its introduction into our schools be carried on under the advice of scientific experts, who shall direct what is best to be taught, and advise with the adepts in teaching how such knowledge may best be imparted. As a journal having the interests of science and education at heart, desiring to see science soundly popularized, and the masses made acquainted with its technical value, we make this suggestion, and furthermore ask: Is there any man of scientific attainments in the present Board of Education? Is there any scientific authority upon its general staff? And how many teachers favorably known to and having the confidence of the really scientific portion of the community are engaged in giving scientific instruction in our public schools?

SOCIAL SCIENCE.

Science, in the philosophical meaning of the term, is a collection of the general principles and facts relating to a subject, arranged in a systematic form. We do not, however, consent to apply this term to a collection of facts and deductions until the accumulation comprises the leading facts possible to be collected by the application of proper scientific methods. One would only be laughed at for styling ancient alchemy a science, though it was the beginning of one of the noblest of modern sciences. Facts, to become the proper basis of science, must be examined with careful scrutiny to exclude all which is only *seeming* fact, and to be sure that nothing creeps into the category incapable of demonstration.

A series of assumptions may form the basis of a beautiful system, but it is now universally agreed that assumptions are inadmissible where experimental knowledge is attainable. But experimental *knowledge* is only attained by well-conducted, accurate experiment. When a lad, the writer performed a series of experiments with some heterogeneous chemicals, culled from a quantity of old jars and bottles, without labels. He gained only the knowledge that such crude experiments are very dangerous, and gained it at the expense of a burned face and some other personal damage. Doubtless many interesting and important facts might have been demonstrated by the proper use of the substances referred to; but, in the hands of the inexperienced and unskillful, they were only capable of jeopardizing life and limb.

The history of the human race is spotted all along with results of just such crude experiments. At present, we are trying numerous social experiments on a grand scale. An explosion has just occurred in Europe which has cost two countries great bloodshed and misery. We ourselves recently came near to destruction by an explosion, the wounds of which will not be healed in half a century, and our experiment is not yet ended, nor by any means free from the liability of future disaster.

Looking over the history of mankind one may well ask, where are the carefully ascertained facts on which to build social science? Who were the master hands whose efforts demonstrated these facts to the world? If social science, properly so called, is a future possibility, is it, from the nature of the case, a *present* possibility? And are the so-called systems, for which their authors claim the proud name of "science," really worthy of the name?

In looking over a volume which has lately found its way to our table, and which purports to be a treatise on Social Science,* we find much which gives a negative answer to the questions we have propounded. We find a negative answer, also, in the proceedings of so-called "Social Science Associations," and conventions, which contain little but disjointed theorizing upon assumed facts. We find a negative in the *status* of modern society in which suffering and misery are predominant, and much of which results directly from social organization. Mr. Carey, whose larger work — somewhat clumsily (we think) condensed by a female writer—forms the substance of the treatise under review, has acquired considerable reputation as a strong and fearless defender of the system of protection to American industry, and as a writer on political economy. His work entitled the "Past, Present, and Future" entitles him, in the opinion of the editor of the volume under review, to be called the "Newton of Social Science,"—a proud title, indeed, were it fitly applied. A comparison, however, between the labors of the two men, so far as Mr. Carey's socialistic speculations are concerned, will show, that where one took his points of departure from experimentally demonstrated and carefully ascertained facts, the other has made his deductions from the crude facts, the results of the turmoil of the jumbled elements of human society, as they have rushed together under the guidance of no directing mind.

Nor is Mr. Carey, in our opinion, free from the charge of building symmetrical theories, and regarding them as resting upon solid foundations, simply because their exterior presents a harmonious and firm appearance. Certain it is that his views have been strongly opposed by those who would have been convinced, had his system approached the demonstrative character of a science.

On page 27 of the work under review, we find the following paragraph:

"Seeking now to understand the history of man in past ages, or in distant lands, we must commence by studying him in the present; and having mastered him in the past and present, we may then be enabled to predict the future. To do this, it is required that we do with society as does the chemist with the piece of granite—resolving it into its several parts, and studying each part separately, ascertaining how it would act were it left to itself, and comparing what *would be* its independent action with what we see *to be* its societary action; and then, by help of the same law of which the mathematician, the physicist, the chemist, and the physiologist avail themselves—that of the composition of forces—we may arrive at the law of the effect."

