on which to put a counter balance, to round up the motion to make it run as steadily as if it were not a crank motion? I am going to make a thorough test, by putting on counter balance to overcome the weight of the gate. What is your theory as to putting on balance opposite to the wrist, or must a fly wheel be put on of sufficient weight that the momentum will carry it past the dead centers so as to steady the motion and resistance of the cut of the saws?—E. F. J.

19.—THE SEA WAVES.—Can any one oblige me by answering the following questions? What is the average hight of the waves of the ocean, in a heavy sea, and also in an ordinary sea? What is the distance from the center of one wave to the other? What is the difference in the hight of the ends of an ordinary ocean steamer when the stern is in the trough of the sea and the bow on top of the wave in a heavy sea, and also the same in an ordinary sea?—J. G. H.

20.—PLUMBERS' SOLDER.—Will some one please tell me how much time is necessary to thoroughly eat all the impure metals out of plumbers' solder, and the quantity of water to put to the sulphuric acid? My object is to get the metal to retain its heat while in a semi-melted state (while wiping with the cloth) as quickly and at the least expense possible. Such metals as zinc, iron, and bismuth give it a tendency to crystallize and to be porous and white instead of having a bright solid metallic shine when the joint is wiped. We plumbers have always used sulphur with a little rain thrown into the pot while the metal is at a dull red heat, but that not only burns the zinc out, but also the tin, lead, and pot together.—W. S.

21.—PURITY OF WATER.—In the SCIENTIFIC AMERICAN for Feb. 17th is reprinted an article by Professor Chas. F. Chandler on the "Effect of Animal Excreta in Water." As the majority of our population residing out of large cities is dependent on wells for its water supply, this is a matter of the greatest importance to thousands who, nevertheless, are not aware of its importance. The points of the above article were included in a lecture, delivered by Professor Chandler about a year since, before the American Institute. At that time, he stated that there had not then been discovered any chemical test for discovering the presence of sewage contamination in water, nor was it apparent to the senses, except by its influence on health. Has any method since been discovered for its easy detection? In villages and country towns especially, privies, cesspools and drains are unavoidably located unpleasantly near the wells, and this is used as a strong argument by those interested in the sale of earth closets. Comparatively few use earth closets at all, and of this number still less apply the system so thoroughly, to all sources of contamination, as to secure the advantages claimed therefor. Can Professor Chandler, or any one, point out a feasible method of securing immunity (as society is at present constituted) from sewage poison? What amount of filtration through the different soils is necessary to secure perfectly pure water? Or in other words, as a privy or cesspool and a well must often exist within the limited enclosure of a village lot, what would be the nearest approach that would be admissible, while securing freedom from contamination?—J. Q.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal.

ALL reference to back numbers must be by volume and page.

INDICATOR OF METALS.—W. H. L. is informed that there is no known substance that will attract gold, silver, or lead.

J. L. J., of R. I.—A. L. D., of Canada.—For the mechanical books you mention, Bourne's "Catechism of the Steam Engine," and Dussauce on "Perfumery," address H. C. Baird, Philadelphia.

CEMENT FOR ALABASTER.—In answer to query No. 7, page 90, Vol. XXVI., I would say that I have had success in cementing different kinds of stone together, and also stone to wood. I use plaster of Paris tempered with glue, mixed up in small quantities as needed. It takes some time to set.—E. B. M.

COPPER DIP FOR IRON CASTINGS.—Query 2, February 10, 1872. Dissolve two pounds sulphate of copper in three gallons of water, and add two fluid ounces sulphuric acid.—K., of Conn.

RUBBER BOOTS.—J. R. M. can patch his rubber boots as follows: Rub the patch and boot thoroughly with sharp sand paper. Smear both with liquid rubber five times, every time letting them dry. Do this once more, and, before they dry, apply the patch, with pressure, if possible, and the boot is mended. If liquid rubber is not obtainable, dissolve small pieces of rubber, not vulcanized, in warm spirits of turpentine to the consistence of molasses in summer.—L. S., of N. Y.

WATERPROOFING BOOTS.—In answer to query 2, page 42 of current volume, I will say: Let C. B. take one pint neatsfoot oil, one pound old rubber boots, and one ounce rosin. Melt slowly, take out the fragments of the cloth of the old boots, and apply warm, say at 100° Fah. The boots will be water and snow proof.—C. E. G.

