards, each rifleman having 15 shots over each range. As a bullseye counts as 5, the highest possible figure which can be made by each man is 450. The largest individual scores were made by Messrs. L. C. Bruce and C. E. Blydenburgh of the American team. Mr. Blydenburgh counted 429 out of the possible 450 on his six targets, and Mr. Bruce 425. The leading British total, made by Sir Henry Halford, ranks seventh as compared with the American list.

It is generally conceded that the American team owe their success not merely to superior skill but to better weapons and more perfect organization than were possessed by the English.

METEORIC HEAT.

In our abstract of the proceedings of the British Association at Plymouth, in last week's issue, we noted Sir William Thompson's rather untenable idea of the possibility of the importation of life from other planets to our earth by means of a meteorite. The supposition was that as some germs are known to be able to withstand a comparatively high degree of temperature, and as in fact the exact degree fatal to all forms of life is not definitely known, therefore it was possible that some germs might stow themselves away in a deep crevice of the meteorite, and so be transported to earth none the worse for the heat to which they might be subjected during the voyage.

The velocity of meteorites has been found to be between 51,200 and 512,000 feet, or say, on an average, 30 miles per second. Assuming this last mean, M. Govi, in a recent communication to the French Academy of Sciences, has shown that a meteorite striking our atmosphere at a distance of about 95 miles from the earth, where the pressure about equals .04 inch of mercury, would lose, through the resistance of this highly rarefied air, half its velocity, which would be reduced to about 89,600 feet, or say 15 miles per second. If the meteorite continued into the atmosphere until it reached a point where the pressure was .4 inch of mercury, its velocity would then be reduced to 18,931 feet, or between 3 and 4 miles, and finally, if it succeeded in attaining a region where a pressure corresponding to 4 inches of mercury prevailed, its velocity would be only 1,619 feet per second.

The consequence of this loss of motion is development of heat proportional to the mass multiplied by the square of the velocity. Now M. Govi has calculated that, even at that extreme height where the barometric pressure is equivalent to but .04 inch of mercury, the heat developed by the loss of motion of the average meteorite amounts to three million calories, equivalent to that required to raise 6,600,000 lbs. of water 1.8° Fah. As the heat developed increases as the meteorite enters further into our atmosphere, it is somewhat improbable that any such body ever reaches our earth until it has been subjected to a temperature much more than sufficient to destroy any form of organism.

INFLUENCE OF LIGHT ON THE ELECTRIC CONDITION OF METALS IN SALINE SOLUTIONS.

Metal plates were placed by Herr Hankel, one in a porous battery cup (closed by a cork) the other in a transparent exterior vessel. The vessels were filled with solution and enclosed in a blackened box in which was an aperture which could be closed at will, or before which colored screens could be placed.

With two plates of polished copper, plunged in water, the plate on which the sunlight fell was negative. The action of colored rays reached its maximum in the blue. When the copper became more or less strongly oxidized or covered with salts, the plate, at first positive, then became negative and kept its sign when the light was altogether suppressed. The action is ascribed principally to the feebly refrangible rays, while the dark blue or violet rays render the plate negative. Polished copper in sulphate of copper became first negative and then strongly positive.

Other metals gave the following result: Clean plate of polished silver, in water, negative; lightly silvered platinum, positive; silver covered with platinum, strongly positive; tin, negative; brass acted like oxidized copper; amalgamated zinc, in solution of ZnO. So₄, strongly negative; ordinary zinc, nearly neutral (hence the action of the battery is due to the oxidized copper); and platinum, weakly positive.

The author has also studied the action of heat on the zinc-copper-water element, of which he states the electric motive force becomes augmented, while it is enfeebled by light.

The New Metals Neptunium and Davyium.

Herr H. Herrman, who for many years has been investigating the metals of the tantalum group, announced not long ago his probable discovery of a new metal, which he believes to be a fourth member of the above named group, and to which he gives the name of neptunium. The mineral, in which evidence of the existence of the metal is said to have been found, came from Haddam, Conn., and was reputed to be tantalite, though on examination it proved to be a mixture of columbite and ferro-ilmenite. Only 40 grains of the hydrated acid of the new metal were obtained, not sufficient for its isolation. The atomic weights of the metals of the tantalum group, including this new discovery, are as follows: Tantalum 176, neptunium 118, niobium 114.2, and ilmenium 104.6. Their densities are: Tantalum 10.7, neptunium 6.5, niobium 6.5, and ilmenium 5.9. Ilmenium was supposed to be obtained by the same chemist from a Swedish mineral, which he called yttrilmenite several years ago; but its existence, in view of the subsequent researches by M. Marignac, is now considered doubtful, and hence it is generally omitted from the list of elements.

The second new metal, davyium, was discovered by M. Sergius Kern, of St. Petersburg, Russia, who ascribes it to the platinum group. It was discovered in separating the metals rhodium and iridium from some platinum ores. It has been isolated in the form of a hard silvery metal, slightly ductile, extremely infusible, and having a density of 9.385 at 77° Fah. It is named after Sir Humphrey Davy, and the discoverer thinks it may occupy a place between molybdenum and ruthenium in the system of elements, arranged according to Mendeleeff's law of periodicity.

Influence of Wine Bottles on Wine.

It has recently been determined in France that wine may be injured through the glass of the bottles in which it is contained being too alkaline. According to analyses given the *Revue Industrielle*, glass for wine bottles should yield per 100 parts: silice, 58.4; potash or soda, 11.7; lime, 18.6; clay and oxide of iron, 11; other ingredients, 0.3. Glass in bad bottles has been found to contain, silice, 52.4; potash or soda, 4.4; lime, 32.1; clay and iron, 11.1. It seems that the wine suffers principally from excess of lime. Thus, in glass composed of silice, 45; soda, 15; lime, 30; and clay, 15, for example, the wine became thick and lost its aroma. The best bottle glass contains from 18 to 20 parts lime and 59 to 60 silice; the worst, 50 to 52 silice and 25 to 30 lime.

Stationary Meteors.

To the Editor of the Scientific American:

A few minutes after ten o'clock on Friday evening, September 7, 1877, Mr. John Graham, of Bloomington, Ind., had his attention arrested by a sudden light in the heavens, and on looking up he saw a stationary meteor between *Aquila* and *Anser et Vulpecula*, about R.A. 295°, declination 15° N. It increased in brightness for a second or more, and disappeared within less than half a degree east of the point in which it was first seen. Immediately after the extinction of the first, three others, separated by intervals of three or four seconds, appeared and vanished in the same place, with the exception that one disappeared about as much west of the radiant as the first did to the east of it. Mr. Graham's curiosity was excited, and he continued to watch till, after an interval of a few minutes, a fifth meteor, corresponding in appearance to the preceding, was seen in the same place. The meteors were about equal to stars of the first magnitude. The facts indicate that a stream of meteoric matter was moving at the time almost exactly towards the observer. Two or three isolated instances of stationary meteors have been recorded; the phenomena of the 7th inst. are, however, quite extraordinary.

I have stated the observations as given me by Mr. Graham, who pointed out the position in which the meteors were seen.

DANIEL KIRKWOOD.

Bloomington, Ind.

One Reason why the Moons of Mars were not Sooner Discovered.

Mr. George R. Cather, in recounting the reasons given by Professor Newcomb before the American Association for the Advancement of Science, at Nashville, why the satellites of Mars were not sooner discovered, makes the suggestion that these satellites are of recent origin, and says: "This may be groundless, yet it is but fair, if there could be such a probability, let its weight be ever so little or great in the solution of the question, it should be stated for what it is worth. But as a reason, it is of greater importance than at first glance may be imagined; for if it is admitted as a remotely probable reason, it suggests the profoundest problem of the age—that is, that the satellite systems of the planets have been supplied by the asteroidal belt of our planetary scheme—a theory I propounded several years ago, and which since has become a solid conviction of my mind, as careful investigation of our planetary structure has confirmed me in this opinion."

A Tree that Rains.

The Consul of the United States of Columbia in the Department of Lereto, Peru, has recently called the attention of President Prado to a remarkable tree which exists in the forests adjoining the village of Moyobamba. This tree, known to the natives as Tamai-Caspi (rain tree), is about 58 feet in height at full growth, and the diameter of its trunk is about 39 inches. It absorbs and condenses the moisture in the atmosphere with astonishing energy, and it is said that water constantly exudes from its trunk and falls like rain from its branches. So abundant is the water supply that the soil near by is turned into a marsh. The tree gives forth most water when the rivers are dry during the summer season, and when water generally is scarce. Its cultivation is proposed throughout the arid regions of Peru.

Bodily Recoil.

The curious fact has recently been pointed out by Mr. J. W. Gordon, in the *Journal of Anatomy and Physiology*, that at every beat of the heart, the whole body is projected a small but perfectly observable distance in a direction from foot to head—that is, so that any pressure exercised by the feet would undergo a diminution, while a pressure exercised by the head would be increased. When the heart contracts a quantity of blood is propelled down the aorta, while at the same time, the whole body is caused to recoil with a velocity which bears the same ratio to the velocity of the blood as the weight of blood driven out bears to the weight of the body.

When the Birds Wake Up.

A French ornithologist has lately been investigating the question of at what hour in summer the commonest small birds wake up and sing. He states that the greenfinch is the earliest riser, as it pipes as early as half-past one in the morning. At about half-past two the blackcap begins, and the quail apparently wakes up half an hour later. It is nearly four o'clock, and the sun is well above the horizon, before the first real songster appears in the person of the blackbird. He is heard half an hour before the thrush; and the chirp of the robin begins at about the same length of time before that of the wren. Finally, the house sparrow and the tomtit occupy the last place on the list. This investigation has altogether ruined the lark's reputation for early rising. That much celebrated bird is quite a sluggard, as it does not rise until long after the chaffinches, linnets, and a number of hedge-row birds have been up and about.

The American Association for the Advancement of Science.

The Nashville session of the above named body adjourned on September 4, to meet again on the third Wednesday in August, 1878, at St. Louis, Mo. Professor E. C. Marsh, of New Haven, was elected to preside at the next session. Full abstracts of the principal papers lately read will be found in current issues of the *SCIENTIFIC AMERICAN SUPPLEMENT*.

[Continued from first page.]

To facilitate cleaning and repairs, the boiler shell is made in two parts united by a bolted joint, as shown, the upper part of the shell sliding on the uptake or chimney. This uptake passes through a stuffing-box at the top of the boiler, the part of the uptake which traverses the stuffing-box being thickened and screwed to receive a deep brass nut which bears upon the top of the stuffing-box, as shown, and through which pass screws for setting up the gland. This arrangement enables the uptake to act as a stay between the crown of the fire-box and the shell, while at the same time, by slackening back the brass nut just mentioned, the upper part of the shell is left free to be raised when the bolted joint which unites it to the lower portion is broken.

To secure dry steam, the steam pipe is made to communicate with an annular chamber in the steam space, as shown in Figs. 1 and 2, this chamber having slots formed on its top for the admission of steam, while its bottom is made to slope towards one side of the boiler, a drain pipe—led down below the water line—being provided to take away any water which may be carried into the chamber by the steam. In addition to this chamber, the boiler, of which we are now speaking, is provided with an external separator, as shown in the perspective view.

The principal dimensions of the boiler are given in the engravings. The area of the firegrate is 4 square feet, and of the heating surface 162 square feet, this latter being made up of 38 square feet of fire-box surface and 124 square feet of tube surface.

TELLURIUM.

BY THEODORE REIDELL.

Tellurium is one of the rare minerals, and up to the present time has been found but in small quantities. As there is no use in the arts for this metal, it is worthless, and is mined only for the gold and silver it contains. As a very complete description of all the varieties exists in Dana's "Mineralogy," the names need only be given here as follows: Native tellurium, tetradymite (Bi_2Te_3); Joseite, same, with the Te replaced by S and Se; Wehrlite, same, with Bi replaced by a little Ag; Altaite, Pb Te; Nagayagite, same, Pb replaced by Au Ag; Hessite, Ag Te; Petzite, same, Ag replaced in part by Au; Sylvanite (Ag Au), Te_2 ; Montanite, TeO_2BiO_2 ; Melonite, Ni Te; Calavarite, Au Te; Coloradorite (new), Hg Te, discovered by Professor F. A. Genth from the Mount Lion Mine; Magnolico Lionite; and, lastly, one variety the writer claims to have discovered from Mt. Lion Mine. Analysis: Te 53, SiO 25, FeO 4, Au 1.75, Ag 10. Deducting the SiO, this would be almost native tellurium. It has, however, an entirely different crystallization and resembles an artificial product very much like a matte. I have only found a very little of it. One of the simplest tests for tellurium is boiling in SO_2 , giving the purple color. SO_2 does not dissolve a very large quantity, and soon becomes saturated when the tellurium is thrown down, the same as if water had been added. Another very good test is by the use of the blowpipe as follows: Put a small sample well pulverized on a porcelain dish; direct the flame; TeO_2 is formed, and gives a coating, of course white. While still warm, add a drop of SO_2 , and the purple color appears. This is very distinct from any of the other metals. Tellurium dissolves in NO_2 to TeO_3 , which is again dissolved by HCl, and can be precipitated by H_2O . The TeO_3 can be reduced to the metallic state by mixing with powdered charcoal and smelting quickly in a muffle. This process gives a very pure article. Another way consists in melting raw ore with a very quick and readily fusible flux in a crucible, leaving it in the muffle, which should be at a red heat, only long enough to form the slag, say five minutes. The metallic button thus obtained, which is only Te, Au, and Ag, is again fused at a low heat in a stream of chlorine gas. The tellurium goes off as TeCl_4 , and is collected in water precipitated as TeO_2 , and smelted as before. The tellurium is lost in the first fusion. By roast-

surface is volatilized, leaving the gold thereon. This is one of the ways our miners find the richness of their ore themselves, for the gold is their only aim. It can be done in any ordinary stove by placing the specimen on the hot coals. A better plan is to use a muffle admitting a good supply of air. The muffle is kept at a low red heat which, towards the last, is raised. The tellurium burns with a light bluish flame, and gives off the white dense fume of TeO_2 ; the other is the tellurium in the natural state. The mines producing the richest ore in tellurium are the Smuggler, John Jay, Mt. Lion, and Keystone, Colorado. I have had specimens (deducting the quartz) that yielded from 92 to 97 per cent tellurium. The largest amount I have ever seen was about 400 lbs., shipped from the John Jay Mine; this

as any found. This has given great encouragement. At present capital is needed for opening the mines. Denver, Col.

Vitriol Vinegar.

The Board of Health of the District of Columbia has condemned five car loads of vinegar sent there from Chicago, on the ground that it is not a genuine article, and is injurious to health.

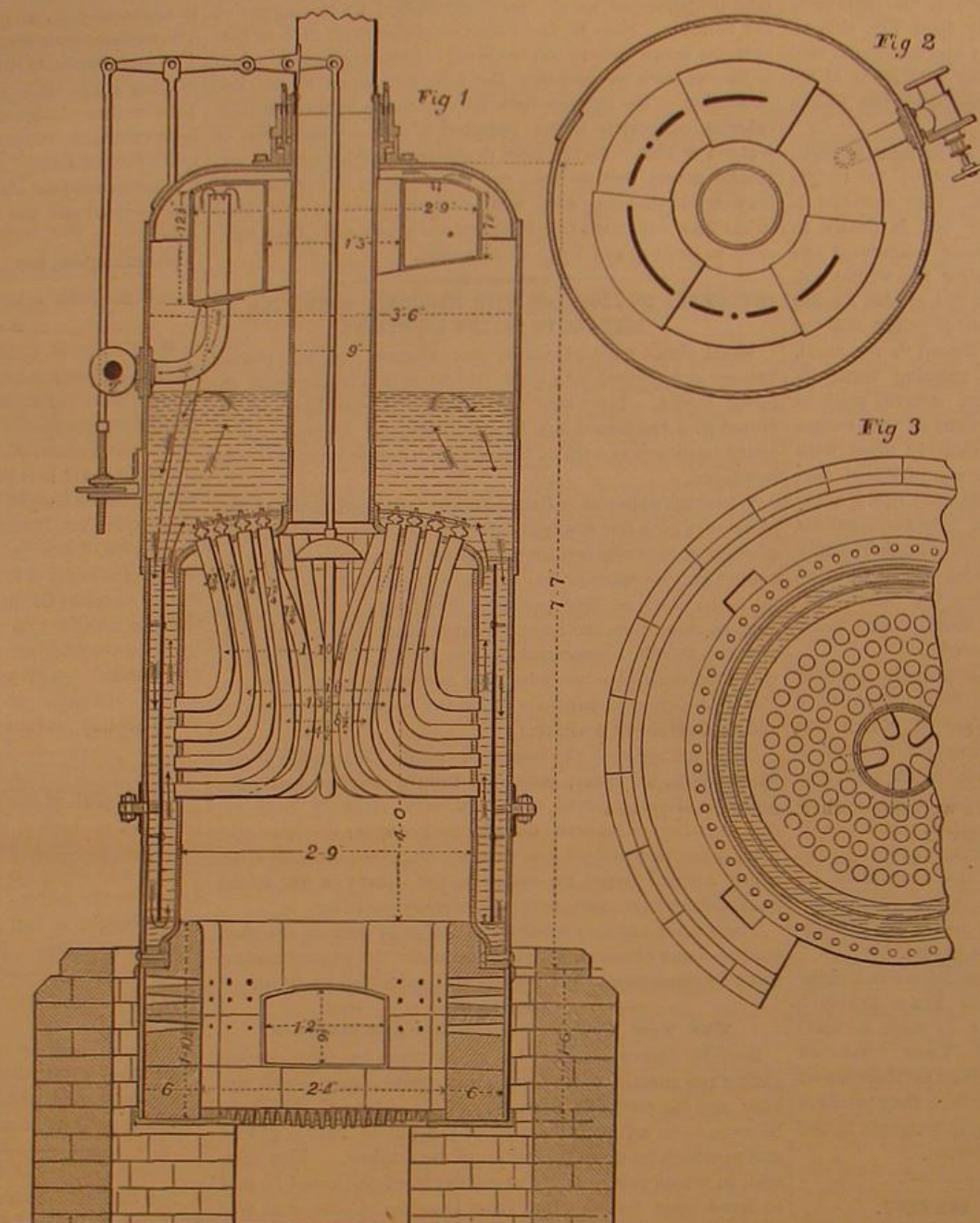
An analysis of the so-called vinegar has been made. It appears, according to the report of the Board of Health, that the vinegar contains 54.5% grains per gallon of anhydrous sulphuric acid, combined with lime, to form a sulphate of lime equivalent to 117.5% grains of gypsum per gallon, and besides that, five grains of free sulphuric acid per gallon. The Board also reports that this sample was taken from an invoice of more than 1,000 barrels brought there to be sold as vinegar, and that it is likely to find a ready sale on account of its low price. The report concludes as follows: "When we think that oil of vitriol (sulphuric acid) can be bought at five cents per pound, and that a pound of said acid would render a barrel of fluid as acid as the strongest vinegar, the wonder will cease that it is sold cheap. This, therefore, is a fraud upon commerce, and a dangerous substitute for vinegar." The fraud and danger are more general than the great mass of people will readily believe. It is asserted that probably one half the vinegar sold at city groceries is a rank poison with either sulphuric or other objectionable acids for its base.