Now, we ask, how we are to ascertain what the "parts" would do when left to themselves? Have they ever been so left, or, if they have, has their action been studied by those competent to study, and recorded by those competent to record? Does history show us any record of man except in some sort of social organization, possessing in itself the evidence of its unscientific structure? Surely, then, the action of the "parts" isolated must be assumed, unless we are to isolate them and experiment with them, as we do with the components of granite. No chemist ventures to predict what will be the properties of the components of a substance. He first separates the elements and applies to them rigid tests, to gain the knowledge he seeks.

Those who seek to frame a social science are in a position precisely similar to that of a man who should seek, by the aid of a book of ancient alchemy and a collection of animal, vegetable, and mineral substances, to create a science of chemistry. History teems with lies. To sift its truth from its falsehood puzzles the profoundest minds. It is plain that it is not a reliable guide in the construction of a system to which the name of science can be appropriately applied. All the experiments in social organization, even approximating to the rigid conditions which make experiment of any value, are found in social organizations like the Oneida Communists, and others of a somewhat similar character, and these are so few, and are accompanied by such palpable errors, as to exclude them from the pale of scientific investigation. Where, then, are the data? From what are the general principles to be evolved on which to build a science? In all attempts of the kind we have met, the principles are assumed, and the facts culled from the imperfect records of the crude experiments in association. found in history. The book before us is not an exception, and though it is written in a vigorous style, and embodies much thought which is suggestive and instructive, we see nothing which entitles it to the name selected for it.

We have before avowed the belief that at present, at least, social science is not possible, and have entertained the doubt that the future will ever bring about a state wherein the elementary principles and facts necessary for such science will be obtainable. We may be in error in this opinion, but if so we are not alone in our mistake. We do not, however, on this account, deprecate the study of social organization, or political economy. We only wish to caution the student against mistaking assumptions for facts, and mere theories for the enunciation of principles.

* Manual of Social Science. Being a Condensation of the "Principles of Social Science" of H. C. Carey, by Kate McKean. Philadelphia: Henry Carey Baird, 406 Walnut street.

THE FAILURE OF THE HON. OAKES AMES.

The recent failure of the Hon. Oakes Ames has made quite a stir in business circles. An instructive moral may be drawn from it.

According to the Springfield *Republican*, the legitimate business of Mr. Ames and his brothers was never in a more prosperous condition than at the time of the failure. The profits of their shovel factory is estimated at $1,000 per day, and the Ames Plow Company's business was also going on profitably and smoothly. The journal quoted says:

With the success of his first investments in railroad building in Iowa and in the Union Pacific Railroad, and the great power which such vast enterprises brought back to him, there grew up in Mr. Oakes Ames a real passion for gigantic operations among the material forces of our civilization. It came to be so strong that, as he once confessed, he could not resist the fascination of a brilliant opening for connecting States or cementing continents with railroads, founding a city, or reconstructing social order, with great money gains behind it. He had still on hand large railroad operations in Iowa and in the South; the Mobile and Chattanooga Road was under his patronage; he was a prime party in an organization for reviving and completing a new railroad from the Potomac across Virginia to the Ohio River; and his real estate investments were numerous and large in all parts of the country. The consequence was, of course, an ever-increasing mountain of debt Every new scheme locked up more and more means; they gave him great values—a wealth of lands, bonds, and stocks—but from which he could not realize at present; and so he came to be a borrower for millions, and needing, for fresh investment and to renew falling notes, new loans of $50,000 to $100,000 daily. Naturally, lenders became distrustful, and he had to pay higher interest. He found it more and more difficult and expensive to borrow, and only some untoward circumstance has been wanting for many months to close the market against him. This came doubly in the suspension of Mr. Treadwell, of San Francisco, the great dealer of the Pacific coast in agricultural implements, owing the Ameses, as reported, hundreds of thousands of dollars, and in the decision of Mr. Boutwell and the Attorney-General, backed by public opinion, against the impudent demand of the Union Pacific managers, that the Government should put its bonds and their interest back of their own income and land-grant bonds and stock—in effect, to surrender the Government claim to them entirely—which impaired the market for all Union Pacific securities, of which Mr. Ames is still naturally a very large holder.

