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Part Ninth of Mr. Pope's admirable series of upland pame birds and water fowl flgures the mountain quail Mareca Americana, Stephens. Our high opinion of the

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(1) S. B. M. asks how the "beton concrete," used in the buildings, etc., illustrated in the
Scientific Ambrican Sorplement, No. 118 is made A. Consult Gillmore's "CoignetBéton, and other Artif cial Stones."
(2) P. W. J.-Send full name and address. (3) G. B. G. asks: What is the composition of the steel bronze dip used by brass fnishers? A. Dip the articles bright in dilute nitric acid, pass them immediately through clear water, and place in the following on ; ferrous sulphate (copperas), $1 \mathrm{lb} \cdot$ arsenious acid lon; ferrous sulphate (copperas), $1 \mathrm{lb} \cdot ;$ arsenious acid
(pure white arsenic), 1 lb . Then remove, rinse in cold water, and dry in sawdust. It may be polished with black lead and coated with a lacquer made as follows: Spirits of wine or wood naphtha (methylic spirits), 1 gallon; shellac, 5 ozs.; sandarac, 4 ozs.; elimi, 1 oz .; turmeric, 6 ozs.; pamboge, 1 oz. Digest together in a covered vessel in a warm place, decant the varnish, d1gest the residue again with 26 gallon of spirit, and add
this tothe rest of the lacquer. How do print the lacquet.
How do printers measure type when set up at so much
per thousand ems? A. The unit of measure ment in printing is the squarc of the depth of the type, called an em, because the letter $m$ was at one time a square letter. The number of these squares contained in a line of type in width, being multiplied by the number of lines, or ems, in the depth of the page or column, gives the nnm ber of ems. The large type on the reading pages of this journal is brevier, 29 ems wide, 132 lines or criss in
 cents a thousand ems, $3,828 \times 50=\$ 1.91$. See Webster' Dictionary, under " Type," for comparison of sizes of (4) Quandary writes: I have a telephone with which I want to connect my store and house. I telephones have many more ohms resistance than the sounders, which have only two ohms. How shall I connect, so that I can attract attention with the sounders? I have used 2 cells of the usual style battery, and cannot get it to work. A. Do not place the telephones in the elegraph circuit. Connect one binding post of each (5) A. Z. M. asks where to get carbon points and their probable cost. Also wants an outline of the Bell telephone, as he is trying to make one. A. You can get carbon points from any dealer in electric batteries, or you can make them by following directions given
on p. 171 (1) of current volume. Full directions for entific American Supplement, No. 142.
(6) L. O. R. asks: 1. Can Spanish well be parned without a teacher? A. Not to speakit. 2. What
partar textbooks, grammar, dictionary, readers, and the like, are best for an unassisted scholar? A. Consult publishers' catalogues.
(7) D. H. S. asks: Can a 4 horse power engine be made to exert 8 horse power by increasing speed to double its former rate? In other words, by doubling speed an engine will its power be increased at same
ratio? A. Yes, providing the same mean cylinder pres
$\left(\begin{array}{c}\text { mean pressure } \\ \text { in } \\ \text { per Bq. inch. }\end{array}\right) \times\left(\begin{array}{c}\text { piston speed } \\ \text { in feet } \\ \text { per minute }\end{array}\right) \times\left(\begin{array}{c}\text { piston area } \\ \text { in sq. } \\ \text { inches }\end{array}\right)$
(8) G. H. H. writes: I have a steam engine the cylinder is 3 inches in diameter and 4 inches stroke. What is the power, how large a boiler will it require, and what kind is the best for me to get? A. Such an
engine would rate about 2 horse power. A vertical engine would rate about 2 horse power. A vertical
boiler, 22 inches in diameter and $41 / 2$ feet high, would be boiler, 22 inches
suitable for it.
(9) L. S. I. asks how to weld and temper broken carriage spring. A.To weld, heat in a clean fire to a yellow heat, and use borax as a flux. To temper, heat it evenly to a low red, quenchit in oil, and blaze it
off two or three times.
(10) C. F. D. asks how to construct a cheap telephone from his room to another, distant about 150
feet. A. See Scientific Amrican Suppuement, No. feet. A. See Scientific Amrrican Supplement, No.
142, which contains full directions for making a telephone.
(11) A. O. writes: Please state in the ScrzNTIFIC AmRRICAN, for the benefit of many readers, the breaking load of a white pine pillar, 12 inches square
and 40 feet long. A. Mr. C. Shuler Smith's rule is as

