SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES

Vol. XIX.---No. 20. [NEW SERIES.] | NEW YORK, NOVEMBER 11, 1868. | $3 per Annum [IN ADVANCE.]

Patent Steam Engine Governor.

The nature of this improvement consists in swinging the balls of a centrifugal governor, at an angle to a radial line, harmonizing with and corresponding to the motion of said balls, in such manner that the inertia, the momentum and centrifugal force, all act in favor of the governor, instead of against it, as is the case in the ordinary centrifugal governor.

This is illustrated in Fig. 2. A circle, B, is struck, of nearly the size of the ball. A square is then formed by drawing lines tangentially with the circles as shown by dotted lines. This square gives the plan of the governor. C is the point of suspension of the arm; the line from C to D represents the arm, as also the direction of the swing of the ball. The lines from C to E constitute the centers of the pins upon which the arms, F, and links, G, are firmly fixed. The pins connecting, F and G, turn freely in sockets, C E. Links, G, form a connection with a stem passing through the center of the valve. Links, G, may also turn outward, as shown at H, and form a connection with a sliding sleeve. The sockets, C E, are firmly secured to the shaft giving them motion. The angle of the plane in which the balls swing is indicated by the dotted radial line, I. Balls vibrating at this angle will swing freely whether moving quickly or slowly; if moved slowly, they will be acted upon by but little centrifugal force, and will swing low and perfectly free from the point of suspensions; if moved quickly, they will be acted upon by greater centrifugal force, and will swing higher and further out, though quite freely, without causing the least binding or friction at the joints, by which the arms are suspended. The balls are at liberty to fall to the rear of the points of suspension, or to gain upon said points, according as the force of their inertia or their momentum predominates. By this arrangement we obtain a governor the most simple and cheap of construction, beautiful in form, and in action, durability, and efficiency the most complete.

THE VALVE.—Much difficulty is experienced from improperly constructed valves. Many valves being so constructed that large surfaces slide upon and against each other. The contact of these surfaces is expected to be steam tight, and yet freely move against each other. This is a mechanical impossibility; if such valve is anything like steam-tight, it will require a great force to move it; and should it gum or expand the least; it will stick so tight as to require a sledge to move it. If it is made to move freely, steam will pass between the surfaces, and in a short time cut a passage around the valve, instead of passing through it. Such valves should never be put on engines. The valve attached to this governor is so constructed that its opening and closing does not depend upon surfaces moving upon or against each other, but upon surfaces moving towards and from each other. The impact of the passing stream is not upon and over the surfaces that are depended upon for closing the valve, consequently the cutting of the valve by the steam will never cause it to leak. The valve has two steam passages perfectly balancing each other. The steam can never make for itself false passages, as there are no joint or openings but the proper passages for the steam.

GRADUATING VALVES.—An idea has been entertained that a valve should have an increased opening, tapering toward a point. Such valve will, as is intended, supply steam to the engine in a ratio differing from that of the action of the governor. To graduate the quantity of steam to the engine is especially the office of the governor, and any attempt to effect it in the valve acknowledges the deficiency of the governor. If the valve openings are proportioned to the supply pipe, a good governor will do all the graduating. The effect of a taper valve is but to lengthen the throw of the valve. This becomes necessary from the defects of the radial centrifugal governor, as it never acts at the proper time and always with a plunge beyond the proper point. For this reason the valve openings are made close, requiring a long throw, so that the defective governor will not at one moment cut all the steam off, and the next throw it all on. Hence a graduating valve.

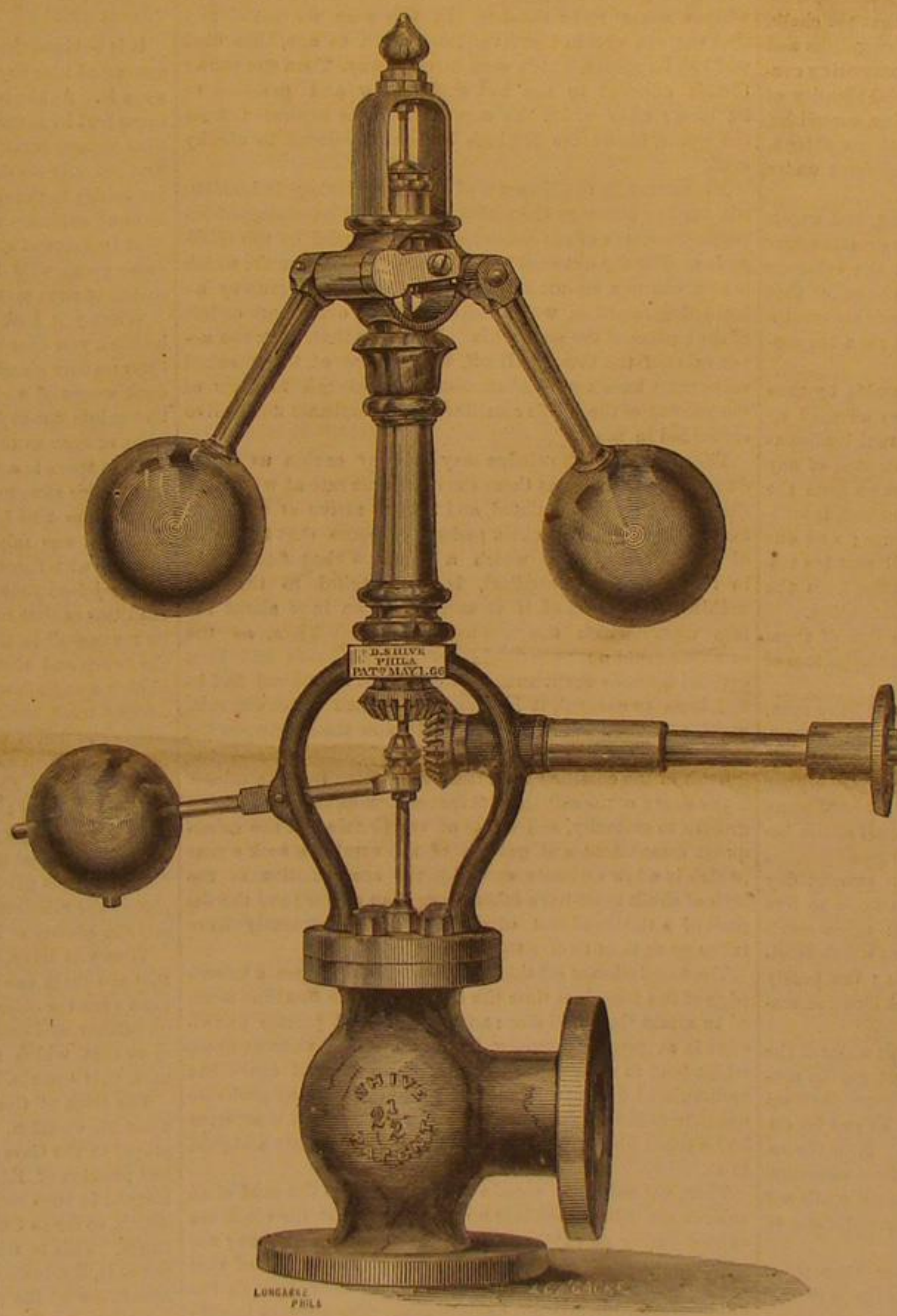
THE GOVERNOR AS A CUT-OFF.—A good governor combined with a properly constructed valve constitutes perhaps the best variable cut-off made. The capacity of the valve should equal that of the pipe; the openings should be perfectly straight across, without the least taper. Such a valve will require but very little throw, and a governor acting positively and simultaneously with any change of speed in the engine will either cut off all the steam, when required, or give the boiler pressure of the steam from a change of speed impossible to be detected by the eye. With the usual variable cut-off the steam may be cut off near the beginning of the stroke, and no steam can be admitted until the beginning of the next stroke. If a heavy load be thrown on the engine immediately after the steam is cut off near the beginning of the stroke, the speed of the engine will be dragged down before steam can be admitted after passing the center.

The manufacturers say: "By this arrangement we have the use of the steam at boiler pressure, when required, as also expansively. The steam is also admitted or cut off at any point where and when required.

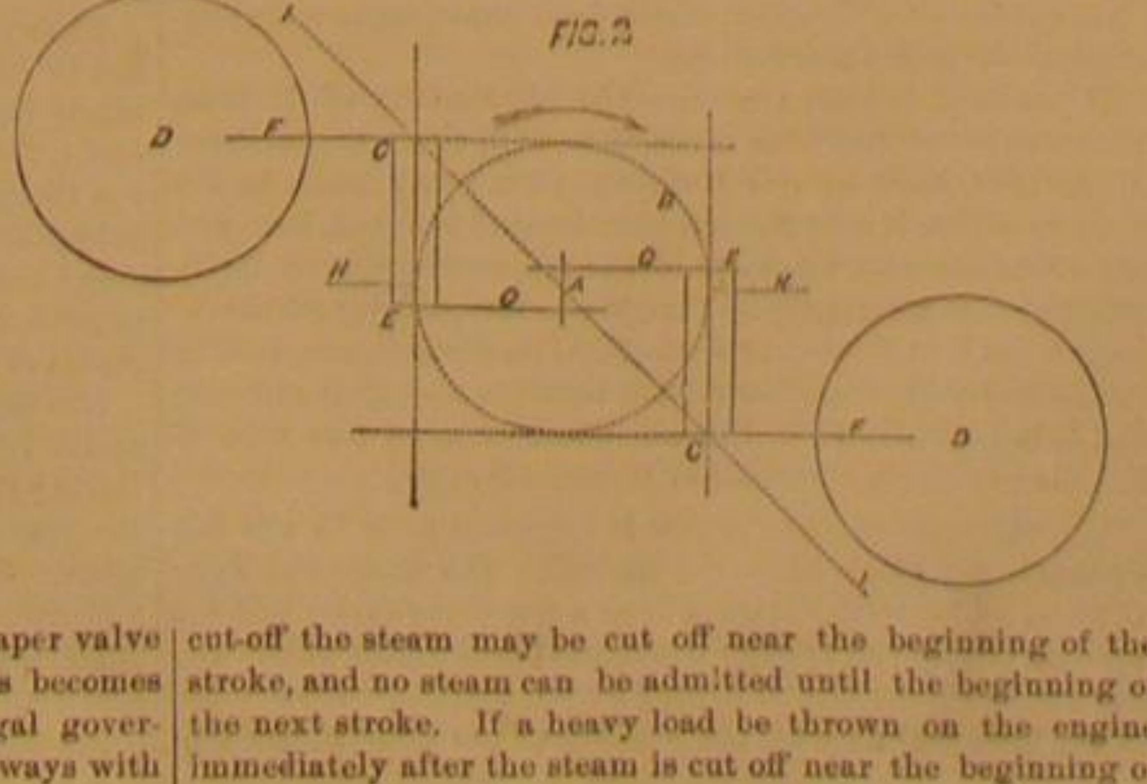
"In offering this governor to the public we start out with the broad assertion that all ball governors heretofore have been constructed upon false principles—that it is false theory to swing a pendulum across the line of the power which imparts to it motion, and that a ball and arm made to vibrate in planes nearly horizontal are in a very bad position to act the part of a pendulum.

"We show by experiment that a governor so constructed that the pendulum swinging in harmony with the laws of mechanics, has a power over the best usual ball governor of like weight as ten to one, and action ten times greater. The wear and friction in the new, being perhaps one-tenth of that of the old. In mounting the old and the new upon the same shaft the defects of the old become so glaring by contrast as to excite surprise at the length of time they have been permitted to exist."

Patented May 1st, 1866. Manufactured by the Shive Governor Company, Northwest corner of Twelfth and Buttonwood Streets, Philadelphia. Pa.



SHIVE'S STEAM ENGINE GOVERNOR.



Road Making by Steam.

The common practice of road making in this country, says the *Railway Times*, is one of waste and utter want of economy in every respect. The process is something like this: The upper soil is removed, and coarse gravel or broken stone supplied to bring up the grade, and the road is then left to be worn down smooth by passing teams and carriages. Think what a waste of power is thus involved, what an immense and useless wear of vehicles, what loss of time and what amount of general discomfort. Drainage is seldom thought of, and during the wet seasons, and especially when the frost is coming out of the ground, the roads are nearly impassable. The common remedy for all this is to pile on more gravel or broken stone, and then again commences the destruction of wheels. This useless tax to the owners of horses and vehicles could nearly all be prevented if the roads were properly made, drained and cared for. Proper drainage is the first essential; then the road dressed with gravel or stone should be formed and rolled into proper form to shed water—a very slight incline to either side is all that is necessary—and then you have a road that is easy to horses, and the load is carried with half the power that is expended in hauling over very many of the roads in our suburban towns. Less gravel or broken stone, but more care that it is kept in place and mooth, is what is required. In England and France they are using powerful steam rollers with beneficial results.

A London paper describes the process thus: "The road is first prepared by being loosened with pick-axes, then covered with the ordinary broken granite; above this a dressing of sand is laid; the whole is then watered. An immense roller is propelled by steam, and moved slowly over the prepared surface. It exerts a pressure of twenty-eight tuns, and the result is that in an unusually short time a firm and compact Macadamized road is formed so smoothly that the lightest vehicles may be immediately driven over it without fear of injuring the springs. The engine works almost without noise, and appears to consume nearly all its own smoke."

Daily care is required for a while, to prevent the forming of ruts; as soon as the ruts appear, they should be filled and then rolled over again. This costs something, but the eventual or resultant cost is less, both to the town authorities and those who use the roads, than is that of our present system. A smooth and even surface is nearly as important on common roads as it is on the railway. The science of road making is simple enough, but our people almost always fail in it. Once properly constructed and drained, our common roads could be kept in good working order for a tithe of what it now costs. The use of the steam roller simplifies the matter very much, and probably before long it will be freely used in nearly all our larger towns. One of these powerful steam rollers has lately been constructed in England, to be used in the United States Arsenal grounds in Philadelphia, and on trial it is found to work admirably.

ON A "PIECE OF CHALK."—A LECTURE TO WORKING-MEN.

[Concluded from page 290.]

In working over the soundings collected by Captain Dayman, I was surprised to find that many of what I have called the "granules" of that mud were not, as one might have been tempted to think at first, the mere powder and waste of *Globigerinæ*, but that they had a definite form and size. I termed these bodies *coccoliths* and doubted their organic nature. Dr. Wallich verified my observation, and added the interesting discovery, that not unfrequently bodies similar to these "coccoliths" were aggregated together into spheroids, which he termed *coccospheres*. So far as we knew, these bodies, the nature of which is extremely puzzling and problematical, were peculiar to the Atlantic soundings.

But, a few years ago, Mr. Sorby, in making a careful examination of the chalk by means of thin sections and otherwise, observed, as Ehrenberg had done before him, that much of its granular basis possesses a definite form. Comparing these formed particles with those in the Atlantic soundings, he found the two to be identical; and thus proved that the chalk, like the soundings, contains these mysterious coccoliths and coccospheres. Here was a further and a most interesting confirmation, from internal evidence, of the essential identity of the chalk with modern deep-sea mud. *Globigerinæ*, coccoliths, and coccospheres are found as the chief constituents of both, and testify to the general similarity of the conditions under which both have been formed.

The evidence furnished by the hewing, facing, and superposition of the stones of the Pyramids that these structures were built by men has no greater weight than the evidence that the chalk was built by *Globigerinæ;* and the belief that those ancient pyramid builders were terrestrial and air-breathing creatures like ourselves, is not better based than the conviction that the chalk makers lived in the sea.

But as our belief in the building of the Pyramids by men is not only grounded on the internal evidence afforded by these structures, but gathers strength from multitudinous collateral proofs, and is clinched by the total absence of any reason for a contrary belief; so the evidence drawn from the *Globigerinæ*, that the chalk is an ancient sea bottom, is fortified by innumerable independent lines of evidence; and our belief in the truth of the conclusion to which all positive testimony tends receives the like negative justification from the fact that no other hypothesis has a shadow of foundation.

It may be worth while briefly to consider a few of these collateral proofs that the chalk was deposited at the bottom of the sea.

The great mass of the chalk is composed, as we have seen, of the skeletons of *Globigerinæ*, and other simple organisms, embedded in granular matter. Here and there, however, this hardened mud of the ancient sea reveals the remains of higher animals which have lived and died, and left their hard parts in the mud, just as the oysters die and leave their shells behind them in the mud of the present seas.

There are certain groups of animals at the present day which are never found in fresh waters, being unable to live anywhere but in the sea. Such are the corals: those corallines which are called *Polyzoa;* those creatures which fabricate the lamp-shells, and are called *Brachiopoda;* the pearly *Nautilus*, and all animals allied to it, and all the forms of sea-urchins and star-fishes.

Not only are all these creatures confined to salt water at the present day, but so far as our records of the past go, the conditions of their existence have been the same; hence their occurrence in any deposit is as strong evidence as can be obtained that that deposit was formed in the sea. Now the remains of animals of all the kinds which have been enumerated occur in the chalk in greater or less abundance, while not one of those forms of shell fish which are characteristic of fresh water has yet been observed in it.

When we consider that the remains of more than three thousand distinct species of aquatic animals have been discovered among the fossils of the chalk, that the great majority of them are of such forms as are now met with only in the sea, and that there is no reason to believe that any one of them inhabited fresh water—the collateral evidence that the chalk represents an ancient sea bottom acquires as great force as the proof derived from the nature of the chalk itself. I think you will now allow that I did not overstate my case when I asserted that we have as strong grounds for believing that all the vast area of dry land, at present occupied by the chalk, was once at the bottom of the sea, as we have for any matter of history whatever; while there is no justification for any other belief.

No less certain it is that the time during which the countries we now call southeast England, France, Germany, Poland, Russia, Egypt, Arabia, Syria, were more or less completely covered by a deep sea, was of considerable duration.

We have already seen that the chalk is, in places, more than a thousand feet thick. I think you will agree with me that it must have taken some time for the skeletons of animalculæ of a hundredth of an inch in diameter to heap up such a mass as that. I have said that throughout the thickness of the chalk the remains of other animals are scattered. These remains are often in the most exquisite state of preservation. The valves of the shell fishes are commonly adherent; the long spines of some of the sea-urchins, which would be detached by the smallest jar, often remain in their places. In a word, it is certain that these animals have lived and died when the place which they now occupy was the surface of as much of the chalk as had then been deposited; and that each had been covered up by the layer of *Globigerina* mud, upon which the creatures embedded a little higher up have, in like manner, lived and died. But some of these remains prove the existence of reptiles of vast size in the chalk sea. These lived their time, and had their ancestors and descendants—which assuredly implies time, reptiles being of slow growth.

There is more curious evidence, again, that the process of covering up, or, in other words, the deposit of *Globigerina* skeletons, did not go on very fast. It is demonstrable that an animal of the cretaceous sea might die, that its skeleton might lie uncovered upon the sea bottom long enough to lose all its outward coverings and appendages by putrefaction; and that, after this had happened, another animal might attach itself to the dead and naked skeleton, might grow to maturity, and might itself die before the calcareous mud had buried the whole.

Cases of this kind are admirably described by Sir Charles Lyell. He speaks of the frequency with which geologists find in the chalk a fossilized sea-urchin, to which is attached the lower valve of a *Crania*. This is a kind of shell fish, with a shell composed of two pieces, of which, as in the oyster, one is fixed and the other free.

"The upper valve is almost invariably wanting, though occasionally found in a perfect state of preservation in the white chalk at some distance. In this case we see clearly that the sea urchin first lived from youth to age, then died and lost its spines, which were carried away. Then the young *Crania* adhered to the bad shell, grew and perished in its turn; after which the upper valve was separated from the lower, before the Echinus became enveloped in chalky mud.

A specimen in the Museum of Practical Geology in London, still further prolongs the period which must have elapsed between the death of the sea-urchin and its burial by the *Globigerina*. For the outward face of the valve of a *Crania*, which is attached to a sea-urchin (*Micraster*), is itself overrun by an incrusting coralline, which spreads thence over more or less of the surface of the sea-urchin. It follows that, after the upper valve of the *Crania* fell off, the surface of the attached velve must have remained exposed long enough to allow of the growth of the whole coralline, since corallines do not live embedded in mud.

The progress of knowledge may one day enable us to deduce from such facts as these the maximum rate at which the chalk can have accumulated, and thus to arrive at the minimum duration of the chalk period. Suppose that the valve of the *Crania*, upon which a coralline has fixed itself in the way just described, is so attached to the sea-urchin that no part of it is more than an inch above the face upon which the sea-urchin rests. Then, as the coralline could not have fixed itself if the *Crania* had been covered up with chalk mud, and could not have lived had itself been so covered, it follows that an inch of chalk mud could not have accumulated within the time between the death and decay of the soft parts of the sea-urchin and the growth of the coralline to the full size which it has attained. If the decay of the soft parts of the sea-urchin, the attachment, growth to maturity, and decay of the *Crania* and the subsequent attachment and growth of the coralline took a year (which is a low estimate enough), the accumulation of the inch of chalk must have taken more than a year; and the deposit of a thousand feet of chalk must consequently have taken more than twelve thousand years.

The foundation of all this calculation, is, of course, a knowledge of the length of time the *Crania* and the coralline needed to attain their full size; and on this head precise knowledge is at present wanting. But there are circumstances which tend to show that nothing like an inch of chalk has accumulated during a life of a *Crania*; and, on any probable estimate of the length of that life, the chalk period must have had a much longer duration than that thus roughly assigned to it.

Thus, not only is it certain that the chalk is the mud of an ancient sea bottom, but it is no less certain that the chalk sea existed during an extremely long period, though we may not be prepared to give a precise estimate of the length of that period in years. The relative duration is clear, though the absolute duration may not be definable. The attempt to affix any precise date to the period at which the chalk sea began or ended its existence is baffled by difficulties of the same kind. But the relative age of the cretaceous epoch may be determined with as great ease and certainty as the long duration of that epoch.

You will have heard of the interesting discoveries recently made, in various parts of Western Europe, of flint implements, obviously worked into shape by human hands, under circumstances which show conclusively that man is a very ancient denizens of these regions.

It has been proved that the old populations of Europe, whose existence has been revealed to us in this way, consisted of savages, such as the Esquimaux are now: that, in the country which is now France, they hunted the reindeer, and were familiar with the ways of the mammoth and the bison. The physical geography of France was in those days different from what it is now—the river Somme, for instance, having cut its bed a hundred feet deeper between that time and this; and it is probable that the climate was more like that of Canada or Siberia than that of Western Europe.

The existence of these people is forgotten even in the traditions of the oldest historical nations. The name and fame of them had utterly vanished until a few years back; and the amount of physical change which has been effected since their day renders it more than probable that, venerable as are some of the historical nations, the workers of the chipped flints of Hoxne or of Amiens are to them as they are to us in point of antiquity.

But, if we assign to these hoar relics of long vanished generations of men the greatest age that can possibly be claimed for them, they are not older than the drift of boulder clay, which, in comparison with the chalk, is a very juvenile deposit. You need go no further than your own seaboard for evidence of this fact. At one of the most charming spots on the coast of Norfolk, Cromer, you will see the boulder clay forming a vast mass, which lies upon the chalk, and must consequently have come into existence after it. Huge boulders of chalk are, in fact, included in the clay, and have evidently been brought to the position they now occupy by the same agency as that which has planted blocks of syenite from Norway side by side with them.

The chalk, then, is certainly older than the boulder clay. If you ask how much, I will again take you no further than the same spot upon your own coasts for evidence. I have spoken of the boulder clay and drift as resting upon the chalk. That is not strictly true. Interposed between the chalk and the drift is a comparatively insignificant layer containing vegetable matter. But that layer tells a wonderful history. It is full of stumps of trees standing as they grew. Fir trees are there with their cones, and hazel bushes with their nuts; there stand the stools of oak and yew trees, beeches and alders. Hence this stratum is appropriately called the "forest bed."

It is obvious that the chalk must have been upheaved and converted into dry land before the timber trees could grow upon it. As the bolls of some of these trees are from two to three feet in diameter, it is no less clear that the dry land thus formed remained in the same condition for long ages. And not only do the remains of stately oaks and well-grown firs testify to the duration of this condition of things, but additional evidence to the same effect is afforded by the abundant remains of elephants, rhinoceroses, hippopotamuses, and other great wild beasts, which it has yielded to the zealous search of such men as the Rev. Mr. Gunn.

When you look at such a collection as he has formed, and bethink you that these elephantine bones did veritably carry their owners about, and these great grinders crunch in the dark woods of which the forest bed is now the only trace, it is impossible not to feel that they are as good evidence of the lapse of time as the annual rings of the tree stumps.

Thus there is a writing upon the wall of cliffs at Cromer, and whoso runs may read it. It tells us, with an authority which cannot be impeached, that the ancient sea bed of the chalk sea was raised up and remained dry land until it was covered with forest, stocked with the great game whose spoils have rejoiced your geologists. How long it remained in that condition cannot be said; "but the whirligig of time brought its revenges" in those days as in these. That dry land, with the bones and teeth of generations of long-lived elephants, hidden away among the gnarled roots and dry leaves of its ancient trees, sank gradually to the bottom of the icy sea, which covered it with huge masses of drift and boulder clay. Sea beasts, such as the walrus, now restricted to the extreme north, paddled about where birds had twittered among the topmost twigs of the fir trees. How long this state of things endured we know not, but at length it came to an end. The upheaved glacial mud hardened into the soil of modern Norfolk. Forests grew once more, the wolf and the beaver replaced the reindeer and the elephant; and at length what we call the history of England dawned.

Thus you have, within the limits of your own county, proof that the chalk can justly claim a very much greater antiquity than even the oldest physical traces of mankind. But we may go further, and demonstrate, by evidence of the same authority as that which testifies to the existence of the father of men, that the chalk is vastly older than Adam himself.

The Book of Genesis informs us that Adam, immediately upon his creation, and before the appearance of Eve, was placed in the Garden of Eden. The problem of the geographical position of Eden has greatly vexed the spirits of the learned in such matters, but there is one point respecting which, so far as I know, no commentator has ever raised a doubt. This is, that of the four rivers which are said to run out of it, Euphrates and Hiddekel are identical with the rivers now know by the names of Euphrates and Tigris.

But the whole country in which these mighty rivers take their origin, and through which they run, is composed of rocks which are either of the same age as the chalk, or of later date, so that the chalk must not only have been formed, but after its formation the time required for the deposit of these later rocks, and for their upheaval into dry land, must have elapsed, before the smallest brook which feeds the swift stream of "the great river, the river of Babylon," began to flow.

Thus evidence which cannot be rebutted, and which need not be strengthened, though if time permitted I might indefinitely increase its quantity, compels you to believe that the earth, from the time of the chalk to the present day, has been the theater of a series of changes as vast in their amount as they were slow in their progress. The area on which we stand has been first sea and then land for at least four alternations, and has remained in each of these conditions for a period of great length.

Nor have these wonderful metamorphoses of sea into land, and of land into sea, been confined to one corner of England. During the chalk period, or "cretaceous epoch," not one of the present great physical features of the globe was in existence. Our great mountain ranges, Pyrenees, Alps, Himalayas, Andes, have all been upheaved since the chalk was deposited, and the cretaceous sea flowed over the sites of Sinai and Ararat.

All this is certain, because rocks of cretaceous or still later date have shared in the elevatory movements which gave rise to these mountain chains, and may be found perched up, in some cases, many thousand feet high upon their flanks. And evidence of equal cogency demonstrates that, though in Norfolk the forest bed rests directly upon the chalk, yet it does so, not because the period at which the forest grew immediately followed that at which the chalk was formed, but because an immense lapse of time, represented elsewhere by thousands of feet of rock is not indicated at Cromer.

I must ask you to believe that there is no less conclusive proof that a still more prolonged succession of similar changes occurred before the chalk was deposited. Nor have we any reason to think that the first term in the series of these changes is known. The oldest sea beds preserved to us are sands, and mud, and pebbles, the wear and tear of rocks which were formed in still older oceans.

But, great as is the magnitude of these physical changes of the world, they have been accompanied by a no less striking series of modifications in its living inhabitants.

All the great classes of animals, beasts of the field, fowls of the air, creeping things, and things which dwell in the waters, flourished upon the globe long ages before the chalk was deposited. Very few, however, if any, of these ancient forms of animal life were identical with those which now live. Certainly, not one of the higher animals was of the same species as any of those now in existence. The beasts of the field in the days before the chalk were not our beasts of the field, nor the fowls of the air such as those which the eye of man has seen flying, unless his antiquity dates further back than we at present surmise. If we could be carried back into those times, we should be as one set down suddenly in Australia before it was colonized. We should see mammals, birds, reptiles, fishes, insects, snails, and the like, clearly recognizable as such, and yet not one of them would be just the same as those with which we are familiar, and many would be extremely different.

From that time to the present the population of the world has undergone slow and gradual but incessant changes. There has been no grand catastrophe—no destroyer has swept away the forms of life of one period, and replaced them by a totally new creation; but one species has vanished and another has taken its place; creatures of one type of structure have diminished, those of another have increased, as time has passed on. And thus, while the differences between the living creatures of the time before chalk and those of the present day appear startling, if placed side by side, we are led from one to the other by the most gradual progress, if we follow the course of Nature through the whole series of those relics of her operations which she has left behind.

And it is by the population of the chalk sea that the ancient and the modern inhabitants of the world are most completely connected. The groups which are dying out flourish side by side with the groups which are now the dominant forms of life.

Thus the chalk contains remains of those strange flying and swimming reptiles, the pterodactyl, the ichthyosaurus, and the plesiosaurus, which are found in no later deposits, but abounded in preceding ages. The chambered shells called ammonites and belemnites, which are so characteristic of the period preceding the cretaceous, in like manner die with it.