TENSILE STRENGTH OF SWEDISH IRON.—O. W. is in error in quoting our statement, as to the above, as from 120,000 pounds to 160,000 pounds. Our figures (see page 107) are from 70,000 pounds to 112,000. Knut Styffe bears us out in this statement. On pp. 124 and 125 of the English edition of his work, he gives the breaking weight of puddled steel and puddled iron from Surahammer as ranging from 72,737 pounds to 111,987 pounds, and the average of all the results in this table is about 85,000.

HYDRAULIC CEMENT.—J. A. T., on page 106, can take lime which contains from twenty to thirty per cent of clay or finely divided silica and make it into mortar with water. Should he wish to make watertight joints for a slate cistern, or aquarium, or for filling up metallic joints, let him take equal parts of red and white lead and work them to a thick paste with boiled linseed oil. This hardens slowly.—R. T., of Ill.

VOLUME OF HYDROGEN.—W. W., page 90, current volume, will find 22,429 97-107 cubic inches in one ounce of hydrogen, being ·0214 of a grain to one cubic inch.—R. T., of Ill.

SLIDE VALVE QUESTIONS.—Query 17, page 90, current vol. I more than agree with C. G. concerning the engine he has been repairing. I think there must have been some heavy rotary motion, either in the shape of fly wheel or mill stone, to carry the engine over the centers. I claim that any amount of lead that forces back against the crank before it gets to the center is a resistance; all the lead that is required is to overcome the *inertia* of the reciprocating parts, and this is partially accomplished by the lap of the valve cutting off the exhaust. I think that one thirty-second of an inch would be lead enough on the feed side, and about one sixteenth on the exhaust side. The more exhaust lead and lap of the valve there is, the less feed lead is required.—E. W. K.

POUNDING OF PISTON.—Query 12, page 90, current volume. To W. M. T. I think the pounding in your engine arises from the connection of the piston rod and the cross head; if this is the case, there will be some difference in sound; for, as the engine starts on the front stroke, it forces the piston rod into the beveled socket in the cross head; whereas when it commences its return stroke, it withdraws from the socket against the key. A very little play in this joint will make a good deal of noise.—E. W. K.

D. S., of Pa.—The insurance companies have good reason to charge higher rates for woolen mills heated by steam pipes, in which buildings woolen waste, wood, and other rubbish about the mill are allowed to come in contact with the pipes. Woolen waste often takes fire spontaneously when oily, and so will wood shavings. The danger of this is much increased by artificial heat, even though the latter is not intense enough to ignite these substances directly.

W. C. A., of Mass.—The reason that low steam will not dry yarn as readily as high steam is that the yarn holds its moisture by adhesive attraction with such force as to require greater heat than the ordinary boiling point to expel it. The conditions for the evaporation of water under any circumstances are very different from those of heating a gas or mixture of gases. The force of the vapor of water at 212° is just that of the atmospheric pressure, and thus only surface evaporation from moist yarn could take place at this temperature. With higher temperatures, the water is converted into steam exceeding in expansive force the pressure of the air, and is thus expelled with greater or less rapidity.

LIGHT ENGINES FOR SAW MILLS.—In the SCIENTIFIC AMERICAN of January 20, query 16, inquiry is made how can an engine of light power be made to run a saw and cut lumber in proportion to the power used. This is a subject which should be better understood than it is by many. There is no reason why a ten horse power should not be made to cut one half as much as a twenty, or a five horse power to cut one fourth as much. The common mistake made when engines of limited power are used is to run the saw with too high a motion. If a twenty horse engine can revolve a forty inch saw successfully at 300, a ten horse power should revolve the same saw at 150 revolutions in the same time, and a six horse power should revolve the same saw at 90. The difference in the power of the engines must be made in the revolutions of the saw, and not in the feed. Or, in other words, the cut of the saw for each revolution should be the same with the ten as with the twenty horse power engine. A fifty inch saw, run by the same power as a forty inch, should revolve one fourth slower, but should be made to cut one fourth more to each revolution. Perhaps some will ask why the ten horse power may not run the saw with same number of revolutions as the twenty, making the difference in feed. But in this case it would have the same friction to overcome as the twenty, and consequently but a small part of its effective power would remain. One of the first things to do in applying a small power engine to run a saw mill is to enlarge the saw pulley. With an eight or ten horse power portable engine of the usual order, the saw pulley should be made nearly or quite the size of the saw. If the saw is forty inches diameter, the pulley should be made nearly the same.—S. W., of Ga.