Now, in these facts is contained a lesson well worth pondering. The greed with which men seek to amass colossal fortunes, and the impatience of delay in the realization of their ambitious schemes, are characteristics of American business men, which have become vices. The old avenues of trade by which their fathers secured fortunes, and were able to keep them when obtained, are too slow for the average American of to-day. Gigantic risks are unhesitatingly assumed if they offer a chance of rapid accumulation. The spirit of speculation has possessed the commercial public, and men stop at no means, within the limits of the law, to hasten their progress towards wealth.

Hence we have the spectacle of men like the Hon. Oakes Ames unblushingly casting their votes in our legislative bodies for measures which indirectly aggrandize themselves, and which have no other purpose. The interests of the commonwealth, duty to constituencies, official honor, all are forgotten in the mad scramble for wealth, and the power which wealth brings.

Is it to be wondered at, that in all this scramble and haste, men should frequently stumble and fall? Is it a wonder that confidence falters, and that men hesitate whom to trust? Is it a wonder that large monopolies are created; that the big fish eat the little ones, and that public and private morals deteriorate?

Did this affect only the personal interests of the men who thus seek to build their own fortunes at the expense of others, it would not be a matter of so great import, but when men like Oakes Ames fail, the industrial interests of the entire country suffer; credit is damaged, and general embarrassment is created.

We wish we could see a prospect of a more moderate ambition, and a return to the slower, but surer, paths to wealth in the immediate future; but in all the signs of the times we read no such pleasing augury. We must wait, therefore, till wisdom is obtained in the school of disastrous experience, and misfortune has cured the mania for rapid money-getting, now unfortunately so prevalent.

RAILROAD PROGRESS IN THE SOUTHERN STATES.

In no one particular has the South so materially advanced as in the construction of new railroad lines. Perhaps she has thus advanced more in what she proposes to do and is doing than in what she has done. With many navigable streams flowing through their land, and the slow character of business dealings previous to the war, the people of the South did not so much feel the necessity of well-conducted railroads as in these days of rapid transportation and quickly-made fortunes. Hence, many of the railroads built and existing in the South previous to 1861 were poor affairs, and in many instances more progress has been made in improving the old than in constructing new lines. Instances there are, too, of tracks torn up in the military operations of the war, which, like their owners, have been reconstructed, much to their present benefit and future durability.

In 1864 there were 8,944 miles of railroads in the Southern States proper. Of these 296 miles were built during the war, viz.: in North Carolina, 47 miles; Tennessee, 43 miles; Alabama, 62, and Texas, 144 miles. Up to 1871 there have been built 1,461 miles of railroad. These figures are according to "Poor's Railroad Manual," which, however, takes no note of the fact, that to build the forty-seven miles in North Carolina, another railroad was torn up by the Southerners. In Virginia there have been 104 miles of new railroad built. This work is chiefly on the Chesapeake and Ohio road and the road from Richmond to York River; also some on the Alexandria, Loudon, and Hampshire road. A great deal has been done in renewing and rebuilding old lines. The amount of this last character of work is particularly noticeable on the lines controlled by General Mahone, from Norfolk to Bristol, Tenn.

Of new roads, and roads in progress, the Chesapeake and Ohio, which has so slowly dragged its weary length along, commands first attention. It is intended to be a great through line for grain and other freight from the Ohio River to tide water at Richmond or below. It is being built as fast as the nature of the country will admit. The contract stipulates that it shall be finished in running order by January 1, 1872. The entire length is 427 miles.

Another line of great importance is one proposed to run the entire length of the famous Shenandoah Valley to Salem. It has been placed under contract, but will be built slowly, unless taken in hand by the Baltimore and Ohio Railroad Co., which line it would benefit. Another line much talked of, but hardly to be built, is an air line west from Norfolk to Bristol, Tenn., partly in North Carolina and partly in Virginia.