But amongst these fading remainders of a previous state of things are some very modern forms of life, looking like Yankee peddlers among a tribe of Red Indians. Crocodiles of modern type appear; bony fishes, many of them very similar to existing species, almost supplant the forms of fish which predominate in more ancient seas; and many kinds of living shell fish first became known to us in the chalk. The vegetation acquires a modern aspect. A few living animals are not even distinguishable as species from those which existed at that remote epoch. The *Globigerina* of the present day, for example, is not different specifically from that of the chalk; and the same may be said of many other *Foraminiferæ*. I think it probable that critical and unprejudiced examination will show that more than one species of much higher animals have had a similar longevity, but the only example which I can at present give confidently is the snake's head lamp-shell (*Terebratulina caput serpentis*), which lives in our English seas and abounded (as *Terebratulina striata* of authors) in the chalk.

The longest line of human ancestry must hide its diminished head before the pedigree of this insignificant shell fish. We Englishmen are proud to have an ancestor who was present at the Battle of Hastings. The ancestors of *Terebratulina caput serpentis* may have been present at a battle of *Ichthyosauriæ* in that part of the sea which, when the chalk was forming, flowed over the site of Hastings. While all around has changed, this *Terebratulina* has peacefully propagated its species from generation to generation, and stands to this day as a living testimony to the continuity of the present with the past history of the globe.

Up to this moment I have stated, so far as I know, nothing but well authenticated facts, and the immediate conclusions which they force upon the mind.

But the mind is so constituted that it does not willingly rest in facts and immediate causes, but seeks always after a knowledge of the remoter links in the chain of causation.

Taking the many chances of any given spot of the earth's surface, from sea to land and from land to sea, as an established fact, we cannot refrain from asking ourselves how these changes have occurred. And when we have explained them—as they must be explained—by the alternate slow movements of elevation and depression which have affected the crust of the earth, we go still further back and ask Why these movements?

I am not certain that any one can give you a satisfactory answer to that question. Assuredly I cannot. All that can be said for certain is, that such movements are part of the ordinary course of nature, inasmuch as they are going on at the present time. Direct proof may be given that some parts of the land of the northern hemisphere are at this moment insensibly rising and others insensibly sinking; and there is indirect but perfectly satisfactory proof, than an enormous area now covered by the Pacific has been deepened thousands of feet since the present inhabitants of the sea came into existence.

Thus there is not a shadow of a reason for believing that the physical changes of the globe in past times have been effected by other than natural causes.

Is there any more reason for believing that the concomitant modifications in the forms of the living inhabitants of the globe have been brought about in other ways?

Before attempting to answer this question, let us try to form a distinct mental picture of what has happened in some special case.

The crocodiles are animals which, as a group, have a vast antiquity. They abounded ages before the chalk was deposited; they throng the rivers in warm climates at the present day. There is a difference in the form of the joints of the backbone, and in some minor particulars, between the crocodiles of the present epoch and those which lived before the chalk; but in the cretaceous epoch, as I have already mentioned, the crocodiles had assumed the modern type of structure. Notwithstanding this, the crocodiles of the chalk are not identically the same as those which lived in the times called "older tertiary," which succeeded the cretaceous epoch; and the crocodiles of the older tertiaries are not identical with those of the newer tertiaries, nor are these identical with existing forms. (I leave open the question whether particular species may live on from epoch to epoch). Thus each epoch has had its peculiar crocodiles, though all since the chalk have belonged to the modern type, and differ simply in their proportions, and in such structural particulars as are discernible only to trained eyes.

How is the existence of this long succession of different species of crocodiles to be accounted for?

Only two suppositions seem to be open to us—either each species of crocodiles has been specially created, or it has arisen out of some pre-existing form by the operation of natural causes.

Choose your hypothesis; I have chosen mine. I can find no warranty for believing in the distinct creation of a score of successive species of crocodiles in the course of countless ages of time. Science gives no countenance to such a wild fancy; nor can even the perverse ingenuity of a commentator pretend to discover this sense, in the simple words in which the writer of Genesis records the proceedings of the fifth and sixth days of the Creation.

On the other hand, I see no good reason for doubting the necessary alternative, that all these varied species have been evolved from pre-existing crocodilian forms by the operation of causes as completely a part of the common order of nature as those which have effected the changes of the inorganic world.

Few will venture to affirm that the reasoning which applies to crocodiles loses its force among other animals, or among plants. If one series of species has come into existence by the operation of natural causes, it seems folly to deny that all may have arisen in the same way.

A small beginning has led us to a great ending. If I were to put the bit of chalk with which we started, into the hot but obscure flame of burning hydrogen, it would presently shine like the sun. It seems to me that this physical metamorphosis is no false image of what has been the result of our subjecting it to a jet of fervent though no wise brilliant thought to-night. It has become luminous, and its clear rays penetrating the abyss of the remote past, have brought within our ken some stages of the evolution of the earth. And in the shifting "without haste, but without rest" of the land and sea, as in the endless variation of the forms assumed by living beings, we have observed nothing but the natural product of the forces originally possessed by the substance of the universe.

THE BEST MODES OF TESTING THE POWER AND ECONOMY OF STEAM ENGINES.

BY CHARLES E. EMERY, LATE OF THE U. S NAVY AND U. S. STEAM EXPANSION EXPERIMENTS.

Read before the Polytechnic branch of the American Institute, Oct. 22, 1868.

It is unnecessary for us to do more than simply call attention to the extended usefulness of the steam engine. It is the only motor that has successfully competed with or supplanted the changeable and uncertain power derived from animal muscle, and the natural forces of wind and water, and its varied adaptations and applications have brought it into general use throughout the civilized world—not only in stupendous water works and manufactories and in furnishing reliable and rapid communication by land and sea, but also in reducing the physical exertions of both sexes in the less grand but more important operations of the producing community in the forest, field, and farm house.

Surely, then, the steam engine is not an experiment. Years ago it was made a success, and soon became a necessity; and notwithstanding the grand discoveries that have been ade in theoretical and practical science, the steam engine has to this day remained unchanged in every important particular. The principal advance has been in the perfection and general adoption of the simple high pressure engine. Many of the so-called improvements, were mere variations in form and in the details of construction, which often failed to produce as economical results as older well-tried mechanism. Nearly all the true improvements have been in workmanship and in adaptations and applications to various uses. A few of the general principles which influence the economy of the steam engine have long been known; and our manufacturers have, in very many cases, claimed a superiority for their engines on account of alleged excellence in the details of the valve gear, or other mechanism, designed to secure the results promised by theory—forgetting that theoretical propositions are of little value unless all the conditions assumed are the same as those in practice, which is rarely the case. It therefore often happens that engines which, in the opinion of the educated engineer, possess many of the elements considered necessary for economical working, do not have those elegant, moving details which fix the attention of the amateur and delight the eye of the skillful mechanic. Business men seek only to sell, and therefore push into chief importance such points as the purchaser can see and understand. Statements are made also regarding actual performance, but they cannot be considered impartial, because the trials upon which they are founded are made by interested parties, with no competition present. We have therefore to conclude that the purchaser of a steam engine has to base his selection, almost exclusively, upon the excellence of simple mechanical details; and having done this, if the engine works well, and especially if it does better than the old neglected one, with its worn out boilers, he is entirely self-satisfied, and ready to sign a recommendation to the public of the engine which *he* has selected, thereby benefiting the manufacturer and flattering his own vanity. But little true progress can be made in this way, as each manufacturer and purchaser knows little more than the result of his own experience.

To bring the steam engine to a high standard of efficiency, accurate comparative trials should be publicly made of every different system of construction. This would be most satisfactory, if it could be done in the same place, doing the same work, under the same circumstances. This would require the erection of costly experimental fixtures, which could be done by private enterprise, for expected gains, or by the combination of several wealthy manufacturers; or, better still, by some scientific organization. The majority of cases must, however, be reached, by trying the steam machinery in the actual performance of the duty for which it has been purchased. We desire, then, in our present inquiry, to ascertain methods and means to test the power and economy of the steam engine in a strictly scientific manner, which shall be above criticism, and also under the practical circumstances of every day use.

We propose, first, to mention some of the terms in general use on the subject; then to discuss the ways and means employed to measure the power and its cost, and afterward to select proper units of comparison, and point out the manner of their practical application.

A steam engine is simply a heat engine. The heat evolved by the combustion of fuel is imparted in the boiler, to water, separating and agitating its molecules, and thus forming steam. The steam exerts pressure, varied according to its density, upon all sides of the vessels in which it is inclosed. This pressure or force is measured in pounds per square inch. The elastic force of the steam, acting upon the engine piston, produces motion, which is measured in feet. The combined effects of force, acting through distance, produce mechanical work, which is measured in foot pounds. The number of foot pounds which an engine is capable of developing, in a given time, expresses the power of the engine. The unit of the power is one horse power, the value of which is conventionally fixed at 33,000 foot pounds per minute.

In proportioning steam machinery for any particular purpose, the first thing to settle upon is the amount of power required; and this being fixed in all cases within certain limits, the practical question is, to obtain a certain power, at the least possible cost.

We will first discuss the ways and means used to measure and determine

I. THE POWER.

It has been said the power of an engine depends upon the work done in a given time; and as work implies force and motion, we must ascertain three things before we can calculate the power; namely, the mean force and the distance through which it is exerted, also the time required for the movement. Having these, we first ascertain the distance moved per minute; and this, multiplied by the mean force, gives the number of foot pounds per minute, which, divided by 33,000, gives the horse power. The distance through which the force is exerted is usually calculated from the number of revolutions made per minute by the engine, which can be ascertained approximately by actual count, but better by means of a register. The speed of the engine is varied more or less by every change in the load, or in the pressure of steam, even when a governor is used; for a change in speed must take place before the governor can operate. The variations are small, with sensitive regulators, but in a majority of cases would materially affect the result. The true plan, then, is to attach a register to the engine, the indications of which should be taken once an hour to check mistakes; and in the calculations, the revolutions per minute should be an average for the whole time through which the trial extends. If the power is to be calculated from the pressure on the piston, the piston movement is also used and ascertained by multiplying the revolutions per minute by double the stroke of the engine, when the latter is double acting. When the tension of a belt, or series of springs, is to be used in calculating the power, the movement of each must also be found, and may be calculated from the speed of the engine. It will thus be seen that two elements of the power are easily ascertained; namely, the time and the distance through which the force is exerted. The mean driving force is more difficult to obtain. There are two instruments in use for measuring this, namely, the indicator and dynamometer. These two names are used in this paper in a restricted sense. The first is applied only to the well known steam engine indicator, and the latter to that form of dynamometer which is used to measure the force transmitted by revolving wheels or shafts.

It would be impossible, in the limits of this paper, to give a detailed description of the indicator. We therefore will mention only such features as are necessary to explain its mode of operation. The indicator is so constructed and attached that steam from the main cylinder presses upon one side of a small piston in the instrument, the atmospheric pressure being upon the other side. To the indicator piston is attached a spring and a pencil, the latter arranged to mark on paper. The predominating pressure on the indicator piston, whether of the steam or of the atmosphere, extends or compresses the spring in proportion to the intensity of the pressure, and moves the pencil up and down on the paper. The paper is arranged on a drum, which is so connected that it has a side motion corresponding to that of the engine piston. Consequently, as the engine piston moves the paper is moved sideways, and, as the pressure changes, the pencil is correspondingly moved up and down; so that the figure or diagram traced on the paper is a combination of the two movements, and should show the pressure at each and all points of the stroke. The mean of a number of ordinates on the diagram represents the mean pressure per square inch of piston, which, multiplied by the area of the piston, gives the total force which produces the piston movement, from which the power may be calculated, as has been before explained. The indicator is a beautiful instrument, of such great value to the steam engineer that it may be said to deserve the numerous words that have been spoken in its praise. Still, in many cases where it has hitherto been considered practically perfect, its indications are of the most deceitful and unreliable character. It shows very perfectly whether the valves are adjusted properly; and often, when applied to an engine which is working improperly, a mere glance at the diagram will reveal the difficulty, and suggest the remedy. Large leaks in the valves or piston may also be detected in this way. The indicated pressure at the end of the stroke has very often been employed to determine the quantity of steam used by the engine. Calculations founded on such a basis are entirely worthless, as will be explained when treating of the cost of the power. It has often been attempted, also, to calculate the friction from indicator friction diagrams; but the system is practically erroneous, as will be explained hereafter. The indicator is chiefly employed, however, to determine the power of an engine, it being supposed that the diagram shows correctly the pressure at all parts of the stroke. Even this it fails to do under certain circumstances. The moving parts of the instrument must have weight and friction, and some force is necessarily required to overcome the latter, and put the mass in motion. If, therefore, the pressure be ascending, the indicator will show less than it should; and when the pressure is descending, the instrument will show more than it ought. In either case, then, the length of the ordinates is increased during any change of pressure, whence the mean pressure indicated is greater than actually existed in the cylinder. Until quite recently we supposed that these inaccuracies were too small to require serious attention. Experiment has, however, proved the contrary.

To be continued.]

THE NATURAL AND THE ARTIFICIAL.

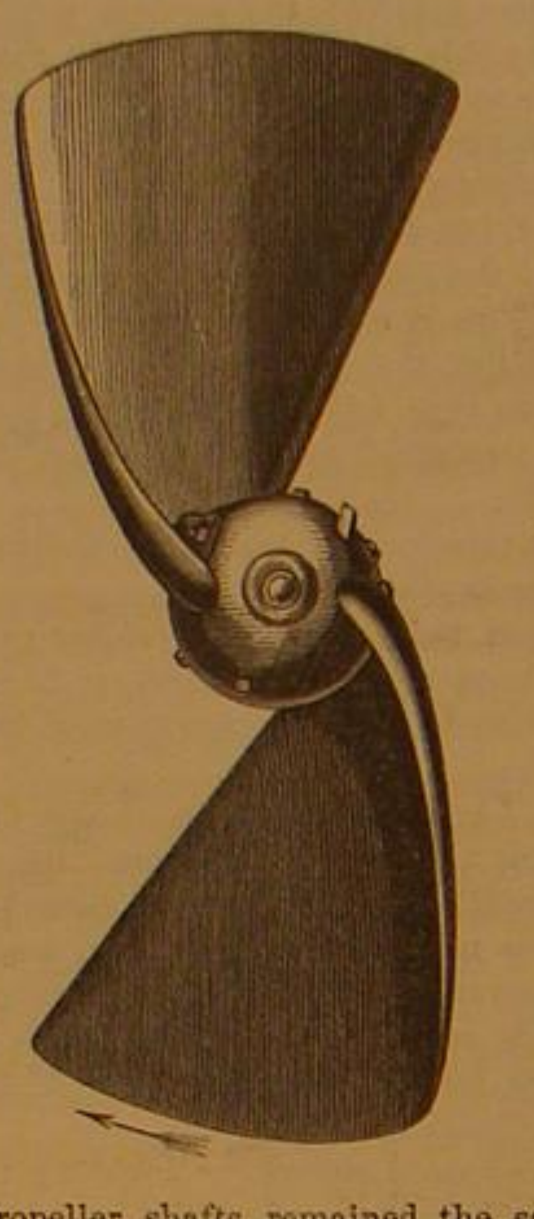
All artificial forms have sprung from natural forms. The proof of this is simple. Imagination is the grouping together of remembered images. Forms thus imagined, and constructed, although as a whole they may differ from anything else known, still are derived forms, so far as their elements are concerned. The first objects ever copied by man must have been natural forms. The grouping together of these gave new patterns for imitation, and the re-grouping of secondary forms others, and so on until those now in vogue in various departments of the arts were obtained.

A principal element in a good design is that the suggestive forms, the elements of the composition, should be so combined that no single one is conspicuously shown. If the contrary is the case, there is a want of harmony—of tone; the eye is carried from a general to a particular effect; from the result to one of the means intended to produce the result. Hence in the composition of designs for dress patterns, paper hangings, etc., it is rare that natural forms and colors of objects are preserved. The form may be retained and the color altered, or *vice versa*; or both may be modified to suit the general character of the design.

A chaste design always subordinates details to general effect. To this end a rose is often painted green or blue; blackberries may be represented as growing upon grapevines; any other incongruity may form a part of the composition. It is evident then that the profession of a designer in any department of the arts, requires great skill and judgment. There is only a short step from the harmonious and tasteful to the monstrous and disgusting; and the multiplication of new combinations, to the extent required in some departments of industry, calls for talents of a very rare and peculiar type. Especially is this the case in the manufacture of prints, and paper hangings, and a close scrutiny and criticism of the patterns of such goods exposed for sale in the shop windows, will soon convince the observer that a truly chaste and harmonious conception, is the exception not the rule. It is hardly possible from the circumstances of the case that this could be otherwise, but it is equally obvious, that there is much room for improvement in these designs,—not impossible improvement, but such as might easily and profitably be made.

HANCOCK'S SCREW PROPELLER.

The many advantages offered by screw propulsion over the paddle-wheel system have led to innumerable improvements and modifications in the former principle. Some of these are to be taken for what they are worth—which is little or nothing—while others possess a practical value which has led to their adoption. Among the most recent inventions in this direction, and one which has given the most signally successful results under competitive trials, is the screw propeller of Messrs. F. and C. Hancock, of Dudley. This screw has recently been tried against a two-bladed Smith's screw with results entirely in favor of the former. In the interests of steam navigation, we propose to place before our readers all the facts we have obtained respecting the trial, feeling assured that the Hancock screw embodies elements of superiority which entitle it to every consideration, and which there is every reason to believe will place it before every other competitor. The trial in question took place in a steam tug belonging to the Shropshire Union Canal Company, on one of their lines of water near Wolverhampton. This company for some years used a Griffith's screw in their tugs, but the results being unsatisfactory they instituted a series of experiments, at a cost of several thousand pounds, with the view of obtaining an efficient screw propeller. These experiments led to the adoption of a two-bladed Smith's screw, the blades each filling a quadrant of the whole circle, so that the entire screw area is equal to half the area of the circumscribing circle. No other form of propeller, Messrs. Hancock's alone excepted, has given such good results as this on the Shropshire Union Canal, and it was one of these against which the Hancock screw recently competed. The same boat was used in all cases, the screws only having been changed as required. The screw shaft makes two revolutions while the screw makes three, and the relative speeds of the crank and the propeller shafts remained the same throughout, the screws only being changed.



The Smith screw is 3 feet 1 inch in diameter, 4 feet pitch, and 20 inches along the shaft, and is driven by a double cylinder engine of upwards of 20-horse power. The Hancock screw is of an entirely new curve, as will be seen by the annexed engraving; it revolves from left to right, that is, the concave face moves forward. It is 3 feet in diameter, 6 feet pitch, 6 inches along the shaft, and has two thirds less surface than the Company's screw. The following tabulated statement gives the results of two runs with the tug boat alone, one with the Hancock and the other with the Company's or Smith's screw:

HANCOCK'S SCREW.

	Pressure in boiler in lbs.	*Revolutions per minute.*	*Miles run.*	*Time in minutes.*
First mile, not full steam	22	68	1	21
Second mile, full steam	23	80	1	17
Half mile, full steam	23	80	½	8
Total			2½	46

THE COMPANY'S SCREW.

	Pressure in boiler in lbs.	*Revolutions per minute.*	*Miles run.*	*Time in minutes.*
First mile, full steam	45	115	1	19
Second mile, full steam	45	115	1	21
Half mile, full steam	45	115	½	11
Total			2½	51

It will be seen by the above statement that the Company's screw had double the pressure of steam, and made upward of thirty-five revolutions per minute more than the Hancock screw. It is, therefore, fairly to be inferred that double the quantity of coal was consumed with the former, while a lower rate of speed was speed was obtained than by the latter screw. The value of a screw on a canal is its power to carry weights behind it; experiments were therefore made in towing, and the tug boat took in tow four loaded boats containing 95 tuns of goods. The first run of 2½ miles was made with a four-bladed Hancock screw. The pressure in the boiler was 50 lbs. full pressure; the run was accomplished in 67½ minutes, the engine making 86 revolutions per minute. The Hancock screw was then removed and the Smith screw put on, the boiler pressure remaining the same. The same four boats, with their 95 tuns of cargo on board, were again taken in tow, and the run was accomplished in 65 minutes, the engine making 148 revolutions per minute. From these figures it would appear that nearly the same results were obtained in both cases with a very different consumption of steam, and consequently of fuel, highly in favor of the Hancock screw. In a third experiment with the Hancock screw, the boiler pressure being 60 lbs., the engine made 103 revolutions per minute, and the run of 2½ miles, towing the four boats loaded as before, was accomplished in 55 minutes, upward of half a mile an hour faster than the run with the Company's screw. Such a result was certainly never obtained with the ordinary screw. Although we have no exact figures as to the consumption of fuel, neither were any indicator diagrams taken from the engine, there is evidence of a considerable saving in fuel. As this saving has been realized on the narrow and shallow waters of a canal, we may anticipate similar results with increased speeds in ocean steamers fitted with the new propeller. It should be borne in mind that speed cannot be obtained, however great the power used, in shallow canals where the boat draws four feet of water, as was the case in the present instance, leaving only six or eight inches of water below the bottom of the tug boat. It was found that with the Hancock screw no vibration whatever was experienced, while in all cases with the Company's screw, and in fact with all other screws, considerable vibration results.

It was at one time hoped that a revolution of the screw would be made to give a result analogous to that of a cart-wheel. The wheel revolves upon an unyielding substance, and carries its load the entire length of the revolution, without loss or slip. But as the screw revolves the water yields to its pressure, and the fastest ships in the Royal Navy only obtain a speed of one fourth the margin velocity of the screw with a best Griffith propeller. The small steam launches attached to the navy, fitted with a pair of twin Smith screws, attain in some few cases a speed equal to about one third of the margin velocity of the screw. But then it is only in those cases where the engines are proportionately more powerful than any that could be put into a large ship. The loss of propelling power in the screw is due to the great amount of slip. The long angle screws require too much power, and throw the water sideways. The lighter angles throw the water more in a line with the vessel, but the screw requires a high velocity to obtain speed, and this is one of the great defects our large ships have to contend with. The *Warrior*, with an engine giving out upward of 6,000-horse power, has to work at about 75 revolutions per minute to give the ship its full speed. So high a speed of the engine with so large a power cannot be maintained for long with safety; and this is the general position of our navy and our merchant ships. The Hancock propeller was invented to meet this special point and to remedy this great defect. It proposes to give a higher speed to a ship, and at the same time to greatly reduce the revolutions of the engine. So far as the trials have at present gone, these results have been attained. They go to prove that the engine will work one third slower, and the ship move faster, than with any other screw. To these advantages is to be added the economy of fuel, which is a most important feature in every case. The experiments have been very conclusive in establishing the superiority of the Hancock screw for one class of navigation. That it will prove as efficient in larger vessels, and under different conditions, there is no reason to doubt. But we cannot of course pronounce a decided opinion in the absence of actual trials. The invention is one full of promise, and we shall watch with interest the progress of the Hancock screw, feeling assured, from what has already been done, that if a trial in an ocean vessel were made, and the results carefully noted in detail, such advantages would be shown as would lead to its adoption in all future cases. We look forward with confidence to this result, and in the meantime congratulate the inventors on having inaugurated a new era in the history of screw propulsion.—*Mechanics' Magazine.*

The Water Power of Maine.

The report of the Commissioners appointed to conduct the hydrographic survey of the State of Maine contains some interesting statements. Returns were obtained from 2,015 sites of water power, all located within an area of 14,000 square miles, the entire area of the State being 31,000 square miles. The Penobscot River, in the twelve miles above Bangor, has power equal to 40,000 horses. The Kennebec River has power equal to 32,800, divided as follows: Augusta has 5,000; Waterville, 8,900; Solon, 4,900; Skowhegan, 5,700; Fairfield, 7,300; Anson and Madison, 2,000-horse power. The Androscoggin has power equal to 58,990 horses, divided as follows: Lewiston, 14,500; Brunswick, 8,600; Lisbon, 6,740; Livermore, 3,200; Jay, 4,950; Rumford, 21,000. From these figures it appears that the three principal rivers of the State afford power equal to over 130,000 horses. The report gives a total of 450,000, and taking into account the powers not reported, the aggregate water power of the State will not fall short of 1,000,000 horses. Lowell, in Massachusetts, has 9,000-horse power. The water power of Maine indicated above is, in the drouth of summer and at its present stage of development, equal to the working power of 4,000,000 of men, and is twice greater than the power, both steam and water, employed in Great Britain and Ireland, in 1856, in cotton, woolen, worsted, silk, and flax manufacture.

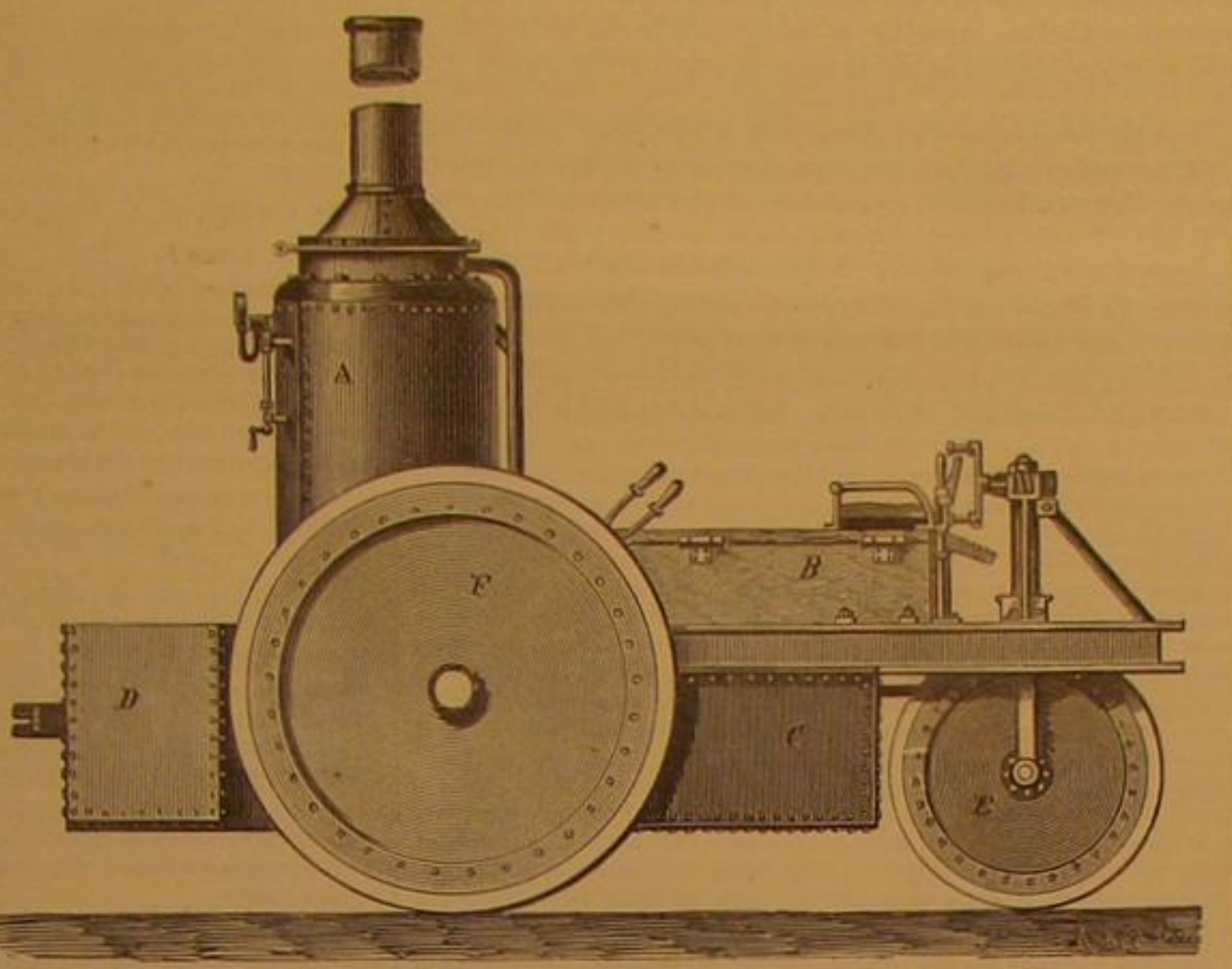
TESTING THE POWER OF STEAM ENGINES.

We commence this week the publication of a paper entitled "The Best Modes of Testing the Power and Economy of Steam Engines," read before the Polytechnic branch of the American Institute, Oct. 22, 1868. The paper is a marked contrast to the majority of the papers, and the discussions which have occupied the time of the Institute for a considerable period, and although exceptions may, and probably will be taken to some of the views of the author, its perusal will be found both interesting and instructive. We therefore strongly urge our readers to give it earnest and candid attention. It will be found that the author, although in the portion of the paper that we publish this week he points out important defects and sources of error in the application and use of the indicator, still claims, as he proceeds with the subject, that this instrument is the only one that can well be universally used for testing steam engines. His directions for its proper use, and the interpretation of its diagrams, are of value to all interested in the subject.

Road Locomotion by Steam.

On page 226, No. 15, current volume, SCIENTIFIC AMERICAN, we published accounts of the performances of a new steamer for traversing common roads and drawing trains of loaded wagons, the principal peculiarity of which is the use of vulcanized rubber tires on the wheels, by which the jolts and obstructions owing to unevenness of surface of the roadway are avoided and overcome. The trials, which appear to have been very satisfactory tests, were made at Edinburgh and Leith, Scotland, in the first instance by drawing a train of coal carriages over paved roads, up and down steep inclines, and around curves and corners; and in the second case the locomotive running over a grass field and over loose earth, lightly laid to the depth of from twelve to twenty-four inches. The weight of the machine used was between four and five tuns, yet in passing over the loose earth the weight compressed it so little that a walking stick could easily be pushed down in the track of the wheels, without marked exertion.

The accompanying engraving we copy from the London *Mechanics' Magazine*. The boiler, A, is an improved vertical boiler evaporating 4·68 lbs. of water to one pound of inferior Scotch coal, for 3·66 lbs. to one pound of the same coal in the ordinary upright boiler. B is the casing of the engine, C the water tank, and D the coal bunker. E is the steering wheel, with a rubber tire twelve inches wide by four and a half inches thick. The main driving wheels, F, connected to the engine by suitable gearing, have tires of rubber fifteen inches in width by five inches thick.



THE THOMPSON ROAD STEAMER.