G. L., of Vt.—In the long run you will find it better to carry the water to drive your proposed factory through a canal sixty rods than to attempt to transmit the power through that distance by compressed air and the aid of an engine. The expense of pipe and engine will nearly or quite construct the canal, unless very adverse circumstances in cutting the latter exist; and a canal will cost little or nothing for repairs.

POUNDING OF PISTON.—Query 12, February 3, 1872. To W. M. T. Your engine may be out of line, so that tightening any of the bearings may be only temporary relief. Engines that have run some years, working full capacity, frequently pound when passing centers from the shaft wearing flat in the crank bearing on the side next the crank pin, as this portion of the shaft takes the heaviest strain on either center. There is no remedy except to true up the shaft in a lathe, and refill the box. Watch the main bearing carefully, when the engine is running with a heavy load on, and see if the lost motion is not in the main box.—C. T. S.

E. S. E., of N. J.—I contend that it is impossible for a player of ball, in throwing or pitching the ball, by any particular "twist" or "screw" of the wrist, or by any possible device, to cause the ball to describe a curve in the air, that is, to turn to the right or left in the track of a curve after leaving his hand. Of course the parabolic curve which it makes in its fall to the earth is not referred to. I maintain that any regular body, such as a sphere or cube, hurled by the hand cannot be, unless blown by wind, made to go in any line except one in a straight vertical plane, and that the famous slow and deceptive pitchers in base ball have never yet succeeded in making a ball deflect to the right or left, in the form of a curve. The boomerang I suppose is irregular in form, and its motion, like all deviations of a flying body, is produced really by a compound force. Please settle this point, as there is a wide diversity of opinion about it among men who set themselves up as authorities.—E. S. E. Answer: You are right in every particular.

D. W. H., of Mo.—The friction of the earth upon the ordinary plow is greater upon the mold board than upon the land side and bottom together. Therefore, one half of the power used in drawing a plow is not wasted by friction on the land side and bottom.

R. G., of Nova Scotia.—We advise you to use steam pipes for your lumber drying room.

FACING OIL STONES.—The most convenient way to face oil stone that I have yet tried is to use No. 3 sand paper. I have used it for about six years, and have always found it effectual; and it is generally so convenient that it can be done at short intervals, and the stone at all times kept in a good condition. I lay the sand paper upon a smooth and true surface, and in rubbing I confine myself to one half of the sheet until it is nearly rubbed down, to leave a sharp surface to finish up with. One sheet of sand paper has always answered for me, and it can be done in from ten to twenty minutes.—H. W., of Ill.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

CAR COUPLING.—John A. J. Chapman, Kansas city, Mo.—When two cars are uncoupled a dart headed link is held by one or the other, the free end of said link being held by springs in such a position as to freely enter the jaws of the opposite draw head. The spring, adjusted in strength and position for the purpose, presses against the inclosed dart head beneath it, and thus sustains the outer or free end of the link. The invention consists in an arrangement, of the springs described, with the pivot jaws and a combination with a car coupling, of bars, a compression spring, ratchet, and pinion, by which the proper movements and the desired attachment are made.

UPRIGHT PIANO FRAME.—Justin Whitney, Boston, Mass.—The frame stands upright, and forms the back, which supports the strings of the instrument, the strings being drawn across it over the bridge and sounding board. The sides and bottom of the frame are made in double angle form, and the trusses are of iron in the form of double Ts in cross section. The top is of irregular form, the front portion being the bridge over which the strings pass. Like some other parts of pianos—the legs, for instance, for square or horizontal pianos—these frames are made for the "trade" and sold as an article of commerce, the form or size of the frames being varied to suit different piano manufacturers.