## Breaking load in lbs. per sq. inch of area=

 $+\left(\frac{5 \text { square of }}{\text { square }} \frac{5,000}{\text { of }}\right.$ length in inches $\left.\left.-\times 0.00\right) 4\right)$(12) Foreman. - Your data are insufficient.
(13) F. S. W. asks: 1. Which of two water Wheels of equal size is best, one discharging at the center, the other at the periphery, and why? A. A ques-
tion of this kind cannot be generalized, as there are on of this kind cannot be generalized, as there are the effliciency of a wheel. 2. Which of two pulleys of equal size,one with straight arms, the other with curved, equal size,one with straight arms,the other with curved,
is the strongest, and why? A. For equal crose sections, the straight arms are usually the strongest, for the
same reason that a straight beam is ordinarily gtronger thana curved one.
(14) O. V. F. asks: Does increasing the size of the arm or axle of a wagon increase or decrease
the draught? A. After passing the requisite proportions, the draught is increased
Would falling through the air from one mile in height
cause death before reaching the
$\qquad$ (15) C. R. M. writes: I am building an ice house, $16 \times 20$, and 20 feet deep intheground, with loge
in the form of a square pen. Ought $I$ to leave an opein spacebetween the logs and the earth, or had I better fill in with tan bark, sawdust, leaves, or something of that
sort, as is usually done? My opinion is an air chamber or space between the earth and loge would be the best non-conductor I could have. Am I right? I find ice commences to melt around the sides next to the logs,
making an open space of 10 or 12 inches. People most. making an open space of 10 or 12 inches. People most-
ly fill up the space with ice (which takes a good quanly flll up the space with ice (which takes a good quan-
tity) and others fill up with leaves, tan bark or sawdust My opinion is to leave the space open. Am I right? A. Dry air is one of the poorest conductors of heat, but at
the same time it offers no impedfment to thermal radiationor convection. Walls of loose non-conducting sub stances, as sawdust, intercept the one and impede the other. See pp. 871, 939, 1570, and 1851 of the Scientific ican Supplement.
(16) W. C. S. asks: What size boiler must I have for a $11 / 2$ diameter by $21 / 2$ inch stroke cylinder?
Please give thickness of how high the water must'stand in such a boiler when in working order. How long should I make the connecting rod? A. You can make a boiler 12 inches in diameter and 24 inches high. Carry the water level at about two thirds of the height. Use iron plate about ${ }^{9}$ ithick. The connecting ro
length of stroke.
(17) X. Y. Z.-You will find in the last ed tion of Ganot's "Physics" a full description of Helm holtz's apparatus for the analysis and synthesis of
(18) G. G. L. writes: Some time ago you mentioned in your paper that you would be pleased to
receive any communications on the practical results of receive any communications on the practical results of
small steam yachte. I send you the following description and performance of one that I have built this summer, hoping that it may be of service to others who
want to build one. The boat is a lap streak 26 feet over all, and 5 feet beam; the planking is of pine \% of an inch in thickness, the ribs are of oak $3 / 4$ of an inch thick and $11 / 4$ inch wide, steamed and bent in, and placed 6 inches between centers. The boiler is made of
steel $\frac{\pi}{1 \pi}$ inch thick in the shell, and the firebox and tube steel $\frac{3}{\text { In }}$ iuch thick in the shell, and the firebox and tube
sheets are of iron 34 inch thick, and is 34 inches high, 20 sheets are of iron 34 inch thick, and is 34 inches high, 20
Inches diameter, with a firebox 17 inches indiameter and 15 inches high; there are 56 inch tubes 19 inches long, the engine is vertical, with cylinder 314 inches diameter inches diameter with 3 blades, and has a pitch of 3 inches, and is placed $31 / 2$ feet from stern post, thus giving room for the rudder forward of the wheel above the shaft; the shaft is supported by the stern pipe, which
is 8 feet long and is made of 2 inch gas pipe, and extends is 8 feet long and is made of 2 inch gas pipe, and extends
prom the stuffing box to the wheel, and has a bearing in each end. With 100 lbs . of steam the engine makes 325 revolutions per minute, and drives the boat 8 miles per hourin still water. The pump iy $3 /$ of an inch in
diameter and $11 / 4$ inch stroke, and gives plenty of water.
correct in every particular. The results are excellent. this direction-En.]
(19) F. B. writes: I am building a lathe. My balance wheel is a 3 part one, namely, 24 inch, 21
inch, and 18 inch diameter. I wish the spindle to match the 24 inch part 3 inches in diameter. What shall be the diameter of the other two pulleys to match the 21 inch and 18 inch parts, so that the belt may be tight on either pulley? A. Having found the ength of belt, call $R$ the radus that is known, $S$ the distance between centers of pulleys, and $L$ the length of
the belt (all dimensions in feet). Then if $R$ is the the belt (all dimensions in feet). The
larger of the two radii, the other radins,
$r=\mathbf{R}-\mathbf{S} \times\left\{1.5708-\left(V_{0.4674+}^{\mathrm{L}^{-\cdots}-6 \mathrm{E}} \mathrm{S} 32 \times \overline{\mathrm{R}}\right)\right\}$, and $\mathbf{R}$ is the smaller of the two radii, the otherradius,