A number of trials have lately been completed, with a powerful road steamer, which has been constructed for hauling wagons loaded with coffee over the hilly roads in the island of Ceylon. This steamer has two cylinders, each seven and a half inches diameter by ten inches stroke, and a vertical boiler three feet diameter by seven and a half feet high. The engine is arranged with gearing to make either six or fifteen revolutions to each revolution of the driving wheels. The machine weighs, with water and coal for two hours' work, about eight and a half tuns. It was intended to haul twelve tuns gross weight up gradients of one in sixteen. It was found, however, on trial that it was capable of doing a great deal more than the stipulated amount of work.

Bleaching of Tissues.

Some recent researches by M. Kolb on the bleaching of tissues will be found of interest to those engaged in this department of the arts. We give a condensed account of these experiments as contained in the London *Chemical News*.

Flax was the fiber chiefly experimented with, alkalies being the reagents whose effects were studied, the object being to fix precisely the nature of the substance which passes by the name of resin, gummy mater, gum-resin, saponifiable matter, etc. Elementary analysis gave no information; it gave figures which closely approached the percentage composition of cellulose. The employment of various solvents used in organic chemistry, on the contrary, led to certain conclusions by a chain of facts. The fiber after treatment with alkalies furnished strongly colored lyes, which had a certain tendency to mold; this result suggested the idea of a saponification, and led to the examination, as solvents, of alcohol, ether, and essential oils. The yellow coloring matter is completely insoluble, and these liquids only remove from the fiber a white fatty matter and a green essence, the penetrating odor of which is found slightly perceptible in bleachers' lyes. The whole only constitutes 48 per cent of the weight of the fiber, and is the portion really saponifiable in caustic alkalies; the alkaline carbonates leave this fatty matter in the fiber, which becomes at the same time, more supple. After exhaustion by alcohol, the fiber, boiled in weak potash, soda or ammonia solution, gave, in three cases, a loss in weight of 22 per cent. Carbonate of soda posesses exactly the same solvent power, but it acts more slowly. The brown lyes thus obtained, neutralized by hydrochloric acid, give a brown gelatinous precipitate; but the coloration of the liquid still indicates the incompleteness of the precipitation. Neither acid in excess, nor lime of baryta, will precipitate that which remains of the coloring matter in solution. This soluble portion varies according to the amount of alkali, and especially according to the duration of the ebullition; thus twelve hours' ebullition with ammonia suffices for acids to cause no precipitate in the solution. The fiber treated by boiling water, loses at the end of a week 16 per cent of its weight, and 18 per cent when pressure intervenes; the matter dissolved is acid to litmus, colors the water slightly, and possesses the singular property of browning by simple contact with alkali.

Considering these first characters, it is difficult to admit the presence of a resinous matter. Caustic alkalies or alkaline carbonates do not act as simple solvents, for in boiling the fiber with determinate amounts of carbonate of soda or sulphide of sodium, it was found that after eight hours' ebullition no trace of carbonic acid or hydrosulphuric acid remained. Resins do not give similar results; they saponify equally well with sulphides and alkaline oxides. Lime does not precipitate this substance dissolved by the alkalies; the fiber boiled with milk of lime loses the same weight as in soda, a soluble combination being formed with lime, containing 48 parts of this oxide for 100 of the coloring matter; chalk gives the same result, although more slowly. The treatment by chalk and lime presents this particular—that the solutions obtained remain colorless, and that the precipitates obtained are white. Analysis assigns to the substance, soluble in alkalies and re-precipitated by acids, the following numbers: Hydrogen, 5·0; carbon, 42·8; oxygen, 52·2.

The research has led to the establishment of the following facts: The gummy substance which adheres to the fibers of flax is nothing else than pectose. The soaking or steeping of the fiber appears to have for its object the determination of the pectic fermentation, and the pectic acid which results remains fixed on the flax, either mechanically or in part, in the form of pectate of ammonia. The caustic alkalies in the cold form gelatinous pectates, which preserve the fiber from being completely attacked. Pectic acid being weak, the alkaline carbonates have in the cold only a feeble action upon the fiber. Ebullition, on the contrary, transforms pectic acid into an energetic acid—metapectic acid, the carbonates are then strongly attacked, and their employment becomes as efficacious as that of caustic alkalies. The carbonate of soda, even in large quantity, is not a cause of the weakening of the fiber, which loses more strength from the employment of caustic soda, especially when the lye is concentrated. The employment of lime, even in the cold weakens the fiber considerably. But the chief cause of the destruction of the solidity of the fiber is too long digestion, particularly with caustic soda. M. Kolb says, that, after having proved the existence of pectose in the unsteeped flax, and of pectic acid in the same flax after steeping, it is to be hoped that the attention of chemists will be drawn to the pectic fermentation, well known doubtless as a scientific fact, but of which no one suspected an industrial application of so high importance

The Mechanics of Spiritualism.

The Journal of the Franklin Institute says: "Dr. Peper, of the Polytechnic Institution in London, so well known for his ingenious inventions of the ghost, the floating head, etc., has for some time past employed himself in the development and exhibition at the above named institute of sundry contrivances, by which all the wonders of spiritual manifestations have been not only paralleled but exceeded. One of the most remarkable of these consisted of an arrangement by which various objects and persons were caused to rise in the air, and remain there suspended under conditions which implied the impossibility of any supporting wire however fine and invisible.

"When, however, we mention that in the patent by which these contrivances are secured to their inventors' use a large plate of glass figures as the 'invisible means of support' of these light characters, the wonder of the thing will be somewhat diminished, while the simplicity and ingenuity of the idea may well claim praise. In a foreign scientific journal we see some tricks of the Davenport Brothers are described and are declared inexplicable, and yet we have repeatedly seen performances, involving every important feature of these super human developments, made by an amateur in the arts of legerdemain in the presence of many spectators, and defying all their ingenuity of detection. Yet to those initiated, these feats are as easily reduced to the domain of nature and mechanics as Dr. Peper's wonders when the glass is recognised."

Nothing if not Scientific.

Forney's *Press* tells a good story about bones, which illustrates the power of science in dealing with extraordinary phenomena: In company with a distinguished member of the American Association for the Advancement of Science, we were recently examining the grounds of an Illinois horticulturist. Our horticultural friend evidently had great respect for the *savant*, and received his every word with almost reverent admiration. Picking up an old bone, the learned scientist remarked: "This is the bone of a horse." The farmer looked doubtingly, but did not express dissent. Soon after our learned friend lifted another, and remarked: "This is the bone of an ox." The farmer was astonished, and asked: "Please tell me how you can so easily distinguish one bone from another? Why is this an ox bone?" "Why don't you see," observed the philosopher" where the butcher sawed a steak off of the bone?"

It was well for our learned friend that he was not in a region of horse meat food, or he might have been confounded in his wisdom. As it was, the farmer had only to exclaim that "learning was a wonderful thing;" and for some minutes he was lost in reflection on the astonishing mysteries displayed by the aid of "science."

The Atmosphere.

The Academy of Sciences, in France, has published the result of observations of the atmosphere, made by Camille Flammerton in an extended series of balloon ascensions. The first chapter of the report establishes a law of variation of the watery vapor in the air, and asserts that the invisible moisture accumulates to the maximum zone of humidity and then decreases until it finally disappears. The second chapter shows that the solar radiation increases in the upper regions in proportion to the diminution of the moisture and of the temperature of the air. The third chapter treats of the circulation of the atmospherical currents. The fourth establishes the diminution of the temperature according to the latitude. The fifth gives very curious observations on the altitude of clouds of different forms, their variations, and physical construction. The sixth gives several problems on optics, acoustics and general physics, of which the definite solution is not completed.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

A Novel Steam Canal Boat.

MESSRS. EDITORS:—In your issue of September 23, you copy an article from the Rochester papers about the new steam canal boat, *Edward Backus*, and as it does not seem to give in all respects a correct idea, I will endeavor to explain it. The boat, *Edward Backus*, was built with the view of overcoming the obstacles that have heretofore made steam on the canal a failure.

It has been demonstrated that a screw or paddle wheel, in as small a water way as the canal, and shoving a boat of the present style of canal boats at the speed of two miles an hour, has a "slip" of about seventy-five per cent; and as this causes a consumption of about two tuns of coal, every twelve hours, and requires a large boiler and engine in proportion to the work done, thereby lessening its carrying capacity, it cannot compete with horses, having direct hold on the ground, and no loss of power. Now, it occurred to me, that if I could run a wheel on the solid ground, at the bottom of the canal, thereby saving this enormous loss of power by slip, and making the amount of power necessary to drive a canal boat conform nearer to the power of two horses on the towing path, I could propel a boat cheaper than with horses. With this object in view, I constructed a boat with a "well" in the center, running through the boat like a box for a center board in a vessel, sixteen feet long, and twenty inches wide, and placed therein a traction wheel eight feet in diameter, and one foot thick. This wheel is hung in a frame, which is hinged at its forward end, allowing it to rise and fall eight feet below the boat; and as the boat, when loaded, draws six feet of water, this wheel can drive the boat when the water is fourteen feet deep; and the frame being hinged three feet above the bottom of the boat, it gives the traction wheel a backward motion as it rises, and as it revolves only seven or eight times a minute, it rolls over stones or other obstructions very easily, and without jar. The back end of the well is enlarged, so as to receive a screw wheel four feet in diameter, for use in deep water, which can be connected with the engines readily, and lowered below the bottom of the boat, the traction wheel lifting and guarding it from injury. This whole machinery occupies no more room than a horse stable, and adding but little weight above that of a team. The boat has made two short trips, and one long one, running the entire length of the canal, and I find nothing in the bottom of the canal to prevent the general adoption of this principle. The boat can be run from Buffalo to Albany, without using the screw wheel more than twenty miles of the entire distance.

The *Backus* has a carrying capacity of two hundred and fifteen tuns, and uses one half a tun of coal in twelve hours, running from two and a half to three miles an hour, and of course making no wash to the banks.

EDWARD BACKUS.

Better Roads Wanted.

MESSRS. EDITORS:—I am inclined to offer a premium of my best good will, at least, to you, or some of your learned contributors, for remarks on the best system of roads and road making.

Can the iron trackway for common roads be made available and practicable to our country at large, or will its great cost prove it, as a scheme, abortive?

If we *must* go on with our common earth roads, "up hill and down," can we not induce travelers to use wide tired vehicles to save them in as good condition as possible?

Will some one give a scientific estimate, through the SCIENTIFIC AMERICAN, of a track in a common road seven feet wide, and of sufficient thickness for all traffic, made of broken or gravel stones, and duly combined with coal tar or asphaltum, and his opinion of it?

It seems to me that roads are of importance equal to any material interest of our great country, and should share the attention of the press, and of able men, to a greater extent.

All you have done, or can hereafter do, to aid such enterprises, will have the gratitude of at least one of your numerous readers.

PATHMASTER.

SPEED OF RAILWAY TRAINS.

A correspondent writes upon the subject of higher speed for railway trains in the United States. His opinion seems to be that the present rates of speed are generally too low to meet the wants of the public; that much higher rates are already talked of, and will shortly be demanded; while he also thinks the machinery of locomotives, and the structure of the rolling stock, too slight to endure an increase of speed with safety.

While it is undoubtedly true that a demand for greater average speed exists on the part of the traveling public, and also that the speed of American trains is generally much lower than the standard of English roads, our correspondent errs in supposing that this is owing to any inferiority in the structure of American locomotives or quality of the rolling stock. Both the locomotives and passenger cars of American manufacture are equal in strength, elegance, and efficiency to any made in the world. Indeed, it may reasonably be doubted whether our passenger cars are equaled by those made in any other country. Our roadways are, however, very inferior to those of England and France, and, until this fault is remedied, the present rates of speed can never be greatly increased with safety.

Foreign railroads are superior to ours in the following respects: First, the roadways are much more firmly constructed at the outset, and are less likely to be injured by frost. Second, there are fewer intersections of railways with each other and with common roads than is the case with us, the practice of undermining being preferred. Third, the lines are kept under a more strict surveilance; they are better fenced, barred and watched than the majority of American roads. Fourth, their bridges are, in general, much more substantial and permanent structures than ours.

These are the reasons why a higher rate of speed is compatible with safety on English roads than is possible with us. Still when grave doubts exists in England whether the rates of speed now maintained on her roads are not too high, and when such men as George Augustus Sala take up the pen to advocate their reduction, sustaining their position, by considerations both of public safety, and comfort, and profit to the companies themselves, it may well be doubted whether upon the inferior railways of the United States a much higher rate is either practicable or desirable. That our railroads cannot be improved so as to approximate in stability the English railways, we do not of course assert. That a speed, under any circumstances, of over from thirty to thirty-five miles per hour, should be made the standard for fast trains we think unreasonable to expect or to demand.

Editorial Summary.

THE oldest house in the United States is believed by some to be a stone edifice in Guilford, Conn. It was built in 1640 the stone being brought on hand-barrows from a ledge at some distance from the site of the building. The cement with which the walls were laid up is said to be harder than the stone itself. The first wedding in Guilford took place in this edifice, the supper provided being pork and peas.

IF storms cannot be predicted, their progress can be communicated, so that preparation can be be made for their approach. The latest proposal is to telegraph to various stations throughout the country the state of the weather, and announce it to the agricultural population by pre-arranged signals, of the discharge of cannon.

CAPITAL OF RAILWAYS.—During the forty-one years which have passed since Stephenson ran his first train on the Stockton and Darlington line, the railways of Great Britain absorbed £500,000,000 of capital, and extended over more than 14,000 miles. In 1865, the length of lines was 13,289 miles, of which more than a third were single lines, and the rest double; this was an increase of 500 miles over the preceding year.

A STEAMER is building in Boston designed to transport molasses from the West Indies. She is to be built in compartments, so as to bring the molasses in bulk, instead of hogsheads as is now the custom, and will have a carrying capacity of eight hundred hogsheads. It is estimated that this method will make a very large saving in the transportation of this article, and if it proves successful, will be generally introduced.

AN avalanche of rocks recently occurred near the Watch House, on Mt. Mansfield, Vt. One huge rock, of a hundred tuns weight, mowed its way through the dense timber for a thousand feet, and only stopped within ten feet of the house. Other enormous fragments rushed through the timber in various directions, their force being shown by the large number of shattered and prostrate forest trees.

A SINGULAR eclipse of the sun will take place on the fifth of November. This is no less than a eclipse of the great luminary by the planet Mercury, of course it will be invisible except to eyes armed by telescopes, and to those only in favored localities of which Paris is one. That city will however have to forego the sensation of the great solar eclipse of 1869, while it be visible in many parts of the United States.

A STATUE of the celebrated Hans Sachs, bootmaker and poet, is about to be erected at Nuremburg. In order to secure the funds necessary, for the inauguration, a lottery is organizing under the direction of the boot and shoe makers of that city, in which all the prizes are to consist of foot gear.

NEWS from Spain is now received at Paris by means of carrier pigeons, telegraphic communication having been interrupted.

WE notice that the cultivation of silk is attracting increased attention in Southern California. This is right; there are no natural conditions wanting to make California as thrifty a silk growing district as exists upon the face of the earth.

THE Zouave Jacob, who made such a stir some time since by his mesmeric healing in Paris, has been called to Berlin by the King of Prussia to treat one of the royal family.

THE largest manufactory of shoe pegs in the United States is said to be at Burlington, Vt. It every day transforms 4 cords of wood into 400 bushels of shoe pegs.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

THE PACIFIC RAILROAD EXTENSION.—The Vice President of the Union Pacific Railroad has written a letter to the President of the United States, in which he says:—"The Union Pacific Railroad Company has been informed of the appointment of a special commission to re-examine their road. If this commission includes all roads receiving similar subsidies and bonds, this company will regard the appointment with satisfaction, but if no other road is included, it becomes evident that the Government has listened to representations unfavorable to the character of our work, and which justice requires that I should contradict. I think it my duty, therefore, to assure your Excellency that the Union Pacific Railroad is at least equal to any of these other lines in construction, appointments, and permanent improvements, and that you can easily ascertain the thoroughness and excellence of the work by reference to Generals Grant, Sherman, and Sheridan, who have lately been over the line, and from many other eminent practical railroad men. I respectfully request that the commission be instructed to include all these roads in the examination, and to report in detail the comparative qualities of each."

THE NEW POSTAGE STAMPS.—The Postmaster General has just awarded the contract for the supply of stamps to the department for the ensuing four years to the National Bank Note Company of New York. The new stamps will be somewhat smaller than those in use at present, but they are of a superior style and finish, with a novelty in design. The two cent stamp contains an engraving of a post boy on horseback in full speed. The three cent has a locomotive under full head of steam, the great carrier of our domestic service. The five cent stamp contains a head of Washington. The ten cent, the finest of all in design and execution, has a miniature engraving of the Declaration of Independence, executed with such delicacy and precision that the picture suffers nothing under a magnifying glass. The twelve cent stamp has an ocean steamship, and the thirty cent has a finely executed engraving of the surrender of Burgoyne. When it is considered that over a million stamps are issued daily the importance of this contract is at once evident.

Mr. Jason Clapp, a well known carriage manufacturer at Pittsfield, Mass., died at his residence on the 19th inst., at the age of 85 years. Carriages of his make have been sent to Germany, one to the King of the Sandwich Islands; and the very beautiful one, presented to President Pierce, while in the Presidential chair, by the citizens of New York was built by him.

The cannon foundery of Krupp, in Essen, Prussia, extends over 920 acres, 246 of which are occupied with buildings. It has 12 miles of railroad, 6 locomotives, 150 wagons, and 50 horses. There are 9,000 jets of gas, consuming about five millions of cubic feet per day; 10,000 men are employed in the foundery; 1,200 at the mines and forges. The wages amount to 3,100,000 thalers per annum. The motive power consists of 160 engines of 6,000-horse power each. The daily consumption is 13,000 bushels of coal, 32,500 bushels of coke and coal, and 200,000 cubic feet of water.

A hydrographic survey of Vermont is talked of.

The highest point on the Pacific Railroad is 8,262 feet above the sea.

The rolling mills of Philadelphia pay annually for wages the sum of $1 000,000.

The only glassworks in Indiana are situated at New Albany where larger quantities of bottles are made.

A single firm in Philadelphia employs in the manufacture of gas fixtures 750 hands. Another employs 400 hands.

The extension of the Horicon branch of the Milwaukee and St. Paul Rail-Road has been formally opened at Winneconne.

It is stated that the reduction in prices of freight over the three trunk lines to the West is the result of general understanding, and is intended to run off the various fast freight lines.

Recent American and Foreign Patents.

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

CONDENSER.—Wm. L. Winans, England, and Thomas Winans, Baltimore, Md.—This invention relates to surface condensers of steam engines and consists in the means for preventing the surface of the condenser and the valves of the air pumps in surface condensing engines from being charged, coated, clogged, or obstructed with grease, tallow, or other extraneous matters which may be carried over with the steam from the cylinder into the condenser.

OPERATING WINDOW BLINDS.—Levi W. Swafford, Edward Butler, and John R. Hess, Muscatine, Iowa.—This invention relates to a new and improved method of operating window blinds, whereby the same are opened and shut and the movable slats of the same are adjusted, and blinds are more securely fastened without the necessity of raising the window for that purpose.

HORSE-POWER HAY ELEVATOR.—Amos B. Hunt, Matteson, Mich.—The object of this invention is to provide the means of elevating hay from the wagon and storing the same in the bay or mow of a barn (or lifting hay from the stack and loading the same on a wagon) in a rapid and easy manner with the aid of only two attendants and a horse or other draft animal. It consists in general terms of a swinging crane or sweep bar provided with a lifting rope, pulleys, and catch and tripping devices, together with other devices perfecting the whole.

ROTARY STEAM ENGINE.—Levi F. Goben, Spring Hill, Mo.—This invention relates to certain improvements in rotary engines.

PAPER CUTTING MACHINE.—Hervey Law, Chatham, N. J.—This invention relates to a new and improved machine for cutting paper, and is more especially designed for the use of book binders.

BEEHIVE PROTECTOR.—Alfred S Johnson, Naupun, Wis.—This invention relates to a simple and economical device for protecting beehives from the cold of winter and the heat of summer.

CHIMNEY CLEANER.—Michael J. Lourrentz, Leavenworth, Kansas.—This invention relates to a new and simple method of cleaning the chimneys of lamps, and it consists in combining two wires or rods with buttons or heads thereon.

PROCESS OF, AND COMPOSITION FOR TANNING LEATHER.—G. Zuppe, New York city.—This invention relates to a new tanning composition, which is so compounded that the leather can be completely tanned in a few days, while heretofore it took months to do it.

STEAM BOILER.—R. W. Humphreys, Clarksville, Tenn.—This invention consists in forming a steam boiler of an annular ring or tube in which are placed tubes or flues for the passage of the products of combustion, and in attaching to the same a fire-box or furnace and a smoke stack.

SUGAR-PAN DERRICK.—J. D. Ayers, East Greensboro, Vt.—The object of this invention is to provide a simple and effective derrick for lifting sugar pans off and on the furnace arches. It consists in the combination of lifting pulleys with a pan frame, which is arranged to slide on a horizontal arm which is raised and lowered by the pulleys, the said arm forming a movable attachment to a rotary upright.

WROUGHT-IRON AND STEEL COLUMNS.—George Walters and Thomas Shaffer, Phœnixville, Pa.—This invention has for its object to furnish an improved column, which may be made of wrought iron or steel, which shall be firm, rigid, strong, and neat in construction, adapting it for use in those parts of a building or structure where neatness of appearance, combined with strength, is required.

CORN PLANTER.—C. W. Thiessen, Effingham, Ill.—This invention relates to a new corn planter, which is so arranged that the wheels contain the seed box and the dropping apparatus, whereby a very secure and regular distribution of the seed is obtained. The invention consists in such an arrangement of adjustable slides, that work on the face of the wheel, in boxes projecting from the face of the wheel, and in such a combination of the same with a seed box secured to the inner of the wheel, that the requisite quantity of seed is dropped during each full, half, or other partial revolution of each wheel, and that such seed is, by such revolution of the wheel, not only dropped, but also securely imbedded in the soil.

REAPING MACHINE.—Miletus J. Wine, Long Glade, Va.—The object of this invention is to provide a simple and more efficient means for removing and depositing the gavel.

COMBINED VISE AND ANVIL FOR CIRCULAR SAWS.—David Huffman, Luray, Va.—This invention consists of an anvil and a vise combined, in a neat and portable shape for the purpose of treating saw teeth.

GATE FOR SCUTTLING SHIPS.—John Hall Marshfield, Mass.—The object of this invention is to construct and attach to vessels a gate which can readily be opened for the purpose of scuttling them, and which can, afterward, be as readily closed, when it is desired to pump out and raise the vessel.

ROTARY ENGINE.—Geo. W. Goodwyn, Petersburg, Va.—The object of this invention is to furnish a rotary steam engine which shall be simple and cheap in construction, and shall economize the power of the steam to the greatest possible extent.

CAR BRAKE.—W. W. Babcock, Harmar, Ohio.—This invention has for its object to furnish a more simple and powerful car brake than any hitherto employed, and to this end consists in a peculiar combination of the screw with a toggle-joint lever whereby the brakes can be at any time applied by a child with so great force as to instantly stop the wheels.

MOLD BLACKING MACHINE.—Benj. S. Benson, Baltimore, Md.—This invention is an improvement in machines for blacking the molds used in casting metallic pipe, and consists in a new arrangement of the mechanism by which the blacking is fed to the brush through the stem that holds the latter, and is thrown against the walls of the mold from among the bristles of the brush.

PRINTING PRESS.—Royal Cummings, Newport, Vt.—This invention relates to a new and improved printing press of that class in which the paper is printed from a continuous roll, and both sides of the paper at one operation, or during a single passage of the paper through the press.

CORN PLANTER AND CULTIVATOR.—Charles Dyer, Coal Run, Ohio.—This invention relates to a new and improved corn planter and cultivator.

CULTIVATOR.—Jacob H. B. Keller, Chambersburg, Pa.—This inventor relates to a new and improved cultivator and it consists in a novel construction of the same, whereby the device may be used in a rough or stony ground without the liability of breaking or injuring it.

TRACE FASTENING.—James Brown, Mattewan, N. Y.—This invention has for its object to furnish an improved fastening for securing the traces to the whiffletrees, which shall be simple in construction, easily attached and detached, and not liable to become accidentally detached.

WASHING MACHINE.—E. F. O'Neill, Prairie du Chien, Wis.—This invention has for its object to furnish an improved washing machine, simple in construction, easily operated, and effective in operation, doing its work quickly and well, and in such a manner as not to injure the clothes or break the buttons.

BUT HINGE.—Lorenz Maschauer and Wm Frankfurth, Milwaukee, Wis.—This invention relates to a new and useful improvement in but hinges of that class which are provided with a removable or detachable pintle to admit of a door, shutter, or gate being unhung without unscrewing either leaf of the buts.

PHOTOGRAPHING ROOM.—George K. Proctor, Salem, Mass.—This invention consists in constructing a room or apartment for photographing purposes, in such a manner or of such a form that the rays of light from a lamp placed within said room or apartment will be reflected and concentrated upon the person or object to be photographed, so that photographing may be successfully performed at night by artificial light, or other than that of the sun.

GRAIN DRILLS.—John T. Lynam, Jeffersonville, Ind.—This invention relates to a new and useful improvement in grain drills.

SWAGE FOR UPSETTING SAW TEETH.—Warren P. Miller, New York city.—This invention relates to a new and improved swage for upsetting saw teeth, bringing the cutting edges of the same to a proper cutting edge and at the same time spreading or expanding the edges of the teeth to a necessary width to insure a free cut of the saw and the ready expulsion of saw dust from the kerf.

SPRING BED BOTTOM.—Thomas J. Gaffney, Detroit, Mich.—This invention has for its object to improve the construction of spring bed bottoms, so as to make them stronger and more durable in construction and more convenient in use.

SCHOOL DESK.—John Mealey, Fairville, St. John, N. B.—This invention has for its object to furnish an improved desk, designed for use in school rooms, lecture rooms, public halls, etc., which shall be simple in construction, strong, and durable, and which shall be convenient for use, being easily adjusted for use as a desk, table, or seat simply, as the occasion may require.

STITCHING HORSE.—Thomas Depp, San Marcos, Texas.—This invention has for its object to improve the construction of the stitching horses used by harness makers, saddlers, etc., so as to make them more convenient and satisfactory in use.

SOLDERING GALVANIZED IRON.—Patrick B. Bonner, New York city.—This invention has for its object to improve the manner of soldering galvanized iron, so that the solder may not crack or break off, and will make the seam perfectly tight.

SPRING.—Frederick Cajar, New York city.—This invention consists in constructing the springs of corrugated metal and arranging the plates or strips so as to take the strain in the direction of the breadth of the same.

COMPOUND FOR PROMOTING THE GROWTH OF THE HAIR.—Benjamin F. Atwood, New York city.—The object of this invention is to provide a vegetable hair dressing, which will strengthen the hair and promote its healthy growth. It has been found by ample practical test to promote the growth of hair where the the same has been lost from fever, and in other cases where the hair follicles are not completely closed.

ARTIFICIAL LIMB.—Geo. B. Head, Albany, N. Y.—This invention consists in the construction and arrangement of the parts by which the necessary movements are produced, but relating more particularly to the method of operating the knee joint.

BIT STOCK.—George Richards, Richland Center, Wis.—The object of this invention is to provide a brace or bit stock the handle of which is extensible, for obtaining more leverage when the resistance requires it. This is accomplished by forming the stock in three separate pieces and uniting them in such a manner that the grasp or handle can be extended at will.

APPARATUS FOR TOLLING GRAIN.—Wm. S. Widger and Wm. M. Read, Fairfield, Iowa.—This invention consists of a rotating funnel provided with a spout that may be adjusted to the same fractional portion of the surface of the mouth of the funnel as the fractional part of the grain to be taken, which is arranged so that the grain must pass through it while it is in rotary motion, whereby an amount of grain equal to the fractional proportion of the spout to the funnel is diverted from the main portion and turned into a separate channel.

TRAMS FOR GAGING MILLSTONES.—Thomas R. James, St. Louis, Mo.—The nature of this invention relates to improvements in apparatus for traming or gaging the faces of the upper or running stones of grinding mills, and it consists in providing a tram brush which may be secured to the stone by the ends of the same being wedged into the recesses provided for the driver having a central opening through it vertically, provided with set screws wherein a shaft may be set with its lower end resting in the socket on the bail of the stone, whereby the said shaft may be nicely adjusted to a position exactly perpendicular to the face of the stone. On the upper portion of the said shaft may be arranged a swinging arm which is provided with one or more gage points.

STATION INDICATORS FOR RAILWAYS.—Elihu Spencer, Ottawa, Canada.—This invention relates to certain new and useful improvements in station indicators for railways, which improvements are more especially applicable to an implement for the above purpose, which was patented by the present inventor December 21, 1867.

LOCOMOTIVE SMOKE-STACK.—J. A. W. Justi, Savannah, Ga.—The object of this invention is to provide a locomotive smoke-stack with such detaining devices that no coal, cinders, nor sparks, can pass through, and with the escaping smoke, while the draft is not in the least impeded.

GRIST MILL.—Bennet Whitney, New Brunswick, N. J.—The object of this invention is to so construct a grist mill that the upper stone will be allowed to swing in either direction, and can at the same time be adjusted up and down; that no meal can escape through an upper opening in the curb; that the whole mechanism can be easily taken apart, without disturbing the bottom of the curb, and that the hopper and its shoe can be arranged on either side of the mill, as may be desired.

ELASTIC ROLLER.—Allen Magowan, Boston, Mass.—The object of this invention is to produce a roller for wringers and other machinery, on which the elastic will not slip on the mandrel, and which will be also durable and soft. The invention consists chiefly in forming an elastic core, by dipping a string into liquid raw india-rubber, and in then winding the string thus saturated around the mandrel. Thus a strong elastic core is produced, which will not slip on the mandrel, especially if projecting arms are formed on the mandrel. The invention also consists in the use of longitudinal tubing for winding the roller on a square handmill.