ANOTHER MYSTERIOUS CLOCK.

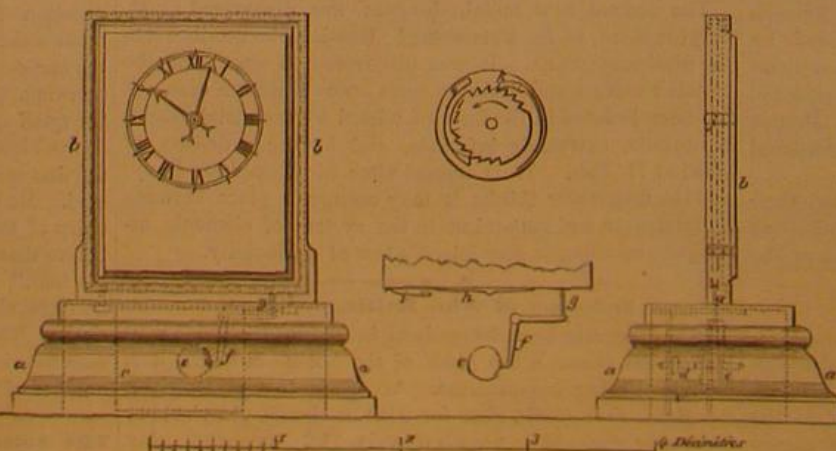
M. Cadot, an ingenious clock-maker of Paris, who has already devised several forms of clocks which apparently work without works, has recently invented still another time-piece, calculated to puzzle even those who are familiar with Robert Houdin's arrangement of the double glass plate. Houdin's invention, which we explained not long ago, consisted in two glass disks placed parallel and contained in the same circular frame. On one was marked the dial, while the other turned on its center and was attached to the minute hand. The turning of the disk was imperceptible, and was effected by mechanism concealed in the surrounding frame. M. Cadot's new clock, an engraving of which, from the *Bulletin* of the French Society for the Encouragement of the National Industry, is given herewith, cannot, it is evident, be constructed on any such principle, because the glass plates are square, and, besides, they appear to be firmly set in the base support. The trick, however, will be readily understood from the diagrams. There are two plates, one of which, *a*, is fixed to the base, and on this the dial is marked. Both plates are enclosed in a single frame, *b*, but this frame is loose enough to let the rear plate oscillate a little. The lower middle figure represents the bottom of the plate which rests on a balance beam, *h*. In the space, *c*, of the standard, the clockwork is concealed, and this rotates a ratchet wheel, *e*, which has 30 teeth, once in an hour. The teeth of the wheel, *e*, engage in turn the hook, *f*, move the bell crank attached thereto, and thus give an up and down reciprocating motion to the rod, *g*, which pushes against the bottom of the movable glass plate. By means of this arrangement and the spring, *i*, the plate is thus caused to oscillate isochronously. In an aperture made through the center of both plates is the ratchet gearing, represented in the upper middle figure, and this communicates the motion of the plate to the minute hand. Finally, the latter in turn, by very simple concealed mechanism, operates the hour hand.

Cement for Fastening Knives and Forks into their Handles.

Take one pound rosin and half pound of powdered sulphur; melt together, and mix in about twelve ounces of fine sand or powdered brick. Fill the cavity of the handle with this mixture, melted. Make the shank of the knife or fork quite warm and insert in place and let it remain until cold, when it will be found to be firmly fixed. The handles of knives and forks should not be put in hot water.



ALLISON'S VERTICAL BOILER.



ANOTHER MYSTERIOUS CLOCK.

as these mines have only been worked for a short time, the developments have not been very great. An enterprise known as the Corning Tunnel started a tunnel under Gold Hill; and after running about 800 feet, struck a vein about 500 feet below the surface, which contained as fine telluride

THE INDUSTRIAL APPLICATIONS OF THE ELECTRIC LIGHT.

We have from time to time noted the extension of the application of electric illumination to workshops, factories, railroad depots, and other establishments in France. In the following article based on a work recently published on the subject, in the above country, by M. Hippolyte Fontaine, the practical details of many instances where this mode of lighting is in successful employment are reviewed.

The electric lamp furnishes the only means of illumination whereby industrial work of almost every description may be continued as well by night as by day. The light produced is so abundant that, reflected by all objects, it becomes diffused like daylight, so that there are no absolutely black shadows, and in a properly illuminated shop it is possible everywhere to handle tools or to read. It is generally necessary, however, to use two lights, so that one may illuminate the shadows cast by the other. One lamp usually lasts for from three and a half to four hours, at the end of which time new carbons must be inserted. This, however, is the work of but a few seconds, so that the temporary extinction of the light is not materially inconvenient, especially if more than one lamp is used. Even this may be avoided in cases where continuity of light is a necessity, by arranging duplicate lamps, so that one is automatically ignited the instant another is extinguished. The light is not fatiguing to the eyes. In workshops where opal globes were first introduced, such screens were afterward found superfluous; and they were removed at the desire of the workmen. Under the electric light, colors appear the same as by sunlight, so that for dyers, weavers, and painters, a single lamp often proves a great convenience.

As a general rule one lamp will illuminate sufficiently an area of 5,120 square feet in a machine shop, half that area in a printing or weaving establishment, and four times that

area on a quay, shipyard or other locality where fine work is not carried on. With these data it is easy to determine the cost of installation, knowing that of the complete apparatus. In France the expense of the latter, including lamp, magneto-electric machine, wires, etc., is about \$480. The following instances exhibit the results of practical use:

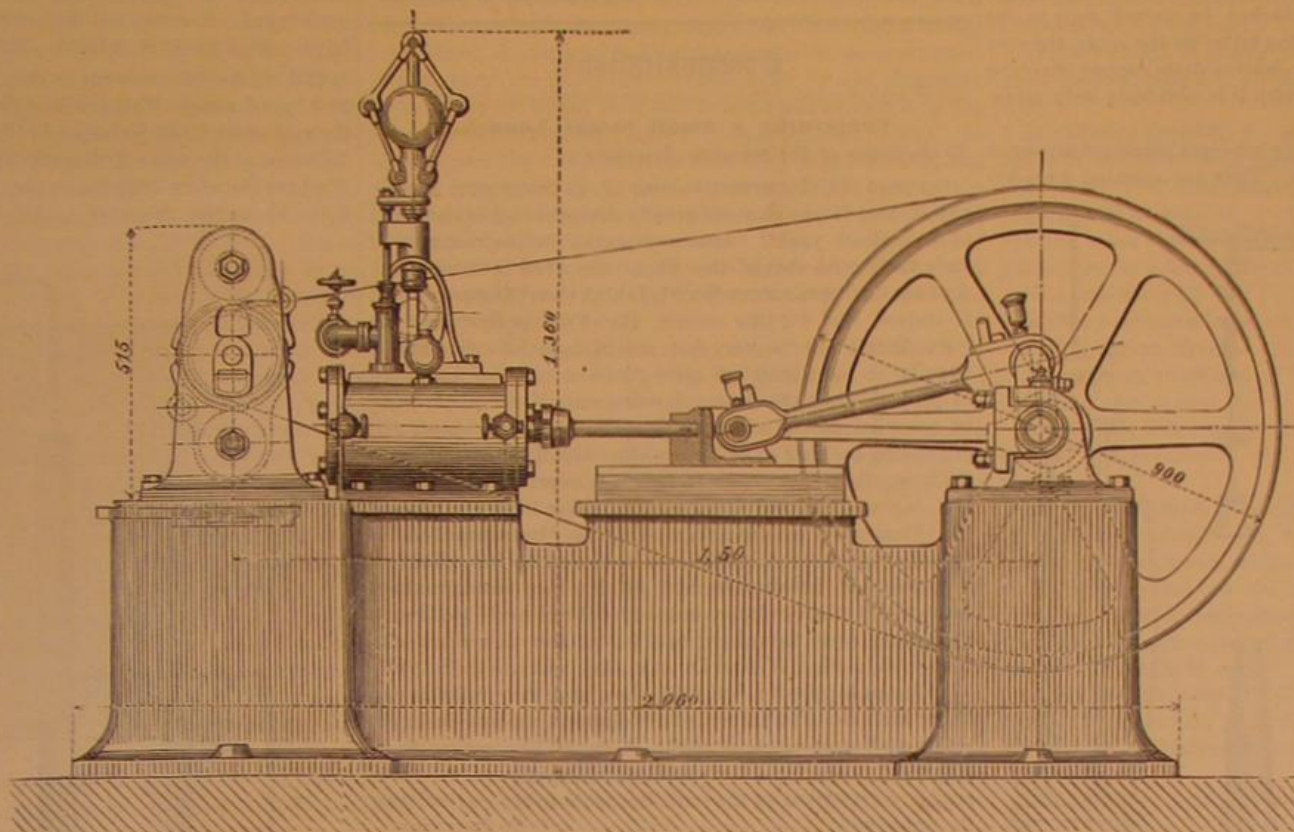
WORKSHOP OF THE GRAMME COMPANY.

In this establishment the light was first introduced in 1873. A single lamp is used, taking the place of twenty-five gas burners. It has operated regularly for four years, and the average expense, incidentals included, has not exceeded 12

establishment, have devised a special arrangement of magneto-electric machine and steam engine, which is represented in Fig. 1, and which is adapted for use in shops or aboard ship. The bed is made heavy in order to avoid all vibration, and the apparatus is quite compact, occupying a floor space of but twenty-three square feet. The fly wheel, to which the Gramme machine (which rests on the same support as the engine) is belted, makes 150 revolutions per minute, the Gramme machine 850 revolutions. The entire apparatus is sold in France for \$800.

SAULTER, LEMONNIER & CO.'S SHOPS, PARIS.

This is a well known manufactory of light-house lanterns. The workroom consists of two bays or sections, each 96 feet long by 80 feet wide; the intermediate space is 32 feet in width. On the lower floor are machine tools, and on the story above the patternmakers and moulders work. Three Gramme machines each maintain a light equal to one hundred gas burners, and the three lamps illuminate all the shops sufficiently to admit of the use of machines of precision, requiring delicate adjustments. The electric machines are located in the engine room, and are driven at the rate of from 850 to 900 turns per minute. About two horse power is required to operate each machine. Carbons are consumed at the rate of 2.7 inches per hour and cost about 40 cents per yard. So that each machine, equivalent to 100 Carcel burn-



ELECTRIC LIGHT.—GRAMME MACHINE DRIVEN BY A STEAM ENGINE.—Fig. 1.

cents per hour. The room lighted is 16 feet high, and 1,468 square feet in area.

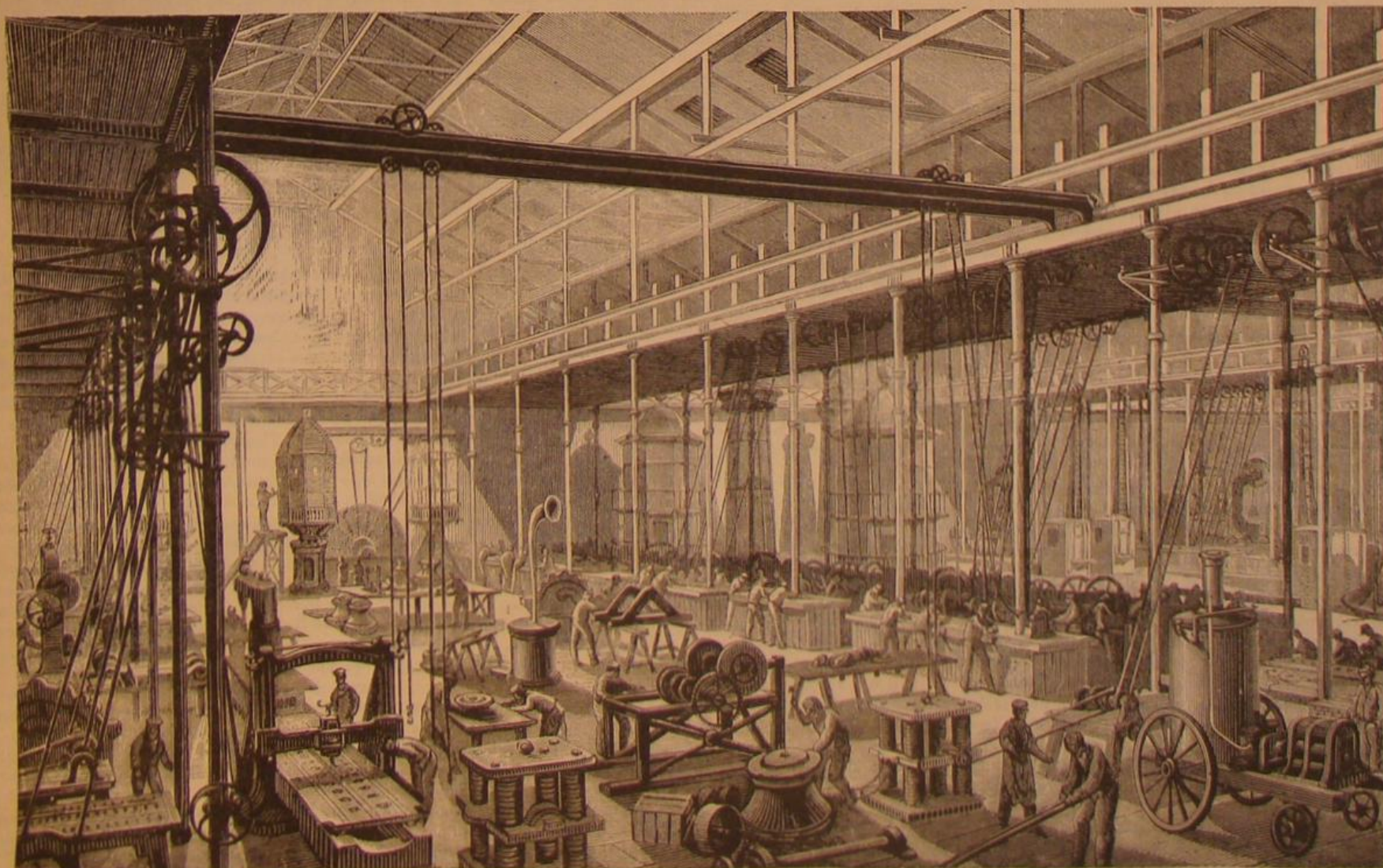
DU COMMUN WORKS AT MULHOUSE.

Four lamps each, worked by a Gramme machine, are employed in the foundry, a large hall of nearly 16,000 square feet area. The lights are attached to crossbeams sixteen feet above the floor. Cost of installation \$2,000, or about the same as the expense would amount to for two hundred and fifty gas burners. The light obtained exceeds that of four hundred burners. MM. Heilmann and Steinlen, of this

ers, costs for maintenance 2.8 cents per hour plus the expense of motive power. In Fig. 3 the interior of the above named shops is represented, from which an excellent idea of their arrangement as well as the brilliancy of the illumination may be obtained.

MENIER FACTORIES AT GRENELLE, NOISIEL, AND ROYE.

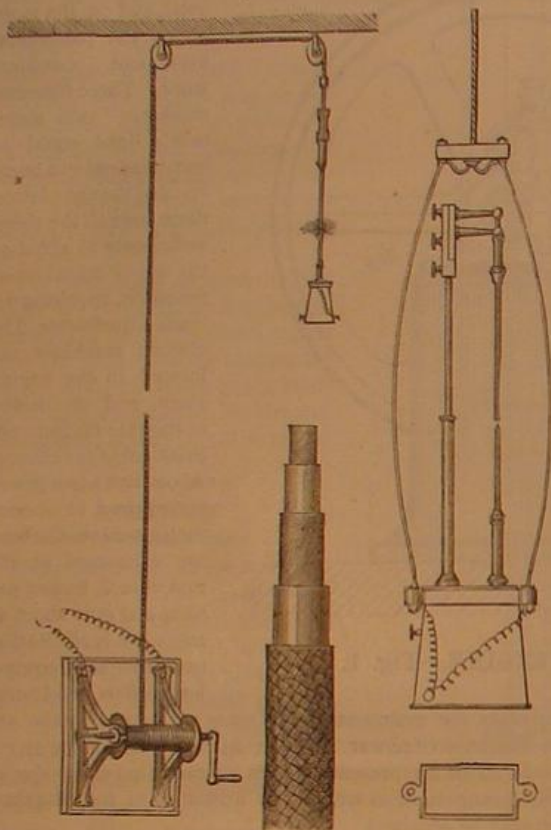
These establishments include one factory for preparing india rubber, a sugar works, and the factory where the famous Menier chocolate is made. In each of the first two, three machines, each equivalent to one hundred and fifty



INDUSTRIAL APPLICATION OF ELECTRIC LIGHT.—Fig. 3.

burners, and the last, eight machines are used. In connection with the lamps employed is a novel invention of M. Menier (Fig. 2), whereby the lamps can be reached for replenishing carbons, etc., without the use of a ladder or stairs. It consists of two cast iron brackets, mounted, supporting a hard rubber drum, and to each of which one of the conducting wires is attached. The brackets communicate metallically with the ends of the cable which is formed, as shown in detail in the illustration, of an exterior envelope of hemp, a layer of rubber, a wick-shaped layer of copper wire, another envelope of rubber, and finally a core of copper wire again. This is wound upon the drum and is hindered from unrolling by a small ratchet. The cable, after passing upward through two pulleys in the ceiling, is secured to a plate which is attached by curved rods to the lamp. The current is led to the latter by the cable, the core serving as one conductor, the intermediate copper envelope as the other. To reach the lamp it is obviously only necessary to lower it.

The Noisiel chocolate factory has eight machines arranged in two batteries of four each. They are operated by a hy-



APPLICATION OF ELECTRIC LIGHT.—Fig. 2.

draulic wheel. The wires lead to a commutator on the ground floor, which allows of the current of each machine being transmitted in fifteen different directions. In this way any machine may be used to supply the lamp in any particular room, so that, in the case of failure of any one apparatus, others are always ready. As this establishment is said to possess the most complete system of electric illumination ever employed, it is interesting to note the disposition of the lights. One lamp placed in a square lantern and suspended at a height of 22 feet illuminated a courtyard of 20,400 square feet area. Two other lamps each illuminate an interior court of 5,700 square feet. The torrefaction room, 141 feet long by 35 feet wide, and 24.6 high, is lighted by a single lamp placed on the floor. The light is projected by a parabolic mirror up to the ceiling, whence it is reflected and uniformly diffused. The moulding and weighing room is occupied by 90 workmen. It is 165 feet long by same width and height as above. Two lamps are used 80 feet apart and hung 19 feet high. The repair shops, of 4,080 square feet area, are illuminated by one lamp.

SPINNING ESTABLISHMENTS.

The employment of the electric light in several spinning establishments is noted. In that of MM. Ricard fils, the room on the first story is 10.5 feet long by 66.6 wide. Two lamps here illuminate 10 self-acting mules. The Gramme machines are placed at the extremity of the shops, and are operated by the motor of the works. The lamps are located 63 feet apart and are suspended at a height of 10.8 feet. This arrangement proved successful under the bad conditions of very low ceilings. The apartment in the second story is much smaller, and one lamp suffices for five mules.