In North Carolina there have been built 146 miles of new railroad, being on the Western North Carolina, Wilmington, Charlotte and Rutherford, and Williamston and Tarboro roads. The first pierces the Blue Ridge, and is to open up the fertile and beautiful mountain section of the State. Of roads in progress, the extension of the Western North Carolina down the French Broad, thus to connect with the East Tennessee Railroad, has been graded. A portion has also been graded of the Western Division of the same road to run directly west to the Georgia line, and there to connect at Dalton, Ga. The Wilmington, Charlotte and Rutherford Railroad is slowly progressing from Wilmington to Charlotte. The Chatham road has been built from Raleigh southwards thirty-one miles, and is to be extended to South Carolina. The Fayetteville and Coalfields Railroad is chartered to extend to Salisbury, but there is no work being done on it, and but little, in fact, on any of these routes. Lines are proposed from and to various points, but none of them are likely to be built in the present condition of the State finances. But little of the track in this State was torn up during the war; but many bridges burned have been rebuilt, and a new one of great strength and handsome architecture constructed across the Cape Fear, at Wilmington.

In South Carolina 128 miles of road have been built, being the air-line from Columbia to Augusta, and part of the road from Augusta to Port Royal. This latter road is to be finished in 1871. The Blue Ridge road, intended to cross the southwestern end of North Carolina to Knoxville, Tenn., has not progressed any since the war. The contract was at one time let out, but afterwards abandoned.

In Georgia 232 miles have been built, being chiefly the Macon and Brunswick road, and the completion of the Selma, Rome, and Dalton, from the Alabama line to the latter point. In progress the Brunswick, Albany, and Eufaula road is most

prominent, as by its connection in Alabama, it is destined to form eventually a great freight line. Several small lines have been built within the past year, shortening the distance from Macon to Augusta. The Cartersville and Van Wert road, a short line, but one of much local importance, will be completed in a few months. The Atlantic and Gulf road also expects to run a branch north to Columbus during 1871. While Georgia can lay claim to having one of the best railroads in the South, she is disgraced, too, by, without doubt, the meanest. The Muscogee road is a shame to any people, and especially so to a corporation that is able to do better.

In Florida only 44 miles have been built, being the extension of the Florida Central from Lake City west. A number of roads are projected, and bonds appropriated to build them, but none are likely to be finished at present. A line is projected north and south through the State to some point on the mainland near Key West.

In Alabama the greatest progress has been made, there having been built 276 miles of road, and there is, at least, as much more in progress. The miles constructed are chiefly on roads in progress, the only completed line being the Selma and Montgomery. The Alabama and Chattanooga Company are rapidly completing their line. The North and South R. R., a line of much importance, is nearly completed. From Selma to Memphis the road is being rapidly built, as is also the Selma and Mobile. The Eufaula and Selma has been in great part graded, and some parts laid with iron. The Savannah and Memphis, from Opelika to Decatur, has been laid with iron about 30 miles, and is under contract the rest of the route. Many of these roads are intended to assist in developing the great mineral interests of the State. There have been some improvements in the old railroads of the State, not, however, so much as in Georgia, and in this respect the Selma, Rome, and Dalton is the only one which can lay any claim to being first-class.

In Mississippi 128 miles have been built, being a portion of the Selma and Memphis, and the New Orleans and Mobile; also a few miles of the Alabama and Chattanooga. The old railroads of the State have been somewhat improved, especially the N. ●., Jackson, and Great Northern. The principal proposed railroad of this State is a continuation of the latter line from Canton to Decatur, Ala.

In Louisiana forty miles have been constructed, being chiefly the Southern Pacific line from Vicksburg to Shreveport. Several lines are proposed in this State, all looking to connection with Texas. The one just alluded to is being rapidly completed.

The Alabama and Chattanooga Co., are said to be endeavoring to control all avenues to the Southern Pacific R. R., by buying up old lines and building new. In this they have rivals from St. Louis and Memphis on the north and New Orleans on the south. One of their own lines, also, starts from New Orleans. The rivalry cannot but be of benefit to the people and the country.