GRAIN CLEANER.—John E. Anderson, Boiling Springs, Pa.—The object of this machine is to accomplish the cleaning of grain in the most effective and perfect manner, and with the fewest and simplest arrangement of parts. It consists, in general terms, of a scouring wheel, revolving with high speed encountering the entering grain, and agitating it, thereby thoroughly loosening it from the chess, and cockle, and chaff. The grain is then delivered from this wheel, upon an inclined screen, when it encounters a blast of air from a revolving fan wheel or blower, located within the general frame of the machine, and immediately below the scouring wheel. The screen is not the plane surface heretofore used, but is corrugated in the form of steps running crosswise to the direction of the blast from the fan wheel, so that the kernels of cleaned grain will catch against the corrugations, and be retained from being blown out with the chaff.

LOOM.—A. W. Silvis, Birmingham, Iowa.—This invention relates to improvements in hand or power looms for weaving cloth, and it consists, first in an improved automatic picker motion; second, in an improved arrangement of harness operating mechanism; and, third, in an automatic take up apparatus, whereby a very nearly uniform tension is maintained on the cloth by means of a weighted take up lever, which is operated by the lay.

TRACE FASTENING.—F. W. Dean, Tremont, Ill.—The object of this invention is to provide a simple, efficient, and easily operated trace fastening. It consists of a link hinged to the single tree in such a manner that it will hold the trace from slipping off from the pin in the end of the single tree, and may also be moved away from the pin when the trace is to be slipped over the pin.

CARDING MACHINE.—Charles F. Morrison, Rifton Glen, N. Y.—This invention consists in providing carriers to receive the waste that falls from the feeding rolls, main card, and doffer, and carry it to a stripping roller, whereby it is returned to the carding rollers again and reworked.

HAMMER HATCHET.—T. S. Coffin, Harrington, Maine.—The object of this invention is to provide a simple and convenient tool. It consists of a hammer having short claws, and a socket extension, all of one continuous piece of metal, in combination with a hatchet blade fitted to screw into the upper part of the chamber in rear of the claws. By this construction the hatchet blade is removable at will, or may be turned at right angles to its usual position, to enable the claws to catch the head of a closely driven nail.

FILTER AND HEATER.—R. R. Fenner, Urbana, Ill.—This invention consists in placing within the heater pieces of cast iron, by the presence of which in the heater the lime, which is in a fluid state, will at a certain degree of heat become crystallized and adhere to the pieces of iron to a great extent. The heated water is then passed through a filter which separates the balance of the lime.

COMPOSITION FOR BURIAL CASES.—J. R. Hathaway, Westfield, N. Y.—This invention relates to improvements in burial cases, and consists of an improved composition of matter for constructing the same either wholly or in part, or for ornamenting the same.

MACHINE FOR TWISTING JACK BANDS.—J. Collier, Morenci, Mich.—This invention consists of an arrangement of rotating hooks and a stationary hook for twisting the yarn, which are automatically thrown out of gear when the yarn has been sufficiently twisted; also a yielding twisting hook to which the yarns are transferred from the stationary hook to be finally twisted together.

TWEER.—O. G. Newton, Edinburg, Mo.—This invention consists of a ball valve, provided with cavities to receive the cinder, arranged on a rotating shaft having a vertically-adjustable bearing whereby it can be raised and lowered to be rotated for the discharge of the cinder, and also for regulating the passage of air to the fire.

PEACH BASKET.—Henry Carpenter, Brooklyn, E. D., N. Y.—This invention consists in a novel manner of securing the bottom in the basket.

CURTAIN FASTENING FOR CARRIAGES.—Ephraim Shepard, New York city.—This invention relates to a new and improved curtain fastening for carriages, whereby a curtain may be readily fastened and unfastened, and be firmly secured in position when in a fastened state.

SULKY CULTIVATOR.—P. R. Totten, Adams, Ill.—This invention relates to a new and improved sulky cultivator for cultivating crops grown in hills or drills.

STIRRUP.—John Bond, Versailles, Ill. The object of this invention is to provide an improved stirrup with an oscillating bottom that shall be more agreeable to the rider, and which will, in case the rider is thrown from the horse, readily open and disengage his feet. It also consists in providing a swinging foot piece so connected to the pendant straps as to become disconnected when by any cause they are spread outward sufficiently, and for which purpose they are made sufficiently flexible.

WATER HEATING APPARATUS.—J. C. Ryan, Chicago, Ill.—The object of this invention is to provide an apparatus for heating water and circulating the same to obtain the greatest amount of steam heat or hot water from the fire of an ordinary stove. It is designed more particularly for shop and household use, though it is equally applicable in situations where it is desirable to economize fuel and utilize the heat of one stove for warming other parts of the building.

HAY ELEVATOR.—F. A. Crane, Zanesville, Ohio.—The object of this invention is to facilitate the operation of lifting hay from the wagon and discharging it into the hay mow of a barn. It also consists of a plank or board provided with internal rails affixed on each side of the lower edge of the said plank, and on which a hanging truck and its accessory apparatus travels to and fro. The hanging truck is provided with pulleys and rollers, and a catch lever, the latter being so arranged with reference to the accessory parts of the apparatus, that the truck will be held stationary until the hay is lifted to the proper hight, when the catch lever will be lifted, and the truck with its suspended load of hay will be free to be drawn along the rails to a position over the hay mow into which the hay is to be discharged from the fork.

BEE HIVE.—Benjamin Leckrone, Somerset, Ohio.—This invention relates to several improvements in the construction of bee hives, whereby the entrance of the bees to, and their movements and operations in the hives, can be perfectly regulated and controlled; and whereby the hive can be more conveniently handled, and will be better adapted to secure the health and comfort of the bees, than any hitherto in use.

HOT BLAST FURNACES.—P. and R. Hoop, Berlin Cross Roads, Ohio.—This invention consists in passing the blast of air to be heated for fanning the flame of a puddling furnace through a series of hollow rings placed one above another, in a chimney, the products of combustion beneath rising through the rings and the blast circulating in the rings one after another, said rings being connected by means of pipes for the transmission of the air current from one to another, which pipes pass outside of the chimney, and are arranged to be removed and replaced at pleasure.

HORSE HAY RAKE.—Solomon C. Brinser, Middletown, Pa.—This invention consists in locking the head of a horse hay rake by means of a simple toggle arrangement, in such a manner that it cannot rotate to any degree upon its bearings, but is compelled to bear the teeth steadily forward without change of elevation, as in raking over even ground; also, in converting the before-mentioned locking mechanism into an arrangement of parts for tripping the rake head to avoid stones or the roughness of uneven surface, said tripping arrangement being operated by means either of a hand or foot lever.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address the correspondent by mail.

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 should be by volume and page.*

J. M. C., of Pa.—Your suggestion about the use of a current of water passing through a tube to assist in propelling a boat is very old.

H. F. R.—We know of no good cement that will resist water, and which is adapted to join glass and wood, that is at the same time elastic to any extent.

J. N., of Ala.—In our opinion the statement that common salt put into a kerosene lamp, will prevent the explosions which often take place in the use of bad oil, is incorrect.

J. R., of Mo.—We advise you to send for Henry Carey Baird's catalogue, of which we give a notice this week. By an examination of the contents of the books as therein described you will be able to make a judicious selection of the books you need.

R. M., of Mo.—The star you see is called Aldebaran. It is in the constellation Tarus—the bull. It forms the eye of the bull as pictured on astronomical maps. It is a star, not a planet. The glass of which you speak will not probably enable you to see the rings of Saturn much less his satellites. You can, however, see interesting objects on the moon's surface with it and also the moons of Jupiter

J. M. D., of Mass.—"Why will a small dry needle float on the surface of water?" Water although a liquid still has a certain amount of cohesive force. This force is sufficient to prevent the breaking of the surface by the weight of a small needle provided it be dry and laid very carefully upon the water. "Why will smoke from a locomotive form rings as it issues from the smoke stack in damp weather?" The dampness of the weather has nothing to do with it except that there is apt to be less wind in damp weather than in dry, and the smoke is more apparent. Gaseous volumes puffed suddenly from the mouth of a tube often assume the form of rings, common examples of which are the smoke from a cannon in a still morning, or the rings of tobacco smoke projected from the mouth held in a proper manner.

A. B., of St. Petersburg, Russia, sends us a paper on boiler explosions combating one of the theories of Mr. Norman Wiard—that of unequal temperature.—For a native Russian the letter, written in English, is very creditable, but the ideas advanced are neither new nor useful; they have been more than once published in our columns.

B. C., of S. C.—Your theory of belts is valueless. Belts cannot, in any way increase power. They are only the transmitters of power, and as such, standing between the source and the result, necessary evils.

J. P. G., of R. I.—The amount of surface of a pulley embraced by a belt is not an essential element of calculation in estimating the amount of power it may transmit. A belt that merely impinges upon a pulley *may* be as effective as though it came in contact with two thirds of its circumferential surface.

W. M. L., of Mass., asks if a thread of a pitch eight to the inch would be too "heavy" for a three quarter inch shaft. If he means a bolt to resist a strain or for securing two portions of a structure, such a grade would undoubtedly detract from its strength; but it might be used in some cases, as for a worm or a feed. A three quarter inch bolt should not receive a heavier thread than ten to the inch. See articles in back numbers of the SCIENTIFIC AMERICAN relative to the American system of bolts and nuts.

B. F., of Tenn.—Stone drills should not be finished by the file before hardening. We know it is a common practice, and that cold chisels are sometimes so prepared. The practice is, in either case, not to be recommended. The grindstone is the proper tool for the purpose.

S. F. M.—Yellow rays have no actinic effect upon sensitive plates; hence photographers use deep yellow glass through which to admit light into their operating rooms. Glass is the best material for the sensitizing bath.

T. D., of N. J.—The bouyancy of your immersed buckets is the same whether open or closed; their position has nothing whatever to do with the force with which they seek the surface.

W. J., of Nebraska.—No experiments yet tried give data for an answer to your query. An experiment made with a special view to determining it would be of value. You can easily try it for yourself, and we should be glad to learn the result.

W. W., of Ohio.—The substances used for rendering clothing water-proof, are either ordinary oil paint, or varnish, very liable to crack, or what is much better, india-rubber dissolved in benzine. For this purpose pure rubber is required. Some other processes are used, but would not be available to you, as they are either kept a secret, or are expensive

J. D. C., of Mo.—"Can the bearing of a shaft of wrought iron 5⅜ inches in diameter, if found to be turned slightly too small, be made a good fit by heating it in a common blacksmith's fire and allowing it to cool? Second, Can a locomotive driving wheel be pulled on tight enough before the tire is on with an inch and one eighth bolt and a 3½ foot wrench, supposing the taper to one sixty-fourth of inch." Answer to both questions No.

NEW PUBLICATIONS.

GENERAL PROBLEMS OF LINEAR PERSPECTIVE OF FORM, SHADOW, AND REFLECTION. By S. Edward Warren, C. E. John Wiley & Son, No. 2 Clinton Hall, Astor Place, New York city.

We have before had occasion to refer to the publications of Mr. Warren, and his abilities as an instructor, and always favorably. His published opinions are received throughout the country as decisive, and his books are the text books of the student who desires to become acquainted practically with the principles of the science and the practice of the art of geometry. In this, his latest volume, Mr. Warren has fully sustained the characteristics of his former publications and laid our students under additional obligations. Whatever he does, either as an instructor or writer, he does well, and he has already made his name the synonym for exactness, as his labors as a teacher have made him successful.

THE TROTTING HORSE OF AMERICA; How to Train and Drive Him. By Hiram Woodruff. Edited by Chas. J. Foster, of *Wilkes' Spirit*. J. B. Ford & Co., Printing House Square, New York city.

All who ever drove or owned a horse, or witnessed a trial of speed with any gratification whatever, will be interested in the book whose title we have given above. To Robert Bonner, we are told in the dedication, belongs the credit of instigating the preparation of the papers which form the body of the book, the reminiscences of Mr. Hiram Woodruff, whose opinion on horses is received as authority the world over. Mr. Bonner has offered another proof of his interest in that noble animal, the horse, beside his purchase of the fastest trotter in the world, by his suggestion of this collection of Woodruff's instructions and reminiscences. A very life-like and correct vignette of the great horse trainer embellishes the volume. All who are interested in horse flesh should procure this book.

CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS, Published by Henry Carey Baird, Industrial Publisher, No. 406 Walnut street, Philadelphia.

In this catalogue over one hundred and eighty different departments of science and the arts are represented. Mr. Henry Carey Baird is probably most extensive publisher of such books in the United States, and his catalogue will be of value to all such as seek a guide for the selection of books adapted to their special wants, either as manufacturers, engineers, inventors, or mechanics. The publication of the contents of each book enumerated in the list will enable any one to judge of its value. The catalogue is sent free of postage upon application.

Business and Personal.

The charge for insertion under this head is one dollar a line. If the Notices exceed four lines, an extra charge will be made.

Bradley's games and house amusements are for sale by all booksellers and toy dealers.

Boston safety faucet, self-closing. For wash basins, hopper water closets, sinks, urinals, and water jars. Specially adapted for depots, steamboats, hotels, public buildings, and all places where water meters are used. Joseph Zane & Co., 81 Sudbury st., Boston, Mass.

Four patents for sale. Address F. Van Dorlen, patentee, Adrian, Mich.

Wanted—a foreman in a wood shop near New York city, in which six to eight hands are employed. Must be accustomed to the use of wood working machinery on hard wood. Address box 6173, N. Y. postoffice

For sale—patent right of McCreary's carriage clip, illustrated No. 13, present volume, Scientific American. Address T. McCreary & Co., Matteawan, N. Y.

C. J. Fay's patent water-proof roofing, Camden, N. J.

For sharpening all kinds of woodsaws, beyond anything heretofore known, inclose 50c., and address E. Roth, New Oxford, Pa. Thousands of mechanics now use it.

Painters' Manual, concise, comprehensive, and practical. 50 cents by mail prepaid. Jesse Haney & Co., 119 Nassau st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for Lithograph, etc.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

For sale—a complete set of the "Scientific American," neatly bound in ½ mor., with marbled sides, (31 vols.) old and new series. Also, odd volumes. Address L. M. Montgomery, Box 2958, New York.

Wanted to know where to obtain a reliable liquid meter for registering petroleum. Address H. W. Faucett, Petroleum Center, Pa.

A. H. Scott, Concord, N. C., has a valuable new patent for sale, and wishes to communicate with dealers in patents in the several States.

Inventors and owners of small patents send circulars to post-office box 111, Peekskill, N. Y.

The pew hat rack.—County rights for sale. Send for circular to E. S. Blake, Pittsburgh, Pa.

Millwrights can make favorable arrangements for sale of best water wheel in use. Address Peekskill Man'f'g Co., Peekskill, N. Y

For sale—barrel machinery, nearly new, for whiskey and coal oil barrels. Address postoffice box 290, Cincinnati, Ohio.

For Blanchard's spoke lathes, address Exeter Machine Works, Exeter, N. H.

Portable pumping machinery to rent, of any capacity desired, and pass sand and gravel without injury. Wm. D. Andrews & Brother, 414 Water st., New York.

Adams' air cylinder graining machines for painters and all manufacturers of painted ware. Machine guaranteed. Send stamp for circular to Heath, Smith & Co., 400 West 15th st.

For descriptive circular of the best grate bar in use, address Hutchinson & Laurence, No. 8 Dey st., New York.

N. C. Stiles' pat. punching and drop presses, Middletown, Ct.

Prang's American chromos for sale at all respectable art stores. Catalogues mailed free by L. Prang & Co., Boston.

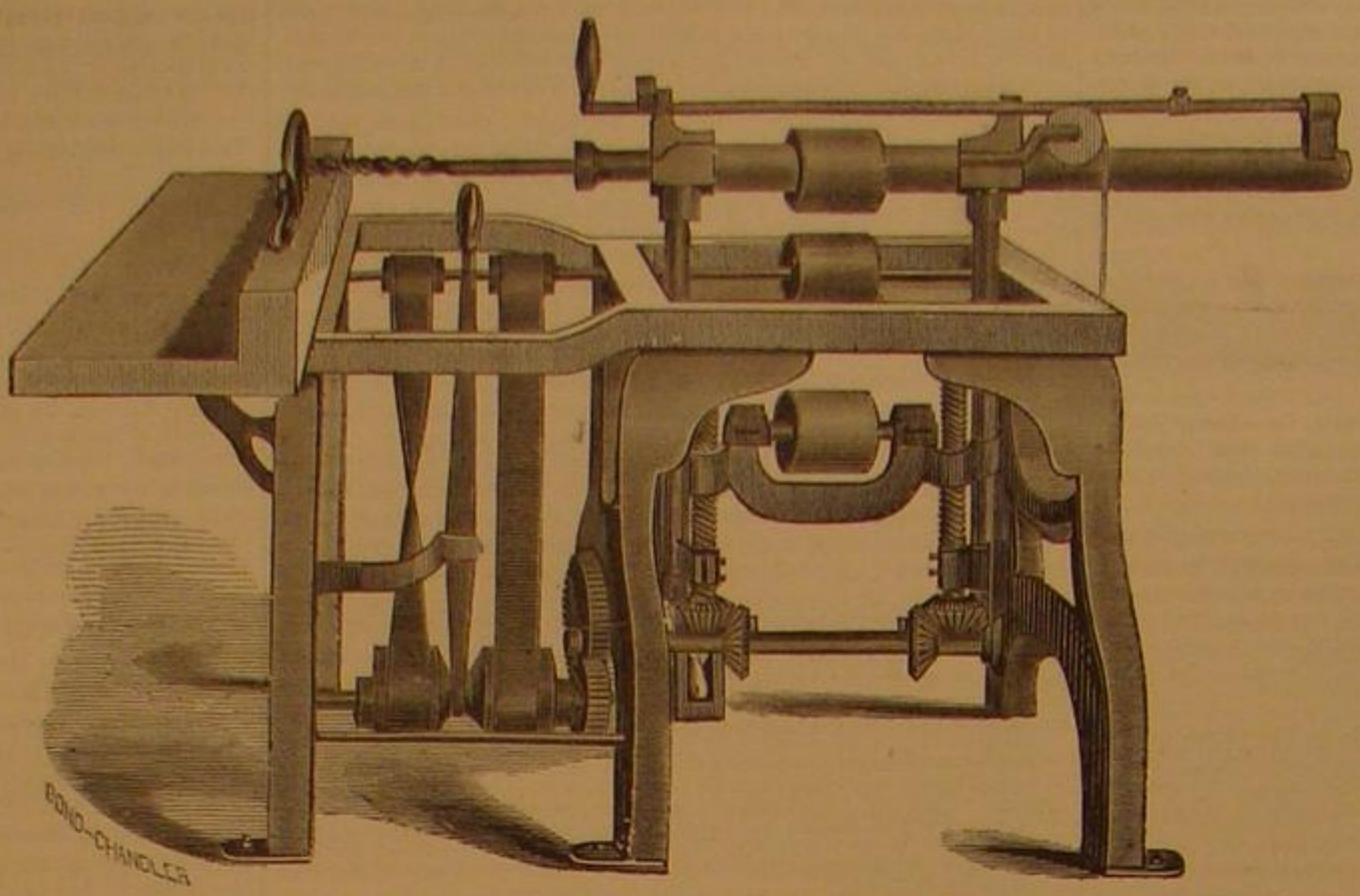
For breech-loading shot guns, address C. Parker, Meriden, Ct.

Winans' anti-incrustation powder, 11 Wall st., N. Y. 20,000 references. No foaming. No injury. 12 years in use. Imitations plenty

Improvement in Machines for Boring by Power.

Boring in wood by power and gaging the depth of the hole bored, the direction and speed of the auger, are not new. Many machines for this purpose have been contrived, and some of them are still in use. They are, however, either too complicated or too little to be relied upon for exactness of work to come generally into use. The table on which the work is laid is not stationary, but must be moved up and down to meet the position of the fixed bit, and in time its bearings wear so that it is no longer reliable. The adaptation of the relative hight of the auger and the stock worked upon is very important. This is one of the objects of the machine the accompanying engraving represents. The manufacturers claim that it will do more than double the amount of work that any other machine now in use can do in the same time, for the reason that the machine is self-regulating by means of a small lever, that the workman can move without changing his position at the machine; the boring bar can be moved up or down to any required point instantly, instead of raising and lowering the table, as by other machines, and that by hand; the workman has nothing to do but put the timber on the table and shift it to the different points, and the machine does the work.

Another great advantage over other machines is in end boring, such as for joint bolts and truss rods in car frames, or any angular boring. Place the timber in any required position, and it remains stationary until finished. The machine is so arranged that any length of auger can be used, from twenty-two inches down to the shortest size. The accuracy of the machine will be at once seen, for the table or bed is made stationary, and is perfectly parallel with the boring bar, consequently it must always bore correctly.



HOIT'S PATENT HORIZONTAL BORING MACHINE.

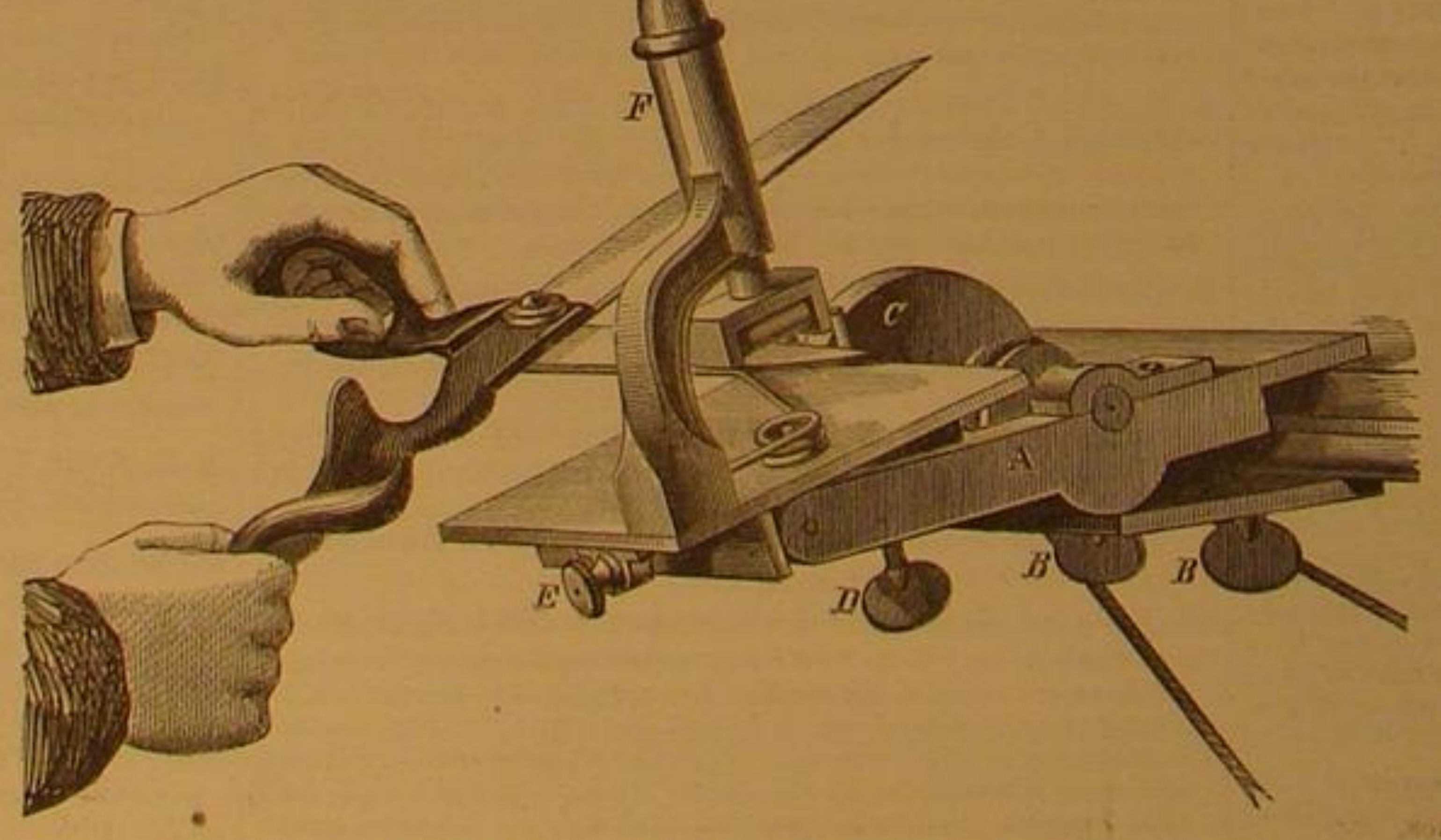
It is also arranged so that the auger is held close to the timber, so that it can be seen exactly when the boring bar is set at its proper hight. The boring bar is moved up and down by means of a friction clutch, consequently as soon as the pressure is let off the lever, the motion stops: and it is also so arranged that it is self-supporting, and will not move up or down unless the lever is applied.

The machine is adapted to all kinds of work, but more particularly to railroad car building and agricultural works. It is well and substantially made, and not liable to get out of order, and is simple and easy to manage.

The machines are built by Hawkins & James, 193 Water street, Chicago, Ill., to whom all letters should be addressed. They are in use by a number of the railroad companies in the country who manufacture cars, and by many other concerns that construct work demanding the employment of the auger.

Improved Device for Sharpening Shears, etc.

A cheap, and generally adaptable contrivance for the sharpening of tailors' shears, seamstresses' scissors, and for the convenience of hotel-keepers, householders, and others, is needed. In cities, they have the unreliable and periodic assistance of traveling grinders, who care nothing for the annoyance they may cause, but receive their payment for a job half done, and know that there all pecuniary or business responsibility on their part ends. The sharpening of a blade of scissors, or of a carving or pocket knife, is not altogether a mechanical process, but requires judgment in regard to the angle presented to the stone, the speed of the stone, and the degree of pressure required to properly present the surface of the steel, and not too rapidly abrade the grinding surface. These may be possibly attained by automatic devices, and the contrivance shown in the accompanying engraving seems to very nearly approach the desired end.



MORSE & COLLINS' PATENT SHEARS SHARPENER.

A, in the engraving, is a jointed frame, suitable to be attached to a sewing or other table by the set screws, B. C is a grinding wheel, either of stone or vulcanite. A gage table, calculated to be elevated or depressed to any angle by the set screw, D, is pivoted to the frame, A, and is moved forward or backward by the screw, E. A spiral spring in the upright hollow sheath, F, holds a roller down on the blade, while a coiled horizontal spring on the gage table presses against the back of the blade of the shears or knife, and holds it to the grinding surface, and two upright roller guides on either side of the wheel regulate the impinging of the blade against the wheel. In operation it will be seen that the device may be attached to a sewing machine and driven by the belt that drives the machine; or it may be used separately as an independent machine to be employed by tailors, hotel keepers, householders, and others, and driven by foot power. The blade can be held to the stone in both directions by means of the roller and spring, and adjusted to any angle by the elevation or depression of the gage table by means of the set screw, D. For tailors' use the value of this device is manifest, as it will enable a country tailor to sharpen his shears without the expenditure of time and money now so necessary for the purpose. It is equally well adapted to sharpening knives for harness makers, market men, and others, as the amount of bevel and of pressure against the grinding surface is entirely controllable.

Patented June 23, 1868, by Melvin M. Morse, and M. V. Collins, Buffalo, N.Y. All communications concerning rights and the patent should be addressed to M.V. Collins, Sherman, Chautauque County, N.Y.

To Detect Common Air in Coal Gas.

Ten parts by weight of anhydrous sulphate of protoxide of manganese are put into a two necked Woulf bottle, and then therein dissolved in twenty parts of warm water. To this mixture is immediately added a solution of ten parts by weight of tartrate of potassa and soda (Rochelle salt), dissolved in sixty parts of water; the thorough mixing of the fluids is promoted by well shaking of the bottle, after this there is added a quantity of a solution of caustic potash sufficient to render the fluid quite clear; immediatety after this the corks, perforated of course and fitted with very tightly fitting glass tubes, are placed in the necks of the bottle, which should be entirely filled with the mixed fluid just alluded to. One of the glass tubes—the inlet tube for the gas to be tested—should just dip a little under the upper level of the fluid; the outlet tube, on the other hand, should only reach half way the perforation of the cork. A very slow current of gas is now made to pass through the fluid, and kept going for at least a quarter and at most one full hour. In case the gas is quite free from atmospheric air, the fluid in the bottle will remain quite clear; if traces even of air are present, a faint coloration of the liquid will soon become apparent; with a larger proportion of air present in the gas the fluid will soon be rendered first light brown colored, and afterwards intensely black. Since these changes of color are due to the oxidation of the salt of manganese, it is evident that every care must be taken to avoid the presence or access of accidental air; the fluid in the Woulf bottle should reach the cork. It is best to cool the bottle during the experiment with ice, if at hand, otherwise with very cold water; the current of gas must be slow.

Mortar---Dr. Artus' Method.

We condense from the *Iron Age* an account of a method of preparing mortar, which gives promise of superiority over the methods now in use:

"It is well known that the mortar used by the Romans made far more durable masonry than modern mortar. The modern mortar hardens very slowly, tears after hardening, does not become very firm, crumbles easily after a considerable period has elapsed, and does not unite well with the building material, so that after thoroughly hardening, there is but little difficulty in removing single stones from the top layers of masonry. In investigating the mortar of old Roman masonry, it was discovered that the mortar had for the greater part been converted into silicates, which had entered into very close union with the quartz particles. It is well known that with modern mortar the formation of silicates does not take place until after a long time, and then only in a very slight measure. But it is just these silicates which give mortar firmness, and at the same time make it capable of resisting the action of water. It is to the formation of such silicates that cement owes its hardness and imperviousness to water. Lately, Prof. Artus discovered a method of preparing mortar by which the silicious earth is, according to the chemical term, set free and the formation of silicates greatly promoted. The mortar prepared after this method hardens much more rapidly than common mortar, attains equal hardness with cement, and forms no tears while drying. It may also be accepted that it can be used under water in the place of cement. Still, until now, only experiments, in which the Artus mortar has proved its excellence as air mortar, have been reported to us, while of its utility in the place of cement under water no confirmatory experiments have as yet been made known to us.