FREIGHT DEPOT OF LA CHAPELLE, PARIS.

The space to be illuminated consists of a hall 192 feet long, 80 feet broad, and 25.6 feet high; a court 64 feet wide; and a car house 224 feet long, 48 feet wide, and 25.6 feet high. The hall is lighted by two lamps placed at a height of 5 feet, and arranged in lanterns, the glass of the lower part of which is painted white, so that the eye is not dazzled by the electric arc. The lamp is ample to allow of the business of expressage in all its details being carried on. The engineer of the depot reports that 25 per cent less men are now needed for night work. One lamp suffices for both car house and court.

HARBOR WORKS AT HAVRE.

In constructing the extensive operations required to enlarge the outer harbor of Havre, involving the removal of a large amount of rockwork and masonry, it has been neces-

sary to labor principally during the hours when the tide is low. In order to carry on work at such times at night, the contractor has used two electric lamps, by which means 150 workmen, distributed over an area of 36,000 square feet, have continued the operations of blasting, etc., with the same facility as by day.

A large number of other instances are given, showing other applications of the electric light, but the above will suffice to exhibit its utility in a sufficiently varied range of industrial pursuits. It seems probable that the invention of the Jablochkoff candle, admitting as it does of the divisibility of the light, will result eventually in the employment of electric illumination everywhere in lieu of gas. In this view such details as are above given are of timely interest.

Communications.

Concerning a Small Steam Launch.

To the Editor of the Scientific American:

On page 140, (2), current volume of the SCIENTIFIC AMERICAN, T. and D. say they are greatly disappointed in the speed of their steam yacht. After comparing the performance of their yacht with that of the Flirt, described in SCIENTIFIC AMERICAN SUPPLEMENT No. 81, I think their disappointment is unjust, and for this reason, the Flirt is described by "Paddlefast" as "a very fast steam launch." She makes 10 miles an hour with 700 revolutions a minute, and pitch of propeller 25"; the steam pressure, cut-off, etc., not being an essential factor as far as the speed *per se* is concerned. Supposing nothing to be lost by slip, the Flirt ought, with the above figures, to make 16 miles an hour; as a matter of fact, however, she only makes 10, so there is about 0.375 of the 16 miles lost by slip. T. and D. say they made 5 miles an hour with 210 revolutions a minute and 3 1/2 feet pitch of propeller. If nothing be lost by slip, they would make a little over 8 miles an hour, but they only make 5, so there is in this case as in the other 3/4 or 0.375 of the theoretical distance lost in slip. T. and D. say they want to make 10 or 12 miles an hour with her. If they do, they will have to either increase the number of revolutions, or put in a propeller with more pitch, or both. I would like to hear from T. and D. concerning the cut-off, size of ports, etc., of their engine, as it strikes us the fault lies more in the engine than the propeller.

I. N. PHILLIPS.

Knoxville, Tenn.

REPLY BY "PADDLEFAST."—With the above correspondent we believe a 5 x 5 engine ought to do more work. The boiler is far too heavy for the boat, causing too great a displacement for good speed. A smaller boiler, a higher steam pressure, and a two-bladed screw 28 inches diameter with 35 inches pitch, ought to give good results.

A Much-Needed Postal Convenience.

To the Editor of the Scientific American:

The large circulation of the silver currency, which has almost entirely superseded the paper fractional currency, brings with it some inconveniences. Large numbers of letters are mailed daily, which contain small sums of money—frequently less than one dollar. Even now, it is difficult to obtain the necessary "change" in paper fractional currency, and many persons substitute postage stamps, to the great annoyance of the individual receiving the remittance.

This state of affairs greatly increases a previously existing necessity for some method of transmitting small sums through the mails in some such manner as the larger postal orders are now transmitted. Perhaps the most advantageous plan would be to have stamps of the usual fractional denominations, kept for sale by postmasters at a sufficient advance on their face value to cover expenses, which would entitle the holder to their face value, and which might be cancelled or destroyed by the postmaster to whom presented. These stamps should be so designed as to be attached to postal cards if desired, and should also extend down to three cents, so that if a correspondent wishes he could "enclose a stamp" even when sending a postal card.

W. J. MCGEE.

Farley, Iowa.

The Keely Motor.

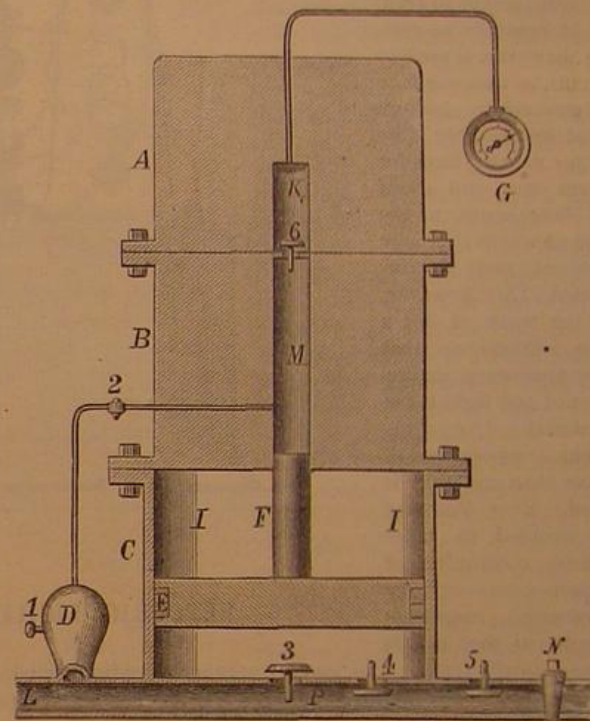
To the Editor of the Scientific American:

The accompanying sketch was prepared at the time the Bailey & Farrell motor came out. I consider the Keely motor a humbug and constructed on the same principle. I do not know that I have hit the Farrell motor or the Keely humbug, in construction; but there is no secret about it, and an apparatus made on this plan will accomplish the same results.

The following is a description of the working of the machine: It is connected to the water main at L; the cock, N, is turned off. As soon as the water is turned on from the main, it will instantly compress the air in the machine in a ratio corresponding to the pressure in the main pipe, and the gauge, G, will so indicate. The cock, N, is now opened, and the machine goes to work automatically as follows: The valves, 4 and 5, are loaded until they will close only when the water has reached its maximum velocity. This would bring the water to a sudden stop if it was not for the valve, 3, which opens and allows the blow to be delivered on the piston, E, forcing the plunger, F, into the chamber, M, displacing the air into the chamber, K, the valve, 6, holds it from escaping. After the blow is spent, the valve 4 opens

at the same time valve 5 opens, allowing the water to escape from under the piston, E; the compressed air, I I, driving the piston, E, back to its former position. The air chamber, D, having inlet valve, 1, and outlet valve, 2, furnishes the chamber, M, with a new supply of air for the plunger, F, on its return stroke. The air in the chamber, D, is compressed at the same time the blow is struck on piston, E, it being connected with the pipe, P.

I will suppose for convenience in calculation that the pipe, P, is one inch area, the piston, E, 12 inches diameter, and the plunger, F, .75 inches diameter. The pressure of the water 30 lbs. per square inch, somewhere near the pressure Mr. Keely used. I may remark the size of the pipe cuts no figure in the case as long as the head of water remains unchanged. Leaving out the coefficient of friction, then we have $30 \times 2.26 = 67.8$ height due to pressure. Then $(\sqrt{67.8 \times 64.3}) = 65.1$ velocity in feet $\times 12 = 781.2$ inches $\times 0.036 = 28.1$ lbs. of water. We have now 28.1 lbs. of water moving at the rate of 65.1 feet per second; $28.1 \times 65.1 = 1829 +$ lbs. effect delivered at the valve 3. But this opening is only 1 inch area. We have therefore 1829 lbs. to the square inch. The piston, E, is 12 inches diameter. $D^2 \times 7854 = 113 + \times 1829 = 206,777$



lbs. pressure at the start, decreasing to $113 + \times 30 = 3390$ at the end. Then $206,777 - 3390 = 203,387 + 2 = 101,643 +$ lbs. average pressure. But the plunger, F, which delivers this pressure, is only .75 inches diameter. Again $D^2 \times 7854 = .44 +$ inches area. We now have $101,643 +$ lbs. pressure delivered by a plunger of .44 inches area. Hence $101,643 + .44 = 231,006$ lbs. pressure per square inch in the chamber, K. When that gets full it may be removed and another put in its place. This is the theoretical view, but we can throw away half and still have enough left to create that goneness Mr. Keely complains about when one bursts. This machine will fulfil all the conditions of the Keely motor.

If the piston, E, is made 21 inches diameter, and the other conditions same as above mentioned, the pressure in K would amount to 693,018 lbs. to the square inch, a pressure which Mr. Keely would likely find trouble in managing.

Frankfort, Ky.

M. A. JONES.

The Sea in Sahara.

To the Editor of the Scientific American:

Last spring there appeared in the SCIENTIFIC AMERICAN an elaborate and thoughtful article upon the formation of a sea in Sahara. I beg leave to say that the Red Sea, just beside the proposed one, has not evaporated to a bed of salt during some centuries, on account of lack of tributaries; it, like the Mediterranean, has two currents at the strait—an under current of heavy and excessively salt water flowing out of it, and a surface current of ordinary heavy and salt water flowing into it. Thus the salt is carried out and the sea is prevented from becoming a salt bed. The object of the project is to produce rain in the adjacent lands. Doubtless this effect would be produced. The secondary results would be increased vegetation, a damper soil, and, proportional to the present and contemplated rainfall, less evaporation; hence stream-rivers would be produced, and most of them would flow into the new sea, thus supplying it with fresh water. The number of ports that would be closed by a depression of two feet in the ocean would be small, perhaps none.

T. MARCELLUS MARSHALL.

Glennville, W. Va.

TYPOGRAPHICAL ERRORS.—In a recent number of the *English Workman*, Richard A. Proctor bewails some of his typographical misfortunes. One journal, speaking of his charts of 22,434 fixed stars, made it "chart of 2,243 stars." This mishap he forgives in consideration of the dulness of a compositor's life; but in the following he thinks a severe test of any one's good nature. He wrote of the solar spectra, "lines, stripes, and bands of the violet end of the spectra," which appeared when printed as "links, stripes, and bonds for the violent kind of spectra."

SCIENCE AT THE BRITISH ASSOCIATION.

THE IDEAL CRIMINAL.

Mr. Francis Galton discussed the ideal criminal, in whom he detects three peculiarities of character: his conscience is almost deficient, his instincts are vicious, and his power of self control is very weak. By the examination of many thousand photographs of criminals, he was enabled, by their physiognomic characteristics, to divide them into three well-marked groups, respectively, of perpetrators of murder, manslaughter, and burglaries, perpetrators of felonies and forgeries, and perpetrators of sexual crimes; and in this way he was enabled to examine how far the peculiarities first mentioned above may be correlated with physical features. The history of the famous Jukes family of criminals was brought forward, to show what extremely important topics may be open to inquiry in a single branch of anthropological research; and the general argument pointed to the necessity of more accurately obtaining explanations of the conditions under which the quality of the stock of the human race deteriorates or improves.

RAILWAY BRAKES.

Mr. E. Woods, C.E., discussed railway brakes, and reviewed the Midland Railway experiments of 1874. His investigations pointed to the following considerations as necessary in view of the provision of perfect brake power for heavy fast trains: 1. The brake power should be applied to all the wheels of the vehicles throughout the trains. 2. The power by which the blocks are forced upon the wheels should be adequate to skidding the wheels upon the speed becoming moderately reduced. 3. The driver should have the whole of the brake power of the train completely under his command, and be able to apply it at a moment's notice, as he is the first person likely to discover any obstruction ahead, and is primarily responsible for the regard of danger signals. He can thus stop the train at once, and no time is lost by his having to signal danger to the guard. 4. The guards should individually possess the like means of applying the continuous brake, that they may be enabled to stop the train without reference to the driver, in an emergency which may have manifested itself to the guard, but of which the driver is unaware—such, for instance, as a broken axle or a carriage getting off the line. 5. The power in hand should be susceptible of easy modulation, that the driver may be able to apply a moderate amount only for effecting ordinary stops, while he keeps in reserve a proper excess of power to be used only in emergencies, as in the contingency of stopping rails. 6. Full brake application should not require more than a very moderate effort on the part of driver or guard. 7. The pressure should be steady and distributed as equally as possible over all the wheels, and acting upon them with the intervention of some elastic medium to prevent too sudden and violent action to occasion the snapping of chains and to inconvenience the passengers. 8. The machinery should be of simple construction, not likely soon to get out of order, and admitting of being easily repaired. 9. Indication should be constantly afforded to driver and guard that the brakes are in proper condition to work or otherwise. 10. A power of working the tender brake and the van brakes by hand, as well as by power, may be advantageously retained. 11. The brakes to be self-acting in case of the severance of the train, and, when severed, the guards to have control over the several portions. 12. Automatic action being provided, means should be furnished to the brake attendants for modifying the action instantaneously, according to the circumstances in which the train may be placed after an accident has occurred. 13. It would be dangerous, and, therefore, inadvisable, to give to passengers any power over the brakes.

AFRICAN EXPLORATION.

Commander Cameron, R. N., the well known African explorer, proposed exploring the continent of Africa through the establishment of trading societies similar to the East Indian and Hudson's Bay Companies; and advocated a system of central stations placed at intervals of from 200 to 250 miles distant. These stations might be turned to account as meteorological observatories, and as depots for botanical and zoological collections. He further pointed out that the productive regions of Eastern and Central Africa were capable of bringing forth corn in sufficient abundance to feed the starving millions of overcrowded India.

CHECKING POPULATION.

Dr. Farr said that, according to the most recent calculations, the population of the whole world was now 1,424,000,000. Within certain limits the reduction of mortality has no absolute tendency to accelerate the natural increase of population. Where the death rate reached a much higher pitch, the birth rate no longer kept pace with it; but the diminution of the mortality of England by sanitary improvement was in no danger of multiplying by multiplying men beyond the means of subsistence. Experience proved the contrary, and therefore to keep a population stationary, or to retard national growth, there was needed neither war pestilence nor famine pestilence, nor a war between man and man, but between the lowest forms of life and human life.

MANGANESE MINES IN ITALY.—It may be interesting to the mineral world, and especially to consumers of manganese, that some exceedingly valuable mines have been recently opened in the Val d'Aosta, situated on the sunny side of the Alps. One mine alone, that of St. Marcel, in the lovely Val d'Aosta, is considered capable of producing 50,000 tons a year, and that of Val Tournanche is a clear competitor in the question of richness and capability.

Patent Medicines and Secret Remedies.

The subject of patent and proprietary medicines is an interesting one, and its discussion involves some delicate questions of honesty and ethics. It is one of the most stringent rules of the regular medical profession not to copyright, patent, or keep as a secret any remedy discovered by one of its members. Physicians are supposed to devote their time and strength to the alleviation of suffering among the human family; new discoveries are at once published for the benefit of the race. A man who puts forth any preparation, whose composition he keeps secret, and attempts to profit by the sufferings of others, is denounced by the profession as a quack, and a physician will seldom if ever prescribe such remedies, even if they possess merit, which, no doubt, they sometimes do. A credulous community eagerly purchases these widely advertised medicines; and as the profits on them are enormous, they are generally recommended by the druggists, and, as we all know, their sale is immense, as shown by the success of Brandreth, Ayers, Helmbold, and others. In many cases the composition is known by the profession, and hence sometimes they advise their use, but usually the profits charged by the manufacturers render it preferable to administer their contents in another form. In other cases, the manufacturing pharmacists are able to combine several substances to form a neater preparation than can be made by the retail apothecary.

The German chemists are very unmerciful to those who would impose upon the public by worthless preparations; and one Berlin journal, the *Industrie Blätter*, edited by Dr. E. Jacobsen, offers to analyze gratis any patent medicine sent to them in the original package. The analyses of over eleven hundred such preparations, made by Dr. Hager, Wittstein, Rose, Chandler, Reveil, and others, have been collected together by E. Hahn and published in book-form by J. Springer. A few of these analyses we propose to lay before our readers for their information and amusement, remarking, however, that in some cases it is impossible for the analyst to exactly determine some of the organic remedies, such as gums, balsam, and resins, when in combination or solution, and noting the difficulty of accurate translation of pharmaceutical terms:

Dr. Pierce's Golden Medical Discovery. A one dollar bottle holds 220 grains of a brownish colored clear liquid, consisting of 15 grains pure honey, 1 grain extract of poisonum or acrid lettuce (*bot. herba lactuca virosa*), 2 grains laudanum, 100 grains dilute alcohol (64 per cent), tasting like fusel oil and wood spirit, with 105 grains of water.

Dr. Livingston's Ant Balm, a German remedy, consists of 72 grains castor oil, 2 grains balsam of Peru, and 5 drops oil of bergamot.

American Tooth-ache Drops, made by Majewsky in Warsaw, have different compositions. Those which took the prize at Vienna consisted of common salt and brandy, colored with harmless cochineal red (price, 37½ cts.).

Asthma Pastils (Danl. White & Co., New York), according to the analysis of Dr. Fleck, contain 20.1 per cent salt peter, 3.5 per cent impure scammonium resin, 35.0 per cent gum and sugar, 40 per cent charcoal powder, leaves and stems of some plant.

Ayer's Pills consists of pepper, colocynth, gamboge (*gutti*), and aloes.

Ayer's Hair Vigor, a solution of 0.6 per cent sugar of lead.

Horsford's Baking Powder. One powder contains acid phosphate of lime and magnesia mixed with a certain quantity of flour; the other is bicarbonate of soda.

Berlin Balsam, for cure of all kinds of sores, burns, cuts, wounds, ulcers, chilblains, etc., is nothing but common glycerine contaminated with a considerable amount of chloride of calcium.

Cook's Balsam of Life is a filtered decoction of 20 parts borax in 250 parts water, and 1½ parts pulverized camphor in 1 liter of liquid. Used externally for toothache and all skin diseases.

Brandreth's Pills, says Dr. Hayer, consist of gamboge (*gummi-resina gutti*), podophyllin, inspissated juice of phyto-lacca, saffron adulterated with yellow root, pulverized cloves and oil of peppermint. The editor states in a foot note that, according to the assertion of two American druggists and one merchant, gamboge is present in Brandreth's Pills, but that the action of the pills does not correspond to this constituent, in which latter assertion we think the editor is slightly mistaken, the pill being really cathartic.

Buckingham's Dye for the Whiskers consists, according to Dr. Schacht, of an ammoniacal solution of lunar caustic, containing 0.5 grammes nitrate of silver, 2.5 grammes aqua ammonia, in 40 grammes of distilled water.

Butter powders seem to be a favorite article of manufacture abroad, and are supposed to aid in making good butter quickly at any season of the year. They consist of bicarbonate of soda (baking soda), colored with turmeric or other less harmless pigment.