PROPELLING BOATS.—Charles Dancker, Hoboken, N. J.—In the stern portion of a canal boat is hung a transverse crank shaft, to which oscillating motion is imparted by means of steam or other power. The cranks of the shaft are connected to the front ends of rods that extend backward through the stern of the boat, where they are packed water tight. The motions of the rock shaft serve to move the rods back and forth. To the outer end of each rod, behind the stern of the vessel, is pivoted a metallic or wooden blade, of suitable width and length the pivot pin being rigidly attached to the rod. To said pin is also secured a metal or wooden plate, which has its ends guided in grooves or tracks provided in backwardly projecting frames of the boat. The said frames also hold transverse pins or friction rollers, upon which the propeller blades rest. As the rods move outwardly they push the blades back, and cause them to gradually drop from a horizontal into a vertical position by bringing its pivot gradually nearer to the supporting pin. The blade crowds the more against the water the more it is brought into a vertical position, the covering plate to which it is attached preventing the water from escaping over the top. In moving forward, the rod draws the blade gradually into a horizontal position, and prevents it from hindering an advance of the boat. The rudder is hung in cross pieces that connect with the projecting frame. One or more rods, blades and plates may be applied to one boat. The space inclosed by the frames may be closed on top if desired. A modification of the invention is one in which the blade is drawn into a pocket formed in the stern of the boat, the projecting frames being dispensed with. In this case two rudders are preferably used near the sides of the boat.

CLOTH PLAITING MACHINE.—Joseph A. Sawyer, Worcester, Mass.—This very ingenious invention relates to a new machine for plaiting fabrics to be used in the manufacture of shirt bosoms, and for other purposes. The invention consists in the use of several appliances for imparting and regulating the necessary motion and guiding the fabric. Seven distinct claims have been allowed on this invention which shirt manufacturers would do well to examine, as we regard it as one of much importance to this line of business.

WASHING MACHINE.—Henry S. See, Evansburg, Pa.—The clothes to be washed are placed upon the bed, and a reciprocating motion is given to a rubbing frame, which carries a rubber over the clothes. The rubbing frame acts as a lever, the rubber being the fulcrum. A reciprocating frame, in combination with spindles, rollers, standards, springs and pins, is employed in combination also with a board pivoted to side pieces and arranged with the bed.

WALL GUARDS FOR FURNITURE.—James L. Brander, Boston, Mass.—The object of this invention is to provide a cheap, safe, and convenient means for preventing the defacement of the walls of parlors and other apartments by the backs of sofas, lounges, or other similar articles of furniture. It consists in a guard, of crescent shape, screwed to the floor so that the front or concave side shall receive the leg of the sofa, lounge, or other article, and so that the guard shall act as a stop to prevent the back of the article from touching the wall of the room.

WASHING MACHINE.—Martin Way and Frank Way, of Springfield, Ohio.—This invention relates to a new washing machine of extremely simple construction. A frame supports the wash tub, which has a cover, the cover having a hinged lid over a central aperture. Vertical posts are attached to and under the cover, extending not quite to the bottom. A crank shaft, swiveled in the lid, carries a forked frame. By operating the crank, the frame rubs the clothes against the posts and thereby cleanses them from dirt.

TIME LOCK FOR BURGLAR PROOF SAFES.—John Burge, of Circleville, Ohio.—This lock is placed upon the inside doors of vaults or safes, and moved and operated by clock work, so that no keyhole or other aperture through the door is necessary. A mechanism composed of a revolving cam wheel and actuating plate and springs is employed, by means of which a continuous motion in one direction locks and unlocks the door. The inventor does not confine himself to any peculiar clockwork or mechanism for this purpose, but designs to use any motive power within the safe or vault by which the purpose may be effected. Neither does he limit or confine himself to the precise form or arrangement of any of the parts described, as they may be varied in many ways without departing from the invention.

BEER FORCING APPARATUS.—William H. Otto and Peter Korper, of Tremont, Pa.—This invention has for its object to furnish an improved apparatus for forcing beer out of the keg. It consists in the construction and combination of an apparatus by which, on opening a stop cock and the faucet of the beer keg, the beer will be forced out violently from the keg. The beer keg may be placed at any desired distance from the operating parts of the apparatus, which may be placed beneath the bar, or in any other convenient place.