"The method employed by Dr. Artus is extremely simple. Take well slacked lime, and mix carefully with it finely sifted sand; when this has been done let there yet be added one quarter as much fine unslacked lime as there has been sand used, and mix thoroughly. While it is being mixed the mass heats and the mortar may then be immediately used. Of course the unslacked lime must not be added to the mass until it is wanted for use. During the heating of the mass silicates form through which it quickly stiffens and becomes very hard in a short time. This mortar forms no tears. It resists all action of the water, and can therefore be used whenever durability is an object. This mortar clings so firmly that after a short time even considerable force has to be used to separate it from the building material. Experiments made with it have yielded brilliant results, so that the writer may believe to have solved the former so-called mortar secret. This is what Dr. Artus writes in his quarterly periodical. An experiment known to us, yielded the following result: One part of well slacked lime was carefully mixed with three parts of fine sand, and just before using, three quarter part of fine unslacked lime was added, and the whole then thoroughly mixed. The mortar thus prepared was used in building a foundation wall, and after four days became so hard that a pointed iron could not be driven into it; it clung with equal tenaciousness to the stones of the wall. After two months the mortar was just as hard as stone. We have then, here, a very valuable discovery under consideration, which must also be of great account from an economical point of view, when the high price of cement is remembered."

It seems that experiment has not yet shown how long the mortar may be used after preparation or what quantities may be prepared at once; important practical details which we trust will be found to form no obstacle to the adoption of the method. We hope the process will be practically tested in this country and we would be glad to receive accounts of the results reached, from any who see fit to give it a trial.

A Singular Criminal Case.

Sometime since, considerable excitement prevailed in this city about the exhibition of a pseudo headless rooster, which was represented to be living, although its head had been chopped off for weeks. Of course none but the ignorant believed the statement, but the means by which deception was accomplished have recently come to light. One Henry Richardson has been arrested and held to answer upon a charge of cruelty to a rooster by cutting off its bill or beak, piercing out and destroying both eyes, taking a portion of its brain out, pulling the feathers from its head and neck and then skinning the same, after which the skin was so drawn up as to make the said rooster appear headless.

The testimony taken shows that the prisoner had practiced this cruelty for a considerable time, and that the fowls would live after the operation several weeks. Richardson pleaded not guilty to the charge, but was bound over to answer. If guilty, we earnestly hope he may be convicted, and we suggest that an appropriate punishment would be to serve him as he served the roosters.

A SOCIETY has been formed in Paris to oppose the use of tobacco. Each member pledges himself to abstain, and to use his efforts to induce others to abstain, from tobacco in all forms. The society already numbers twelve hundred members.

SOME enterprising speculators have made a bid for all the old paving stones and gas lamps of Paris to be shipped to Monte Video and Buenos Ayres, to beautify the streets of those cities.

Scientific American.

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN, S. H. WALES, A. E. BEACH.

"The American News Company," Agents, 121 Nassau street, New York.

"The New York News Company," 8 Spruce street.

A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

Trubner & Co., 60 Paternoster Row London, are also Agents to receive subscriptions.

Messrs. Sampson, Low, Son & Marston, Booksellers, Crown Building 188 Fleet street, London, are the Agents to receive European subscriptions or advertisements for the SCIENTIFIC AMERICAN. Orders sent to them will be promptly attended to.

VOL. XIX., No. 20...[NEW SERIES.]....*Twenty-third Year.*

NEW YORK, WEDNESDAY, NOVEMBER 11, 1868.

Contents:

(Illustrated articles are marked with an asterisk.)

CAVEATS.

Whenever an inventor is engaged in working out a new improvement, and is fearful that some other party may get ahead of him in applying for a patent, it is desirable, under such circumstances, to file a caveat, which is good for one year, and during that time will operate to prevent the issue of a patent to other parties. The nature of a caveat is fully explained in our pamphlet, which we mail free of charge.

EUROPEAN PATENTS.

More than three-fourths of all the patents taken by American citizens in Europe have been secured through the Scientific American Patent Agency. Inventors should be careful to put their cases in the hands of responsible agents, as in England for example, the first introducer can take the patent and the rightful inventor has no remedy. We have recently issued a new edition of our Synopsis of European Patent Laws.

COMPARISON AND RELATION THE ONLY CRITERION OF SIZE.

The "mechanical eye," so valuable in mechanical operations, is educated wholly by the comparison of one object with another; it has no absolute virtue, or power of determining the real dimensions of any object. If it were so there would be small necessity for accurate rules and gages, by which the eye determines any dimensions. Let the most experienced mechanic be shown a piece of say three-quarters inch iron, in connection with other pieces of iron of one inch, and one and a quarter, and of three quarters and less, and he may find no difficulty in determining by his eye the diameter of either one of these pieces, it being considered, of course, that the diameter of some one or more of these pieces are known. Yet let this piece of three-quarters inch iron be shown in connection with bars of from two inches diameter to six inches, and it would puzzle the most educated eye to determine whether the three-quarter inch iron was of that size or whether it was seven-eighths or eleven-sixteenths of an inch in diameter. The reason is that the eye is insensibly misled or diverted from the object to be viewed, or rather is so occupied by the surroundings that an accurate estimate is impossible.

So distance, as all know, interferes with the exact action of the educated eye. No two mechanics, however skillful, will agree, for instance, on the exact size of a cross on a church steeple. Why? because there is no object near by which the relative hight or size of the cross may be gaged.

Yet even when there are means of comparing relative dimensions, it is sometimes difficult to determine size and position. In no case is this seen more plainly than in the work of the proof-reader who wishes to know if a letter is turned. Take the letters S, s, X, Z, and the figures 3 and 8. To the ordinary sight, the lower and upper half of these are identical in form and size; but let the reader reverse them—turn the page upside down—and he will see at once that there is a difference, so great that even the careless reader will be aware of it, although perhaps not able to decide where the discrepancy exists or to point out the remedy. The proof-reader, however, has educated his eye to such a nicety in ascertaining and comparing forms in the relations of contiguous objects that what would escape the notice of others arrests his attention, and he sees at once the trouble without the necessity of reversing the page for the purpose.

There is no fallacy so fallacious, no saying less an axiom, than that one may depend upon the evidence of his senses, especially the one of vision. To use this correctly the eye must be educated, and not only educated, but confined to the observation of a certain set of objects to acquire the skill which is the offspring of discrimination. The astronomer is not a chemist, who can detect the presence of the minutest portion of a foreign element in the substance he examines by the microscope. The sea-going man, used to peering through long distances, would be as much out of his sphere in the watchmaker's shop as a girl would be with the cares of a country on her brain. His eyes are as uneducated to the microscopic niceties of the watchmaker's art, as is the woman's brain to the responsibilities of government.

SELF-EDUCATION.

All men of distinction are self-educated men in one sense. The early possession of what are commonly termed educational "advantages," is of little value unless those who enjoy them have in themselves the elements without which such advantages are worthless. Given these elements and the "advantages" are not indispensable, although valuable. Circumstances have much to do in developing taste for study, which is the common characteristic of all thoroughly educated men. Many a young man who now looks upon the study of books as a dry and irksome task, would, if his attention were fixed upon some subject adapted to his tastes and moderate acquirements, entirely change his views. Without underrating the value of proper instruction, the fact that so many men have been able to achieve scientific eminence without it, is sufficient encouragement to such as are perforce deprived of it. To such, and there are not a few among the youth of this country, we offer a few suggestions as to the best course for self-training.

In higher institutions of learning it is usual to say one *reads* Latin or Greek, or mathematics or mechanics, rather than he studies this or the other subject. The word read is here a synonym for study. That is right; to read properly is to study in its highest sense. It is a much more difficult thing to read than most people think. For the most part that which is called reading is mere skimming. It occupies an idle hour by placing a variety of images before the mind in rapid succession, like a kaleidoscope, but like the images of that amusing toy, each is forgotten as a new one is presented; and after all is done nothing remains but a dim recollection of a jumble of colors. Nothing definite, nothing valuable is retained. But, says one, I read for amusement, and so long as I get that, I wish nothing more. To him we reply that our suggestions are not to him, at least until his tastes are radically changed. Only this much we will say to him; he greatly mistakes if he supposes that even the highest degree of amusement is to be obtained in such reading.

We affirm that when a youth has acquired the power to *read his own language* in the full meaning of the term, he is nine-tenths educated. We care not if he has never looked into a work on mathematics, or conjugated a Greek verb. He may know little or nothing of the sciences, but he has acquired the power to know any thing that any other mind can know, because he has mastered the means by which all knowledge is accessible to him—his mother tongue. Not obtained such a critical knowledge of its etymology as he will obtain by a classical course of reading, or of the niceties of grammatical construction; but mastered it in that he holds the keys that will unlock all the storehouses of learning. He is a mental gymnast who, although he has never attempted to raise the heavy weights of knowledge and science, need have no fear that he will fail in his attempts when he essays it.

Young men who are desirous to educate themselves, should select elementary treatises at first; such as treat of their subjects in a familiar manner. Having thus selected, they should set about reading them with the stern determination, not to let a single page, or line, or word, pass uncomprehended. Geographical names should be properly pronounced and the places they indicate carefully located, not on a map merely, but in the mind. Allusions to men and events should be at once followed by research into the histories of the men and the events themselves. The writer of this article once, upon commencing to peruse a volume found before he had got over the first page, that he must read up two or three biographies, and several other collateral matters before he could go on intelligently. Such occurrences will frequently happen, but the labor involved must not be shirked: if labor at first, it will soon become pleasure.

The habit of fixed attention is also of the utmost importance. A wandering mind is essentially a weak mind. If anything is unworthy attention, renounce it altogether, do not acquire that bad habit of at once half listening, and half pondering, so common and so enervating to mental vigor. Remember always, that *to get* is not so important as the *power* to get. Strive to obtain strength of mind rather than many ill-digested facts. Don't swallow facts whole any more than you would your food. Chew and digest. Overloading is as bad for the mind as for the stomach, therefore avoid cramming. Seek to learn the general principles of science rather than the bare details; the details will come upon application of the principles. Cultivate the habit of closely observing everything you see. Every natural thing is worthy the closest inspection. Works of art and mechanical construction are good studies whether meritorious or otherwise. If good, seek to know the elements of their worth; if bad, criticise their faults. If your tastes incline to any particular field of study, let them run. Don't seek to stop them. You will succeed best in that field. Above all, avoid the pernicious habits of listlessness and day-dreaming, and remember that the chief attribute of genius, if there is anything can be called genius, is the disposition to study anywhere and everywhere, with or without book, to think not hap-hazard, but to think fixedly and connectedly upon what you will. You can study while you are working at a vise, or at the lathe, or pegging a shoe; but it must be thought that is subject to your will; kept within prescribed bounds, or it becomes the day-dreaming which we have cautioned you against.

Lastly, while we do not condemn indiscriminately the reading of works of fiction, we assert that until you have ripened and improved your tastes by a different class of literature, you can not be judges of what is good or bad in fiction; so that if you read such works at all, you should do it under the direction of some one who is competent to advise you what is meritorious and what is to be avoided.

"GOLD! GOLD! HARD TO GET AND HEAVY TO HOLD."

The above line was written at a time when the sources of gold were less numerous than at present, when fewer men were employed in digging it—when the supply was very much less than now. Notwithstanding, gold is harder to get now than in Hood's time, and still harder to keep when got. The reason for the firmness in the price of gold seems to be a universal topic, just now, among papers devoted to finance. Very little light is thrown upon the subject by the essays which we have perused. The fact that the supply has largely increased, is urged to show that present rates are too high. The collateral fact, that gold is used up very slowly, at best, by wear, losses at sea, etc., is also strongly urged to prove that there must be a large increase in the amount of gold in circulation.

The gold fields of California, Australia, Colorado, Idaho, and Montana, have been successively developed during the last twenty years, and have poured an enormous amount of gold into the general current. Since 1850, one billion of dollars' worth of gold has been mined, yet the relative value of gold to other precious metals remains essentially unchanged.

It was predicted, ten years ago, that the price of gold must become permanently depreciated by the large increase in production. To-day that prediction remains unfulfilled; yet to-day the prediction is as confidently reasserted, as it was ten years ago. The quite general distribution of gold, in mountain ranges everywhere, is an admitted fact. At present, it is only profitable to mine for it under circumstances of comparatively little difficulty, so that many large deposits remain unmolested. New deposits are constantly coming to light, so that the supply annually increases rather than diminishes. Accounts reach us of mines of extraordinary richness in Southern Africa. The mines of Italy are just beginning to pay, while the mines of Frontino and Bolivia seem to give specimens of remarkable richness.

Are, then, the predictions of which we have spoken about to be realized? We think not. We believe that, in 1878, gold will be found to have still maintained its relative value, in spite of the large amount that may reasonably be expected to be taken out before that time.

Briefly, our reasons for this opinion are these: First, gold is a commodity as much as iron, and is subject to the same laws of supply and demand. Second, the demand has increased, in the past, and, we are confident, will increase in the future as fast or faster than the supply. The uses of gold in the arts are increasing in number and extent. Compare the number of gold watches, the amount of gold employed in jewelry, dentistry, gilding, bookbinding, etc., with the same, twenty years ago, and it will at once be evident that the demand has increased without resort to statistics. The population of the world is increasing, and, more important still in its effects upon a demand for gold, is the rapid march of civilization, and the consequent spread of a taste for general ornament, in which gold is so largely used.

Here we have elements of increased demand to compensate for increased supply. Those who only think of gold as currency must of course be misled, in their opinions upon this subject. There is probably far more gold in this country to-day applied to ornamental uses than exists in coin. Nearly all above the lowest walks of life have more or less of it upon their persons and in their houses. So long as this is the case, so long as population continues to increase at its present rate, and civilization advances, so long will gold maintain its standard of value, if indeed it does not rise above it.

EXPANSION OF ICE.

A discussion upon the expansion or contraction of ice by the action of cold is exciting much interest in England, both on account of the subject itself, and the high authorities which are parties in the discussion. Prof. Tyndall takes the ground that it expands. Other eminent philosophers dispute the accuracy of the experiment from which Dr. Tyndall draws his conclusions. The experiment is as follows: Around nicely fitted blocks of ice he places bands of cast iron; upon submitting the whole to the action of a freezing mixture the bands soon burst with a loud report. Those who doubt the correctness of Dr. Tyndall's conclusion, argue that the experiment does not prove that ice expands, as the contraction of the iron is sufficient to account for the bursting of the bands. They further confirm their opinions by the fact that the ice which forms upon the surface of the British American Lakes, often to a thickness of several inches during a single cold night, will, upon the recurrence of severe cold, crack open widely. This is thought to indicate contraction instead of expansion. It certainly seems that the experiment of bursting iron rings by refrigeration is not altogether conclusive of the expansion of ice, still although it may be defective, we are inclined to the opinion that ice does expand as the temperature diminishes. If such should be the case, it appears to us that it would easily be determined by a specific gravity test, weighting the ice with platinum, and using mercury as a means of making the test, that substance remaining fluid at low temperatures, and having no solvent power on ice. It would be easy to make a proper allowance for the increased specific gravity of the mercury as the temperature diminishes.

TRANSPORTATION OF CATTLE---REID'S PATENT CATTLE WAGONS.

Some years since, while we were standing in the depot of the New York Central Railroad, at Amsterdam, awaiting the arrival of an express train from the East, there passed the station two enormous trains from the West, each requiring two locomotives to draw them, and laden with live cattle for the New York market. Live cattle, did we say? We must quality that statement, for, on either train, there were some dead, others in a dying state, while all were greatly distressed, as was evident by their violent panting and protruding tongues. Some were prostrate under the feet of the rest, powerless to rise. The causes for this state of things was obvious. The weather was intensely hot, and the cattle crowded together as close as they could possibly stand, and not having been allowed to drink since they left Buffalo, were dying of thirst. We remarked, at the time, that it seemed an easy task to provide water for cattle thus transported, but a fellow traveler remarked that, were a proper apparatus constructed, no railroad in this country would adopt it unless compelled to do it. We, however, hoped, and still hope, that the greed of railroad corporations will not prevent the universal adoption of any simple method for securing such a humane object.

Our attention has been called to a simple and effective mode of supplying cattle with water while being transported in railway cars, invented by Wm. Reid, of Granton Harbor, near Edinburgh, Scotland, which seems admirably adapted to the purpose. The cars are provided with troughs, to which water can be readily supplied while the trains are stopped for taking in water for the use of the engine.

There is no doubt that many cattle become diseased by confinement without water during transportation, and that their meat, rendered more or less unwholesome by it, is sold and eaten, to the detriment of public health. The knowledge of this fact will do more toward correcting the evil than an appeal to the humanity of individuals. If railroad corporations refuse to correct it, they should be compelled to do so by legislation.

NEW MEXICO, ITS NATURAL WEALTH.

The Honorable W. F. M. Arny, ex-governor of New Mexico, has presented to the geological and mineral museum of the United States Department of Agriculture, a collection of specimens of minerals, fossils, agricultural products, etc., from which an idea of the natural resources of that territory may be obtained.

Among these specimens are native copper from the Tijeris mountain, a short distance from Santa Fe; bituminous shale from Placer mountain; iron ore from the San Juan country; brown copper ore from the San Dio range, also but a short distance from Santa Fe; limonite from the vicinity of Placer mountain; purple copper and native copper from the Nacia-mento mountains; iron pyrites, drusic, quartz, felspathic trachyte, pumice, and trachyte from the San Juan. Indian country; argentiferous galena from Stevenson's mine in Dona Anna county, native copper from Hanover mine near Gila river; marble from near Santa Fe; argentiferous galena from Valencia county; dentritic manganese in felspar paste containing gold, from Placer mountain; gold bearing quartz and native copper from the vicinity of Abiqui, Rio Arriba county; conglomerate containing gold from the Ute creek on Maxwell's ranch stated to be unsurpassed in richness, various grades of wool, corals, and so forth.

Strikng as is this exhibit of mineral wealth, there is little doubt that much remains yet to be discovered. The rapid development of these resources is however interfered with by the depredations of Indians who render mining operations, except in places near centres of white population, extremely hazardous. Governor Arny asserts his belief that the mineral wealth of the mountains of New Mexico would pay twice our national debt, if miners could be permitted to develop it in safety. His opinion is that "is is cheaper to feed than to fight Indians, and that the Indians of New Mexico can all be placed on reservations without a war, if Congress will make sufficient appropriations to feed them, and furnish the necessary machinery to enable them to make their own clothing and establish industrial schools, to be kept up at the expense of the Government till the Indians are made self-sustaining, which, by faithful agents, can be done in a few years."

With these Indians such a plan might prove successful, as they are said to be already partially civilized, but so far as our knowledge of Indian reservations extends they are generally constant bills of expense to the Government; the Indians are not self-sustaining and the agents are far more interested in making money for themselves, than in caring for the trusts imposed upon them. We have always held the opinion that a race who will not become civilized, and who at the same time resist the onward sweep of civilization, must not only be inevitably swept before it to extinction, but that they deserve scarcely more sympathy than the other savage beasts of the forest whose ferocity they not only imitate, but surpass. We believe that although feeding may be cheaper—so far as money goes—than fighting, the only effectual remedy for Indian outrages on our frontiers, is the strong hand. The only way to conquer the American savage is to punish such outrages by almost total extermination of the tribes that perpetrate them. To exhibit mercy to these butchers is to waste powder.

ON A PROBABLE CONNECTION BETWEEN THE RESISTANCE OF SHIPS AND THEIR MEAN DEPTH OF IMMERSION.

By W. J. Macquorn Rankine, C.E., LL.D., F.R.S.

1. It was pointed out some time ago, that when a wave in water is raised by a floating solid body which is propelled at a speed greater than the natural speed of the wave, the ridge of the wave assumes an oblique position, and the wave advances obliquely; so that while it travels at its own natural speed in a direction perpendicular to its ridge line, it at the same time accompanies the motion of the solid body at a greater speed. The angle of obliquity of the advance of the wave is such that its cosine is the ratio of the natural speed of the wave to the speed of the solid body. It was at the same time pointed out that under those circumstances there is an additional breadth of wave raised in each second, expressed by the product of the speed of the solid body into the sine of the obliquity; or, in other words, by the third side of a right-angled triangle, of which the speed of the solid body is the hypothenuse, and the natural speed of the wave the base; that in raising that additional breadth of wave per second, energy is expended; and thus that a rapidly increasing additional term is introduced into the resistance to the motion of the solid body, so soon as its speed exceeds the natural speed of the waves which it raises.

2. The waves taken into account in Mr. Scott Russell's theory of the resistance of ships, are waves whose speed depends on their length alone; and that theory accounts for a rapid increase in the resistance of a ship, when her speed exceeds the natural speed of certain waves of lengths depending on her length.

3. In a paper read to the Royal Society in May, 1868, it was shown that for all waves whatsoever, there is a relation between the natural speed and the virtual depth of uniform disturbance, that is to say, the surface particles would have to extend in order to make a total volume of disturbance of the water equal to the actual volume of disturbance. That relation is, that the speed of advance of the wave is that due to a fall of half the virtual depth. In a paper read to the Institution of Naval Architects in 1868, it was pointed out that every ship is probably accompanied by waves, whose natural speed depends on the virtual depth to which she disturbs the water, and that, consequently, when the speed of the ship exceeds that natural speed, there is probably an additional term in the resistance depending on such excess.

4. The object of the present paper is to call the attention of the British Association, and especially of the committee on Steamship Performance, to the probable existence of this hitherto neglected element in the resistance of ships; and to suggest that suitable observations and calculations should be made in order to discover its amount and its laws. Among observations which would be serviceable for that purpose may be mentioned the measurement of the angles of divergence of the wave ridges raised by various vessels at given speeds, and the determination of the figures of those ridges which are well known to be curved; and among results of calculation the mean depth of immersion, as found by dividing the volume of displacement by the area of the plane of flotation; and that not only for the whole ship, but for her fore and after bodies separately, for it is probable that the virtual depth of uniform disturbance, if not equal to the mean depth of immersion, is connected with it by some definite relation.

Results of Observations.—In an appendix are given the results of the only three observations which I have hitherto found it practicable to make, of the speed of advance of the obliquely diverging waves raised by ships. The waves in each case were those which follow the stern of the vessel; the vessels were all paddle steamers, but care was taken to observe the positions of the wave ridges where they were beyond the influence of the paddle race. The virtual depth corresponding to the speed of advance of those waves is calculated in each case, and it is found to agree very nearly with the mean depth of immersion. It is to be observed, however, that the mean depth of immersion of one vessel only, viz., the *Iona*, has been measured from her plans. For each of the other vessels, a probable value of the mean depth of immersion has been obtained, by assuming that it bears the same proportion nearly to the total draft of water in them as the in the *Iona*. That assumption cannot be very far from the truth, for the three vessels belong to the same class of forms, being of shallow draft, and very flat bottomed amidships, but having very fine sharp ends. Few as those observations are, they seem sufficient to prove the existence of waves whose speed of advance depends on the depth to which the vessel disturbs the water. The connection between those waves and the resistance remains as a subject for future investigation.

Glasgow University, 15th August, 1868.

APPENDIX.

1. *Steam Vessel "Iona."*—Speed of vessel at time of observation, 15 knots=25·35 ft. per sec.; angle made by ridges of stern waves with course of vessel, $22\frac{1}{2}°$; sine of that angle, 0·383; product, being velocity of advance of stern waves, 9·71 ft. per sec.; virtual depth corresponding to that velocity $9·71^2 \div 32·2 = 2·93$ ft.; mean depth of immersion of vessel as measured on her plans, 3·18 ft. N. B.—The draft of water was 5 ft., so the mean depth of immersion was 0·64 of the draft, nearly.

2. *Granton and Burntisland Ferry Steamer.*—Speed of vessel at time of observation, 10 knots=16·9 ft. per sec; angle made by ridges of stern waves with course of vessel, 45°; sine of that angle, 0·7071; product, being velocity of advance of the stern waves, 11·95 ft. per sec.; virtual depth corresponding to that velocity, $11·95^2 \div 32·2 = 4·44$ ft.; draft of water of the vessel, 6·67 ft; probable mean depth of immersion on the supposition that it is 0·64 of the draft, 4·3 ft.

3. *Steam Vessel "Chancellor."*—Speed of vessel at time of observation, 12·64 knots=21·36 ft. per sec.; angle made by ridges of stern waves with course of vessel, 22°; sine of that angle, 0·375; product, being velocity of advance of the stern waves, 8·01 ft. per sec.; virtual depth corresponding to that velocity, $8·01^2 \div 32·2 = 2$ ft.; draft of water of the vessel, 3·5 ft.; probable mean depth of immersion, on the supposition that it is 0·64 of the draft, 2·24 ft.

TABLE OF VIRTUAL DEPTHS CORRESPONDING TO DIFFERENT VELOCITIES OF ADVANCE.

	Velocity of Advance.		Virtual Depth.	
Knots.	Feet per second.	Meters per second.	Feet.	Meters.
1	1·69	0·515	0·09	0· 27
2	3·38	1·03	0·35	0 08
3	5·06	1·54	0·80	0·243
4	6·75	2·06	1·41	0·433
5	8·44	2·57	2·21	0·676
6	10·13	3·09	3·18	0·973
7	11·8	3·60	4·33	1·325
8	13·5	4·12	5·66	1·73
9	15·2	4·63	7·16	2·19
10	16·9	5·15	8·84	2·70
11	18·6	5·66	10·7	3·27
12	20·3	6·18	12·7	3·89
13	21·9	6·69	14·9	4·57
14	23·6	7·20	17·3	5·30
15	25·3	7·72	19·9	6·08
16	27·0	8·24	2 ·6	6·92
17	28·7	8·75	25·6	7·81

—*The London Artizan.*

CHEMICAL NOMENCLATURE.

[Continued from page 50.]

The combination of the different elementary substances takes place by a certain attractive power of their smaller particles (atoms or molecules), which is called chemical affinity. As may be expected *a priori*, it differs greatly in different substances, and even differs in the same two substances when the circumstances are changed. The principal modifying circumstance is heat.

Carbon and oxygen, at the common temperature, have no affinity, that is to say, they will not combine. A piece of carbon may lie for a century in oxygen gas without combination taking place, but when sufficient heat is applied the two substances combine with great energy. However, the amount of heat necessary to cause this combination differs according to the form of carbon used. Thus, lamp-black requires much less heat than charcoal, more heat will be required to ignite coke, more still for anthracite coal, yet more for diamond, and, as regards graphite, we can scarcely produce heat enough to ignite it. The comparative incombustible nature of the last named substance, renders it suitable for crucibles for melting brass and other metals or alloys. All these substances are only carbon in different states, called allotropic conditions.

At the same time that the combustion commences to take place, it develops new heat in abundance heating up the adjacent parts to the temperature required for combination in their turn, and so keeping up the heat to cause the final combustion of any amount of carbon and oxygen present. In the place of carbon, sulphur or any other so-called combustible substance may be substituted.

Combustion, therefore, is nothing but a chemical combination of a so-called combustible substance (carbon, sulphur, hydrogen, phosphorus, etc.), usually with the oxygen of the atmosphere; all that is required to start it, is a sufficient rise of temperature, and any large conflagration gives a striking illustration of the considerable development of heat, which is the result.

By the combustion of carbon, every six parts thereof will unite with sixteen of oxygen, when plenty of oxygen is present; by a limited supply of this last substance, it will only combine with eight parts; and, as the symbol C stands for six parts of carbon and O for eight of oxygen, the product of this combustion is expressed in the first case by $C\,O_2$, in the last by C O; and as the first possesses acid properties it is called carbonic acid, and the last possessing no such properties is called carbonic oxide; the last being the generic name for all combinations with oxygen which possess no acid properties.

The combustion of sulphur has for result, the combination of sixteen parts of sulphur with sixteen of oxygen; formula, SO_2, named sulphurous acid.

Selenium and tellurium combine after the same law and with similar results as sulphur, except that the respective numbers of combination are 40 and 64, respectively with sixteen of oxygen; formulæ, $Se\,O_2$ and $Te\,O_2$.

The combustion of hydrogen has for result a compound of one part of hydrogen (always by weight) with eight of oxygen, forming water; formula, H O.

The combustion of phosphorus forms phosphoric acid; formula, $P\,O_5$, which means thirty-one parts of phosphorus and forty of oxygen.

The combustion of potassium forms potassa; formula, K O, which means thirty-nine parts of the metal and eight of oxygen.

Magnesium burning forms magnesia; formula, Mn O, or thirteen parts of magnesium and eight of oxygen.

Zinc burning forms oxide of zinc or zinc white; Zn O containing thirty-two parts of zinc and eight of oxygen.

Of all the substances mentioned above, there is none that has more affinity for oxygen than red hot carbon; for this reason carbon is used as the great reducing agent, and almost any oxidized substance mixed with carbon and heated, will give its oxygen to the carbon, and carbonic acid will be formed. On this principle depends the reduction of iron from its ores, the manufacture of potassium, sodium, etc.; and it shows that also in chemistry the law of the strongest prevails, just as in all nature, not excepting the human race. In savage nations, brute strength only prevails, but among civilized people, the strength of mind and knowledge subdues the mere material brute forces, and illustrates the superiority of mind over matter.

The Great Chaudiere Dam on the Ottawa.

The Ottawa *Times* gives an account of the great Chaudiere dam on the Ottawa river, which was formally opened Oct. 16th. It states that it has been ascertained that for years past the water in the Ottawa during the autumn months has been gradually decreasing in volume, and never before has it been so low as this season. The cause will doubtless remain a mystery until the end of time. In fact so low had the water fallen, that for a time apprehensions were entertained that the great mills and factories at this place would be compelled to shut down in consequence. This would have been almost a calamity, had the necessity for it arisen, as many thousands derive their livelihood from their constant operation. However, human ingenuity came to the rescue, and provided a certain and lasting remedy.