Dr. Brown's Chlorodyne contains 5 parts of concentrated muriatic acid, and 10 parts each of ether, chloroform, tincture of cannabis indica (Indian hemp), and tincture of capsicum, 2 parts each of morphine and hydrocyanic acid, 1 part oil of peppermint, 50 parts simple syrup, 3 parts each of tincture of hyoscyamus and tincture of aconite.

Taylor's Concentrated Castor Oil in Gelatin Capsules. They contain real castor oil mixed with 0.5 per cent of croton oil.

Cosmolin and Vaseline are variable mixtures of paraffin with volatile oils. It is the residue left from the distillation

of petroleum purified by filtration over animal charcoal, says Miller.

Tobias' Condition Powders contain, says Schädler, 2 grammes tartar emetic, 20 grammes black sulphide of antimony, 10 grammes sulphur, 10 grammes saltpeter, 40 grammes fenugreek, and 20 grammes juniper berries.

Eau de la Floride contains, according to Eymael, 50 parts sugar of lead, 20 parts sulphur, and 1,000 parts distilled water.

Eau de Quinine, a favorite hair wash that is much used in Berlin and Leipzig, contains 2 grammes balsam of Peru, 6 grammes castor oil, 60 grammes rum, 35 grammes water, 5 grammes tincture of red chinchona. Its constituents are at least harmless, which can be said of but few of our American preparations for the hair.

English Patent Washing Crystals; 6 parts water glass, 20 parts calcined soda ash, 60 parts bicarbonate of soda, 5 parts water.

Buehligen's Depilatory. A mixture of 2 or 3 parts sulphide of arsenic with 15 parts pulverized quicklime.

Bucher's Fire Extinguishing Powder contains 59 parts saltpeter, 36 of sulphur, 4 of charcoal, 1 of oxide of iron. We fail to see the advantage of this peculiar sort of impure gunpowder as a fire extinguisher.

Non-poisonous (?) Fly Paper, from Bergmann & Co., in Rochlitz, contains a large amount of arsenic!

Iodine Cigars, from J. D. Tormin, in Stettin, bear the motto "No more phthisis;" but contain no trace of iodine. Can the Yankees beat that?

Hamburger Tea contains 32 parts of senna leaves, 16 of manna, 8 of coriander, and 1 of tartaric acid, ground up together.

Dr. Sage's Catarrh Remedy, says Schädler, contains 0.5 grammes of carbolic acid, 0.5 grammes camphor, and 10 grammes common salt, which are to be dissolved in 4 liter of water, and injected into the nostrils. It appears very probable that the wide reputation of this remedy is a deserved one, and the publication of its constituents will rather increase than retard its sale.

Croup Powder, from F. W. Gruse, in Berlin, contains 25 parts of common salt, 10 of flowers of sulphur, 25 of fenugreek, 25 of juniper berries, 5 of gentian root, and 5 of fennel seed.

Horn's Liton, infallible cure for tooth-ache, contains 5 parts of phosphate of lithia dissolved in 400 parts of alcohol.

Schenk's Mandrake Pills. Hager says that these pills contain no mandrake. They do contain the constituents of cayenne pepper, a bitter extract, and some vegetable powder containing tannin.

Bishop's Granular Effervescent Citrate of Magnesia. According to Löhlein, it contains neither citric acid nor magnesia, but is merely a mixture of bicarbonate of soda and tartaric acid.

Poho, a Chinese essence for headache, etc., consists, according to Hager, of good and pure peppermint oil, rather hard and resinous. According to others it is a mixture of Epsom salts and peppermint oil, or of the latter with oil of almonds.

R. R. R. consists of a reddish-yellow liquid, that smells of ammonia and camphor. It contains 14 parts soap, 40 parts of 10 per cent ammonia, 640 parts alcoholic extract of cayenne or Spanish pepper, 4 parts camphor, and 2 parts rosmarin oil.

Selenite Perfectionné, from Paris, for dyeing the hair, is an alkaline solution of acetate and nitrate of lead.

Mrs. Winslow's Soothing Syrup consists, says Hager, of 8 parts of white simple syrup mixed with 1 part of a tincture made by extracting 10 parts of freshly crushed fennel seed and part of oil of fennel with 60 per cent of spirits.

"Sozodont" for the Teeth. The reddish liquid consists of a solution of 5 grammes oil soap in 6 grammes glycerin, 30 grammes spirits, 20 grammes of water, perfumed with a few drops of oil of peppermint, oil of cloves, oil of cinnamon, and oil of anise, and colored with cochineal. The powder is a mixture of carbonate of lime, magnesia, and Florentine orris root. None of the ingredients can be considered objectionable.

Worm Lozenges. A favorite American remedy. It contains 1 part calomel, 6 parts santal, and 200 parts sugar.

World's Hair Restorer contains, says Wittstein, 5.6 grains sulphur, 8 grammes sugar of lead, 100 grammes glycerin, and 200 grammes aromatic perfumed water.

Extract of Walnut Shells. A preparation with this harmless appellation is put up by a Berlin firm; but it contains, according to Schädler, a little nitrate of silver and chromate of copper in ammoniacal water.

The above are but a few specimens, selected to show that humbugs are pretty equally distributed over the earth's surface, including China, while at the same time we are pleased to notice that some of our American preparations are totally harmless, while others are even useful and beneficial. We hope at the same time to have satisfied a pardonable curiosity in some of our readers.

POLISHING BRASS.—For polishing the brass work of engines, rub the surface of the metal with rottenstone and sweet oil, then rub off with a piece of cotton flannel and polish with soft leather. A solution of oxalic acid rubbed over tarnished brass soon removes the tarnish, rendering the metal bright. The acid must be washed off with water, and the brass rubbed with whitening and soft leather. A mixture of muriatic acid and alum dissolved in water imparts a golden color to brass articles that are steeped in it for a few seconds.

IMPROVED CAR COUPLING.

The invention herewith illustrated is adapted to coupling cars of different heights, automatically and by means of the common form of short link. The construction is such that the link is always maintained in proper horizontal position for entering the drawbar of the opposite car.

The drawbar, as shown in Fig. 2, is divided into three compartments, and through the same are made apertures for the reception of the pin. A is a crosshead having a stem, B. The latter is enveloped in a spiral spring and moves in a central longitudinal recess of the drawbar. Said recess opens into the central throat and is of sufficient diameter to receive the shoulder, C, of the stem. The spring bears against this shoulder, and also against a pin which is fixed in the sides of the drawbar, and passes through a slot in the stem. The pin thus serves as an abutment for the spring, a guide for the stem, and a stop to limit the forward movement of the crosshead, A, so that the latter simply advanced to its proper position beneath the coupling pin without striking any of the partitions and thus becoming, in time, worn. The drawbar is recessed to receive the crosshead, which is secured to the stem by dovetailing. To make this attachment the stem is first inserted into its position by passing it longitudinally through the middle throat until its dovetail slot is immediately below the coupling pin hole. The crosshead is then passed down through said hole and then driven into the dovetail slot, where it is suitably secured by screw or rivet. The advantage claimed for this construction is that the narrow shape of the crosshead permits the drawhead to be made more nearly solid and stronger; while the mode of connecting the crosshead to its stem preserves the usual shape of drawbar close to the head, and allows of its being made in one piece. The forward side of the crosshead has beveled faces, which press upon the link and force its inner end down, thus holding the link in proper position for entering the opposite drawbar, as shown in Fig. 1. The link is not rigidly held after coupling, but moves freely up and down, so that it accommodates itself to the varying position of the cars.

In using the device, the coupling pin is supported upon the end of the crosshead, as shown in Fig. 1. The entering link pushes the crosshead to the rear, and causes the pin to drop through the link opening, so coupling the cars.

Patent pending through the Scientific American Patent Agency. For further information address the inventor, Mr. I. Floyd Heavener, Laramie City, Albany county, Wyoming Territory.

DILLON'S HALTER CHAIN, AND TRACE COUPLING.

Mr. John C. Dillon, while Farm Superintendent of the Massachusetts Agricultural College, had in his charge, among other stock, several adult bulls; and, after considerable experience with knobs, buckles, hooks, snaps, and toggles, he became convinced of the need of some new method of fastening these animals, which should be at once simple, easy of operation, strong, durable, and absolutely secure. These conditions, he claims, are combined in the device shown in the engraving.

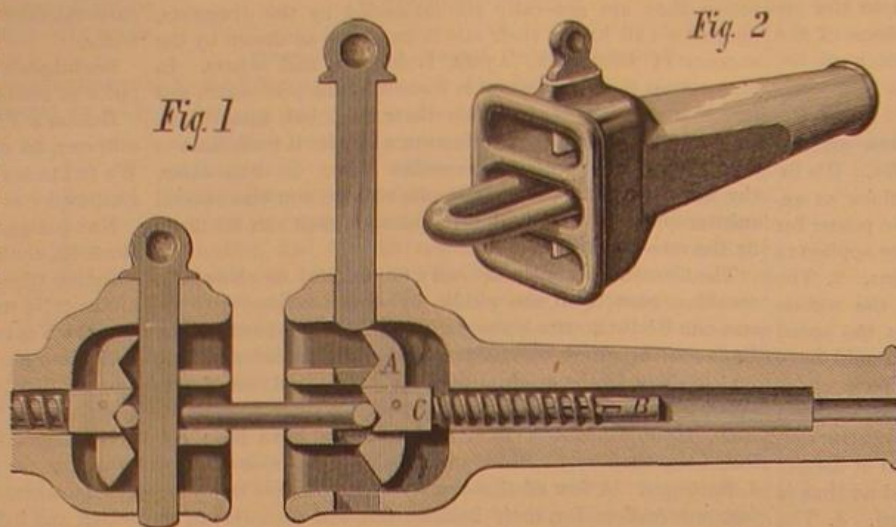


It consists in a crescent-shaped hook, A, and a ring, B. The hook is slipped into the ring, as shown, forming a coupling which can be operated instantly and easily, which cannot be accidentally detached, and which, not being dependent on any screw or spring, is as strong and durable as the ordinary links of a chain.

By bending up the coupling ring, on the chord of an arc of it, as shown at C, or by using a coupler with the shank

perpendicular to its perimeter, as at D, the coupler is made to lie flat in its ring. This coupling, we are informed, has been used with much satisfaction on halters, cow chains, traces, breechings, pole straps, and wood chains. It is also adapted to a variety of other uses, such as satchels, shot belts, fishing-baskets, skirt-supporters, etc.

The following are some of the advantages claimed for the coupling when applied to halters, and will be readily understood by reference to the engravings. It serves as a safe, handy, and durable method of connecting the halter chain or rope with the head-stall, and also with the manger ring or other hitching place. The weight of the lower coupler prevents any slack in the rope or chain between the horse or other animal and the manger ring, and materially lessens



HEAVENER'S IMPROVED CAR COUPLING.

the danger of casting or entanglement. It has also been found to succeed well with horses which were noted for their skill in untying knots. As the chain or rope swings loosely and turns freely in the manger ring, it cannot become twisted. The necessity for constant care and thought as to the proper length for tying up is avoided. When the head-stall is taken off and left attached to the rope or chain, the weight of the lower coupler holds it suspended against the manger, instead of allowing it to lie in the manger or on the floor.

This invention was patented in the United States July 3, 1877, and in Canada July 18, 1877, by John C. Dillon, of Amherst, Mass., to whom inquiries are referred.

THE COLORADO POTATO-BEETLE IN EUROPE.—GERMAN THOROUGHNESS.

BY PROFESSOR C. V. RILEY.

When, a few years since, the writer first announced his conviction that there was real danger of the importation of the above named insect from our Atlantic shores into the potato-growing countries of Europe, he was considered an alarmist by most transatlantic and by some American writers; while there were not wanting those of high entomological authority who made out, to their own satisfaction, the impossibility of the insect's thriving and multiplying in a climate differing in so many respects from that of its native home. Time has, unfortunately, but too surely vindicated my position and established the possibility not only of the insect's importation but of its ready acclimation. The occurrence of a living beetle in the Bremen docks during the summer of 1876, in a cargo from New York, was the first evidence we had of the importation so much feared; and, as the sequel has shown, others, unnoticed, must have been carried to other parts of Germany that year.

The discovery of the pest in all stages at Mülheim, on the Rhein near Cologne, during the latter part of last June, was considered of sufficient importance to be telegraphed and cabled to all parts of the world; while the energetic measures adopted by the Minister of Agriculture to stamp it out have been made known. The name of *Doryphora 10-lineata* has lately become as familiar to the members of the British Parliament, the German Diet, and the French Assembly as have the less pronounceable names of the towns and passes over which the Turks and Russians have had their more sanguinary conflicts. But it is not my purpose to dwell on the fact of the insect's successful establishment on another continent, notwithstanding the efforts made to prevent such an occurrence. I desire, rather, to call attention to, and to commend the thorough methods adopted to eradicate the evil. The authorities, not satisfied with causing the field of potatoes in which the insects were found to be covered with sawdust, saturated with coal oil, and burned, had the good sense, in addition, to send to the scene of action Professor A. Gerstaecker, of Greifswald, a well known entomologist connected with the Berlin Museum, in order that he might examine and report. When he arrived, the potato field in question and several adjacent fields toward Deutz were already in flames, under the management of Alderman V. Nieswand and Mayor Steinkopf. Fortunately, these gentlemen had saved some of the larvæ and the beetles taken from the field, and had preserved them in well secured bottles. Those commissioned to perform the work of extermination by burning took it for granted that the beetles were fresh

from America, and had produced the larvæ. They would very naturally have concluded their labors and rested satisfied in the conviction that no *doryphora* had by any possibility escaped from the fiery ordeal it was subjected to. Not so the deeper sighted entomologist! From analogy in other beetles of the family, and from what American authors had written, Gerstaecker took in the situation at a glance. The pale and fresh color of the beetles and the full grown condition of some of the larvæ indicated that the former were recently from the pupa, and suggested that there might be transforming larvæ and pupæ some inches below ground and unaffected by the superficial fire.

At his solicitation the field was plowed, but without result. No insects were noticed. With faith in the accuracy of his deductions, he still bade the authorities persist, and twelve laborers, in line, commenced turning over the earth foot by foot with the spade. For the first hour this also seemed futile; but as soon as the spot was reached where the larvæ were first observed, one pupa after another was turned up, with here and there a larva not yet transformed. In a few hours over sixty had been found, all alive and some just ready to give forth the beetle. This effort of the German Government to strike effectually at the root of a threatening evil, instead of waiting until it was ramified in all directions, and then spending vast sums in vain attempts to counteract it, furnishes a beautiful illustration of two very plain and simple truths in economic entomology that are too often overlooked. These are, first, that prevention is so much more satisfactory than cure; second, that thorough and special knowledge is necessary in successful warfare against injurious insects.

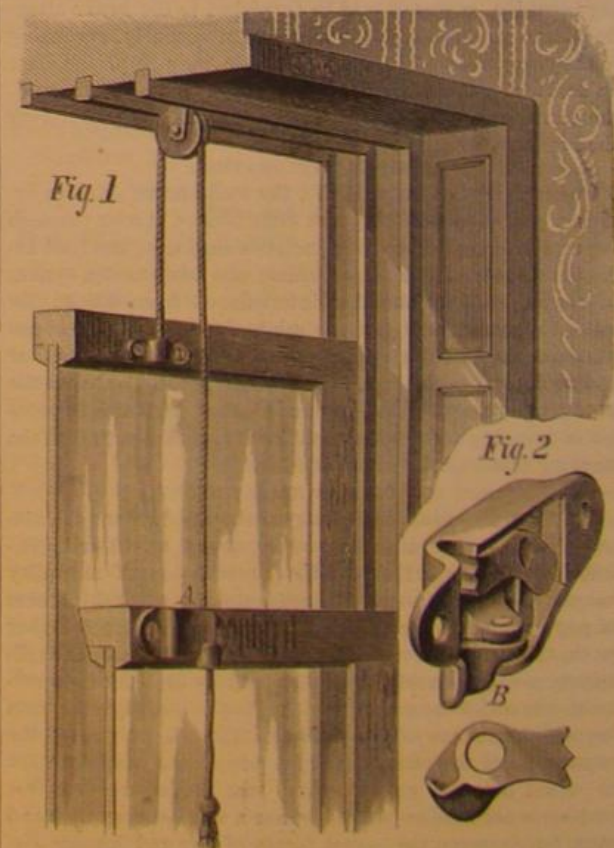
It is doubtful if the thorough measures above described have eradicated the evil in Germany, because the insects found at Mülheim were probably the progeny of a single beetle that went over last year, and other females may have got a foothold in other parts of the empire; but a nation which will use such vigilance and thoroughness in one instance will be apt to do so when occasion again presents.

IMPROVED SASH BALANCE.

We illustrate herewith a simple device whereby the two sashes of a window are caused to balance each other, so that either may be adjusted independently in any position, or both may be moved together.

The fastener, A, Fig. 1, is secured to the meeting rail of the lower sash. The cord is attached to the top rail of the upper sash, passes over a pulley on the window casing, and down through the fastener. The latter is represented in detail in Fig. 1. It consists simply of a spring-acted toothed clamp which clasps the cord. In contact with one arm of the clamp is a pivoted lever, B, which, when the lower portion or tassel of the cord is pulled outwards, acts on the clamp so as to cause the latter to release its clutch on the cord.

When the lower sash is raised the upper one will descend. If it be desired that both sashes shall remain up, then the lower one is first raised and held in position by the left



hand. The cord is pulled outward to release the catch, when it will render through the fastener, thus lifting the outer sash. Similarly to lower the inner sash another pull on the cord releases the fastener, when the sash may be slowly lowered. The movement of the sash may be arrested at any point by simply bringing the cord straight. Patented June 26, 1877. For further information address the inventors, Messrs. Kolb and Osberghaus, Sandusky, Ohio.

THE BIRDS OF PARADISE.

When the Portuguese discovered the Molucca Islands they found there dried birds' skins of so beautiful and strange an appearance as to call forth the admiration of those gold-seeking navigators. The Malay dealers called them *Manuk Dewata*, or "Birds of the Gods," which was translated by the Portuguese as *Passaros da Sol*. The Mohammedan conquerors of that country invented the legend that these birds, which nobody had then seen alive, came from Paradise, that they lived exclusively in the air and never alighted on the earth. Speculation added to this story that these birds had neither feet nor wings, and the dried skins which were brought to Europe strengthened this belief, as the wings and feet were really wanting, having been removed by the natives.

Antonio Pigafetta, who took part under Magellan in the first circumnavigation of the globe, and who returned in the year 1522 to Spain, relates in his diary that Bachion, the ruler of the Molucca Islands, had given them two very beautiful dead birds as a present to the King of Spain. These birds were, according to Pigafetta, about the size of pigeons, had small heads, long bills, legs as thin as a quill and as long as a hand. They had no wings, but in place thereof long feathers of different colors, similar to large plumes. It thus appears that Pigafetta had given, shortly after the discovery of the Moluccas, a truthful description of the bird of Paradise, but the prejudice of the times in favor of the supernatural did not accept his statement. All the skins brought to Europe were without feet, and therefore Pigafetta must be in error. Such was the conclusion of the naturalists of the 16th and partly of the 17th century.