. In Tennessee 155 miles have been built, chiefly short branch lines or spasmodic efforts towards commencing great trunk lines, as the building of 30 or more miles on the Cincinnati, Cumberland Gap, and Charleston R. R., and a like number on the Blue Ridge, etc. All the railroads in which the State is interested are to be sold; they will undoubtedly fall into Northern hands and then be completed.

In Arkansas 90 miles have been built, being the line called Memphis, El Paso, and Pacific, from Memphis west. Another line from Memphis to St. Louis, running up the river in this State, is in progress. Lines are also in progress from St. Louis to the western part of the State and through the Indian Territory.

In Texas 132 miles have been built, being parts of various roads. The future of this State in the railroad line is certain to be great. The character of the country enables them to be built cheaply, the State grants public lands to them, and the fertile soil attracts emigrants, who demand this character of progress. The Southern Pacific skirts its northern border and a half dozen lines shoot up from the south to connect with it, while transversely, others are being constructed or planned.

Such is a brief sketch of the railroad progress of the South. That the next ten years will show a still greater progress, there is no doubt. A point of note in all these new lines is, that they are being completed with the latest improvements. Steel rails are not required, but the fish-bar joint and continous rail tell of comfort, in the future, for those traveling South. The first completed line of road over which mails and passengers were carried, was in the South, yet since that she has lagged far behind. It is frequently thus that pioneers are outstripped in the race of progress by those who adopt their ideas, and there is every probability that we shall be able to show England the best railroad, as we have already the best locomotive. Thus, too, the South has had to learn from the North the perfection of steamship and railway transportation, both in freight and passengers, although she first inaugurated them in this country.

New Use of Dolomite.

We are all of us familiar with the lime light produced by the heat of the oxyhydrogen jet impinging upon a pencil of lime. It now appears that a prism cut out of the mineral dolomite will emit a light as powerful if not superior to the calcium light. The dolomite is made up of nearly equal parts of the carbonate of lime and magnesia, and the combination of these two earths produces effects superior to what can be obtained from either of them alone. The light is said to be suited for photographic purposes, especially for copying pictures. As dolomite is an abundant rock, its application for purposes of light may prove of peculiar value.

ON BLOOD AND ITS USES.

Blood is the liquid which circulates in the arteries and veins of animals. It is made up of colorless substances dissolved in water, and of red undissolved particles diffused through the liquid. It has a saline taste peculiar to the animal from which it is drawn, and modern microscopic research has shown that it is possible to distinguish not only the species of animal from which the blood is taken, but also from what function of the body it was derived.

When fresh drawn it rapidly coagulates into a gelatinous mass called clot, from which a pale yellow fluid separates known as serum. The clotting can be in a measure prevented by agitating the blood with a bundle of twigs or metallic rods. We do not propose to speak of blood in the animal economy, but of its employment in the arts.

SAUSAGES.

Blood has long been employed in some parts of Germany in the manufacture of sausages, known as blood sausages. The peasants stir it thoroughly, just as it is drawn, so as to prevent the formation of clot, and afterwards mix it with the hacked meat. The sausage is not particularly toothsome to strangers, but the natives take to it very kindly.

CLARIFYING SIRUP.

For the purpose of clarifying sugar-sirup blood has long been employed, but this has ever been, as it always must be, regarded as a repulsive method for the purification of an article of diet. The principle upon which it works is the coagulation of the blood by heat, thus carrying with it the coloring matter and impurities. Where albumen can be introduced as a substitute it is found to be preferable on many accounts. The nauseous and sickening odor that comes out of the purifiers when a new charge of blood is introduced, fills half the sugar refinery, and renders the place nearly uninhabitable for several hours. It is not to be wondered at, therefore, that persons engaged in the sugar trade have tried to find a less offensive substitute. For their use, and for analogous purposes, attempts have been made to manufacture albumen from blood with very encouraging results, as we shall see further on.

ARTIFICIAL WOOD.