An arrangement had been effected sometime since between the mill-owners here and the Government, that the former might construct a dam in the bed of the river, just above the Chaudiere Falls, for the purpose of raising the water in the rear, with a view to augmenting the supply in the ponds and "flooms" connected with the mills. Then arose the difficulty about drowning the adjacent country on both sides. This was provided against by the removal of an island, in the immediate vicinity of the dam, to low water level, so as to admit of its escape when high. This part of the work has been so managed, that the obstruction caused by the dam in low water will be equaled by its facility for escaping during high water—there being an exact quantity of high water obstruction removed to equal that put in to affect the low.

It was no ordinary undertaking to control the impetuous waters of the great Ottawa, and subject their powers to the manipulation of man—to obey his will, and to be obedient to his wishes and desires; but with all old Ottawa's greatness it has been brought down to usefulness, and compelled to exercise a certain amount of industry before taking its departure for its final home in the bosom of the Atlantic.

The entire length of the dam is nearly 400 feet, built of framed beams strongly bolted, and securely fastened to the solid rock in the bed of the river. Its width at the base is 74 feet and 62 feet at the top, with a secure bed of stone presented to the current. The island which was removed was about two acres in extent, and stood about 5 feet 6 inches above the water level. This furnished 9,000 yards of stone which were used in filling in the dam.

The New Metals.

The Boston *Journal of Chemistry* says:—We presume but comparatively few of our readers have had opportunities of examining the new metals brought to light by spectrum analysis. The two most remarkable, *cæsium* and *rubidium*, are strikingly like the metal potassium; and so greedy are they for oxygen, it is necessary to keep them constantly immersed in pure naphtha. The expense of eliminating these rare and sparsely disseminated metals is so great, their cost is marvelously high. A specimen of rubidium in our possession cost us at the rate of more than seven thousand dollars a pound, or one dollar the grain. These two new alkaline metals were discovered by Bunsen, a few years ago, while experimenting upon some mineral waters with the spectroscope. By no other method of analysis could they have been discovered. In examining the waters, he observed some bright lines he had not seen in any other alkalies which he had investigated. He felt certain that these lines indicated a new metal or metals, just as Adams and Leverrier, from the perturbations of the planet Uranus, were convinced of the existence of Neptune. The amount present in the substance examined could not exceed the one thousandth part of a grain; hence, the quantity held in the water was infinitesimal. To obtain a manageable quantity, Bunsen evaporated forty tuns of the Durkheim Spring water, and from this vast amount obtained of cæsium only 105 grains of the chloride, and of rubidium 135 grains! How few know anything of the magnitude of the labors of chemists engaged in research. Since the discovery of the new metals, in the spring water of Durkheim, they have been found in many other springs, in mica, and other old plutonic silicates; also, in the ashes of beetroot, tobacco, coffee, and grapes. The mineral lepidolite contains considerable rubidium, and most of the specimens in the hands of chemists were obtained from that mineral. We can not predict for the new alkaline metals any very great practical use in the arts.

The other new and interesting metals which we find in our collection are *lithium*, *thallium*, and *indium*. The first of these is of white color, and fuses at 180°. It is the lightest metal known, being almost as light as cork. Before spectrum analysis was discovered, it was supposed the lithium salts were very rare; but the wonderful spectroscope reveals their presence in almost all waters, in milk, tobacco, and even in human blood. A very strange plant is the tobacco plant. How singular, that atoms of the rarest and most remarkable of all the metals—cæsium, rubidium, and lithium—should be found in this pungent weed! When volatile lithium compounds are heated in flame, they impart to it a most magnificent crimson tinge; nothing in ordinary pyrotechny can compare with it. If one six-thousandth part of a grain of lithium be present in a body, the spectroscope shows it when it is volatilized, or burned.

Sumac.

Considerable inquiry having been recently made for information upon the subject of sumac, the commerce in which seems to be growing in this country, the following from the New York *Mercantile Journal* will be of interest:

"The sumacs belong to the Rhus genus of the order of Anacardiaceæ of plants. Gray, the botanist, makes six varieties of sumac found in America from Virginia northward; namely, the Staghorn sumac, Smooth sumac, Dwarf sumac, Poison sumac, Poison ivy, and the Fragrant sumac. The sumacs have a resinous, milky, acrid sap, and several varieties are poisonous. Several kinds, among which are the most common varieties in this country, namely, the Staghorn and Smooth sumac, contain tannin and yellow coloring matter, and are considerably used for tanning light colored leathers and in dyeing. It is also used in calico printing for producing yellow, grey, or black or brownish yellow, according to the mordant used in the operation. A number of varieties grow in different parts of Europe, which are used for the purposes above specified. The cultivation of this tree for its marketable products has largely increased in some parts of the United States during the past four or five years. The parts of the tree which are gathered are the leaves, the peduncles, young branches, and panicles, of which considerable quantities are exported."

The Richmond *Enquirer* says: "Large quantities are gathered in the counties of Eastern Virginia, and sent to Richmond, Alexandria and Fredericksburg for sale. It is dried and packed in bags, and sells readily for from $1.75 to $2 per 100 pounds. It grows spontaneously, and the crop of next year is improved by breaking off the growth of the present year."

The mordants used in dyeing with this substance are either tin, acetate of iron, or sulphate of zinc. The first gives yellow, the second grey or black, according to strength, and the third brownish yellow.

A Challenge from a Lady.

NEW YORK, Oct. 20, 1868.

Messrs. WHEELER & WILSON, No. 625 Broadway:

Gentlemen:—Referring to the challenge of Mr. Pratt, whose Wheeler & Wilson Sewing Machine has been in use ten years without repairing, I beg to state that I have used my Wheeler & Wilson Sewing Machine, in family sewing, *fourteen years*, without even the most triffling repairs, and it is now in so good condition that I would not exchange it for your latest number (now upward of 350,000). One needle served me more than a year for fine sewing.

Can any one beat this?

Yours truly, Mrs. ANNE WARNER.

Any one who can give a better report than this will be entitled to one of our new tucking gages.

WHEELER & WILSON MANUFACTURING CO.

CHILIAN AGRICULTURAL EXPOSITION.—With reference to the Agricultural Exposition to be opened at Santiago, in Chili, South America, on the 1st of April next—the particulars of which appeared in our issue of the 22d July—we have to state that the Chilian Minister expresses the hope that manufacturers throughout the country are preparing the contributions they intend to exhibit. We learn that liberal and extensive preparations are being made by that Government for the accommodation of all.

OFFICIAL REPORT OF
PATENTS AND CLAIMS
Issued by the United States Patent Office.

FOR THE WEEK ENDING OCTOBER 27, 1868.

Reported Officially for the Scientific American.

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83,355.—HARVESTER RAKE.—Philip Ammerman, Cynthiana, Ky.
I claim the guide bar, k, and beveled block or cap, t, in combination with rake, A, and endless chain, C, substantially as and for the purpose described.

83,356.—SUGAR PAN DERRICK.—Joseph D. Ayers, East Greensborough, assignor to J. O. Cutter, and William Wallace Goss, Greensborough, Vt.
I claim, 1st, The combination, in a sugar pan derrick, of the guide beams, B B', guide post, G, rotating upright, A, pulley, k, cords, a b, derrick beam, C, drum and crank handle, l, all constructed and operating substantially as shown and described, and for the purpose set forth.
2d, The frame, m m o o, hook rods, h h h h, and braces, q q, with the parts specified in clause first of the claim, all substantially as shown and described, and for the purpose set forth.

83,357.—MANUFACTURE OF PIGMENTS FROM THE SULPHURETS OF ZINC AND LEAD.—Nathan Bartlett, Centerville, N. J., assignor to himself and Franklin Osgood, Richmond County, N. Y.
I claim, 1st, The manufacturing of pigments from the sulphurets of zinc and lead, combined in the manner and by the means substantially as herein described.
2d, Also, the pigment made from the sulphurets of zinc and lead, as a new article of manufacture.

83,358.—AUTOMATIC CAR COUPLING.—Wilson Bragg, Connersville, Ind.
I claim the combination of the chain, E, sliding block, C, and coupling pin, F, substantially as and for the purposes specified.

83,359.—HOT AIR REGISTER.—Thomas W. Brown, Reading, Pa.
I claim the improvement of having the sectoral lever fixed directly to the slat journal, when the slats are pivoted to the frame, and to a connection bar having no pivoted connection with the sectoral lever, as set forth, the whole being substantially as described and represented.

83,360.—SPRING.—Frederick Cajar (assignor to himself and James Anderson), New York city.
I claim elliptical or arched springs, made of corrugated sheets or plates, arranged as herein shown and described, substantially as and for the purpose set forth.

83,361.—MILL FOR TEMPERING CLAY.—George Carnell, Samuel Williams, and William Ellis, Philadelphia, Pa.
We claim the inverted double rack, H, cast with a cover, h2, and internal web, h3, in combination with saddle, M, and pinion, E, for operating the wheel, B, of a clay mill, in the manner substantially as shown and described.

83,362.—JIG SAW.—Joseph E. Chamberlin, Wilmington, Del.
I claim the circular timber, b, with its vernier plate and index, iron band, d d, sliding head blocks, c c, braces, e e, and saw, s, in combination with the semi-circular ways, y y, carriage, 5, segment, i, pinions, g g, h h, pulley, 6, and their connecting or reciprocating appliances, constructed, arranged, and operating substantially as and for the purposes set forth.

83,363.—FOLDING PERAMBULATOR.—Andrew Christian, New York city.
I claim, 1st, Extending the front uprights, D, of a folding perambulator downward, to form supports for the front axle, J, as set forth.
2d, Extending the rear uprights, E, of a folding perambulator upward, to form supports for the handle, I, as set forth.
3d, Constructing the jointed arm supports, H, of a folding perambulator, of two parts, a b, which are pivoted together, as set forth, the narrow part, b, fitting into a groove in the under side of the main part, a, as shown.

83,364.—SEEDING MACHINE.—N. A. Clopton, and John S. Clopton, Fauquier County, Va.
We claim the combination and arrangement of the reciprocating slides, k l, vibrating arms or levers, h, connecting pipes or links, j, pivoted arms, g f, and springs, l, or their equivalents, constructed and operated in the manner substantially as shown and described, and for the purpose set forth.

83,365.—MACHINE FOR EDGING METALS.—William Crossley Chicago, Ill.
I claim the combination of the slotted guide, C C', carriage, B E, clamp A, track, G G, slides, M M, crank screw, and slides, F F, constructed as and for the purpose set forth.

83,366.—DRILL PRESS.—John M. Cullen, and Andrew J. Baird, Pittsburg, Pa.
We claim, not any of the specified parts in severalty, but the improved tool, consisting of the several parts specified, all combined, constructed, and arranged as described.

83,367.—FRUIT JAR.—Edward M. Davis (assignor to Henry M. Collins, Benjamin F. Collins, and Homer Wright), Pittsburg, Pa.
I claim, 1st, The method, substantially as described, of labeling preserve cans and other similar vessels, in the act of sealing the covers of such vessels upon them.
2d, The cover, B, constructed with names radiating from its center, and adapted for use upon a preserve vessel, having an index of a suitable description upon it, substantially as and for the purposes described.

83,368.—ATTACHING STRINGS TO TAGS.—Benjamin L. Dennison, Boston, Mass.
I claim, 1st, The combination of the metallic clasp, a, with the string and label card, substantially as and for the purposes described.
2d, The metallic clasp, a, figs. 2 and 5, constructed so as to operate as a clasp, a needle, and a bar, at the same time, substantially as and for the purposes described.

83,369.—COMBINED HINGE AND FASTENER.—Leonard Felker, Tewkesbury, Mass.
I claim the combination and arrangement of the support, e, with its stem, c, and pintle, d, latches, h and i, and catches, b and b', and wings, f f, with or without the plate, a, when arranged to operate as and for the purpose described and set forth.

83,370.—FEED WATER HEATER FOR STEAM GENERATORS.—R. R. Fenner (assignor to himself and Eli Halberstadt) Urbana, Ill.
I claim the arrangement of the supply pipe, E, exhaust pipe, C, ingress pipe, B, water delivery pipe, G, filter, I, and vessel, A, substantially as herein set forth.

83,371.—SCREW TAP.—Walter K. Foster, Cambridgeport, Mass.
I claim the arrangement of the main and lateral oiling passages, a b, and the groove, d, in one of the ranges, of screw cutters, the whole being substantially as described.

83,372.—PROCESS FOR THE MANUFACTURE OF IODINE.—Jules Fouzerat and Lucien A. Tartieré, Quogue, N. Y., assignors to "The Alga Chemical Works," New York city.
We claim, 1st, Filtering the calcinized and boiled mussels, preparatory to their distillation, as set forth.
2d, The application of peroxide of manganese to the making of iodine from mussels, as set forth.
3d, The process herein specified of producing iodine from mussels.

83,373.—SPRING BED BOTTOM.—Thomas J. Gaffney and Charles H. Ducks, Detroit, Mich.
We claim the leather strips, H, in combination with the longitudinal top slats, G, and transverse steel bars, E, whereby the slats are secured to the bars, as herein shown and described.

83,374.—VULCANIZED INDIA-RUBBER BELTING.—Dennis C. Gately, Newtown, Conn., assignor to New York Belting and Packing Company. Antedated October 2, 1868.
I claim, 1st, Belting or banding for driving machinery, composed of paper or other pulped and calendered material, combined with india-rubber or other vulcanizable material, substantially as herein set forth.
2d, The use, in combination with paper or other pulped and calendered material, of a vulcanizable cement, applied either externally as a coating, or both internally, as a cement between several layers of paper, and externally, substantially as and for the purposes set forth.
3d, The vulcanizing of paper belting, with rubber or other material or compound capable of vulcanization, between metal plates or otherwise, as herein indicated, so as to produce a smooth surface on the belts, substantially as set for.

83,375.—SPINNING MACHINE.—John Goulding, Worcester, Mass.
I claim, 1st, The combination of the segment cam, k, in two parts, elastic roller, j, brake lever, s, with its pin, n, and disk, v, or their equivalents, for giving an intermittent feed to the roving, and so that the quantity of roving given out for each revolution of segment cam, k, can be regulated substantially as set forth.
2d, The segment cam, k, in two parts, elastic roller, j, brake lever, S, with its pin, n, disk, v, drum, G, rollers, J I, and spool, e, in combination with the twisting tube, K, provided with a staple, n', or their equivalents, to produce a counter twist to the roving, substantially as set forth.
3d, The segment cam, k, in two parts, elastic roller, j, brake lever, S, with its pin, n, disk, v, drum, G, roller, J, spool, e, twisting tube, K, with a staple, n', in combination with drawing rollers, c' c'' d', flyer, F, spindle, F', bobbin, g', or their equivalents, to produce yarn from roving, substantially as set forth.
4th, The conical cam, H, or its equivalent, mounted on the traversing shaft, N, in combination with the tappet arm, j', lever, k', sliding wedge, n, chain wheels, T, and chain, i', which support the spindle rails, M', substantially as set forth.

83,376.—BOLT-HEADING MACHINE.—Robert Gracey, Pittsburg, Pa.
I claim, 1st, The weighted lever, F, link, G, and toggle arms, K K, in combination with the header, N, and steam cylinder, A, arranged and operating substantially as described.
2d, An adjustable spring bumper head, J, arranged in relation to the weighted drop beam, F, toggles K K', and piston I, steam cylinder, A, for regulating the throw of bolt-heading dies, substantially as and for the purposes hereinbefore set forth.

83,377.—DIE FOR BOLT-MAKING MACHINES.—Robert Gracey, Pittsburg, Pa.
I claim, 1st, The combination of the dies, a a', die blocks, b b', and plunger, f, with or without the socket, o, said parts being arranged substantially as described.
2d, The griping dies, a a', with raised projection, d, in combination with the die blocks, b b', having water passages, n n', when so arranged, substantially as hereinbefore described, as to form an enclosed space for the passage of water around the raised portion of the dies whenever the heading tool is withdrawn.

83,378.—INDEX.—Henry H. Hall, Boston, Mass.
I claim the within-described index or tabular guide to indexes, consisting of the combination of letters and figures, substantially as and for the purposes set forth.

83,379.—IRONING TABLE.—L. Harrington, Saugatuck, Mich.
I claim a folding table, made with a three part top, A B C, in combination with flat iron holder, H, I, hinged leg, G, supporting a pivoted bearer, S, and bearer, T, constructed and arranged to operate substantially as and for the purpose set forth.

83,380.—CHECK-VALVE FOR STEAM AND OTHER ENGINERY.—Joel Hayden, Jr., Haydenville, Mass.
I claim the combination of the valve, J, cup, F, connecting rod, G, outlet, D, and inlet, C, with a partition, A, and valve seat, B, between them, whereby the fluid or liquid is enabled to close the valve by its pressure against the cup, when the valve is relieved from outside force, substantially as herein described and shown.

83,381.—BUCKLE.—Henry Herbert, Jersey City, N. J.
I claim the self-fastening buckle, consisting of a frame and two slotted slides, for the purpose substantially as described.

83,382.—HOT BLAST APPARATUS FOR PUDDLING AND OTHER FURNACES.—F. Hoop, Jr., and R. Hoop, Berlin Cross Roads, Ohio.
We claim, 1st, The rings, C, provided with the lugs, c, in combination with the foundation plates, e, as and for the purposes described.
2d, The rings, C, in combination with the pipes, D, made in three or more sections, and having their middle portions outside the chimney, as and for the purpose specified.

83,383.—DEVICE FOR SHARPENING SAWS.—David Huffman, Luray, Va.
I claim the block, A, jaws, B B, and screws, e e, when constructed and arranged as described, and for the purpose set forth.

83,384.—STEAM GENERATOR.—R. W. Humphreys, Clarksville, Tenn.
I claim a steam boiler, in the form of a hollow cylindrical annular ring, with its top and fire flues, and smoke stack, attached substantially in the manner herein shown and described.

83,385.—ELEVATOR.—Amos B. Hunt, Matteson, Mich.
I claim, 1st, The crane, B, crane post, A, sheaves or pulleys, arranged at the points, d f h and I, rope or cord, C, arranged on the sheaves and passing down through the crane post, in combination with a winch bar, G, all substantially as set forth.
2d, The swivel hook, I, and its accessory parts, [illegible] in combination with the pin, [illegible] and tripping device, [illegible] all substantially as herein set forth.
3d, The crane, B, when constructed of planks and parts, a a g g e b d, substantially as described, in combination with the crane post, A, bearing blocks, [illegible] and pulleys, [illegible] all as set forth.

83,386.—PLANT PROTECTOR.—J. M. Hurt, Blacks and Whites, Va.
I claim, as a new article of manufacture, the plant protector, consisting of the cylinder, A, adapted to rest upon the ground over the plant, perforated circumferentially near its top, a, B, and provided with the horizontal glass top, C, as herein described for the purpose specified.

83,387.—SHOULDER BRACE AND SUSPENDER.—Ebenezer Jennings, Jr., New York city.
I claim, 1st, A combined shoulder brace and suspender, consisting of two straps crossing each other at both ends in adjustable slides, substantially as described, either with or without an adjustable slide at the back crossing.
2d, The adjustable double slide, cut from a single piece of sheet metal, or other suitable material, substantially as described.

83,388.—Bee Hive Proctector.—Alfred S. Johnson (assignor to himself and Lyman B. Balcom), Waupun, Wis.
I claim, 1st, The casing or box, A, composed of paper or *papier maché*, for encasing a bee hive, substantially as herein shown and described.
2d, The shield or projection, a, attached to the case, covering, or box, substantially as and for the purpose specified.

83,389.—Apparatus for Making Extracts from Tan Bark.—Thomas W. Johnson, New York city.
I claim the arrangement of a secondary saturating tank, J, and two sets of squeezing rollers, G M, in combination with the crushing rollers, A, saturating tank, C, and elevators, E K, all substantially in the manner herein shown and described.

83,390.—Knitting Machine.—Daniel Kidder, Franklin, N.H.
I claim, 1st, The detachable stock, D, adapted and employed for the reception of the cams and yarn feeder, substantially as set forth.
2d, The yarn feeder, G, elevating cam, F, and slotted depressing cam, E, secured to the stock, D, substantially as and for the purpose described.

83,391.—Lamp Chimney Cleaner.—Michael J. Lourrentz (assignor to himself and John Myers, Jr.), Leavenworth, Kansas. Antedated October 17, 1868.
I claim, as a new article of manufacture, the holder for lamp chimney cleaners, consisting of the two rods, A A', each double headed, the rod, A, passing through the button at the inner end of the rod, A', and *vice versa*, whereby the cleansing material is held between the inner head of one rod and the outer head of the other, as herein shown and described.

83,392.—Apparatus for Illustrating Spherical Trigonometry.—Stephen N. Manning, Kankakee, Ill.
I claim the combination and arrangement of the hinged sector, plates, and wires, constructed substantially as described, for the purpose of illustrating and demonstrating the problems of spherical geometry and trigonometry, by forming the diagrams so as to show all the parts in their true relative positions and proportions.

83,393.—Pintle or But Hinge.—Lorenz Maschauer and William Frankfurth, Milwaukee, Wis.
We claim the pintle, B, made of uniform diameter in its middle and upper part, and provided with a tapering expanded lower end, c, in combination with the tapering internal diameter of the upper eye, a substantially as and for the purpose set forth.

83,394.—Brick Kiln.—John McDonald, New York city.
I claim the tunnel or kiln, provided with a door at each end, and with a chimney, and with apertures through the side walls, for the management of the fires, substantially as described, in combination with movable platforms, on which the bricks to be burned are to be stacked, with archways in which the fires are to be made for burning the bricks, substantially as and for the purpose described.

83,395.—Singeing Machine for Fabrics.—Peter McEwen, Jersey City, and Wm. McKenzie, Hudson City, N. J.
We claim the arrangement of the rollers, b c f, stretching bars, e e, g g, and rows of burners, l m, for presenting both sides of the fabric to be singed, as and for the purpose set forth.

83,396.—Railway Switch Stand.—R. L. McGowan and Walter Fletcher, Alliance, Ohio.
We claim the lever, c, in combination with the sliding key, b, slot, a, and recesses, a', substantially as descibed.

83,397.—Billiard Cue.—J. N. McIntire, New York city. Antedated October 6, 1868.
I claim a telescopic billiard cue, having a false or spring but, so constructed as to yield to any pressure, and again resuming its natural position, substantially as described for the purpose set forth.

83,398.—Sewing Machine.—Nicholas Meyers (assignor to Edward L. Chamberlayne and Emerson C. Pomeroy), Buffalo, N. Y.
I claim the feed plate, c', in combination with the shank, c, arm a a' a'', spring bar, c'', and eccentric, b, as and for the purpose described.

83,399.—Wash Boiler.—C. E. Miller, Indianapolis, Ind.
I claim the combination of the false bottom, C, perforated hinged flaps, D D', columns, F, and nozzles, G G', all constructed and arranged to operate substantially as and for the purposes herein described.

83,400.—Holdback.—Rufus Moody, Monmouth, Me.
I claim the loop, b c d, in conjunction with the plate, e, piece, f, plate, k, and hinge, h, to be operated by the breeching strap of the harness, as herein described, when attached to a carriage shaft, as and for the purposes set forth.

83,401.—Elbow Joint for Stove Pipes.—H. B. Morrison, LeRoy, N. Y.
I claim, 1st, A cast iron elbow, for stove and hot air pipes, made entire, with a suitable connecting and disconnecting joint, substantially as set forth.
2d, An elbow, for stove and hot air pipes, in which the joint is so formed and connected that the arms or ends of said elbow may be turned to any position, from a right angle to a straight length, as described.
3d, The combination and arrangement of the lugs, F, notches, g, groove, h, and tongue and groove, c d, the whole constituting the joint, as herein described.

83,402.—Machine for Preparing Husks for Mattresses.—William Nash and Montgomery Kenfield, Malden, Mich.
We claim the arrangement and combination of the feed rollers, E and F, the spiral cutting cylinder, D, and the series of slitted springs, a a a, as constructed, and operating substantially in the manner as and for the purposes herein set forth.

83,403.—Button.—Chas. N. Nickerson (assignor to himself and Wm. Hodgkins, 3d), Gloucester, Mass.
I claim the combination of the sleeve, E, stud, A, and spring, C, substantially as described.

93,404.—Convertible Plow and Cultivator.—Johnson Orr and Henry H. Martin, Oxford, Ohio.
We claim, 1st, The combination and arrangement, substantially as described, of the frame, A C, c c', swinging hangers, D d and D' d', adjustable bars, E e and E' e', nuts, G G', ring bolts, F f and F' f', pins, H, apertures, I, plow beams, J J', pivoted sheths, K k, ties, M, pins, N, handles, O, braces, R, r and R' r', and catch, S, for the object stated.
2d, The construction of the brace, T, with depressed partions, t t, to serve as steps, and an elevated central portion, t', to which the seat, P, is attached, all as herein described.

83,405.—Grinding Machine.—John L. Otis, Leeds, Mass.
I claim, in a grinding machine, in which the article to be ground is moved past the face of the grinding wheel or stone, the hanging of either the stone or wheel, or of the clamp frame that carries the thing to be ground, in arms or a swinging frame, whose center of motion is remote from the center of motion of the wheel or stone, for the purpose of grinding the tool or implement on a concave from a greater radius than that of the stone or wheel, substantially as described.
Also, the feeding along of the tool or article to be ground, past the face of the wheel or grindstone, by means of the vibrating frame, reversible pawl, and its spring arm or support, and the ratchet plate, acting together in the manner and for the purpose described.

83,406.—Tension Device for Sewing Machine.—D'Arcy Porter (assignor to himself and Thomas H. White), Cleveland, Ohio.
I claim the tension device, consisting of the grooved wheel, C', shaft, B', cap or box, c', spring, I', screw, H', stay, D', and spring, G', all arranged upon standard, A', and with relation to each other and to the thread, E', and so as to operate substantially in the manner and for the purpose described.

83,407.—Reservoir Cooking Stove.—Julius F. Quimby, Troy, N. Y.
I claim, 1st, Combining the chamber or flue, c, of a water reservoir or tank, C, when constructed and arranged with a cooking stove, substantially as herein described, with the diving or descending flue, e, thereof, so as to divert a portion of the unspent currents of heat going theredown therefrom, and making them pass directly into and horizontally through said flue, c, without first passing under the stove's oven, as formerly, thus making said reservoir flue, c, a branch flue of the diving flue, e, in manner substantially as and for the purposes hereinbefore set forth and shown.
2d, Connecting each end of said branch flue, c, when extending or passing in horizontal direction around the end sides and rear side of said water reservoir or tank, C, as arranged at the rear end side of a cooking stove, respectively, with the diving and rising flues, e and f, thereof, by means of apertures, a and a', in the stove, opposite to the ends of said flue, c, in manner substantially as described and shown for the purposes set forth.
3d, The combination with each other of the extended or branch flue, c, passing in horizontal direction around the end sides and back side of a water reservoir or tank, C, the cross flue, b, as passing in horizontal direction, and connected at each end with said flue, c, and the diving and rising flues, e and f, as connected with the respective ends of said extended flue, c, by apertures, a and a', when all of a reservoir cooking stove, and relatively arranged in manner substantially as herein described and shown for the purpose set forth.
4th, In combination with the damper, G, branch flue, c, aforesaid, and the aperture, a, in the diving flue, e, the employment of a damper, d, to close the opening to said flue, c, to shut off all currents of heat therefrom, and thus make of said flue an air-chamber, for the purpose as herein before set forth.

83,408.—Compound for Preserving Cheese.—Fitch Raymond and August Miller, Cleveland, Ohio.
We claim the herein described compound for the purpose set forth.

83,409.—Mode of Preventing Mildew or Injury to Fibrous Materials during their Manufacture.—Edwin T. Rice, New York city.
I claim moistening flax or other fibers with the material specified, so as to prevent mildew or other injury to the same while being manufactured, substantially as set forth.

83,410.—Bit Stock.—George Richards (assignor to himself and Dexter E. Pease), Richland Center, Wis.
I claim the handle, A, provided with the sockets, B B, to receive adjustably both the shank, b, of the rest, D, and the shank, a, of the tool-holder, C, whereby the leverage of the handle is adjusted equally from the rest and tool holder, as herein shown and described.

83,411.—Stop Device.—Peter Rodier, Detroit, Mich.
I claim a lever, resting in suitable bearings, and operating automatically, both to stop a belt, by compressing it between the end of said lever and another rigid body, upon the opposite side of the belt, and also to release its hold upon the belt, both operations being performed by the action or movement of said belt itself, substantially as herein described and set forth.

83,412.—Match Composition.—William H. Rogers, New York city.
I claim the use of caoutchouc, (or india-rubber), or gutta-percha in a composition for the manufacture of matches, substantially as and for the purposes described.

83,413.—Dish Rack.—E. A. Sawyer, Portland, Me.
I claim the dish rack, as described, having the pan or base, a, with the horizontal parallel pairs of ledges, all combined and arranged as and for the purposes set forth.

83,414.—Fabric for Covering Steam Boilers, etc.—William C. Selden, Brooklyn, and Charlton B. Kid, New York city.
We claim the non-conducting coating herein described, composed of fibrous mineral, secured between layers of strong material, substantially as and for the purposes herein set forth.

83,415.—Hot-air Furnace.—Eli Slater, and Anson H. Platt, Philadelphia, Pa.
We claim the combination of the inner combustion cylinder or chamber, a, outer radiating cylinder or chamber, o, surrounding the same, and the close base, b, all constructed and arranged so that the draft and products of combustion pass down from the first, through the fire grate, g, into the base, and thence up through the space between the two cylinders, substantially as and for the purposes herein specified.

83,416.—Wood-sawing Machine.—Daniel Snell (assignor to himself and J. H. Gano), Springfield, Ohio. Antedated May 28, 1868.
I claim the combination of the spikes or spur points, C C, in the forward ends of the bed timbers, to pierce the log to be sawed, and the grab or cant hook, B, in addition thereto, hinged or fastened to the forward cross beam, the whole constructed substantially as described as and for the purpose specified.