Though the home of the bird of Paradise had been discovered about the year 1512, and was frequently visited by the Portuguese and other European navigators, no reliable information was obtained concerning them. The knowledge of the coast of the country was only of a hydrographic nature, as into the interior no European foot had as yet penetrated. Only in the third score of this century careful and reliable information of the bird was obtained through the efforts of the French physician and naturalist, Lesson, who was stationed during his circumnavigation of the earth in the harbor of Dorey, and who secured about a dozen well preserved skins. Additional information was furnished after 1860, by the Dutch traveler, G. v. Rosenberg, and by the English traveler, A. R. Wallace, who remained for a period of five years in the Malayan archipelago.

The bill of the bird of Paradise resembles that of the crow, and the bird has been placed by naturalists in the same class. Not even the humming bird of tropical America surpasses these crow-like birds of the Moluccas in the metallic hue of their colors. With many of them, long tufts of delicate feathers extend from the sides of the wings, forming long fan-shaped tails; with others the breast feathers spread like shields of enamel, while the neck feathers form fantastic collars. Besides these, two long thread-like feathers extend far beyond the remaining tail feathers; and similar accessory feathers, as they have been called, extend from the head, back, and shoulders. The species *paradisca* is recognized by largely developed, plume-like feathers

that grow out from below the wings. The so-called footless bird of Paradise is the largest of the class and species. Body, wings, and tail are coffee-brown, head and neck of a velvety-yellow, the breast and front head of emerald green. The two long middle feathers of the tail form spiral windings, like wires, from two to three feet in length. At the sides, below the wings, is a heavy bundle of delicate orange-colored feathers, with whitish ends, which are tinted with a brownish-red. This bundle of feathers may be instantly raised and spread so as to surround the body of the bird like a halo.

The Papuan bird of Paradise is somewhat smaller than the one described, but very much resembles it. It differs by being of a brighter brown and a deeper yellow color, which extends over the entire upper part of the back and over the coverings of the wings, another difference being the terminating of the bundles of orange feathers in a clear white. The beautiful plumage is a characteristic of the male only, the female being with very plain plumage. It has neither the long downless feathers of the tail, nor even a single yellow or green feather on the head. The young males are, in the first year, like the female, and only after four years of age does the bird assume his entire brilliant plumage.

The birds of Paradise are very lively and continually in motion. Their voice sounds like a long "wak, wak" or "wok, wok," and can be heard quite a distance. It is not known how they build their nests. They live on fruits and insects.

The natives obtain the birds in different ways. As soon as they find a tree that serves as their meeting place they build a shelter of palm leaves among the branches, where the hunter hides himself before break of day. A boy is in waiting at the foot of the tree. As the birds congregate, the hunter shoots the birds with an arrow that has a blunt point.

As the birds drop they are caught and killed by the boy. The birds are prepared by the natives in the following manner: The wing feathers are drawn out and the legs cut off, the skin is drawn over the body to the bill, and the brains then taken out. A round stick, that extends for a few inches from the bill, is inserted in the skin, and the same dried in the smoke in their butts.

The first live birds were brought to Europe by Wallace, in 1862, who bought them at Singapore for £200 sterling. The larger kind, with one species of a smaller kind, was brought alive to Europe for the first time in the summer of 1875. Both birds were obtained by the Berlin Zoological Garden.

Intellectual Culture of Parrots.

W. B. Cooper, of Philadelphia, suggests the idea of taking advantage of the remarkable facility of imitating speech which parrots possess, and endeavoring to educate them by "intellectual environment" of the race for several generations. He thinks some very interesting results may be obtained within a very limited period; and that as they often repeat words, the meaning of which they do not comprehend, is no argument that they may not be taught their meaning. His idea is to collect a number of the most intellectual parrots of both sexes, give them daily object lessons, removing the stupid ones from the next generation, and so with succeeding ones. By this method the advantage of hereditary effect by having them present at the lessons, would be secured, and the rising generation would have an opportunity of profiting by the experience of their ancestors.

Another New Iron Steamer.

On the 30th August the new steamer City of Washington, for the Havana trade, was launched from Roach's establishment, Chester, Pa. Length, 321 feet; breadth of beam, 38 feet; depth, from spar deck, 35 feet, and from hurricane deck, 28 feet. Her hull is of iron, the plating being riveted throughout in boiler fashion. The plates vary from five eighths of an inch to an inch and a quarter in thickness. Her deck houses near the machinery and the galley are to be of iron, while the others will be constructed of wood. The spar deck is of iron, covered with wood for the entire length and breadth of the vessel. The lower deck abreast of the space occupied by the machinery is also of iron.

The engines were made by the Morgan Iron Works, New York city. They are of the compound pattern, the high pressure cylinder having a diameter of 40 inches, and the low pressure one of 74 inches. The stroke of the piston is six feet. The boilers, two in number, have each a diameter of 17 feet, and a height of 20 feet. The steam pressure will be 80 lbs. to the square inch. The propeller has a diameter of 16 feet, with a pitch of 24 feet. The City of Washington is expected to average 15½ knots per hour, and when her engine is driven so that the shaft makes 75 revolutions per minute, it is thought she will be able to make between 17 and 18 knots.

How to Make Old Steel Pens Good as New.

A subscriber says a pen scratches because the inside corners wear off, and look like the bottom of a *M*. To restore it, rub the end

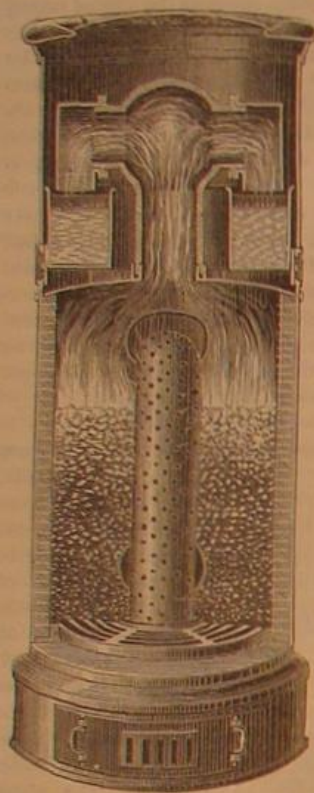


BIRDS OF PARADISE.

square and even on a whetstone. Bring the slope of the nib to a point to suit you. Then, holding the pen nearly upright, roll it around, holding the nib on the stone to make the point round. Make it as round and smooth as you can.

A CHIMNEYLESS STOVE.

M. Mousseron, of Paris, has recently devised the novel form of stove represented in the annexed engraving, the chief peculiarity of which is that no chimney is required for it. It makes its own draft, and is consequently portable. Rising from the grate is a perforated tube, through which, as well as through the interstices of the grate bars, the air enters and passes through the coal. This, it is stated, produces such thorough combustion that the formation of carbonic oxide is prevented and the carbon is wholly converted into carbonic acid. Carbonic oxide is essentially mephitic and deleterious, and a small percentage in the atmosphere is sufficient to produce highly injurious effects. Carbonic acid, on the other hand, while irrespirable, is not poisonous, so that any stove performs its most important duty when it obviates the generation of the gas first mentioned.



The products of combustion arising from the coal are led up through a flue and then conducted downward so that they come in contact with water contained in an annular vessel surrounding said flue. This water never boils, and vaporization is confined to its surface, producing an internal movement of rotation, the result of which is that the gas, etc., from the fuel becomes thoroughly mingled and saturated with the water. On rising, the gas meets the curved cover, and is once more deflected downward, again meets the water, and finally escapes into the atmosphere by side orifices provided for that purpose. In this way it is claimed that the carbonic acid becomes intimately mixed and dissolved in the water, so such as is contained in the escaping vapor is not in a condition to injure the air for respiration.

From the records of experiments we learn that in three hours 2.2 lbs. of charcoal and 6.6 lbs. of coke were consumed. At the end of an hour the air in the room, measuring 4,805 cubic feet, was analyzed with the following result: Carbonic acid, 0.375; carbonic oxide, 0.003; oxygen, by calculation, 20.6; nitrogen, by same, 79. Total, 99.978. With regard to quantity of fuel employed for a given space to be heated, it was determined that the initial temperature being 32° Fah., in order to heat 327 cubic feet of air to 60° Fah. from 1.1 to 2.2 lbs. of fuel were required, while ordinary stoves, under like conditions, necessitated from 4.4 to 8.8 lbs.

THE AMERICAN LIFE SAVER OR SURF CAR.

Nothing of consequence was accomplished to lessen the loss of life occasioned by shipwreck until the year 1848, when Captain Douglas Ottinger, of the United States Revenue Marine, presented to the world his "life car." No sooner was the invention introduced than the American Government acknowledged its fitness for the purpose intended, and ordered the life-saving stations along the Atlantic coast each to be provided with one of these cars.

Although so useful, the car is simplicity itself, and its construction such that it may easily be understood. It is made of galvanized sheet iron. In length it is about nine feet and in breadth three and a half. Outwardly it looks much as we would imagine one of our common clinker-built boats to appear if it had a slightly curved cover placed upon it. Instead of having a stern and stem, the ends are alike, both terminating in a point. Nearly in the center of the top is an air chamber, designed for the purpose of righting the car should it turn over. In shape this resembles a hemispheroid, and it is about two and a half feet in length, and ten inches in breadth. Between its end and the further extremity of the car is the entrance. Water is prevented from coming through this by means of a lid securely fastened. Around the circumference of the car a thick rubber band is placed to protect it from damage in case of contact with hard substances. Above and parallel to this is a rope. It is intended for drowning persons to grasp in order that they may be drawn ashore.

The inside of this curious life-preserver is divided into three separate apartments. Those at the ends are merely air

chambers, and are both about one and a half feet in length. Between these is located that portion of the air designed for occupants. Although this space may seem small, in order to prove its capacity it is only necessary to state that it has accommodated a woman and six children, and that three men can get into it without any difficulty. "How can the car be sent to a vessel during a storm, and especially if it be two thirds of a mile away?" is the question which naturally arises at this point. It has been done and in the following manner: The smallest cord capable of sustaining the force brought to bear upon it is fastened to a copper wire which is bent in form of a spring (to lessen the momentum), and attached to a twenty pound cannon ball. By firing this over a sinking vessel, those on board can grasp the cord. With this, a small rope is drawn in and so on until finally the car itself reaches the vessel. In the meantime, those sending the assistance keep their hold of the car by means of another rope. In this way they can pull it back. If once successful, all further trouble is at an end, because the main difficulty lies in getting the rope to the distressed ship. When this is accomplished both parties can retain their own rope, and thus the car may be drawn back and forth without delay. By working continually, fifty lives can be saved in an hour.

Thus does the usefulness and simplicity of the car combine to make it one of the most perfect life savers yet invented. Although recently introduced it still has a record, and a glorious one, as it has already rescued over four thousand persons from inevitable death. Its celebrity, however, is not bound by two oceans. France, ever on the alert for improvements, soon seized this, and her accounts of its perfections are exceedingly flattering, and are sufficient to cause America to be justly proud that one of her sons invented the life car.

Germ Destruction by Concussion.

Mrs. H. K. Ingram, of Edgefield, Tenn., proposes to kill germs by concussion of the air, and in a paper read before the American Association at Nashville, she explained her theory. It is well known that many dreaded pestilences are transmitted by living organisms which, floating in the air, are inhaled and so find entrance into the body. Mrs. Ingram points out that all the mosquitoes in a room can be killed by exploding in the center of the apartment a small quantity of gunpowder, and from her experiments she is led to believe that similar explosions might be used to kill the phylloxera on grape vines.

There is nothing new in the general idea of destroying lives by concussion, although the application of the same to the extermination of the minute organisms which generate disease is in itself a novel proposition. During the late war two attempts were made by the Federal forces to destroy large numbers of the enemy once by the explosion of a heavily charged mine and once by loading a vessel with powder, etc., and blowing her up under the walls of a fort. Neither were successful.

Mrs. Ingram's proposition suggests the plan frequently broached of firing heavy guns to provoke rain, and shows that such explosions may prove of double benefit.

Coloring Wool.

It is pointed out in Reimann's *Färber Zeitung* that fabrics, especially those of wool, which have for a long time been exposed to air and light, acquire a stronger power of fixing coloring matter than portions of the same material which have been kept in the dark. This circumstance often prevents the production of an even shade, those parts on which the light had fallen taking the light more readily and acquiring a striped or banded appearance.

TRIAL OF MILITARY APPLIANCES.

At a recent field day of the Royal Engineers, Chatham, England, a variety of exercises in practical military opera-



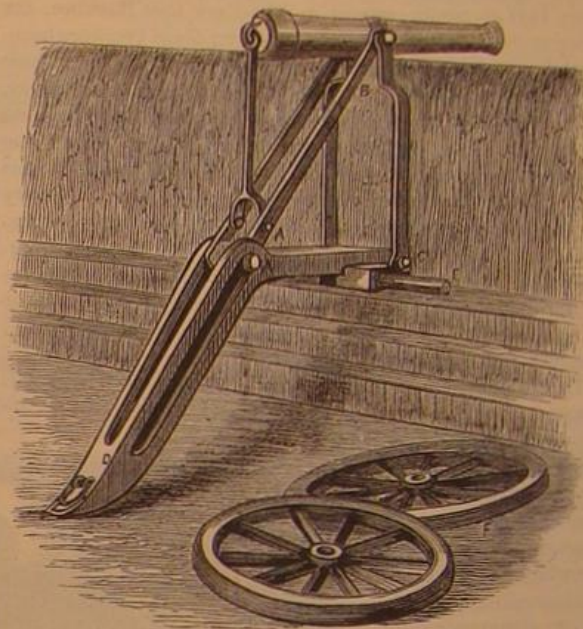
THE AMERICAN LIFE SAVER OR SURF CAR.

tions were performed, and trials made of improved batteries and other war appliances.

The chief features of interest in the siege works were as follows: First, the batteries, built a little in rear of each trench, so as to utilize the trench parapet as a screen to receive the enemy's fire instead of the parapet proper, and to mislead them. These batteries had the narrow soda-water bottle form of embrasure, with sides protected by means of hides. On the gun carriages were hung the so-called Prussian scale slides, for laying guns by reference to a line pass-

ing longitudinally under the carriage. The two scales having corresponding graduations, and being of considerable length, enable the gun to be laid without much traversing. For example, if a gun moves laterally in firing, it is immaterial whether the line on the platform beneath it corresponds to a 1 on the front scale and a 3 on the rear, or a 4 on the front scale and a 6 on the rear, the same inclination between the axis of the gun and the platform line being obviously maintained.

There was rather an ingenious device of Major Maquay's for enabling a field gun to fire over any part of a trench, consisting of a framework carriage of iron, on which the gun was mounted, which, by means of a parallel bar movement, descended under cover on firing. Wheels could be put on and the gun moved from point to point as might be desired.



MAQUAY'S BREASTWORK CANNON.

The trench tramway had carriages for carrying ammunition, guns, and carriages, or wounded along it.

There were examples of the newest forms of blinded trench and of splinter-proof cover, etc. On the salient of the new ravelin was an imitation of an iron-plated battery for three guns, the extreme angle of the salient being rounded off to admit of fire along the capital. In the modern system, it may be remembered that the space in front of the salient of the ravelin, that is to say, along its capital, is defended by direct fire, but that in front of the salients of the bastions by oblique fire, consequently there was no deficiency when the range of guns was short. In these days a spot can be found where the lines of fire have crossed each other which is within easy range of rifled guns; hence there exists a special necessity for fire being provided along the capitals of salients, although that does not apply to the case of the particular one in question. The iron work in question ought to be a very valuable one, both from its commanding position and from the complete protection afforded to the guns. It would be necessary, however, to have very thick armor for such a work, which, if it is liable to receive the fire only of much lighter guns than an armor-clad ship or coast battery, would be the constant mark of numbers of siege guns which would have the range accurately. Railway iron was used for the flank protection of splinter-proofs in places; but there are no examples of the concrete that proved so effectual last autumn. The steam sappers were the chief features of interest in the marching past. An 8 horse power steam sapper came by, drawing three 32 pounder smooth-bore guns on traveling carriages; a 6 horse power engine, four bronze guns of position—heavy 12 pounders and 32 pounder howitzers. Others drew loads of shot and shell, cases of arms, and materials for the engineer parks.

A Horned Rattlesnake.

An inhabitant of Burnt Chimney, Rutherford county, was in the city yesterday evening, exhibiting five rattlesnakes, one of which had genuine horns. The horns project perpendicularly from the snake's head, and are about an inch long. They are of a brownish color, and in shape and general appearance are exactly like those of a deer, with the difference that they are less crooked, and larger in proportion at the point at which they emerge from the head. The snake is about eight years of age, and in every other respect is perfect.

The owner of the phenomenal snake says that it was caught on Black Mountain, in McDowell county, about a month ago. He and several others had heard of a famous rattlesnake den there, and went for the purpose of shooting them. When they found it several hundred snakes were visible, among them the one with horns. Before they began shooting they captured a half dozen or more by means of nooses, taking the horny headed one first.—Charlotte (N. C.) Observer.

SCIENCE AT THE BRITISH ASSOCIATION.

We continue below our brief abstracts of the more important papers read at the recent session of the British Association at Plymouth, England.

EXPERIMENTS ON THE ELASTICITY OF WIRE

have been begun in the University of Glasgow. Thus far the investigation has extended to the effect of continued application of force on the breaking weight of steel wire and soft iron wire. It is found that, when a weight nearly as great as the breaking weight is kept for a long time—several days for instance—and applied to pull out a soft iron wire, the effect is to increase the strength of the wire as much as 6 or 7 per cent. The

CONDITIONS UNDER WHICH LIQUID CARBONIC ACID EXISTS IN MINERALS

was the subject of a paper by Mr. W. N. Hartley. A method was described of determining the exact temperature at which the carbonic acid sometimes found inclosed in minerals becomes gaseous. This has been determined to be 30°-42° C. The investigation has led to some interesting results concerning the motions of the bubbles in fluid cavities when influenced by heat. Bubbles in certain cavities approach the heated source, in other cavities they recede. A rise of temperature of 5° C. causes apparent attraction, while a rise of ½° C. in some cases causes repulsion. In certain cases a bubble which receded from the source of heat at ordinary temperatures approached it when raised to 60° C., the source of heat always being from ½° C. to 5° warmer than the specimen. Mr. Hartley has also examined a remarkable vibration of minute bubbles in fluid cavities. It was found that these bubbles approached a warm body brought near them, and that they ceased moving and clung for some time to the warmer side of the cavity. The conclusion arrived at for these phenomena is that an easily movable particle, which can be set in motion by exceedingly slight differences in temperature, will make the transference of heat from one point to another plainly visible. The minute bubbles in the cavities are such particles, and these vibrator motions afford ocular demonstration of the continual passage of heat through solid substances.

Mr. Silvanus P. Thomson, discussing

BINOCULAR AND MONOCULAR VISION,

stated that light is more powerful in producing an effect when concentrated upon one eye than when equally distributed to the two, though according to what law experiments are not yet sufficiently numerous or exact to determine; but, on the other hand, the light so concentrated on one eye does not produce the sensation of twice as much illumination as the half of the light viewed by both eyes at once.