Artificial wood has been for some time prepared in France by compressing sawdust and blood albumen at a suitable temperature into a solid mass, suitable for cabinet work, decoration for clocks, and interior ornamentation. It is claimed that this wood is more durable than the natural growth. Shavings and sawdust are ground to a powder, and mixed with blood sufficiently diluted with water, and dried at 106° to 120° Fah., in a suitable oven. The albumen of the blood thus becomes intimately incorporated with the sawdust, and the prepared wood in the form of fine powder is put into molds, where it is subjected to a powerful pressure with a hydraulic press. The plates of the press are heated with gas sufficiently to reduce the contents of the molds to a semi-fluid mass.

Resinous woods are found to combine better with the albumen than hard woods. The artificial wood can be cut and worked in the same manner as lumber, and as it is made chiefly of refuse material, the price in France is such as to render it available for many purposes. The ground wood, after being saturated with blood albumen, has the specific gravity of 0·800, but after having been subjected to the hydraulic press it is 1·300.

MANUFACTURE OF PRUSSIAN BLUE.

Attempts have been made to employ blood in the manufacture of ferro-cyanide of potassium. 150 pounds of well-dried blood were melted with 100 pounds potash, but it was found that no more than one sixth of the nitrogen was economized. The yield ought to have been 127·5 pounds, instead of which only 19·7 pounds were obtained. It would appear from this experiment that Prussian blue cannot be economically made from blood.

MANUFACTURE OF ALBUMEN FROM BLOOD.

In Pesth, Hungary, blood is dried in about twenty-four hours, at 100° to 112° Fah., in flat iron pans; and it has been found in practice that 110 pounds of albumen can be made from 3,000 pounds of blood. The best quality is clear, transparent, and soluble in cold water, and is used for mordanting goods. It costs in Pesth 60 florins for 110 pounds, whereas it would require 16,200 eggs to make 110 pounds albumen, the cost of which would be 200 florins. The egg albumen is more expensive, but is preferred for most purposes. The second quality of blood albumen is darker in color, but is nearly all of it soluble in water, and is used by sugar refiners. It can be kept any length of time without change, is effective in small quantities, and is quite uniform in its action, so that it can be used by sugar refiners with great economy.

A more complicated process for the manufacture of blood albumen is pursued in Northern Germany. The blood is caught in round zinc pans, three inches deep, and is put aside in a quiet place until it is coagulated. Only a small part of the serum separates on the top. The coagulated blood cake is cut into small cubes, and thrown upon seives or strainers, and the serum, mixed with blood corpuscles, flows off into pans provided with movable tubes, so that at the proper moment it can be drawn off without carrying the impurities with it that may have settled on the bottom. The serum obtained in this way is run into square porcelain dishes, and exposed to a current of air at 50° to 60° Fah., and is thus rapidly dried. It is indispensable to have the blood in thin layers to avoid its decomposition from moisture.

Richter finds that the blood of buffalo yields a whiter serum than that of other animals. It may be well in this connection to remark that albumen from fish has been made of good quality, and at a fair price.

Some varieties of blood albumen have been found on analysis to contain 53 to 55 per cent of soluble albumen, and in this state of purity it can be advantageously employed in

CALICO PRINTING.

In order to fix aniline colors, it is necessary to use albumen, and as these colors are now very popular, the consumption of eggs for furnishing the requisite quantity of albumen has become enormous, and the price of albumen is raised in proportion. We understand that the use of blood albumen by the calico printer is very large at the present time, and is constantly increasing; and that it can successfully compete with the egg albumen.

IN PHOTOGRAPHY.

Albumen paper has become very popular in photography, and some of our large manufacturers of photographic material use many gross of eggs in the preparation of the paper. If the blood albumen could be made sufficiently white and pure to be used as a substitute for the albumen of eggs, it would be a great boon to artists.

IN AGRICULTURE.

Blood is a powerful manure, and has long been used for this purpose. It is also employed in making cements, in mixing with coarse pigments for protecting walls from the action of the weather, in making animal charcoal, and as a coloring matter.

The above are some of the uses to which blood is applied in the arts.

Frendeet.