83,417.—Purifying Illuminating Gas.—Peter Spence, Newton Heath, Manchester, England.
I claim the use of protosilicates and protocarbonates of iron, specially the slags before mentioned, for purifying gas, for lighting, from sulphureted hydrogen, and also the use of these substances, as specified, for the product of dry copperas, or the copperas of commerce, and the use of said dry copperas for purifying gas from ammonia.

83,418.—Car Brake.—Joseph Steger, New York city.
I claim the combination of the roller, G, lever, E, friction bar or plate, L, and axle, B, substantially as described, for actuating the brakes of a car.

83,419.—Portable Gas Apparatus.—M. C. Stebbins, Springfield, Mass.
I claim the combination of the vessels, C and D, and the gasometer, B, with their pipes and connections, all arranged and operating substantially in the manner and for the purposes herein specified.

83,420.—Blasting Vessel.—J. B. Stoner, L. Mendelson, and Theodore Crommelin, New York city.
We claim, 1st, So applying a ballasting weight, B, to a casing, D D', or its equivalent, that such weight can be raised or depressed bodily, and at the same time it is free to swing in a direction with the keel of a vessel, substantially as and for the purposes described.
2d, The arms, b, of weight, B, provided with a pin, C, whose ends are fitted to slide up and down, and to oscillate in grooves, c c, formed in the case, D D', substantially as described.

83,421.—Blind slat Operator.—L. W. Swafford, E. Butler, and J. R. Hess, Muscatine, Iowa.
We claim the bent arm, G, and slotted lever, E, arranged, with relation to the blind slats and window casing, in such a manner that their combined action shall adjust said blind slats in any required position, as herein shown and described.

83,422.—Car Brake.—Benjamin Tatham and Joseph Steger, New York city.
We claim, 1st, The reversing arrangement, as herein substantially described, by which the brakes of a car may be brought into alternate action by the motion of the plate and axle.
2d, The means, as herein substantially described, of applying the brakes simultaneously upon the wheels of a series of cars by the combined operation of a connecting rope, chain, or rod, upon a series of levers, one on each car, the levers having friction rollers, and acting, by the revolution of the axles, on the brakes, as set forth.

83,423.—Manufacture of Vinegar.—H. A. Tilden, New Lebanon, N. Y.
I claim the jacket, f, around the vat, a, with the openings, 2 and 3, in combination with the heating coil, g, as and for the purposes set forth.

83,424.—Hydraulic Press.—J. B. Tunstall, Boydton, Va.
I claim the arrangement, herein described, of cross head, D, attached to levers, E E', by link connection, x, segment gearing, o o, rack, g, press head, G, shaft, F, pulley, f, with its cord and weight, all constructed and operated as set forth.

83,425.—Method of Constructing Wrought-iron Columns.—Geo. Walters and Thos. Shaffer, Phœnixville, Pa.
We claim an improved column, formed by the combination of the segmental bars, C, skewback bars, A, and interior rings or bands, B, with each other, substantially as herein shown and described, and for the purpose set forth.

83,426.—Ring for Spinning Machine.—J. W. Wattles, Canton, Mass.
I claim my improved ring, as made with the traveler supporter or rail, a, and the oiling trough, b, arranged as represented in the accompanying drawings, and as hereinbefore described, such being so as to cause the traveler, on ceasing to revolve on the supporter, to dip its lower part into such groove as and for the purpose specified, when such groove may be supplied with a lubricating fluid.

83,427.—Rotary Steam Engine.—James D. Whelpley, Boston, Mass.
I claim, 1st, The friction cradle, consisting of exterior bearing rolls, b, and the interior ring, a, in combination with the abutment ring, G, substantially as described.
2d, The arrangement of the interior friction ring, a, whereby its axis of revolution coincides with the axis of revolution of cylinder, A, substantially as described.
3d, The arrangement of the steam cylinder, D, revolving on its axis, perpendicular to the axis of its piston cavity, and carrying the reciprocating piston E, combined with the rod, F, abutment ring, G, and friction roll, a, substantially as described.
4th, The arrangement of the steam cylinder, D, the reciprocating piston, E, rod, F, abutment ring, G, and friction rolls, b, substantially as described.
5th, The combination of the eccentric, m, gib, l, eccentric, k, gib, i, and valve plate, h, with reference to the rod, n, and ears on the induction pipe, H, substantially as described.
6th, The arrangement of the valve chest, C, valve plate, o, with the packing, p, and adjustable eccentric, r, substantially as described.
7th, The arrangement of the cylinder, A, with the trunnion, K, revolving with it, abutment ring, G, and its friction cradle, b and a, and the neck, B, of the steam chest revolving with cylinder, A, with reference to the fixed steam pipe, H, substantially as described.
8th, The arrangement of the valve plate, h, revolving about a ring k, held from revolution by ears on pipe, H, thereby allowing linear motion when combined with the adjustable interior eccentric, m, pivoted on the axis of revolution of cylinder, A, substantially as described.

83,428.—Apparatus for Tolling Grain.—Wm. S. Widger and Wm. M. Read, Fairfield, Iowa.
We claim the rotary funnel, A, having a spout provided with the movable part, C', adjusted by means of the slot and set screw, all arranged and operating substantially as herein set forth.

83,429.—Trap Net.—Wm. S. Wilcox, Wellington, Ohio.
I claim, 1st, The supplementary funnel, G, and cover, C', as arranged, in combination with the funnel, C, and pound, A, in the manner as and for the purpose set forth.
2d, The use of weights, J, for sinking and anchoring the net, in combination with buoys, in the manner suostantially as described.

83,430.—Condenser.—Wm. L. Winans, Clarges Street, England, and Thomas Winans, Baltimore, Md. Patented in England March 23, 1866.
We claim the means herein set forth of constructing the condensers of steam engines, and providing for the drawing off therefrom of the greasy water or scum that may accumulate therein.

83,431.—Beer Cooler.—George Winter, Buffalo, N. Y.
I claim, 1st, The tanks, A, in combination with the reservoir, B, and conducting pipes, D, all parts being constructed, arranged, and operating substantially as herein described.
2d, Supporting the tanks, A, within the reservoir, B, by means of the upright posts or rods, B', and cross bars or tie rods, C, substantially as set forth.
3d, The reservoir, F, in combination with the tanks, A, for the purposes and substantially as herein described.

83,432.—Wardrobe Bedstead.—Albert A. Young (assignor to himself, Helen J. Dalton, and Geo. W. Armstrong), Boston, Mass.
I claim the combination and arrangement of the several parts of the wardrobe bedstead, to wit, the case, A, with its drawers, B B, the two parts of the bed frame, d d', joined by the hinges, l l, with its pillow rest, e, its cord, p, with its springs, s, the intermediate legs, k k, having supports, q q, and the turn-down legs, j j, and the sacking, g, all combined and arranged substantially in the manner and for the purpose set forth.

83,433.—Process and Composition for Tanning Leather.—G. Zippe (assignor to himself and Werner Werner), New York city.
I claim, 1st, The composition herein set forth for impregnating hides during the tanning process.
2d, The process herein set forth of tanning hides.
3d, The soaping compound herein described for insolubly binding the metallic contents of the tanning compound.

82,434.—Cartridge.—John Abraham and Thos. R. Bayliss, Birmingham, England. Patented in England March 20, 1868.
We claim, 1st, Making a series of longitudinal, oblique, or helical incisions in the metallic cases or shells of the said cartridges, for the purpose and substantially as hereinbefore described, and illustrated in the accompanying drawing.
2d, The construction, substantially as herein described, of the percussion chamber, by forming the same, as shown and set forth, of a blank, independent from the cartridge case, and securing it in the rim of the case, as herein described.
3d, The combination with a cartridge case provided with a percussion chamber constructed as described, of a primed percussion pin, enlarged at its base, so as to close tightly the said chamber, substantially as herein set forth.

83,435.—Washing Machine.—Anson T. Adams, Indianapolis, Ind.
I claim, 1st, The application of the lever, A B, and the perforated bottoms F G and H I, to an ordinary wash boiler, for the purpose and in the way substantially as herein set forth.
2d, The combination of the hook, g h, and the lug, a c, with a common wash boiler, with perforated bottoms, constructed as aforesaid, and used in the way and for the purpose herein set forth.

83,436.—Flyer for Speeders.—John H. Aldrich (assignor to himself and John C. Whitin), Northbridge, Mass.
I claim the flyer substantially as described, having the arm of the flyer and the detachable presser connected by a spiral guide and worm, so that when turning one way the presser detaches from the flyer, when there is no bobbin or spindle for it to press against, and turning the other way, it stops by the presser arm itself coming in contact with the end of the flyer arm, thus forming a more direct passage for the roving to the presser arm, substantially as described.

83,437.—Vine Cutter and Garden Cultivator Combined.—Prudden Alling, Norwalk, Ohio.
I claim the wheel, B, cutter, C, cultivator, D, and beam, A, combined and arranged to operate in the manner as and for the purpose set forth.

83,438.—Grain Cleaner.—John E. Anderson, Boiling Springs, Pa.
I claim, 1st, The scouring wheel, substantially as described, when forming part of a grain cleaner, as set forth.
2d, The arrangement of the scouring wheel above the fan wheel, with the chute board, K, inclined screen, L, and chaff box, B, all substantially as set forth.

83,439.—Sash Fastener.—Daniel Armstrong, Chicago, Ill.
I claim the arrangement of the thimble, B, and coil spring, m, the latter fitting into the ends of the bolts, A A', and operating both of them at the same time, in combination with thimbles, G G, pins, d d, and thumb pieces, c c, as and for the purpose set forth.

83,440.—Compound to be Applied to the Hair.—Benj. F. Atwood, New York city.
I claim, 1st, A hair stimulating compound consisting chiefly of a decoction of quince seed and smart weed, substantially as herein described, as a new article of manufacture.
2d, The addition to the said quince seed and smart weed, of sage, sweet fern, and hemlock bark, to form a modification of the compound, substantially as described, the whole being softened with glycerin, all as set forth.

83,441.—Peat Machine.—N. Aubin, Plattsburg, N. Y.
I claim the cylinder, A, provided with the stationary shear bladed cutters, E, shaft, C, with trough shaped revolving knives, F, and mold, D, with its removable bottom, d, having angular projections, d1, all arranged together together and operating substantially as and for the purpose herein set forth.

83,442.—Car Brake.—Wm. W. Babcock, Harmar, assignor to himself, A. W. McCormick, and Samuel S. McNaughton, Marietta, Ohio.
I claim, 1st, The combination of the screw spindle, C, cross bar, G lever, H, and brake head, I, when said parts are constructed to operate substantially as described.
2d, The combination of the screw spindle, C, cross bar, G, lever, H, arm, J, and wedge shaped brake head, K, when constructed to operate in the manner set forth.
3d, The arrangement of the brake heads, I K M, wheels, B B levers, H L, cross bar, G, and screw spindle, C, as described and shown.

83,443.—Saw Grinding Maching.—John G. Baker (assignor to Henry Disston), Philadelphia, Pa.
I claim, 1st, A saw grinding machine in which two stones are so arranged that a line drawn through their centers shall be at an angle with the blade of the saw, as and for the purpose herein set forth.
2d, The combination of the above with the guides, E and E'.

83,444.—Steam Engine Valve Device.—William Baxter, Newark, N. J.
I claim, 1st, The piston, K, and barrel, J, in combination with the valve, H, substantially as herein described.
2d, The regulating valve, g, in combination with the barrel, J, piston, K, and valve, H, substantially as herein set forth.

83,445.—Steam Generator.—William Baxter, Newark, N.J.
I claim the arrangement of the fire box, A, flues, D, jacket, F, pipe, K, and steam dome, G, substantially as set forth.

83,446.—Splice for Railroad Rails.—Sidney A. Beers, Brooklyn, N. Y.
I claim the combination and arrangement of the flat bolt and nut with fishing plates, as illustrated by letter e, fig. 1", and letter c, fig. 3, when applied to any form of rail.
Also, the device for preventing the nut from working loose, as illustrated by letters c and d, in fig. 1", whether used separately or in combination, for the purposes above set forth.

83,447.—Shirt and Drawers Combined.—Erastus S. Bennett (assignor to himself and Justus Smith), Brooklyn, N. Y. Antedated Oct. 7, 1868.
I claim, 1st, The combination of the shirt or body, E E, drawers or legs, F, and the reinforced portion, B and C C, all substantially as described and for the purposes set forth.
2d, In combination therewith, the drawing string or adjuster, a a, applied and operating substantially as described.

83,448.—Mold Blacking Machine.—Benj. S. Benson, Baltimore, Md.
I claim, 1st, Supplying the brush and mold with blackwash, or facing, for coating the inner surface of pipe molds, through a hollow shaft or tube, while the brush is spreading and smoothing it.
2d, The reservoir, D, communicating pipes, E F, valves, e' c, and hollow revolving shaft, in combination with a revolving reciprocating brush.
3d, The spool, H, and pawl or latch, h, in combination with the cord, I, and pulleys, i l.
4th, A revolving reciprocating brush, in combination with a force pump, so arranged that it will supply the brush with the blackwash at the time of its being rotated.

83,449.—Tea Kettle Boiler.—Alfred Berney, Jersey City, N. J.
I claim a combined tea kettle boiler, pitcher, and measure, made of tapering form, as described, and provided with a handle, lid, and spout, and graduated into quantities, essentially as herein shown and described.

83,450.—Stirrup.—John Bond, Versailles, Ill.
I claim as a new article of manufacture the riding stirrup consisting of the elastic pendent prongs, A, between which the oscillating foot piece, B, is pivoted in such a manner as to fall out when the elastic prongs are spread apart, as herein described, for the purpose specified.

83,451.—Mode of Soldering Galvanized Iron.—Patrick B. Bonner, New York city.
I claim the process of soldering galvanized iron, substantially as herein described and set forth.

83,452.—Horse Rake.—S. C. Brinser, Middletown, Pa.
I claim the combination and arrangement of the lever, H, curved as described and shown, with the connecting rod, F, having a series of holes in its rear end; the frame, K, having the series of holes, k'; the arm, E, and the rake teeth, B B, when the said parts are so constructed and combined together as to operate in connection with a pin in the frame, K, substantially in the manner described.

83,453.—Scissors.—Sarah H. Brisbane, Fordham, N. Y.
I claim, 1st, The combination with a pair of scissors of a gage or measure, B, substantially as and for the purposes set forth.
2d, A pair of scissors one blade of which is provided with a slot at right angles to the line of its cutting edge, in combination with a gage or measure, B, substantially as and for the purposes set forth.

83,454.—Trace Fastening.—James Brown, Matteawan, N.Y.
I claim, 1st the socket, A, having a tapering dovetailed groove formed in its outer end the strap or bar, B, having its rear part dovetailed and tapering, and having a cross head, b', formed upon its rear end, and the spring, C, or eqvivalent, in combination with each other, substantially as herein shown and described and for the purpose set forth.
2d, Forming an inclined recess, a', in the bottom of the forward end of the dovetailed groove in the end of the socket, A, to receive the end of the spring, C, in detaching the fastening, substantially as herein shown and described, and for the purpose set forth.

83,455.—Hose Coupling.—Henry C. Bull and Samuel T. Shelley, Louisville, Ky.
We claim a hose coupling, consisting of the following elements: The female portion, E, with its concave shoulder, f, the male portion, F, having the elastic ring or tube secured therein, and the eccentric ring, D, all constructed and combined substantially as herein described.

83,456.—Automatic Spading Plow.—Francis L. Cagwin, Joliet, Ill.
I claim, 1st, The spades, a, when operating in the manner and by the devices described, so as to enter the ground on the cycloid line, as set forth.
2d, The maintaining of the parallel between the spades, a, from the time of their entry into the ground until the heel of the spades comes to a rest up against the drum or disk, b, to any given point, either before or past the hinge, by means of the traction and weight of the machine causing them to turn on their hinge, as described.
3d, The backward turn of the spades, a, from the cycloid entry line to their original position, as described, by means of the upright lever, e, and spring, l, as set forth, regulated to stop at any given cycloid point by means of the device shown in fig. 5, or its equivalent.
4th, The spades, a, constructed with a crank and hinge, when attached, as set forth, to the periphery of the drum or disk, b, in combination with the upright lever, e, and spring, l.
5th, A rotary spader or plow, constructed with spades, a, hinged to the drum or disk, b, as shown, in combination with a frame, constructed and operating substantially as set forth.
6th, The mode of leverage, substantially as described, to force the spades into the ground, and to raise them out of the ground, when desired, as set forth.
7th, The combination of all the parts described, when arranged and operating as set forth.

83,457.—Steam Generator.—Charles W. Cahoon, Portland, Me.
I claim, 1st, The boiler, A, with the pipe, B, flexible by means of the joints, D D, having the coupling, E, and valves, substantially as herein set forth and described.
2d, The combination of boiler tank, F, with the boiler, A, and with reference to the carriage C, substantially as herein described.
3d, The combination of pipe, G, flexible, as described, and having the coupling, whereby to convey the residuum of the carriage reservoirs into the boiler tank, F, as described.
4th, In combination with the boiler, A, having a supply pipe, B, for connecting with the carriage, C, to supply the tanks therein, as described, the relief pipe, b, with its valve, c, substantially as described.

83,458.—Double Oven Cooking Stove.—Edward Card, Providence, R. I.
I claim placing the forward oven, with its accompanying flue, upon joints or hinges, substantially as described.
Also, the division plate, h, in combination with either of the division plates, l or l', and plate, a, substantially as described.

83,459.—Peach Basket.—Henry Carpenter, Brooklyn, E. D., N. Y. Antedated October 17, 1868.
I claim securing the raised bottom of the peach basket upon the inner hoop, D, by means of the central batten, a, let into said hoop at each end, beneath the bottom, and by the wires, c, and screws, b, all arranged as described, whereby the bottom and batten are raised above the lower edge of the hoop, D, and prevented from being knocked into the basket, when the latter is inverted and used as a seat, as herein shown and described.

38,460.—Ironing Table.—Patrick P. Carroll, Washington, D. C.
I claim a combined ironing and work table, consisting of the sliding parts, C C C, and supplementary legs, D D, in combination with a table of the usual form and construction, substantially as herein shown and described.

83,461.—Elevator for Buildings.—Dexter H. Chamberlain, West Roxbury, Mass.
I claim the rods, c c, or their equivalents, in combination with the wedges, d d, or their equivalents, and the cross head, C, substantially as and for the purpose set forth.
Also, the levers, H H, spring, h, and pin, G, in combination with the wedges, d d, and the rods, c c, for the purpose described.

83,462.—Lamp.—Theodore Clough, Dobb's Ferry, N. Y.
I claim the two opposite segmental wick tubes, in combination with the air jet pipe, having a gas burner, nozzle, when arranged in combination, substantially as described.

83,463.—HAMMER.—T. S. Coffin, Harrington, Me.
I claim the hatchet, D, adapted to be removably attached to the hammer head, A, having the short claws, B, by means of the screw, E, and held in any desired position by the spring catch, a b d, as herein described for the purpose specified.

83,464.—CAR COUPLING.—F. Coffrin, Claremont, N. H.
I claim the levers or keepers, f, the pins, h, the spindles, g, the springs, i, the staple, l, the hooks, e, and link, D, all arranged and combined substantially as and to operate for the purpose specified and set forth.

83,465.—MACHINE FOR TWISTING JACK BANDS.—J. Collier, Morenci, Mich.
I claim the combination of the hook, H, levers, I and L, sliding wheel, C, hooks, F, and springs, G K, substantially as and for the purpose described.

83,466.—STAVE MACHINE.—William S. Colwell, Allegheny City, Pa.
I claim the combination of the wheels, f g h and i, with the rack, e, for imparting a reciprocating motion to the ram, B, substantially as herein described and set forth.

83,467.—REFRIGERATOR AND COOLER.—Levi Richardson Comstock and James N. Cherry, Keokuk, Iowa.
We claim, 1st, The combination of the ice chamber, K, with the horizontal detachable strainer, L, and chamber, I, and hinged lids, C C', as and for the purpose specified.
2d, The combination of the non-conducting chambers, A P, and the trough, O, and pipes, N and M, as and for the purposes specified.

83,468.—CALL BELL.—Ezra G. Cone, East Hampton, Conn.
I claim the combination, with a suitable handle, of two gong shaped or open mouthed bells, provided with a suitable clapper or clappers, substantially as arranged, and as herein specified.

83,469.—COG WHEELS FOR GEARING.—Horace I. Crandall, Bedford, Mass.
I claim, 1st, The teeth of cog wheels, for gearing, constructed as hereinbefore described.
2d, The thickness of the teeth spaced at right angles from the center line of the same, substantially as set forth.
3d, The meeting point of the root and point face circles inside of the pitch circle, in accordance with the rules as specified.
4th, The radii, for sweeping the faces of the teeth, obtained from the wheel containing the least number of teeth in a set, as so described.

83,470.—HAY ELEVATOR.—F. A. Crane, Zanesville, Ohio.
I claim, 1st, The combination of the plank A, having lashings, B, side rails, C, with the truck, D E E, rollers, G, catch lever, H, having a shoulder, h, and stirrup plate, I, shoulder cleat, J, expanding pulley, a a, having shoulders, k, with india-rubber block interposed between them, rope, K, and pulley, L, all constructed and operating together, substantially as shown and described.
2d, The pulley, constructed as described, of the circular plates, a a, having radial shoulders, k, clamping between them the india-rubber disk, b, in such a manner that the width of the disk and the distance between the plates are made adjustable for the purpose specified.

83,471.—PRINTING PRESS.—Royal Cumming, Newport, Vt.
I claim, 1st, The pressure cylinders, C C', in connection with the reciprocating type beds, B B', and the paper feed rollers, I I', J J', all arranged to operate in the manner substantially as and for the purpose set forth.
2d, The combination of the two impression cylinders, C C', revolving in opposite directions above the reciprocating beds, B B', with the paper carrying cylinders, I I', J J', substantially as described, for the purpose specified.

83,472.—SUBSOIL PLOW.—John Custer, Corsica, Ohio.
I claim, 1st, The share bar, D I K, with slots, d and h, when constructed and used in combination with the plow beam, A, and rear beam, B, substantially as and for the purpose herein specified.
2d, The peculiar arrangement and combination of the share and shoe, F G, bolts, f f, and share bar, D I K, the several parts being arranged substantially as and for the purpose specified.
3d, The peculiar arrangement and combination of the share and shoe, F G, with common point, g, the cutter, E, share bar, D I K, and plow beam, A, the several parts being arranged substantially as and for the purpose specified.

83,473.—WASHING MACHINE.—John Dare, Liberty, Ind.
I claim the arrangement of the roller, D, pawl, j, and ratchet, f, for allowing the same to move without revolving one way, and to revolve the other, when suspended from the arms, C, and exterior adjustable springs, B, and operated by the double lever, H, all as herein shown and described.

83,474.—TELLURIUM.—John Davis, Allegheny city, Pa.
I claim, 1st, Pivoting one pole of the earth to the disk, S, and pivoting it to the crank, 7, and operating said disk and crank through the medium of disk, 6, wheels, t x l 5, and endless screw, 15, the whole being constructed, arranged, and operating in the manner substantially as herein described, and for the purpose set forth.
2d, The inclined disk, B', in combination with disk, o1, stem, 18, and arm, 11, provided with friction wheel, 12, and disks, being constructed, arranged, and made operative through the medium of the mechanism herein described, and for the purpose set forth.

83,475.—APPARATUS FOR TRANSPORTING, EXTENDING, AND ELEVATING PIPES AND HOSE.—Lester Day, Buffalo, N. Y.
I claim, 1st, The reservoir, M, swivel, G, windlass, I, and the extension pipe, C E, in combination with the platforms, A and B, as and for the purpose described.
2d, Pipes, E and F, the latter having a spring cover, u, guide rope, f, annular coupling, g, and belt, v, in combination with case, C, socket, D, raising and lowering devices, i j k l n, and guides, r s, as herein set forth.
3d, The hollow axle, N, with bars and supports, J, as specified.

83,476.—TRACE FASTENER.—F. W. Dean, Tremont, Ill.
I claim the loop, B, hinged to the rear of the single tree, A, and adapted to rest against the front side of the pin, a, outside the trace, and the equivalent of the hoop, B, as shown at D d and e e, all operating as described, for the purpose specified.

83,477.—STITCHING HORSE.—Thomas Depp, San Marcos, Texas.
I claim, 1st, The combination of the seat, D, lever, F, and strap or cord, H, with each other and with the bench, B, and clamps, C, substantially as herein shown and described, and for the purpose set forth.
2d, The combination of the foot lever, K, and strap, or cord, I, with the lever, F, and bench, B, substantially as herein shown and described, and for the purpose set forth.
3d, An arrangement of mechanism by means of which the jaws or the clamps of a stitching horse may be closed to hold the work by the weight of the workman when sitting upon his seat, substantially as herein shown and described.

83,478.—COMBINED CORN PLANTER AND CULTIVATOR.—Charles Dyer, Coal Run, Ohio.
I claim the described arrangement of the flexible tubes, G, rigid tubes, H, standards, I, furrow shares, J, seed coverers, Lx, pivoted braces, Jx, standard, N, shares, M, pivoted brace, O, connecting rod, f, crank shaft, g, and lever, Kx, as herein set forth for the purpose specified.

83,479.—BEE HIVE.—Duncan Edge, St. Mary's, Ill.
I claim a beehive, having the stationary central chamber, with the glass, D, at one end, and the removable piece, a, at the opposite end, with the drawers, B, and doors, C, arranged on opposite sides thereof, all constructed as described.

83,480.—WRINGING MACHINE.—S. F. Emerson, Seville, O.
I claim, 1st, The bearing plate, C2, furnished with axes, C and C1, substantially as and for the purpose set forth.
2d, The bearing plate, C2, furnished with axes, C and C1, slot, d, and hook d', substantially as and for the purposes set forth.
3d, The curved slot, d, and hook, d', in combination with the gears, c c1 b b', rollers, B B1, slotted plate, G, wedge-shaped bearings, b, and plate, C2, with the axes, C C1, substantially as and for the purposes set forth.

83,481.—SHOVEL PLOW.—W. B. Evans, Bracken county, Ky.
I claim the circular conformation of the rear portion of the beam, the front or inner part of which is formed of steel, and reduced to a sharp cutting edge and bent downward at its lower end, for the reception of the plowshare.

83,482.—HORSE HAY FORK.—John Gilmore, Phœnixville, Pa.
I claim the turning knives, C C, provided with the projecting pieces, d d, to prevent the knives from cutting through the hay when the latter is being elevated, substantially as set forth.

83,483.—ROTARY STEAM ENGINE.—Levi F. Goben, Spring Hill, Mo.
I claim, 1st, The construction of the central cylinder, A, with longitudinal channels adapted to receive the pistons, C, of the cylinders, B, substantially as herein shown and described.
2d, The steam chambers, D, having ports, e f, and adapted to receive the cylinders, B, provided with pistons, C, substantially as herein shown and described.
3d, The combination of the central cylinder, having longitudinal grooves, the cylinders, B, provided with pistons, C, and the steam chambers, D, with ports, e f, all arranged within the case, A, to operate substantially as described.
4th, The means for operating the cut-off valve, consisting of the arms, n n, and crank, g, all arranged to operate substantially as herein shown and described.

83,484.—ROTARY STEAM ENGINE.—G. W. Goodwyn, Petersburg, Va.
I claim, 1st, The combination of the rotary valve, H, with the arms, t t t R R R, when so constructed and operating that, by the rotation of the main shaft, the arms, R R, shall be caused to strike and turn the valve, H, substantially as described.
2d, The arrangement of the shaft, B, with the arms, R R R t t t, the rotary valve, H, and the induction port, G, substantially as described.

83,485.—BOTTLE STOPPER.—William Graff, Philadelphia, Pa.
I claim the ribbon, C, or its equivalent, passing around the bottle and over the stopper, in combination with a flexible strip, D, adapted to the ends of the ribbon, and to grooves in the said stopper, all substantially as herein described.

83,486.—CAMPAIGN BADGE.—H. C. Griggs, Waterbury, Conn.
I claim, 1st, The combination of the base plate, constructed with the raised surface, A, and provided with perforations, a, with the ring, B, constructed so as to be applied to the plate, and secured through the perforations, substantially as described.
2d, The arrangement of a common pin upon the plate, so as to be secured and held by a notch in the said plate, and so as to secure the badge, substantially in the manner herein set forth.

83,487.—CULTIVATOR.—A. M. Griswold, Momence, Ill.
I claim, 1st, The tracks, B, the slides, F, one or both, when arranged with relation to the rod, D, and beams, E, and to operate as and for the purposes set forth.
2d, The extra shovel, A, when arranged upon the beams, E, substantially as described and set forth.

83,488.—COUPLING FOR RAILROAD-TRAIN HEATERS.—J. R. Guy (assignor to Rice & Guy), Springfield, Ohio.
I claim, in combination with the permanent pipes, G, and elongated, open sockets, H, constructed with flaring mouths, the tubular coupling formed by a single rigid pipe, I, terminating with balls, I', fitting said sockets, substantially as and for the purpose set forth.

83,489.—SPRING-BED BOTTOM.—Charles Hacker, Euphemia, Ohio.
I claim the combination of the slats, H K, the spiral springs, A D, the cushioned rail, B, the cords, E F, in the manner shown and described and for the purpose specified.

83,490.—DEVICE FOR SCUTTLING VESSELS.—John Hall, Marshfield, Mass.
I claim the device above described, consisting essentially of the metallic piece, C, having the flanges, c c', the former expanded sufficiently to form a bed, for the gate to slide upon, and having the guide flanges, e e, the gate, G, the rod, R, swivel joint, F, and screw rod, M, all combined in the manner and for the purpose set forth.