1. Can I, with a furnace like the one described on $p$. scribed on p. 75, vol. 39, Scientific American, obtain heat enough to melt copper in a common sand If not, what heat can I get? A. Except in very small quantities, no. 2. At what temperature will a mixture by weight of iron 36, copper $1 / 4$, and zinc 14 , melt? A. If the zinc were not all volatilized in the operation the
(20) W. W. MacC. asks: Which is the better engine for a flouring mill, a long stroke and slow
motion, or a short stroke and quick motions A. We think the latter is preferable.
(21) E. H. C. asks: Will an enginc having cylinder $11 / 2$ inch in diameter and 3 inches stroke, run
(22) A. J. F. asks: How can 1 do enameling on gold and silver? A. The enamels used consist o a very fusible glass variously colored by metallic ox-
ides, reduced to powder and made into a paste with wades, reduced to powder and made into a paste with wa er for use. These are applied to the finished surface of the metal, on which they are fused by means of a How can I make hair cosmetic? A. Fuse together 2 parts of lard and 1 part of beef suet, and incorporate
by trituration any of the bouquets given on p. 1030, ScI entific American Supplement
Please give me a good recipe for making cologne. A. Eau de Cologne-6 quarts 82 per cent alcohol, 2 ozs. essence of orange, 2 ozz. essence of citron, 2 ozs. oil des petits grains, 1 oz . de cedro, 1 oz. de cedron, 1 oz.
de Portugallo, 1 oz . neroll, $1 / 2$ oz. roemarinol, $1 / 4 \mathrm{oz}$. ymol
(23) T. H.-In your first inquiry the data are insufflcient. Rosin is sometimes applied to belts
to prevent slipping, but there never should be occasion

(24) A. I. asks: What size propeller whee is required for an 834 by 8 inch engine, and what pitch wanted for towing and running partly, and which is the ent make to buy? A. A propeller suitable for such an pitch of from 5 to 6 . We do not recommend special in these columns.
(25) C. C. B. writes: I wish to raise water for domestic use to a perpendicular height of two
hundred feet, and deliver six hundred feet from supply point. Is the hydraulic ram practicable for this height A. You can use a ram for the purpose, but it may be necessary to fit pipe of extra strength. A manuf
turer will give you fullinstructions as to fall, etc.
(26) W. M. E. writes: Which is best for seasoning white oak, open air, kiln or steam? A. Air easoned timber is generally
the difference is not great.
Does a 40 inch circular aaw, 26 teeth,gauge 7,sawing a plank 16 inches wide, take more or less power than a 50 ach, 26 teeth, gauge 7 , on 16 mich plank, both run on
same speed of mandrels A. Less, as we understand same speed of
the conditions
(27) R. H.B.asks: 1. What is sumacused for n chemistry? A. Sumacis used principally in dyeing and tanning. 2. Where is the best quality procured in with that brought from Italy? A. Virginia. Fine Sicil. ies sell pared for markets to $\$ 60$ per ton. 3. How is it pre dried in the shade. When dry they may be beaten with ticks or flails. The gathering of the leaves may com mence in July and continue tillfrost. It may be packed in bafs preparatory for shipment to market. The
amount of tannin contained is from fifteen to twenty pr cent.
(28) F.-In your thread telephone use a
(29) S. E. W. asks (1) for some good durable cement or glue not affected by moisture, that will gutta percha and pitch. Have the metal dry and use the ement moderatelty. Have the metal dry and use the cheap blue, black orgreen ink, such as is used by large bbber roller printing machines for marking wood; it is o be applied toa roller covered with felt, which recured the rubber type9 A. See p. 204 (33), current vol(30) W. T. M. asks: What oil or oils will make a photograph, or other pictures. transparent on ace of the moistened print with good starch paste containing a drop or two of clove oil, press the picture face ownward on the clean glass, press out the excess of paste, and dry. Then saturate the paper with castor oil, wipe of excess, cover with a thin glass plate for protec-
tion, and bind the edges with cloth or paper and paste.
(31) H. A. P. asks: What will remove the smoky discoloration of 10 years' standing on an Italian
marble mantel, occasioned by being parlor9 A. Moisten quicklime with a strong cold aqueous to remain for several hours. Then clean off and wash