TEMPERATURE COEFFICIENTS OF INSULATING ENVELOPES.

Mr. Bruce Warren had already shown that the rate of variation in the insulation resistance of a core or cable under changes of temperature could be determined for any period of contact. He now points out that an important consequence of the phenomenon of electrification being reducible to an intelligible variation is that we can calculate not only the changes in the resistance due to variation of temperature, but we can ascertain with the same precision any required change due to prolonged contact at any required temperature. It also appears that electrification, which is an inseparable property of all insulators, follows some law of variation in which the temperature coefficient of the insulator itself is a function.

ACTION OF FATTY OILS ON COPPER.

Mr. W. H. Watson stated that paraffin and castor oils have the least action upon copper, whilst the action of sperm and seal oil is slight. Linseed, olive, almond, colza, sesame, and neatsfoot oils all act considerably upon copper, the action of linseed oil being especially great. The author concludes that the comparative action of different oils cannot in all cases be decided upon from the appearance of the oils after exposure to copper plates, though minute quantities of the metal may be easily detected in most oils from the color produced.

CHANGES IN CANDLES PRODUCED BY SEA WATER.

Professor Gladstone had examined some candles taken from the wreck of a Spanish vessel which had been submerged for 173 years. The fat had been converted mainly into calcium and sodium salts. Although, however, the fats have been in contact with a practically unlimited quantity of sea water for the above lengthy period, and a chemical change between them has been possible, the double decomposition has proceeded so slowly that the reaction is only about half completed at the present time.

CONSTITUTION OF ARCTIC COAL.

Mr. T. Wills has examined some coal from the side of a mountain gorge about two miles from Discovery Bay. By comparing the results of an analysis with those of obtained from another analysis of a mixture of specimens from thirteen different seams in English coal fields, Mr. Wills has found that arctic coal possesses very nearly the same composition.

PROTECTION OF IRON SURFACES BY FORMATION OF BLACK OXIDE.

Professor Barff stated that a perfectly adherent and coherent coating of black oxide which will protect iron from corrosion may be formed as follows: A wrought iron muffle, containing the iron articles to be operated upon, is heated to a dull red heat, all the openings closed, and dry steam turned in. The muffle is kept filled with steam for from three to five hours. The fire is then raked out, and the articles are

allowed to become black in an atmosphere of steam. After this the steam is turned off, and the muffle and its contents are allowed to cool slowly. The temperature to which the muffle is heated varies according to the nature of the articles operated upon, from 662° to 1,292° Fah.

IMPROVEMENT IN MANUFACTURE OF BETON.

BY JOHN C. GOODRICH, JR., OF NEW YORK.

In the method now employed of making *béton* or concrete, cement and sand are used without previously preparing the cement. In the Coignet methods sufficient water only is added to make a plastic pulverulent paste. This does not contain sufficient water to form hydrates, unless lime enters largely into the composition, in which case the moisture held by the lime is taken up by the cement during its crystallization, the lime absorbing its moisture from the air; but lime in a large quantity weakens the *béton*, from having but a low adhesive power in comparison with cement. Neither is it able to withstand the action of water or fit for underground work, as it does not become hard when kept constantly damp, nor does it become hard in the interior of large monoliths when it is removed from the effects caused by the atmosphere.

In the other and ordinary methods a larger quantity of water is used, sufficient to make a semi-liquid mass that will flow. This excess of water is forced out of the concrete by the contraction of the cement during its crystallization, and leaves the stone porous. It also prevents the proper ramming of the *béton*, and gives rise to the difficulty known as "*laitance*," hereinafter described. On the other hand, a *béton* containing too little water becomes friable.

My process is as follows: When, in the construction of large monoliths or structures, largely underground, the checks and efflorescence which usually appear are not a serious objection. Sand and cement may be mixed in the proportion of from three to six parts of sand to one of cement. This may be done by means of machinery or by hoes, shovels, and rakes. During this process water is added by means of a hose or watering pot having a rose jet. The water is added gradually until the sand and cement contains so much that a handful of *béton* will, if tightly squeezed, allow a little water to exude, but will, when laid down, still retain the impression of the hand. The *béton* so mixed will have about the consistence of melting snow. It can be compacted in the same way, and pressure will force the moisture out of it. This condition, though difficult to describe, is learned at sight by the workmen, and the correct amount of water is more accurately gauged by trying the *béton* from time to time in the hand during its mixture (as it varies in different cements) than can be done by any rule of measurement. The *béton* is then placed in position and rammed, as described below.

The quantity of water thus gauged will be enough to form hydrates, in combination with the components of the cement, leaving no excess to be forced out during crystallization, and does not prevent the proper ramming of the *béton*, while there is not sufficient to cause *laitance*. But to obtain a perfect result where a finished surface is requisite, and to make a *béton* free from the deleterious ingredients that are found in all cements, and to insure the use of a proper quantity of water, I proceed as follows: Having obtained the heaviest slow-setting cement, the first step in this process is to separate from it the light, earthy impurities—the uncombined lime and clay and the soluble salts. This can be done to a considerable extent by a regulated current of air being driven against the cement while falling from a height, and in a proper inclosure; or it can be done by revolving screens, or by means of a centrifugal mill; and I claim these methods to be equivalents of the following. But the method which I prefer, and recommend as much more perfect, is to allow the cement to fall slowly into a box filled and constantly fed by a stream of water, the entrance of which is preferably near the bottom of the box. One side of the box is lower than the others, for the overflow of the water. Where a constant stream of water cannot be had the result may be obtained by agitating the cement with water in a swinging box or other convenient way, pouring off the water and supplying its place with fresh water from time to time.

A box may be placed in and on the bottom of the larger box to collect the cement as it settles. The portion thus preserved consists of the heavy, gritty, and inactive parts of the cement, which is without adhesive power, and which acts simply as so much sand. This equals about ten per cent of the whole mass of cement.

Cements containing a larger amount than usual of this gritty portion may, when mixed pure, stand a high test, but will not bear a large admixture of sand. With this gritty part settles the true cement, which we call the "*matrix*." This is that portion which is capable of crystallization or hydro-silicification called "*setting*." This portion of the cement is the only one of value, and is about 80 per cent of it.

The third or lighter portion, which is washed away with the overflowing water, consists of impurities, light earthy matter, uncombined lime and clay, and soluble salts. This portion of the cement is entirely without adhesive power, and, when separated from the other portions of the cement, acts in all respects like the impure and dirty clays. When dry it shrivels and contracts, and when wet expands and becomes slippery. This portion of the cement is the cause of the unsightly checks, and what appear to be cracks, but which are simply projections of this earthy portion, which,

by its own action in contracting and expanding, and the crystallization of the cement, has become separated from it. With this earthy portion the alkaline salts, consisting mainly of soda and potash, escape. This is the portion that causes the efflorescence or white appearance on the stone as heretofore made, and also what is known as *laitance* on concrete laid in water.

The light, earthy, and soluble portions having been removed from the cement, the supply of water is turned off, and it is all allowed to escape from the wash-box.

The cement, freed from its deleterious portions, and being thus saturated or supplied with the proper amount of water, is thoroughly mixed by machinery, or by means of shovels, hoes, or rakes, with clean, dry, sharp sand, in the proportions of from three to six parts of sand to one of cement, according to the strength desired.

The *béton* thus mixed is rammed into position, layer by layer, with a pounder, having knobs or projections to make an irregular face. The irregularities made by the pounder on the top of the layer leaves it much the better bonding of the succeeding layers.

During the process of ramming and compacting, large stones of suitable shape to form a good bond may be put into the mold or mass, and the *béton* rammed around and between them, the stones not being allowed to come in direct contact with each other. This gives stronger work, and allows more thorough ramming and the use of larger stones than where in the usual way broken stone is mixed with the sand and cement before being put into the mold or mass.

The phenomenon of *laitance* is one of the gravest difficulties besetting the laying of concrete under water. It is caused by the impurities hereinbefore set forth. When the concrete is mixed in the ordinary manner, so as to form a semi-liquid mass, these impurities rise to the top of the layer in position, gradually subside and deposit an unctuous stratum. Thus between each layer of the concrete is interposed a slippery layer, utterly preventing any union or bond between the layers of concrete, and very seriously impairing the solidity and strength of the structure. The former of my processes prevents this, since the *béton* is sufficiently dry to prohibit any movement of its component parts. The second modification of the process prevents it for the same reason, and because the impurities forming the *laitance* are themselves eliminated.

Inventions Patented in England by Americans.

From August 21 to August 27, inclusive.

ELEVATORS.—C. Baldwin, Brooklyn, N. Y.
MOTIVE POWER ENGINE.—F. M. Townsend (of Memphis, Tenn.), Liverpool, England.
PLUMBERS' TRAPS.—J. E. Folk, Brooklyn, N. Y.
RAILWAY SWITCHES.—J. S. Williams (of Rivington, N. J.), London, Eng.
SPRING BEDS.—W. Peacock, New York city.
STEAM ENGINES.—G. B. Nassey, New York city.
STOPPERS.—N. Thompson (of Brooklyn, N. Y.), London, Eng.
SURVEYING INSTRUMENTS.—H. Wadsworth, Duxbury, Mass.
UMBRELLAS.—W. H. Richardson, Philadelphia, Pa.
WIRE-DRAWING MACHINERY.—J. S. Winsor, Providence, R. I.

NEW BOOKS AND PUBLICATIONS.

ON THE SCIENCE OF WEIGHING AND MEASURING. By H. W. Chisholm, Warden of the Standards. Illustrated. Macmillan & Co., London and New York. Price \$1.50.

This is a capital treatise written by one who is an official authority on its subject. The scope of the book includes the following general heads: Definition of weight and measure; ancient standards of weight and measure; English standard units of weights and measures; the restored standards, imperial standard pound and yard; secondary imperial standards; derived units of imperial weight and measure; the metric system, and weighing and measuring instruments and their scientific use. There is an abundance of valuable information gleaned evidently at the cost of industrious research, the engravings are many and good, and the work in all respects is fully up to the latest progress.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class wood engravings of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED COMBINED DIVIDER AND SIDING HOOK.

Homer Sherman, Flushing, Mich.—The object of this invention is to furnish for carpenters an improved tool that combines the advantage of a pair of dividers and of a siding hook with a marking knife scale, bevel square, etc., forming a simple and handy implement for cutting and marking boards in siding and wainscoting. The invention consists of a siding hook having a straight back and a fixed point, in combination with a pivoted divider leg. The tool may be used as common dividers, or for setting off bevels and squares, by a swinging leg, when the straight back of the siding hook is placed against the edge of the board, or it may also be employed in siding, as dividers, hook, and marking knife may be used at will, and for wainscoting, and for other applications in carpentry.

IMPROVED PLANTER AND MANURE DISTRIBUTOR.

John Real, Double Springs, Miss.—This invention relates chiefly to the use of a harrow which is so arranged as to cover the cotton seed, and is also made vertically adjustable at its front end. Cultivating plows may likewise be easily attached place of the harrow.

IMPROVED PERFORATOR FOR PRINTING PRESSES.

James A. Caruth, Topeka, Kansas.—This invention consists in providing the frisket finger of a printing press with perforating teeth. The perforator is triangular in cross section, and is provided with a cutting edge that is serrated and with a square end piece, through which a hole is bored for receiving a bolt that secures it to the nipper frame. The perforator

moves with the nippers, and when the platen presses the paper against the face of the type it also forces it against the serrated edge of the perforator which is backed up by the furniture of the chase. The paper is thus punctured along the line upon which it is to be separated, and the holes are more or less numerous, according as the serrations in the perforator are coarse or fine. The invention consists of a knife-like piece of metal with a serrated or notched front or broad back, for perforating paper so that the latter may be easily detached from each other. The serrated edge is constructed with the perforators twice the length of intermediate notches. The perforator is engaged by a piece of furniture in the form, which presses and drives the serrated edge into the paper.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED WATER CUT-OFF.

John G. Diem, St. Francisville, La.—This invention has reference to improvements in the cut-off for conducting the water from the roof either to the waste pipe or cistern, so as to first cleanse the water of dust, soot, etc., and then conduct the pure rain water to the cistern, and when the same is filled again to the waste pipe. The invention consists of a cut-off of circular shape, having conical supply and exit pipes, separated by a tapering partition, in combination with a centrally swinging semi-circular gate, that connects the supply pipe with either discharge pipe. The inner end of the supply pipe is of conically-tapering shape, while the discharge pipes are separated by inclined walls, that form a sector-shaped body, which extends into the cylindrical main body nearly up to the center. A centrally pivoted gate, with semi-circular side walls, is carried by the outer handle end of the gate pivot from one half of the body to the other, so as to bear on one side of the supply pipe and rest on the correspondingly inclined partition wall, conducting thus the water from the supply pipe to the waste pipe or cistern, as required, without leakage or choking, as the semi-circular space of the main body serves as a kind of regulator, and produces the even discharge of the water. The cylindrical shape of the cut-off imparts to the same a lighter and neater appearance, and renders the same more effective and reliable in use.

IMPROVED FLYING TARGET.

Edwin M. Leavitt, Auburn, Me.—This invention has reference to an improved flying target, which is to be shot at and used as a substitute for the wild pigeon sprung from a trap; and the invention consists of a supporting stake with an adjustable barrel having slots and a spring trap arrangement for shooting the dart-shaped target. The barrel may, by means of the stake and socket, be adjusted at any direction and angle, so as to throw the target high or low, or to the right or left, as desired. The stake is, however, driven into the ground, and the barrel clamped so thereon that the catch to which the releasing string is attached is placed toward the shooter. The target is made in the shape of a dart, with a slitted stick of wood or metal and detachable wings of paper, pasteboard, or other material, cut in any desired form. The wings of the dart-shaped target present to the shooter a full target, let it turn as it will. By pulling back the crosshead of the spring and retaining the same by the catch and inserting the target, the device is ready for use. By pulling, then, the string the target is thrown out by the spring so as to be shot at. The stick or carrier of the target may be made of spring pieces that are held by a sliding ring, or when made of steel this ring may be dispensed with, and the ends first bent inwardly, so as to be readily lifted for taking out the torn wings and inserting new wings.

IMPROVED STOVEPIPE ELBOW.

Greene Choate, East Saginaw, Mich.—The object of this invention is to cut the section of which the elbow is composed from a rectangular piece of sheet metal without wasting material or incurring the labor of trimming the sections after they are cut from the sheet. Another object of this invention is to place the seam of the elbow at the side of the same, instead of at the bottom, so as to prevent the pyrolytic acid or soot, which usually accumulates in stovepipes, from exuding or oozing out, there being no seam at the bottom of the pipe for such a result to take place. Blanks for the sections of four-piece elbows, as ordinarily cut, require trimming after being cut from the sheet, to give them the required curvature. The end sections of the elbow also require trimming, so that one end of the elbow shall be small enough to enter the pipe to which it is placed, and the other end of sufficient size to receive the small end of a length of pipe. A sheet of metal is cut on three similar but oppositely arranged curves. Each of these curves is composed of two arcs of equal radius. The sections cut upon these reversed curves require no trimming, but are ready to be at once formed into an elbow. The central portions of the elbow are secured together by rivets, and inside of the lines in the section the holes are made for receiving a rivet that holds the smaller end of the elbow together, and outside of the lines in that section the holes are made for receiving the rivet that holds the larger end of the elbow together. By cutting the blanks as above described, the seams in the elbow section are placed at the sides of the same, instead of at the bottom, thus preventing the pyrolytic acid from passing out. By this invention the blanks are cut in such a manner as to make the proper difference in the ends of the elbow sections, to allow one end to receive the other, this being done by making the taper half in each section only, thus avoiding all trimming and effecting a great saving of time.

IMPROVED UMBRELLA.

William S. Harris, Brooklyn, N. Y.—This invention relates to certain new and useful improvements in umbrella handles, and consists in making the handle with a taper, the same being either hollow or solid, and providing the same with a suitable spring attachment at the upper or this end of the handle, which will fill and hold the runner firmly when the umbrella is raised. In order to provide for the runner fitting the upper or this end of the handle, a bow spring is supported between two ferrules, which have wires extending between them, so as to assist in filling up the barrel of the runner, and thus form a bearing for it equal in diameter to that part of the handle on which the runner rests when the umbrella is closed. On the bow spring there is a catch, which allows the runner to be raised; but when above, it will hold the runner, so that it cannot return until the spring is compressed by the user. It will be observed that the umbrella handle is not weakened, as those at present made are, by slitting the handle for the insertion of the spring. Consequently a stronger stem or handle, much neater in appearance, and capable of being made smaller in size, owing to no part being cut away, is produced.

IMPROVED WATERCLOSET.

Francis E. Kerochan, Pittsfield, Mass.—The object of this invention is to improve the construction of waterclosets in such a way as to prevent the escape of sewer gas and enable the supply of water to be regulated and controlled as may be required. The water pipe rises above the basin of the watercloset and opens into a reservoir, placed at a suitable distance above said basin. From the reservoir an outlet pipe leads down to the basin, passes in through the bottom of said reservoir, and rises nearly to its top. An inlet or water pipe enters the reservoir near its top. In the side of the outlet pipe, just above the bottom of the reservoir, is formed a hole of about half the area of the inlet pipe, so that when the water is admitted a part of the water will flow out through the hole and outlet pipe into the basin, and the rest of the water will tend to fill the reservoir. Should the valves be kept open sufficiently long the reservoir will be filled, and after that the water will flow out through the pipe as fast as it enters through the water pipe. The difficulties that may arise from the varying supply of water at different places, or at the same place at different times, may be met, either by the use of a self-filling tank controlled by a floating bulb, as at present used, or by a valve connected with a separate pipe used to supply the after-wash, so that that pipe shall be always closed when the

inlet pipe leading to the reservoir is open, and open when said inlet pipe is closed, so that the only entrance of water to the basin while the lifting rod is raised will be through the overflow pipe in the reservoir, and after the lifting pipe is lowered through the after-wash pipe.

IMPROVED ADDING MACHINE.

Marshall M. Smith, Kirksville, Mo.—This invention is intended to combine the advantages of an adding machine and paper weight in a cheap, neat, and convenient manner, it being reliable and durable in use, and operated with accuracy and dispatch. It consists of fixed disks with circumferential sliding and toothed rings, and of a movable unit and tens disk, operated by a thumb wheel and interior shaft, and by a sliding and eccentrically pivoted catch lever. A fixed arm with pointer or index end extends from the supporting standards, and carries a small end pinion, that is turned by each revolution of the adjoining sliding ring by a fixed lug at the zero point for one tooth, and moves the next ring forward thereby. The machine is operated in the following manner: The sliding rings are turned until the zero points connect with each other, and with the pinion and fixed stop of arm, so that the pinion will stand in 1 and the stop of the first-sliding ring in line with the pointer. The revolving wheel and catch lever are then turned by the thumb wheel until the catch lever forms contact with the stop piece of arm, when the wheel is turned in opposite direction and the catch lever drawn in so as to take along the first ring band until the first figure to be added appears on the revolving wheel in line with the pointer. The catch lever and wheel are then turned back to the stop piece, and turned forward again until the second number appears thereon, and so on, the catch lever moving the first band and the first band moving automatically the pinion, and thereby the second sliding band, and so on, the sum total of all the numbers being finally read off at the pointer, being in line therewith. The addition of different numbers is thus accomplished mechanically in neat, quick, and accurate manner, without the least chance of making mistakes. In setting the bands it is only necessary to set the band indicating the 100 and 1,000 with the finger, as the units and tens band may be set easily and readily by the wheel and catch lever.