BIN FOR STORING AND DRYING GRAIN.—Jarvis Royal, of White Rock, Ill.—This invention is an improvement in the construction of bins, boxes, ships, boats, etc., in which grain or other substances are placed for storage or transportation, so that the substances placed in them—whether grain, fruits, flesh or fish, salt or sugar—may be dried and thus preserved from injury from dampness; and it consists in lining the inside of the bins with porous bricks or tiles. The bricks or tiles may be secured in place by a slight frame work, or in any other convenient manner. In case plain brick or tile are used to line the bin when made close, thin laths should be placed along the sides and bottom of the bin for the bricks or tiles to rest against, so as to form channels or openings for the ingress of the air. In some cases—as, for instance, in grain boats and ships—it may be advisable to line the lower part of the bin with thicker and heavier brick or tile than is necessary for the sides or upper parts. By this construction the porous bricks or tiles will, it is claimed, absorb the water from the grain or other substance, which, coming in contact with the air in the chamber or corrugations, is evaporated. This process of absorption and evaporation continues until all the grain in the bin is sufficiently dried. The claim is based upon the interposition of these laths so as to form the open spaces between the bricks or tiles and the outer walls of the bin.

CARRIAGE WHEELS.—Charles H. Appel, of Allentown, Pa.—This invention pertains to an improvement in the devices for securing the spokes of carriage wheels in the sockets of their wooden hubs; the invention consists of a detachable metallic ring or collar, provided with dovetailed lugs, in combination with the spokes and wooden hub.

FISHING APPARATUS.—Orange M. Fuller, of Catasauqua, Pa.—This invention consists of a float from which the line is suspended by a trip lever and spring in such a manner that when a fish takes hold of the hook and pulls on the line, the spring will be tripped by the lever and the fish will be hooked; also a weighted arm, held in a horizontal position by the spring, will be let fall to raise a flag as a signal that a fish is taken, and the hook will be pulled in by the spring, so as to fasten the fish, the said float being connected by a long line to a reel in the hands of the operator, to be pulled in by him to secure the fish.

ORE AND STONE CRUSHER.—Robert Learmouth, of Buffalo, N. Y.—A method of adjusting the stationary jaw, by means of detachable links formed of different lengths, constitutes this invention. In other respects the construction does not differ from other stone crushers in use.

VISE.—John Peace, of Camden, N. J.—The vise is placed on horizontal and vertical swivels, so it can be turned in suitable direction to hold the work in convenient position. The invention consists in a new general arrangement of parts, and also in a new application of the proper jaws. A flanged and flat sided screw, provided on opposite sides with jaws, when combined with and swiveled to a nut, constitute the claim on which a patent has been obtained.

CASTERS FOR FURNITURE.—William Ireland Blackman, of Columbus, Miss.—This invention relates to an improvement in casters for furniture. It consists in the mode of confining the ball and securing the caster to the leg. A shell in which the ball is confined, having a shank, a fastening ring, a thimble, and a holding pin are the several parts of the device. The shell and shank are made in two pieces, forming a globular opening for the ball and a tapering shank for the leg. The main bearing or the ball is at the center of the globular opening above; but, to reduce the frictional surface of the shell, there is a small rib with which the center of the ball comes in contact. About one fourth of the diameter of the ball projects below the shell. The bottom of the thimble rests upon a shoulder and a collar of the thimble rests upon the top of the fastening ring, while the ring itself rests upon the shoulder. The fastening ring is secured to the end of the leg. The ends (one or both) of the holding pin project from the shank over the edge of the thimble, which prevents the caster dropping from the leg when the piece of furniture is raised. In some cases the entire shell and shank will be let into the leg, in which case a larger ring will be used.

STONE LIFTER AND STUMP EXTRACTOR.—Josiah Knoop, Casstown, O.—The invention consists in several improvements, upon the portable stone lifters and stump extractors heretofore known to the public, by which the inventor has produced a durable and convenient machine, peculiarly well adapted to its purpose. It seems to provide pretty effectively for all the accidents to which such machines are liable, and to economize the power required in producing the desired effect.

CULTIVATING PLOW.—Cealy Billups, Norfolk, Va.—The invention consists in constructing two wing mold boards so that they can be reversed on the cultivator plow and thus made to represent two different sizes and widths. The same wings will thus serve for all stages in the growth of the plant and never require to be left off the plow.

FENCE.—Alfred M. Aplin, Chetopah, Kan.—The invention consists in forming a fence of tubular clay posts placed close together in the ground and held in line by top caps at suitable intervals. This fence dispenses entirely with rails, is almost imperishable, and yet may be made at the small cost of about 30 cents a panel.