Sir S. W. Baker, the famous African explorer, states in his exploration of the Nile tributaries, that he was often called upon, in his capacity of physician, to treat diseases among the natives; but there was one complaint that baffled all his skill, and he was obliged to leave it entirely to the Arabs. It is caused by drinking water from table land pools. Frendeet commences with a swelling of one of the limbs, with intense pain; this is caused by a worm, several feet in length, but no thicker than a packthread. The Arab cure is to plaster the limb with cow dung, then prick the skin in many places with a red hot lance, to form doors, as they term them, for the escape of the worm. In about a week one of the wounds formed by the lance will inflame like a boil, and from it the head of the worm will issue, when it is seized and fastened to a small piece of wood, and gently wound daily, until, in the course of a week, the entire worm will be extracted, unless broken during the operation, in which case severe inflammation results.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—LEAKY CISTERNS.—What is the best method of stopping leaks in a wooden cistern? Is there any cement that will adhere to the wood, and which can be used for this purpose?—L. B.

2.—What is the best solder for aluminum? Is there not a better recipe than the following? Aluminum, 16 parts; tin, three parts bismuth, one part. This will do, but I wish to obtain a solder which will not change in the mouth when used for dental purposes.

3.—TURNING LATHE.—There is a lathe in the shop I work in, that no man in the shop can turn a true cylinder on, when the centers are straight. What is the trouble? I have worked on this lathe, and find that the centers being set straight, the cylinder will be one sixty fourth of an inch larger at the tail stock than at the cone. We get along by setting the tail stock over, as though we were going to turn a taper. What I wish to know is, why the lathe will not turn a true cylinder when the centers are straight, everything else about the lathe being in place? There are several machinists in the shop; all have tried to find the trouble and failed.—M C. R.

4.—GALVANIZING STEEL SPRINGS.—How can I galvanize steel springs without injuring the temper?—W. G. B.

5.—How can I fasten sheet copper to rough or smooth cast iron without rivets or bolts?—J. W. B.

6.—I wish a recipe for a leather cement, such as is used by belt manufacturers.—B. B. G.

7.—BROWNING GUN BARRELS.—Will some practical man tell me how the fine clouded brown on the fine double guns of the present day is produced, with full details of the process?—E. H. B.

8.—STEAM PUMP FOR HIGH PRESSURE ENGINE.—I am concerned in a steam tug. The cylinder is 16x16, and, as usual with small high-pressure engines, the pump, which is ample, is not the least troublesome item. Our first engineer inserted a waste pipe in the air chamber, and by means of a stop-cock let off, at each stroke, so much of the pumped water as he did not want in the boiler. The next man made use of the "sea cock" to throttle back so much of the water that the pump required as he did not want in the boiler. I object to both methods as unengineer-like, and propose to govern the quantity injected by making the stroke variable. Will your engineer correspondents please give an opinion on each of the modes, and say what way is generally adopted or considered best?—P. D.

9.—TOUGHENING BRITTLE HORN.—How can horn that has become brittle by age become tough again?—R. A. C.

10.—How can I tan or cure sheep's pelts with the wool on so that the skin may be soft and pliable, and the wool uninjured?—B. F. P.

11.—BRASS CHAIN.—How can I make a solder to braze brass wire rings? I want to make brass chain, and have the solder dip yellow, the same as the brass wire. I have tried silver solder, but that turns black on dipping in acid. I want the solder to melt at a low heat, that is, about the same as silver solder, cherry red.—G. H. H.

12.—BOILER FIRING.—How can I fire up my boiler so as to keep up seventy pounds pressure? The boiler is 8½ feet long and 42 inches in diameter. It is used for a tannery. I can run all my other machinery, but when I grind bark I cannot keep up pressure; must stop twice per hour to raise steam, even with all the other machinery detached. I commence grinding with seventy pounds and run down to sixteen pounds. The boiler is an upright one, and I use the best of wood for fuel when grinding. The smoke stack is red hot six feet above the boiler. The size of the engine is 8x24 inches. When running, every time I fire up I lose five pounds of steam. I feed hot water, and have a good draft, and would like to know if I could not save the heat passing through the stack and use it for the boiler. The engine runs sixty-five revolutions per minute.—M. S. M.