IMPROVED HOG TRAP.

Thomas C. Weaver and Harry V. Weaver, Kenney, Ill.—The object of this invention is to furnish an improved apparatus for catching and holding hogs and stocks while being marked, branded, or having other operations performed upon them, and which shall be simple in construction, convenient in use, and effective in operation, catching the animal readily and holding it securely. It consists of a rectangular frame, the top and bottom bars of which are grooved or slotted to receive the upper and lower ends of the slides. The outward and inward movements of one slide produce corresponding outward and inward movements of the other slide. In using the device the door or gate is raised and the animal is driven into the pen, where it is secured by lowering the said door or gate. The slides are then moved a little apart, the animal puts his head through between them, when they are moved together, so as to clamp his neck and hold him until the desired operation has been performed upon him.

IMPROVED ADJUSTABLE SUPPORT FOR LAMP REFLECTORS.

Richmond Henry, Glassborough, N. J.—The object of this invention is to provide an adjustable frame for attaching a reflector to an ordinary lamp or gas burner. A ring, having an adjusting screw, by which its size may be varied, is fitted to any ordinary lamp collar or gas burner. Loops are attached to the sides of the ring for receiving wires which are bent twice at right angles to form a rectangular frame, which is inclined at such an angle as to bring the reflector supported by it into the proper relation with the flame of the lamp or gas burner. A socket, which receives the shank of the reflector, is drilled to receive the ends of the wires, and is provided with a set screw, which retains the shank of the socket in any position into which it may be turned. The reflector thus mounted is capable of turning in any direction within certain limits.

IMPROVED BOILER FOR HEATING WATER UPON OIL STOVES.

Robert E. Killip, Brooklyn, N. Y.—This invention relates to kettles in which to boil water; and the object is to obtain a very large amount of heating surface in a comparatively small space. The nature of the invention consists in a boiler which is constructed with a skirting that is extended into and below its bottom, in combination with tubes which pass through the skirting and part of the water space, and project from the interior surface of the skirting. Below the body, tubes are applied to the skirting, and arranged around it equidistant from each other. These tubes may be cylindrical or tapering, and they all project inside of the skirting a short distance, for the purpose of slightly arresting the outwardly escaping heated products, and utilizing as much of the heat as possible. The boiler is used by arranging it over the lamps of an oil furnace; or a common oil lamp may be applied inside of the skirting, when it will be found that comparatively little heat will be required to boil water in the body.

IMPROVED HEATING STOVE.

Alfred H. Chase, Dowagiac, Mich.—This invention relates to improvements in heating stoves by which the fuel is economized, a larger percentage of the heat supplied to the rooms, and the sweating of the stovepipes and chimneys prevented. The invention consists of a stove connected by a direct draft pipe with the outside of the room or building, and by a pipe branching off from the same with the stovepipe, the pipes having suitable dampers to keep up a draft in the stovepipe and chimney and carry off smoke, while confining the heat in the stove. A stove of an suitable construction may be used, to which cold air is supplied from the outside of the room or building by a draft pipe that passes through the floor and prevents the taking up of any of the heated air from the room. The heat in the room is thereby preserved, and no extra fuel required for reheating the air drawn off. The air is drawn by a pipe into the stove below the grate, and the stove thereby made independent of the atmosphere in the room. A draft pipe is connected with a cold air pipe which branches off from the same below its opening into the stove, and below is a damper. The cold air pipe is extended below the stove, and then in upward direction to the stovepipe, entering the same above the damper of the stovepipe. The cold air pipe is also supplied with a damper near its upper end, which is closed when the current of air is to be thrown entirely into the stove for keeping up a brisk fire therein. By changing the dampers the fire may at any moment be restored to the required briskness, so as to keep it up when supplying coal, and without drawing off any of the heated air of the room.

IMPROVED METALLIC SEAL.

William W. Johnson, Nashville, Tenn.—The bows or shackles of metallic seals have been usually constructed of several strands of wire twisted together in such manner that the bows have a comparatively smooth exterior, and, in consequence of such construction, they may be withdrawn from the lead ball without injuring it materially, thus destroying the practical efficiency of the seal. It is the object of this invention to provide a metallic seal whose bow or shackle, although constructed as cheaply and simply as those previously used, cannot be withdrawn from the lead ball or seal proper without defacing or injuring it to such an extent as to render detection easy. The bow or shackle is formed of a central wire and an outer wire or wires, which are wound spirally around it in such manner as to leave a considerable interval of space between the respective convolutions, thereby forming a composite wire screw with widely separated threads. The ends of the bow or shackle thus constructed are inserted through the holes previously formed in the lead ball, and the latter being compressed sufficiently to close said holes and cause the lead to set firmly around the wire screw, the latter will be held so tightly that it cannot be withdrawn without seriously defacing or mutilating the ball, and thus disclosing the fact that the seal has been tampered with.

IMPROVED BRACELET, ETC.

Charles H. Graef, Edgewater, N. Y.—This invention has reference to improvements in that class of rubber, horn, and other articles which are

made with a natural spring, so as to return to their normal position on being applied, the improvement being intended to embellish said articles without weakening them or detracting from their ready use; and the invention consists of a bracelet, child's long comb, or other article of springy nature, having a broken-out ornamental band of suitable metal attached at the ends only, so that the band gives on spreading the article, and resumes its snugly fitting position on the article without getting torn and without injuring the article. An elegant ornamentation for such articles that return to the normal position by the spring of their material is thus furnished, which is not detrimental to the articles themselves, nor damaged by the working of the same, so that thereby the more general use of such articles is promoted by the improved appearance of the same.

IMPROVED WOOD-SAWING MACHINE.

John A. Chandler, Monticello, Iowa.—A treadle is pivoted to the saw-horse and attached to a frame which extends beyond the treadle, and to which the saw frame is pivoted. Stop pins are arranged for preventing the saw from dropping too low and from being thrown too far back. A spring is attached to the frame and to the saw frame for drawing the latter downward, so as to cause the saw to bear upon the wood supported by the horse. To the inner end of the treadle a spring is attached, which strikes a buffer spring at each downward stroke of the treadle. A lever pivoted to the crossbar at the back of the horse, and provided with a curved serrated dog or holder that engages the surface of the wood being sawed as the lever is drawn forward. The operation is as follows: A stick of wood is placed upon the horse and the treadle is oscillated with both feet, while at the same time the upper end of the saw frame is grasped by one hand and the lever which clamps the wood by the other. The wood is thus quickly sawed with very little exertion.

IMPROVED ANIMAL TRAP.

Chauncey M. Orton, Glen's Falls, N. Y.—The box of the trap, which is rectangular in form, is designed to be made of tin, so that animals cannot eat their way out. This box is divided into two compartments by a partition that slides in grooves in the sides of said box. In the partition, near one side, is formed an opening of such a size that the animal trapped for can easily pass through it. The trap is set by drawing up a sliding partition. The animal, in roaming about, sees the bait upon a wire, and in seeking to reach it enters the box, steps upon the platform, and withdraws the wire from the door, which allows said door to drop. The frightened animal, seeking to escape, passes through the opening in the partition to the bridge, which tilts under his weight, and he passes through the opening in the plate into the inner compartment of the trap, and is securely caged. The descent of the bridge raises the door, which is caught and held by the wire, and the trap is reset, the bridge returning to its normal position as soon as the animal has passed from it.

IMPROVED LIFTING JACK.

Samuel Barrow and David Barrow, Windfall, Ind.—This invention relates to lifting jacks which are designed for raising stumps, wagons, broken down fences, and for rolling logs, and all purposes where heavy objects are to be moved. A strong standard has a base secured to it which is adapted to receive and guide a vertically movable lifting bar, and also to receive between its open cheeks the end of a lever, which is constructed with an enlarged head, having a fulcrum pin fixed eccentrically to it, and this lever is connected to the lower bifurcated end of the lifting bar by means of a bent link. The edges of the cheeks of the standard are notched to receive the ends of the fulcrum pin, and to allow the lever to be adjusted higher or lower, as may be desired. An arm is adjustable independent of the plate or bar, and is used for raising fences and supporting them while being repaired or straightened. When it is desired to use the jack for rolling logs or turning heavy beams, the plate is detached from the jack and the cant hook is attached to the lifting bar by inserting the straight portion into the hole in the upper end of this bar.

IMPROVED FIRE ESCAPE.

Thomas A. Andrews, Gainesville, Tex.—The object of this invention is to provide a simple and inexpensive fire escape that cannot get out of repair, and that is always ready for use. In the pulley stile of a window frame is formed a receptacle for the rope and strap of the fire escape. This receptacle is provided with a door, which, when closed, forms a part of the stile. The hinges upon which the door swings are each provided with a stop, which prevents the door from being accidentally closed. The door serves the double purpose of closing the receptacle and of a bracket for supporting the pulley and rope of the escape. A grooved pulley is journaled in a casing that is secured to the door. This casing prevents the rope from slipping from the pulley, and also from becoming knotted or twisted. The strap is attached to one end of the rope, and is provided with a snap hook or buckle, by which it may be adjusted. The rope is of such length that both ends may touch the ground. The manner of using the escape is as follows: The window is raised above the door, which may then be opened, and when open it extends beyond the wall of the building. The person desiring to descend places the strap around the chest under the arms, and drops the free end of the rope to the ground. The escape may be operated by persons below or by the person descending. The person escaping steps out of the window, and either lowers himself or is lowered by persons from below. One person may in this manner lower a number of people. The apparatus may be placed in the wall of the building, either inside or outside, but it is most convenient when arranged in the window frame, as described.

IMPROVED FAUCET.

Thomas A. Andrews, Gainesville, Tex.—The object of this invention is to provide a faucet which is inexpensive in its construction, easily repaired, and efficient in operation. The body of the faucet is L-shaped, and contains a passage which is enlarged, forming a valve seat, and is threaded internally to receive a screw. A lateral oblong aperture is formed in the body just above the valve seat for the escape of liquid from the faucet. The inner end of the screw is provided with a square projection, to which is fitted a packing disk, of elastic material, which is secured to the screw by another screw. The screw that closes the faucet is provided with a handle or thumb piece, by which it may be turned, and the body of the faucet is provided with a tapering portion, which may be driven or setweld into the vessel or pipe in connection with which the faucet is used. The advantages claimed for this improved faucet over others now in use are that it may be more cheaply manufactured, is more easily repaired, and is perfectly secured against leakage.

IMPROVED BEE HIVE.

Aaron Deardorff, Joseph W. Stutzman, and Aaron D. Stutzman, Morrisville, Ill.—The object of this invention is to furnish an improved beehive, which shall be so constructed as to give the operator full control over his bees, and which, at the same time, shall be simple in construction and convenient in use. The front, sides, and top of the hive are permanently attached to each other, and the back is separate, being hinged at one end to adapt it to serve as a door. Bars are permanently attached to the lower parts of the sides of the main hive and may be folded in beneath the rear parts of the brood chamber, or may be turned outward to form a way for the brood chamber to be slid out and in upon. The front and rear parts of the brood chamber are permanently secured to its bottom at their lower edges, and are rabbeted upon the inner side of their upper edges to receive the projecting ends of the top bars of the comb frames, and the projections formed upon the corners of the side boards of the said brood chamber, which projections may be the projecting ends of cleats attached to the upper edges of the said sides. The sides of the brood chamber are so formed as to fit snugly between the front and rear of said chamber. This construction enables the sides of the brood chamber to be moved in or out, to adjust the size of said chamber, as may be required. The comb frames are kept at the proper distance apart by staples attached to the side edges of their top and side bars.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion.

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John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

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More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years constant use prove them stronger and more durable than wrought iron. See advertisement, page 236.

Emery Grinders, Emery Wheels, Best and Cheapest. Hardened surfaces planed or turned to order. Awarded Medal and Diploma by Centennial Commission. Address American Twist Drill Co., Woonsocket, R. I.

Notes & Queries

(1) T. M. S. asks how "tube white" in artist colors, is made? A. Precipitate a solution (in water) of barium chloride by addition of dilute sulphuric acid in excess. Decant the liquid after the precipitate has subsided, wash the precipitate well with water, dry it, and finally grind it with a small quantity of fine oil.

Please give me a recipe for waterproofing a blanket? A. Boil 4 1/2 ozs. of white soap in 2 1/2 gallons of water, and separately dissolve 5 1/2 ozs. of alum in 2 1/2 gallons of water. Heat these two solutions to 190° Fah., and pass the goods once through the soap bath, and afterwards through the alum solution. Lastly, dry it in the open air. The alum causes the precipitation of an insoluble alum soap within the fiber.

(2) R. J. says: Will powdered coke cemented together do for the carbon rod in a Leclanché cell? What kind of cement shall I use? A. The carbon is ground fine, mixed with gas tar, pressed into form, and baked at a strong heat. The pores are filled by dipping in the tar (sometimes molasses is used in place of the tar) and rebaking. This is often repeated 4 or 5 times.

(3) L. J. asks: What will take out the stain left by common gunpowder, where it has been blown into the skin? A. It can often be removed by blistering the parts, but this is painful, and does not always succeed.

(4) G. S. says: 1. The conductivity of copper is said to be 100, that of iron about 16 per cent. Does that mean that a wire of iron, six times as large as copper wire, offers the same resistance (to electricity) as the copper wire? A. Yes, 2. Would dipping common fence wire into hot coal tar protect the wire from rust? A. Yes, for a time; depending on the conditions of exposure, etc. 3. Would the tar impair the conducting qualities of the wire? A. No. 4. I wish to prepare two miles of wire for telegraphing. What is best to protect it from rust? A. Coat with boiled oil or good asphaltum dissolved in naphtha or turpentine.

(5) T. A. J. asks for a recipe to clean ivory knife handles that have become colored by use? A. Try bisulphide of carbon and whiting or pipe clay.

Also a recipe to make solder for a Britannia teapot? A. Tin, 8 parts; lead, 4 parts; bismuth, 1 part. Melt at a moderate heat and run into bars.

(6) T. J. P. asks if rubber hose burned in a firebox is injurious to the steel or iron of which it is made, as in a fire engine for generating steam quick? A. Yes, the sulphur it contains will corrode the metal. Unvulcanized rubber would not prove injurious.

(7) W. E. asks: 1. What is the Jablockhoff electric candle? A. See No. 22, p. 339, vol. 36, of the SCIENTIFIC AMERICAN. 2. Does it require a battery? A. The candle is supplied with electricity from a powerful galvanic battery or magneto-electric machine.

What is kaolin? A. Kaolin is a pure white clay—such as is used in the manufacture of porcelain ware.

(8) W. B. K. asks: 1. Does the solution of 1 lb. of tungstate of soda in 3 gallons of warm water prevent wood from decaying as well as render it fireproof? A. Yes, to a certain extent, if properly applied. 2. If not, what will prevent the decay of beams, joists, etc., in buildings? A. Solutions of zinc chloride, sodium sulphate, water glass, pyroligneous acid, carbolic acid, and corrosive sublimate have been used. The latter is poisonous. 3. Is the tungstate of soda solution simply to be applied with a brush? A. It is better to saturate the wood as far as may be with it—it should be used hot. 4. If so, will you inform me how to estimate the cost both of material and labor in rendering all the wood fireproof that would be required in building a large wooden house? A. You can best determine this by experiment—it will probably require not less than a pound for every hundred square feet of surface. 5. If the solution applied as a wash is not sufficient for the purpose, how long should the wood lie in a bath of the same? A. If the wood were dry and the solution hot, ordinarily half an hour would suffice. 6. Is there any firm in the country, to your knowledge, from whom fireproof wood can be purchased? A. We do not know of such a firm. 7. Which is the better way of making black mortar for brickwork, to use anthracite coal dust instead of sand, or to mix a sufficient quantity of ivory black with the sand? A. The latter. 8. Which stone trims the walls of a large country house built of pressed brick, to better effect, the brown stone so common here, New York, or the light yellow stone? A. This is a matter of taste. The brown stone is, we believe, generally preferred.

(9) G. A. P. asks: 1. How can I make a good electric light by means of a galvanic battery? A. Connect fifty or sixty quart cells (of a Bunsen or Grove description) in series—that is, the carbon or platinum pole of one to the zinc of the next, and so on. Bring the conducting wires—one from the free pole at each end of the series of elements—to the lamp. This may be of the kind known as "Jablockhoff's candle" (described on p. 339, SCIENTIFIC AMERICAN, vol. 36). When the wires are properly connected to the lower ends of the carbons in the candle, and a small pea of carbon or lead is thrown between the upper ends of the same so as to establish communication, the current passes, and the electric arc appears—the lead or carbon being burned. 2. How many batteries would I need, and what would be the cost? A. About sixty large-sized carbon cells, costing about 75 dollars. 3. In making an electric light, would I have to have an induction coil? A. No. 4. Also how calcium lights are made? A. Oxygen and hydrogen—or coal gas—are caused to mingle in a very small, stout chamber, situated near the tip of a suitably curved jet. The mixed gases, as they issue from the jet, are ignited, and the flame caused to impinge upon a small cylinder of hard lime, which thereby becomes heated to incandescence. The gases are kept under pressure in large rubber bags or iron cylinders, and are conducted thence separately by rubber tubing to the jet. 5. How much would one cost? A. The cost of apparatus for the light is about fifty or sixty dollars.

(10) S. L. C. asks how to make parchment paper? A. Strong unsized paper is immersed for a few seconds in oil of vitriol diluted with half its volume of water. It is then washed in pure water or weak ammonia water. The acid solution must not be warmer than the surrounding atmosphere.

(11) J. C. G. asks: Is the accumulation of carbonic oxide gas, in wells, sudden or gradual? A. Gradual.

(12) P. McG.—The scale insect infesting the orange trees of Florida seems to be *Aspidiotus citri-*

cola. For information on orange blight in Florida see Packard's "Guide to the Study of Insects."

(13) E. G. asks for a recipe for preparing wax for modeling? A. Mix lard with white wax to make it malleable. It may be colored any desirable tint with dry color. In working, the tools and board or stone should be moistened with water to prevent its adhering.

(14) W. T. R. asks: 1. Whether the offensive odor, in the spring of the year, arising from the alanthus tree is detrimental to health? A. Such has not proved to be the case. 2. What is the best season of the year to destroy the tree? A. It is a difficult matter to destroy them completely at any time; perhaps the latter part of October would prove most favorable.

(15) P. M. B. asks: What is the cheapest application or process to retain the polish on steel plates in a damp room? A. Oil or a thin transparent varnish is often used. The polished surfaces on machinery, stored or in disuse, are often protected by coating them with a mixture of tallow and white lead.

(16) J. J. asks: 1. Which is the most improved magneto-electrical machine? A. Probably the Gramme machine. 2. Where can I get a full description and illustration of the same? A. See pp. 181, 195, vol. 34, SCIENTIFIC AMERICAN, and No. 17 of SCIENTIFIC AMERICAN SUPPLEMENT. 3. When was it patented? A. We believe the first patents were secured in the year 1873. 4. How large a machine would it require to completely decompose one gallon of water in five hours? A. One using about thirty horse power would probably do this, the water being acidulated. 5. How does acidulated water compare with pure water for this purpose? A. Acidulated water is generally used; its electrical conductivity is very much greater than that of pure water. 6. How many revolutions per minute does it require to obtain the best possible results and the most powerful current? A. This depends on the size of the machine. Usually with as great a velocity as compatible with the safety of its parts. With the two or three horse power machines about 250 revolutions per minute give good results. 7. Upon what conditions does the efficiency of a magneto-electrical machine depend? A. When properly constructed, mainly upon the rapidity with which the bobbin wires pass through the magnetic field, the number, size, and arrangement of the bobbin wires, and the power of the magnet.

(17) R. E. R. asks for a cement for aquariums? A. Take 10 parts, by measure, of litharge, 10 parts of plaster of Paris, 10 parts dry white sand, 1 part finely powdered rosin, and mix them when wanted for use into a stiff putty with boiled linseed oil. This will stick to wood, stone, metal, or glass, and hardens under water. Do not use the tank until three or four days after it has been cemented.

(18) C. A. R. says: In a discussion on optics the question was asked why we could not see through fog. A. said it was on account of polarization of light. B. said it was because the top part of the fog up in the air acted like a mirror and reflected the rays of the sun. C. said it was refraction, that is, the fog was a prism, and bent the ray so we could not see, being able to see only in straight line. A. A. has the correct idea.

(19) J. B. F. asks for a recipe for making koumiss? A. As made by the Calmuck Tartars, mare's milk is distilled as it is undergoing fermentation.

(20) C. P. W. asks: Is there anything cheaper than alcohol that could be successfully used in a common blowpipe lamp? A. No.

(21) J. H. asks what greenheart wood is, such as fishing poles are made of? A. Greenheart is a tree belonging to the laurel family. It is found in the West India Islands and in parts of South America. The value of the wood is in great strength and hardness.

(22) A. I. asks how to anneal old saw blades? A. Heat carefully in a forge, fire to a dull red heat, and while hot immerse in wood ashes or air-slacked lime until cold.

(23) J. B. S. asks for a preparation for polishing turned work in the lathe; says he has used bleached shellac and sweet oil, but it takes too many applications and time to produce the desired finish. A. Dissolve gum sandarach in alcohol in proportion of 1 oz. of the gum to 1/2 pint of alcohol. Shave fine in 1 oz. of beeswax and dissolve in turpentine sufficient to make a paste. Add to the dissolved sandarach. To use, apply with a woolen cloth to the work while running in the lathe, and polish with a soft linen rag.

(24) H. C. B. asks what to use to paint the smokestack of a portable engine that is exposed to the weather, to prevent its rusting? A. Dissolve asphaltum in turpentine with the application of a gentle heat. Use when cold. Apply with a brush.

(25) I. W. D. asks how to thin printing ink so as to distribute even on pads? A. Mix with boiled linseed oil or common kerosene and grind with a muller or a pallet knife on a painter's slab.

(26) W. T. B. asks: Will it hurt a steam boiler to use corn cobs for fuel? A. No.

(27) E. O. K. asks for a method of coloring wall plastering before it is put on the wall? A. Wet the coloring material, if in powder, with alcohol, then mix with the water with which the mortar is made.

(28) J. D. B. asks: Shall I use nitric or sulphuric ether to dissolve rubber? A. Ethyl—commonly called sulphuric—ether is the kind. To be of use as a solvent for gum rubber (it does not dissolve vulcanized rubber) it must be quite free from alcohol and water. Ether of requisite purity is often difficult to procure. Pure ether boils readily at the temperature of the hand.

(29) L. A. B. asks: What time of the year is best to cut branches to make rustic work? A. Late in the autumn.

(30) E. B. asks: How is it that opticians will give eyepieces with telescopes warranted to magnify 100 or 150 diameters, when the magnifying power of

a telescope varies with every object whose distance varies? A. Opticians do not usually focus their telescopes on objects to determine their focal length. Whenever they do, it is on a small star; this is the nearest to parallel light and may be considered as such. The focal length of a telescopic objective is computed for light entering parallel; it is in this condition that the eyepiece is said to have a certain magnifying power, but it is the combined magnifying power of both objective and eyepiece. Some use the dynameter, which gives the magnifying power at once without being obliged to know the focal length of any of the lenses.

(31) W. J. R. asks: Is a circular saw, made for sawing logs into lumber, made concave on one side? A. No.

(32) R. I. T. asks for a process for refining beeswax, and how to tell pure wax from the adulterated? A. Melt the wax with a little water in a vessel heated in a water bath or by steam, and after boiling a few minutes withdraw the heat and sprinkle over its surface 3 or 4 fluid ozs. of oil of vitriol to every 100 lbs. of wax. Care must be exercised in applying the acid, as the wax is liable to froth up and run over the sides of the vessel. Cover over and leave for two or three hours to settle. Carefully skim and decant the clear portion. Pure beeswax burns without smoke or smell. Its complete solution in bisulphide of carbon and benzene demonstrates its freedom from sulphur, sawdust, or bone dust. Spermaceti may be detected by the wax bending before it breaks, and by its flavor when chewed. Rosin may also be detected by the taste. When greasy matter is present in any considerable quantity it may be detected by an unctuous feel and by a disagreeable taste. Chalk, plaster, etc., will subside to the bottom of the vessel when the wax is melted, owing to their superior gravity.

(33) W. F. T. asks how to prepare glue to use cold, also what can be added to make glue pliable when dry? A. Prepare the glue with alcohol and acetic acid instead of water. To make glue pliable and glycerine or molasses.

(34) J. N. S. W. asks (1) for a method of straightening a rifle barrel? A. Gun barrels before they are rifled are straightened by observing peculiar shadow lines in the interior of the barrel, which are a guide to the workman. After the barrel is rifled, these lines cannot be seen. Some gunsmiths draw a fine black silk thread through the barrel and observe if it touches the barrel alike through the interior. 2. How to blue parts of a gun, such as the lockplate, etc.? A. To blue the parts of a gun, first polish the parts and then burnish them with a steel burnisher. Put them in an iron box containing powdered charcoal or wood ashes and heat over a forge fire until by observation the parts are of the desired color, then remove and let them cool.

(35) J. B. I. asks how to cut a lamp chimney lengthwise? A. If the shape of the chimney precludes the use of a diamond, a small thin copper wheel, such as used by glass engravers, charged with sharp gritted sand and water, will accomplish it.

(36) H. G. asks how to bronze gun barrels, also the best protection of guns from rust near the seashore? A. Mix 1 oz. each of nitric acid and sweet spirits of nitre, 4 ozs. powdered blue vitriol, 2 ozs. tincture of iron, and water 3/4 pint. Agitate until dissolved. Polish the barrel and rub with powdered lime or whiting to remove all grease. Stop up breech and muzzle of the barrel with wooden plugs made long enough to handle the barrel by. Rub the solution on evenly and put in a warm place to dry until the next day, when rub off the coating produced by the solution with a wire brush. Repeat the process of wetting, drying, and rubbing off until the desired color is produced. When this is the case, wash in pearl ash water and then in clear water. The best protection for guns when exposed to the influence of a sea atmosphere is to rub them over with mercurial ointment.

(37) H. F. C. asks: Does it produce a physical or chemical change in a knife blade to magnetize it? A. No.

(38) E. P. L. asks: What is the method employed to detect bad eggs? A. Hold the eggs to the light, encircling them with the thumb and fingers. Good eggs show transparent, but the bad ones are opaque.

(39) W. & S. say: 1. We are engaged in the manufacture of cast steel mould boards for plows. In hardening them they often crack. What is the remedy? A. Over heating in forging will often cause steel to crack in hardening. Another trouble is hardening them in water that is too cold and having the steel at a high heat when so hardened. Careful forging in working use water that is a little warm in hardening are the remedies. 2. Can they be casehardened, and if so, how? A. Pack the work in an iron box, filling all the space around the work with fine bonedust, or burnt leather reduced to a powder. Be careful to press the bonedust or leather tightly around the work, and see that the surfaces of the work do not lie in contact. Cover the box and lute with clay so as to be tight. Heat in a brick fire until the box and contents are heated to a red heat, and keep so for one quarter or one half hour, then remove the cover of the box and empty the contents into water. If too hard, the temper may be drawn in same manner as hardened steel.

(40) M. A. J. says: If a nut on an old bolt cannot be started with a wrench, cut into each side of the nut with a dull cold chisel, holding a sledge on the opposite side, and the cutting will stretch the nut enough so that it can be readily turned off.

(41) J. M. asks if there is any such thing as a mineral plumb, used by men prospecting for gold or silver? A. No.

(42) J. Q. R. asks for a rule for the standard horse power of steam boilers? A. There is no standard for the horse power of a boiler that is generally recognized by engineers.

(43) S. E. S. asks: 1. What mixture is used for making blackboards? A. Incorporate flour of emery or powdered pumicestone with shellac varnish, adding sufficient lampblack to give the required color. Ap-

ply to the surface to be coated with a fine flat brush. It is better to apply two coatings. 2. What kinds of wood are best for the boards? Good clear white pine, well seasoned.

(44) C. B. asks: 1. What constitutes the calorimeter of a boiler, and how is it measured in connection with the grate and heating surfaces? A. It is the area for the passage of the products of combustion from the furnace to the chimney. In case this area varies throughout the run of the gases, it is usual to take the smallest area for the calorimeter, since this limits the supply of air, and by consequence the rate of combustion. 2. What kind of steel is it that is generally used in making connecting, piston, and valve rods, etc., of steam engines? A. Both cast steel and semi-steel are used.

(45) C. R. P. asks: Can a press be made to work with compressed air instead of water? We are using an hydraulic press. It requires refilling with water quite often on account of rust from the tank getting under the valves. In case an air pump could be made to work, how much longer would it take to run it up with air than it does with water? A. Air could be used, but in the majority of cases that occur in practice water pressure is preferable. The time required to run up the ram would depend upon the dimensions and arrangement of the apparatus.

(46) J. H. asks: Will you give me a rule for finding the latitude and departure of a course when the distance and bearing are given? A. Latitude = length of course $\times$ cosine of bearing. Departure = length of course $\times$ sine of bearing.

(47) D. McR. says: I have a force pump which works well for a short time when it is primed. Valves seem to be in perfect order and airtight. A. There is probably a leak, either in piston, suction valve, or suction pipe.

(48) E. M. B. asks: Which is the most economical in the use of water in supplying a boiler, an injector or pump, allowing the evaporation to be the same? A. There is not a great deal of difference so far as can be judged from the few comparative experiments that are accessible.

(49) A. H. C. asks: 1. In sea-going steamers, which is the most efficient, a screw propeller or paddle wheels? A. The propeller. 2. How do paddle wheels compare with the screw in smooth water? A. Well designed wheels compare favorably.

(50) P. J. M. asks if the lock gates in any canal are opened by machinery, or some motive power, such as steam? A. The machinery for opening the lock gates of the Des Moines Rapids Canal is operated by hydraulic power.

(51) G. D. asks for a wood filling, for filling the grain of wood to be varnished? A. Mix magnesia with shellac varnish.

(52) Apprentice asks how to cast a joint? A. If it is a pivot joint, cast the socket part first; ram out the socket; wash it with plumbago and fine charcoal, and then run the pin part into it. (If you run the pin half first and run the socket around it, the latter is apt to shrink and split). By working the parts together the wash will be rubbed out.

(53) J. E. T. says: If two steam radiators of equal size and under the same conditions are painted, one black and the other white, which will radiate the most heat? This depends upon the pigment used. A. The radiation from surfaces coated with lampblack and white lead are about the same.

(54) W. H. B. says: I wish to use a core of wood within a steam pipe, leaving an annular space around the same, between core and the walls of the pipe. This space will be filled with steam during about half the year, and air during the other half of the year. What will be the life of the wood? A. Make the core of well seasoned wood, and it will probably last you several years.

(55) P. S. asks: Will it do to have a stream of oxygen gas blow through an alcohol lamp flame, used for melting small glass rods? A. There is no objection to the use of oxygen other than that of expense.

(56) C. D. asks for a recipe for an axle lubricant for heavy vehicles? A. Take 5 parts beef tallow, and 1 1/4 or 3 parts of graphite, pulverized (black lead of commerce), mix while warm. This is for summer use. For winter, use lard in place of beef tallow.

(57) L. R. asks how to soften brass work? A. Heat it red hot and cool suddenly by plunging in cold water.

(58) R. C. L. says: In using heaters for steam boilers where the water is heated nearly or quite to the boiling point, and the force pump refuses to work, what is the remedy, supposing the pump to be in good order, and would work all right with cold water? A. It is necessary to allow the vapor to escape. For successful working under such circumstances, it is well to deliver the water to the pump under a head somewhat greater than the pressure of the vapor.

(59) J. O'B. asks how large a boiler to make for a small engine with cylinder 1 1/4 by 2 1/4? A. 11 inches diameter, 15 inches high.

(60) W. C. T. asks how to construct a cremation furnace? A. In vol. 39, p. 255, of the SCIENTIFIC AMERICAN is given cut and description of such a furnace.

(61) A. R. C. asks for a finish or polish for sheepskin colored linings? A. Varnish with the white of eggs and finish by rubbing with a burnisher.

(62) J. R. P. asks: 1. If a drop of nitric acid should be dropped on an ounce of nitro-glycerin dynamite, or dextrin, would it cause them to explode? A. Probably not. With nitro-glycerin, however, the force of impact of concussion might be such as to cause an explosion. 2. Which of the three named would be the most powerful? A. Nitro-glycerin is the more powerful. 3. Suppose a person should be placed at the extreme height of the atmosphere, how would he be affected? A. Immediate death from rupture of the blood vessels and asphyxia would ensue.

(63) Constant Reader asks what effect inhaling the fumes of naphtha has on persons who use it? A. It attacks and deteriorates the mucous membrane.

(64) J. W. G. asks: What books can I get that will inform me how to construct furnaces for small steel castings and for malleable iron castings? A. You will find information on the subject in standard works on metallurgy.

(65) P. B. asks for a cement for mending harness or other leather? A. Take common glue and American isinglass equal parts. Put in a glue pot, and add water sufficient to cover, and soak about ten hours. Then bring to a boiling heat and add pure tannin until the mass becomes rosy or like the white of eggs. Scrape the leather where it is to be joined, apply the cement warm, rub the surfaces solidly together, and let the work remain undisturbed till dry. The leather must be free from grease or oil.

(66) A. B. C. asks for instructions how to stain marble? A. Apply color in solution to the stone when it is heated sufficient to make the liquid simmer on the surface. For blue, use an alkaline solution of indigo; for brown, tincture of logwood; for crimson, a solution of alkanet root in turpentine; for yellow, tincture of gamboge or turmeric; for red, tincture of dragon's blood, alkanet root or cochineal; for green, a tincture of sap green, or stain first blue, then yellow; for gold color, a mixture of equal parts of white vitriol, sal ammoniac and verdigris, all in fine powder.

(67) A. G. R., of Canada, asks for instructions in raising sumac and preparing the leaves for market? A. The roots may be planted at about six feet apart. It will flourish in either low or upland. The leafy tops are broken off and dried in the shade. When dry they may be beaten with sticks or flails. The gathering of the leaves may commence in July and continue till frost. It may be packed in bags, preparatory for shipment to market. The amount of tannin contained is from fifteen to twenty per cent.

(68) J. B. W. asks for a preparation to mix with black (printer's) ink, to print designs on tin, one that will dry readily? A. First give the plate a very thin coating of light colored copal varnish, and, if necessary, add a little fine Japan dryer to the ink. The printing plates may be of vulcanized rubber.

(69) W. W. W. asks how to make glass fusible? A. By addition of excess of lead oxide and alkalies, glass can be made so as to fuse readily in an ordinary furnace.

(70) Drummer asks how to make parchment for drumheads? A. Remove the wool from sheepskins, strip them in line, stretch on a wooden frame, and scrape with a knife. If any greasy matter remains steep again in lime. If the surface is uneven or of unequal thickness, rub it down with pumice stone.

(71) T. W. O. asks: Is there a substitute for alcohol in the making of transparent soaps? A. Use methylic alcohol—wood naphtha.

(72) W. F. R. & Co. ask how to re-color green bronze French statuary that has become broken? A. Dissolve 1 oz. sal ammoniac, 3 ozs. cream of tartar, 6 ozs. common salt in 1 pint of hot water; add 2 ozs. copper nitrate in a pint of hot water. Mix well together and apply with a brush to the parts repeatedly.

(73) G. R. asks: 1. What is celluloid and how is it made? A. Celluloid is a kind of solidified collodion. It is composed of some fibrous material, such as cotton, which is dipped in sulphuric and nitric acid. The cotton then possesses the quality of solubility and sudden explosion, and is termed gun cotton or pyroxylin. When this is dissolved in ether and alcohol it is called collodion, and is used in photography. Celluloid is made by using camphor in place of alcohol and ether, in connection with pyroxylin. The pyroxylin is ground to a pulp with water. It is then strained to expel the water, and pressed into a mass. Gum camphor is ground with water and thoroughly incorporated with the pulp, one part, by weight, of camphor being used to two parts of the pulp. The mass is then put in a mould and subjected to powerful pressure, and heated while under this pressure from 150° to 300° Fah. 2. Is this the article used in the manufacture of artificial ivory, billiard balls, etc.? A. Yes. 3. Is not gun cotton, the same as that used by photographers, one of its constituents? A. Yes.

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

C. F. L.—No. 1 is pyrites in trap. No. 2 contains clay, oxides of iron, lime and magnesia. No. 3 is a piece of greenstone with adhering clay colored by iron oxide.—G. P.—No. 1 is principally of hornblende schist with some oxide of iron. No. 2 is pyroxene, with oxide of iron and clay.—I. J.—It is quartz rock—it is not of value.—Lyman, London, Eng.—The sample contains copper, iron, antimony, and sulphur. We do not know of a substitute for alcohol in the varnish—wood spirits (crude methylic alcohol) might answer.—D. S.—It is asbestos—it is found in nature as a mineral. We do not know that there is any patented method for dressing it.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:
On the Striped Water Snake. By C. F. S.
On Fire Escapes. By J. C. M.
On a Simple Nash Bottom. By H. J. N.
On the Skull of the Domestic Fowl. By C. F. S.
Also inquiries and answers from the following:
D. A. S.—F. C. S.—V. M. M.—J. S. A. B.—E. S. B.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

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

Inquiries relating to patents, or to the patentability

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

Hundreds of inquiries analogous to the following are sent: "Who deals in wood prepared so as to resist decay? Who makes clay-grinding machines that will grind small stones at the same time the clay is being ground? Who makes machinery for rolling iron? Who manufactures silver card board? Who makes a light spring power suitable for running sewing machines?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

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INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

August 21, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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

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