83,491.—GRAIN DRILL.—W. N. Hamilton, Odessa, Del.
I claim, 1st, The employment, in the fertilizer hopper or receptacle, of an adjustable bottom, capable of being moved from or toward the distributing wheels, so as to increase or diminish, at pleasure, the size of the openings from which the fertilizing compound in the hopper is discharged, substantially as and for the purposes set forth.
2d, The combination, with the fertilizer receptacle and distributing wheel or wheels, arranged beneath and relatively to the receptacle, as described, of an adjustable bottom, hinged to the front of said receptacle, and actuated by a set screw, united to said bottom, and mounted in bearings attached to the frame of the machine, under the arrangement and for operation substantially as set forth.
3d, Forming the adjustable bottom of the hopper, and the saddles attached to the same, of metal, cast in one piece, as and for the purposes specified.
4th, The employment, in machines such as described, of distributing wheels formed of glass, porcelain, or other silicate, or of metal enameled or coated with a silicate, substantially in the manner and for the purposes shown and set forth.

83,492.—SEWING MACHINE.—Henry J. Hancock, New York city.
I claim the combination of the needle bar slide, I, with its wings, z z, inclined guides or ways, J J', presser foot, K, made capable of independent lift from the cloth, but reciprocating in the direction of the feed, together with the needle bar, from or through a rock shaft or center, i, common to both, substantially as specified.

83,493.—FISHING NET.—Smith Harper, Leipersville, Pa.
I claim a fishing net, constructed as described, longer at the bottom than at the top, and the bottom line small and weak, and provided with balls, substantially as and for the purposes herein set forth.

83,494.—APPLE CORER AND QUARTERER.—John M. Hassam, Mount Vernon, Me.
I claim the combination with the spring plunger, F, cross bar, G, knives, K or Q, and corer, J, of the conveyer, L, and the extended conveyer or spout, N, whereby the cores and the quarters or slices are conducted to separate places of deposit, substantially as described.

83,495.—COMPOSITION FOR THE MANUFACTURE OF BURIAL CASES.—J. R. Hathaway, Westfield, N. Y.
I claim, 1st, The compound herein described, substantially as and for the purpose described.
2d, Burial cases, made either wholly of the compound herein described, or in part of the same, and wood, or other suitable material, as a new article of manufacture, substantially as and for the purpose set forth.

83,496.—ARTIFICIAL LEG.—George B. Head, Albany, N. Y.
I claim, 1st, The bar, J, in combination with the stand, A, connected with the foot by one or more rods, and operated for unlocking the knee joint, substantially as shown and described.
2d, The combination of the bar, A, and the disk joint, b, and its square pivot, with the coiled spring, i, whereby the leg is thrown forward, substantially as described for the purpose specified.
3d, The stop, N, in combination with the bar, J, substantially as and for the purposes set forth.
4th, The combination of the bar, J, and rods, B B', with the stand, A, knee joint and foot, whereby the pressure of the toe or ball of the foot upon the ground, in the act of walking, relieves or unlocks the knee joint, substantially as described, for the purpose specified.

83,497.—TRUCK AND WAGON REACH.—Philip Hicks, Chicago, Ill.
I claim, 1st, The reach made of two wooden parts, A B, connected by a metallic curved splice, consisting of separate plates, P P, or of solid metallic piece, K, the whole arranged substantially as and in the manner herein set forth and specified.
2d, The metallic block, K, constructed and secured to the curved part of the reach or splice, substantially as and for the purpose set forth.

83,498.—TILL ALARM.—Austin D. Hoffman, Minneapolis, assignor to himself and Frank Brewster, Austin, Minn.
I claim, 1st, In combination with the drawer, A, a revolving knob, C, ring, C', rod, D, notched disk, E, and projection, I, the pins, F, lever, G, and bell, H, arranged to operate substantially as described.
2d, The disk, E, constructed with pins, F, substantially as and for the purpose set forth.
3d, The combination of the knob, the adjustable ring, C' shaft, D, and notched wheel, E, with the projection, I, substantially as and for the purpose set forth.
4th, The disk, E and pins, F, so arranged in relation to the lever and bell, that the bell shall be struck when the disk is turned, after a pin has been projected behind it, substantially as and for the purpose set forth.

83,499.—BOX OPENER.—Leonard Holtzscheiter (assignor to A. B. Shipley), Philadelphia, Pa.
I claim the within described instrument, composed of the handle, A, blade, D, and head, C, constructed and arranged as set forth for the purpose specified.

83,500.—HASP LOCK.—M. G. Imbach, Hartford, Conn.
I claim the arrangement of the casing, I, sliding plate, E, spring bolt, D escutcheon, H, latch, A, and staple, C, all constructed and operating substantially as and for the purposes herein set forth.

83,501.—NEEDLE.—Samuel Ivers, New Bedford, Mass.
I claim my improved needle, made substantially as described and represented, that is, with an opening leading out of one side, rather than one end of the eye, and also with an inelastic head at the upper end of the eye, and with an elastic hook, and either an elastic or inelastic abutment, constructed and arranged together substantially in manner and so as to form the eye as hereinbefore explained, the whole being to operate as set forth.

83,502.—DYEING TEXTILE FABRICS WITH ANILINE COLORS.—I. O. Iversen, Madison, Wis.
I claim, 1st, The herein-described mode of treating aniline colors before they are dissolved in the dyeing compound.
2d, The herein described compound of bichromate of potash, alum, and soda-ash, with an aniline color, substantially as and for the purposes set forth.

83,503.—TRAM FOR GAGING MILLSTONES.—Thomas R. James, St. Louis, Mo.
I claim the tram bush, C, constructed as described, bearing the vertical mandrel, D, adjustable arm, E, and screw gage pins, F, when secured to the runner by being wedged into the recess provided for the driver, in such a manner as to step the spindle, D, in the bail, B, of said runner, as herein shown and described.

83,504.—FRUIT BOX.—T. B. Jones, Radnor, Ohio.
I claim a box or basket, constructed with a hinged bottom (which bottom is provided with a bail for dropping and closing the same), for handling fruit and other articles, constructed, arranged, and operating substantially as and for the purposes set forth.

83,505.—STEAM GENERATOR.—Thomas B. Jordan, South Lambeth, England, assignor to B. H. Bartol, Philadelphia, Pa. Patented in England Oct. 28, 1865.
I claim, 1st, The combination of the upright pipes, E, horizontal pipes, B, and a steam chest or reservoir, E, substantially as described.
2d, A generator constructed substantially as described, and having its lower portion embedded in the brick work, substantially as set forth.
3d, The combination with a chamber containing a steam generator, of two or more flues having independent dampers, substantially as set forth.

83,506.—SMOKE-STACK FOR LOCOMOTIVES.—J. A. W. Justi, Savannah, Ga.
I claim, 1st, The gate formed by the rings, K K1, etc., or their equivalent arranged in the ring, G, and under the plate, H, substantially as described and fitted into the smoke-stack of a locomotive, for the purpose of arresting sparks, ashes, etc., as set forth.
2d, The combination within the smoke-stack of a locomotive engine, of the pipe, B, having an enlarged upper end, of the cap, C, ring, D, deflector, E, cap, F, ring, G, plates, K K1, etc., or their equivalents, plate, H, and ring, p, all arranged substantially as herein shown and described.
3d, The caps, C and F, and the ring, E, constructed with inward and downward bent inner edges, substantially as herein shown and described.

83,507.—WHEEL PLOW.—James Kay, Salem, Ind.
I claim, 1st, A two-wheel single riding plow, having the plow, E, and its standard, C', secured to a hinged frame, C, as described, in combination with lateral, front, and rear braces, arranged for sustaining said standard, substantially as described.
2d, The brace bar, j, connected to the bar, n, of the plow, E, passed through the standard, C', and secured to the frame, C, substantially as described.
3d, The combination of levers or treadles, e f, with a plow which is applied to a hinged frame, C, upon a two-wheel carriage, one of which levers or treadles is adapted for raising the plow and its frame, while the other is adapted for depressing said parts, substantially as described.
4th, The brace, z, connected to the bracket, d', and the seat standards, c', substantially as and for the purposes described.
5th, The adjusting screw rods, o o, applied to the hinged frame, C, and supporting this frame upon the axle, A', of a single riding plow, substantially as and for the purpose described.
6th, In a machine which is constructed as described, the three holdback rods or chains, p p s, attached to the doubletree, substantially as and for the purposes described.

83,508.—CAR BRAKE.—Peter Keffer (assignor to himself and E. G. Fishburn), Reading, Pa.
I claim a railroad car brake consisting of a yielding wedge shaped frame, C, constructed and operating substantially as herein described, in combination with brake shoes, B and B', hung to the car or truck, substantially as set forth.

83,509.—CULTIVATOR.—J. H. B. Keller, Chambersburg, Pa.
I claim, 1st, The pivoted standards, G, arranged in connection with the rods, J, india-rubber springs, I, and beams, E, all arranged in the manner substantially as and for the purpose set forth.
2d, The levers, K, attached to the beams, E, and arranged in relation with the driver's seat, D, substantially as and for the purpose specified.

83,510.—RAILROAD SWITCH.—Michael Kelly, St. Charles, Mo.
I claim the lugs, C C, and guard rails, E E, when arranged relatively to each other as set forth, in combination with switch rails, A, as shown, for the purpose explained.

83,511.—THILL COUPLING.—Wilson W. Knowles, Plantsville, Conn. Antedated Oct. 17, 1868.
I claim the combination and arrangement of the center piece, C, with the eared piece, A, eye piece, B, bolt, E, and nut, F, all arranged, combined, and operating as described.

83,512.—AUTOMATIC CAR COUPLING.—Perley Laflin, Warren, Mass., assignor to himself and John J. Sprague, Providence, R. I.
I claim, 1st, The combination with the draw piece, B, the projecting arm, C, and its slotted standard or upright piece, b, of the hinged or pivoted arm, D, and the prop, G, and toggle pin, E, attached to said arm, substantially in the manner described, the whole being arranged to operate as set forth.
2d, In combination with the parts named in the preceding clause, the rod, H, constructed and arranged to operate in connection with the swinging arm D, substantially as described.
3d, The combination and arrangement with the arms, C and D, of spring, g, and screw, h, substantially in the manner and for the purposes set forth.

83,513.—MACHINE FOR CUTTING PAPER.—Hervey Law, Chatham, N. J.
I claim, 1st, In machines for trimming books the turning of the bed, S, on which the paper is cut, by the receding movement of the bed from the knife, after the completion of each cut, so as to present an uncut side of the pile of paper or books to the knife at each upward movement of the bed, substantially as set forth.
2d, Giving the bed, S, and consequently the paper to be cut, a lateral horizontal movement at the termination of its upward oblique movement, in order to effect a clean cut, substantially as shown and described.
3d, The automatic mechanism, substantially as shown and described, for operating the clutch lever, H, and stopping the machine at the completion of the cutting of the four sides of the paper or piles of books on bed, S, as set forth.
4th, The pendent projections, r r' r'' r''', at the under side of the bed, S, in connection with the projections, s s', on the upper surface of the fixed bed, J, for the purpose of holding the bed, S, in proper position relatively with the knife, C, when the paper is being cut, and also when receding from the knife, and at the same time admit of the bed being turned at the proper moment, substantially as set forth.
5th, The trip on the fixed bed, J, composed of the fixed part, t, the pivoted part, t', and the spring, u, when used in connection with the projections on the beds, S J, and arranged to operate in connection therewith, substantially as and for the purpose set forth.

83,514.—BEEHIVE.—Benjamin Leckrone, Somerset, Ohio.
I claim, 1st, The device for hanging the frames, J J, so that they are independently attachable to or removable from the sliding boxes which support them, such device consisting essentially of the rods, m m, flattened at, o, and operating, in connection with the hook, n, and the perforated lug, r, substantially as described.
2d, The combination and arrangement of the feed rack, D, and cleaning box, C, substantially as described.
3d, The boxes, F F1 F2 when constructed with the front doors hinged at aa, latched at a', having the catches or hooks, d d, by which the slide boards can be attached to them at pleasure, and containing the comb frames, J J, substantially as described.
4th, The arrangement and combination of the ventilating aperture and bee-entrance, c, the foraminated slides, I I, the foraminated plates, H H, and the space, K, between the front of the comb boxes and the wall of the hive, for the purpose of affording a free ventilation to all parts of the hive, whether the bees are confined or free.
5th, The arrangement of the entrance, c, cleaning box, C, feed rack, D, boxes, F F1 F2, comb frames, J J J, windows, G G, ventilators, H H, and door, E, substantially as and for the purpose set forth.

83,515.—GAGE FOR STONE WARE.—A. W. Loomis, Atwater, Ohio.
I claim the adjustable gages, G and F, in combination with the handles, D E, when arranged, in relation to a potter's wheel, in the manner as and for the purpose specified.

83,516.—GOVERNOR FOR STEAM AND OTHER ENGINERY.—Jos. Theodor Lossen, Würzburg, Bavaria.
I claim, 1st, The arrangement of the spur wheel, F, pinion, G, weighted lever, I, and vane arms, L, substantially as shown and described.
2d, The inverted bucket or air shell, M, having an air cock, b, and vessel, N, in combination with the spur wheel, F, pinion, G, weighted lever, I, and vane arms, L, substantially as herein set forth.

83,517.—GRAIN DRILL.—John T. Lynam, Jeffersonville, Ind.
I claim the combination and arrangement of cutters, F, springs, E, and the tubes, D G, all applied to a seed drilling machine, to operate in the manner substantially as and for the purpose set forth.

83,518.—WRINGER ROLLER.—A. Magowan, Boston, Mass.
I claim the elastic roller, having its core formed by winding the square mandrel, A, having radial arms, D, with a string or cord steeped in liquid raw india-rubber, an outer rounding filling, composed of longitudinal strips, E, being interposed between the winding string and mandrel, as herein described, for the purpose specified.

83,519.—CULTIVATOR.—James Mallon, Lockport, Ill.
I claim, 1st, The handles, E, brace, Q, in combination with the bar, 5, pivoted to the under side of the tongue, reciprocating bar, g, braces, P, rods, f, and braces, G', for giving a lateral motion to the shovels, as set forth.
2d, The braces, G G', in combination with bars, F F', shanks, J J', and stirrups, d, substantially as set forth.
3d, The combination of the draft rod, I I, spools, T, bars, F F', cams, V, and lever, X, substantially as set forth.
4th, The hill protector, K, pivoted to the brace, G', and arranged substantially as set forth.

83,520.—HARVESTER.—L. J. McCormick, W. R. Baker, and L. Erpelding (assignors to C. H. McCormick & Brothers, Chicago, Ill.
We claim, 1st, The combination, substantially as set forth, in a two-wheeled harvester, of a tongue, with its rear end pivoted so that the tongue can play laterally in a socket over the main axle, a corrugated laterally slotted bracket on the front of the main frame, a correspondingly corrugated socket on the tongue, and a vertical clamping bolt connecting the socket and bracket, whereby the angle of the tongue to the line of draft can be varied at pleasure.
2d, The shields, S, constructed as described, attached to the main frame, and enclosing the counter shaft, the pinions which drive it, and the backing ratchets, for the purpose set forth.
3d, The arrangement, as set forth, for joint operation, of the counter shaft, the adjustable bevel gear, O, and its sliding clutch, with the nut and removable pinion on the front end of the crank shaft, whereby we vary the speed of the cutters by using a single gear wheel on the counter shaft without moving either shaft.
4th, The arrangement, as described, for joint operation, of the finger beam, the shoe, and the stirrup, with the horn, l, and dog, L, whereby we lift the divider end of the finger beam first in raising the cutters.
5th, The combination, as set forth, of the shoe, H, and arched shield, I, with the roller, provided with wooden bushing.

83,521.—SCHOOL DESK.—John Mealey, Fairville, New Brunswick.
I claim, 1st, The adjustable desk, G H, in combination with the seat, C, and its supports said desk adapted to be folded back, to form a back rest for the seat, substantially as shown and described.
2d, In combination with the adjustable desk, G H, the seat, C, and its supports the hinged back, D, as herein described, for the purpose specified.

83,522.—MACHINE FOR FORMING THE HOOK OR EYE ON POT BAILS, ETC.—Jacob Miller, Washington, Pa.
I claim the disk, c, provided with the mandrel, e, and pin, f, combined with the lever, B, furnished with a forming roller, e, and guide, J, constructed, arranged, and operating as herein described, and for the purpose set forth.

83,523.—MACHINE FOR BENDING OVAL HANDLES FOR TIN WARE.—Jacob Miller, Washington, Pa.
I claim the frame, A, provided with the slots, B and e, pin, J, forms, L, and brace, l, and used in combination with levers, D, provided with rollers, f, constructed, arranged, and operating as herein described, and for the purpose set forth.

83,524.—GAGE FOR CIRCULAR SAWS.—Warren P. Miller, New York city.
I claim the gage for rounding circular saws, consisting of gage point, h, gage rod, g, nut, k, tube, f, plug, c, and curved arms or forks, m m, in connection with grooved collar, b, all constructed, combined, and arranged substantially as and for the purpose specified.

83,525.—BOLT CUTTER.—Thomas W. Moore, Richmond, Ind.
I claim the arrangement of the shear blades, levers, and swivel pivot pins in the manner described and for the purpose set forth.

83,526.—WASTE SAVER FOR CARDING ENGINE.—Charles F. Morrison, Ritton Glen, N. Y.
I claim, 1st, The described arrangement of the horizontal waste carriers, E F, with relation to the doffer, D, cylinder, C, feed rollers, B B', and stripping roller, G, as herein described, for the purpose specified.
2d, The horizontal waste carriers, E F, constructed as described, of small wire ribs, widely spaced upon the belts, and adapted to be shaken, in the manner described, for the purpose specified.

83,527.—STEAM GENERATOR.—E. P. Mosman, deceased (Albert S. Bolles, and Sarah E. Mosman, administrators), Norwich, Conn.
I claim, 1st, An evaporizer for a steam boiler, consisting of a case or shell, H, with an inclosed diaphragm, I, arranged within it, substantially as described.
2d, The combination of short flue boiler sections and evaporizers, constructed, arranged, and communicating with each other, substantially as described.
3d, A feed water heating chamber, combined with a short flue boiler section or sections, substantially as described.
4th, The manner, substantially as shown and described, of conducting the water from a chamber, j, horizontally over the fire chamber, and thence vertically through said fire chamber.

83,528.—STEAM GENERATOR.—T. H. Muller, New York city.
I claim, 1st, The heads, E, provided with openings, a, in their sides, and openings, b, in their tops, placed eccentrically toward the center lines of the pipes, D, substantially as shown and described.
2d, The perforated tubular brackets, a, through which bolts, m, pass, arranged with relation to water jacket, F, and heads, E, substantially as set forth.
3d, The water chambers, c d e f, communicating with the heads, E, and inclosing the pipes, D, substantially as shown and described.

83,529.—COMPOSITION FOR FORMING TILES, FLOORS, AND FOR OTHER PURPOSES.—Joseph Neubrand, Green Point, N. Y.
I claim the combination of the within described articles for the purpose specified.

83,530.—TWEER.—O. G. Newton, Edinburg, Mo.
I claim the combination of those parts with the adjustable bearing for the shafs, G, as arranged and described.

83,531.—PAPER FILE.—Baruh Ney, and Henry Hofheimer, Alexandria, Va.
We claim the paper file, A, provided with an outer supporting edge, A', counterbalanced by the advertising frames, E, arranged and combined substantially as shown.

83,532.—BEE HIVE.—Abner Niebel, Tiffin, Ohio.
I claim, 1st, The feed box, A, constructed as described, in compartments, with wire cloth top, door, and ventilating holes, and provided with dirt drawers, B B, and slides, e e, and with blocks, e e, covering the openings, b b, substantially as and for the purposes herein set forth.
2d, The combination of the feed box, A, chambers, D D, honey boxes, E

E, and cap, H, all constructed as described, and operating substantially as and for the purposes herein set forth.

83,533.—Apparatus for Preserving and Freezing Fish, Meats, etc.—Philip Nunan, Sandusky, Ohio.
I claim, in a meat and fish preserving house, having compartments, B B, with walls, as herein described, the combination of the vessel, C, pipes, D and E, and vessels, F F F F, all suspended in the house, so as to allow a space below them, for the articles, substantially as herein shown and described.

83,534.—Bag Fastener.—Charles H. Nye, Vineland, N.J.
I claim the described arrangement of the handle, D, buckle, B, and strap, A, secured to the bag, for the purpose specified.

83,535.—Washing Machine.—E. F O'Neill, Prairie du Chien, Wis.
I claim the combination of the bow lever, D, board, I, apron or flange, J, arms or bars, G, and three or more corrugated rollers, H, with each other, and with the tub, A, and cylinder, B, substantially as herein shown and described, and for the purpose set forth.

83,536.—Seat Back.—W. H. Paige (assignor to himself, John Sweeny, and James W. Russell), Springfield, Mass.
I claim the metallic springs, b b, attached to the body or frame, A, the ends of said springs having a bearing in the channels, n or n', with the screws, a, a, or other protruberances therein, the whole, when covered and stuffed, forming a seat back, all constructed and operating substantially as herein described and set forth.

83,537.—Corn Plow.—Clinton J. Paine, Young America, assignor to himself and Henry Creswell, Warren County, Ill.
I claim, 1st, The curved draft bar, B, running from the inside of the center of the wheels forward and upward, substantially as and for the purposes herein set forth.
2d, The arrangement of the curved plow beams, F F, coupled to the curved draft bar, B, as and for the purposes herein set forth.
3d, The bar, E, running from the outside of the center of the wheels, and across the top, as and for the purpose as herein set forth.
4th, The combination of the forked ends, a a, of the plow beams, and the pins, b b, and plates, c c, forming a hinged coupling, substantially as and for the purposes herein set forth.

83,538.—Knife and Fork Holder.—John W. Patten, North Greenbush, N.Y.
I claim, 1st, The longitudinally supporting device, A, mounted on a stand-ard or standards, B B, which extend up from a rod, C, substantially in the manner and for the purpose described.
2d, The combination of the longitudinal supporting device, A, standards, B B, rod, C, and spring clamp or clamps, D D, substantially in the manner described.
3d, The rod, C, with clamp screws, a, fitted to the standards of supporting device, A, substantially as described.

83,539.—Roofing Compound.—M. Pinner, Buffalo, N. Y.
I claim a cement composed of the ingredients above specified, in substantially the proportions and for the purposes set forth.

83,540.—Apparatus for Shuffling and Dealing Cards.—Honoré Etienne Paquet, Sartrouville, France.
I claim, 1st, The transverse metal wires, H, in combination with the box, A, substantially as and for the purpose set forth.
2d, The combination of the clock movement with the distributing roller, J, the spring, D, the platform, D1, and the pin, F G, constructed and operating substantially as and for the purpose described.
3d, The platform, D1, in combination with the spring, D, the pin, F G, and distributing roller, J, constructed and operating as and for the purpose set forth.

83,541.—Chair Seat.—Cornelius Platt, New Haven, Conn.
I claim the chair seating herein described, as an article of manufacture, consisting of the compound foundation, a and b, covered, and so as to be applied to the chair frame, substantially in the manner herein set forth.

83,542.—Furnace for the Manufacture of Iron and Steel.—Auguste Ponsard, Paris, France.
I claim a furnace for the manufacture of iron and steel, constructed substantially as specified, and provided or fitted with tubes or ore, carbon and flux receptacles, B B, in communication at their base with the basin, D, of the furnace, essentially as shown and described.

83,543.—Feed Water Heater.—Louis B. Powelson, Pittsburg, Pa.
I claim not any of the specified parts in severalty, but an improved feed water apparatus, consisting of the several parts specified, all combined, constructed, and arranged as described.

83,544.—Bed Lounge.—James D. Pratt, Cleveland, Ohio.
I claim so arranging the springs, E and F, on the flat horizontal bars, C and D, that the middle of the entire space of the bed shall present a soft and elastic surface, substantially as shown and described.

83,545.—Photographic Room.—George K. Proctor, Salem, Mass.
I claim, 1st, For photographing purposes, an apartment or room, having its interior of such a curved form as to reflect and concentrate the rays from a lamp, or other light, upon the person or object to be photographed, substantially shown and described.
2d, The opening, c, in the room or apartment, A, for the purpose of adjusting the camera outside of the room in proper position with the person or object to be photographed within the room or apartment, substantially as set forth.
3d, The employment of magnesium, when used for illuminating purposes, in connection with a room or apartment, A, constructed in the manner or form as shown, and for the purpose specified.

83,546.—Thill Coupling.—Robert Pyle, Wilmington, Del.
I claim, 1st, The die, as constructed, in combination with the bolt and washers, as shown and described.
2d, The combination of the die, a, and screw bolt, c, with the clip iron, k, tie iron, f, and thill iron, with an eye or hooked end, constructed and operating in the manner and for the purpose substantially as herein shown and described.

83,547.—Road Grader.—James M. Ragsdale, McCoy's Station, Ind.
I claim, 1st, The arrangement of the wheel, F, plow, R, and revolving arms, H H, when connected with the frame, A, and constructed and operating, substantially as specified.
2d, The combination of the hinged axle, B', and lever, K, with the frame, A, provided with the wheel, E, plow, R, and arms, H H, and connected to operate as set forth.

83,548.—Photographic Printing Frames.—Byron Reed, Kokomo, Ind.
I claim, 1st, Placing an indefinite number of papers, prepared for receiving photographic impressions from a negative, in a frame at one time, substantially in the manner herein shown and described.
2d, The frame, A, constructed substantially as described and arranged for receiving a large or a small number of papers, substantially as set forth.

83,549.—Steam Pump.—A. J. Reynolds, Chicago, Ill.
I claim, 1st, A water elevating engine, having two cylinders, arranged one upon the other, the upper one for receiving the steam, which aids in expelling the water therefrom, and which by means of its condensation, causes a vacuum to be created therein, and another, into which the steam from the latter is caused to flow by the discharge of the water from the former, and in which the steam from the upper cylinder is condensed, substantially as described.
2d, The combination of cylinders, A and B, and float or piston, M, with its apertures or passages, O, substantially as described.
3d, The combination of the float or piston, M, and valve, P, substantially as set forth.
4th, The combination of the rod, E, float, M, valves, P Q and X, substantially as described.
5th, The combination and arrangement of valves Q and X, on rod, E, and valve, W, in the head of cylinder, A, substantially as set forth.
6th, The arrangement of valve, H, in relation and with reference to valves, X and W, substantially as set forth.

83,550.—Gate.—John F. Rogers, South Bend, Ind.
I claim a gate, constructed as described, having the rail, a, for sustaining the lateral pressure, placed at the bottom of the gate, in combination with the short post, D, the rollers, A, their supporting posts, E, and connecting bar, A', and posts, E', all constructed and arranged, as and for the purpose set forth.

83,551.—Furnace for the Manufacture of Iron and for Other Purposes.—Henderson Ross, Pittsburg, Pa. Antedated September 30, 1868.
I claim so constructing the fire chamber of furnaces used in the manufacture of iron and steel, that the interior walls of said chamber shall consist of iron, which are surrounded with water, substantially as herein described, for the purpose set forth.

83,552.—Water-heating Apparatus.—John C. Ryan, Chicago, Ill.
I claim the combination of the pipes, E D L C, with the boiler, A, stove, S, and coil, B, whereby the circulation of water is effected, as above described, and at the same time the steam is taken from the pipe, D, or vessel, A, and conveyed to the heater, H, as herein set forth for the purpose specified.

83,553.—Hot-water Heater.—George H. Sellers, Phœnixville, Pa.
I claim, in combination with the external water chamber, C, the cylindro-conical fire chamber, A, as and for the purpose substantially as described.
Also, in a hot-water heater, the immediate connection of the water chamber with the street mains, so as to avoid the necessity of a reservoir, substantially as described.

83,554.—Screw Cutting Lathe.—H. F. Shaw, West Roxbury, Mass.
I claim the arrangement, substantially as described, of the lever, L, pivoted at L', the nut, N, having a slotted shank, N', thereon, the adjustable connecting button, K, carriage, G', pivoted with the swiveled and slotted disk, H, and the screw, r, or their equivalents, for the purpose described.

83,555.—Fastening for Carriage Curtains.—Ephraim Shepard, New York city.
I claim the tube, B, slotted substantially as shown, to form a spring, b, in combination with the eye, E, in the curtain, D, all constructed and arranged to form a new and improved curtain fastening, as set forth.

83,556.—Railway Cattle Guard.—D. B. Shirk, Brunnerville, Pa.
I claim the arrangement of the crank, c c', when not in the same plane, on the top of a shaft, which shaft is provided with pickets, P, and a central weight W, appended below, and when operated by a hinged lever, L, with its open jaws, J, the lever being pivoted at one end, all combined and operating substantially in the manner and for the purpose specified.

83,557.—Loom.—A. W. Silvis (assignor to himself and S. B. Shott), Birmingham, Iowa.
I claim, 1st, The arrangement of the picker staff, a, with its enlarged lower end notched a a2, the swinging reversing pawl, a1, provided at its enlarged lower end with double inclines, the hinged spring hooks, a3, and the bridge, a5, all operating as described for the purpose specified.
2d, The arrangement of the pawl, b'', bracket, b1, secured to the lay, the pattern cylinder, b2, catch pawl, b3, and pivoted right-angular harness levers b4, all constructed as herein described for the purpose specified.
3d, The combination of the right angled harness levers, b5, with the harness frames and pattern cylinder, substantially as and for the purpose set forth.

83,558.—Jack for Turning Shafting.—Alfred Sims, Brooklyn, N. Y.
I claim the lever pawl, C D, and jack, E, in combination with the ratchet wheel, B, mounted on the shaft, A, substantially as and for the purpose described.

83,559.—Shuttle for Looms.—C. E. Smith and F. T. Jaques, Lowell, Mass.
We claim the twisted shank, C, provided with the removable tip, B, constructed substantially as shown and described, in combination with a shuttle.

83,560.—Tool for Turning and Planing.—J. P. Smith, Glasgow, Scotland.
I claim the within-described formation and adaptation of the under surface of the part, c, to fit tightly and firmly to the properly curved surface of the tool, b, the curvature of each being uniform through the whole length, by rolling, molding, or otherwise, the part, c, and the tool, b, being used, in combination with the part, a, substantially as and for the purposes herein set forth.

83,561.—Hay Rack.—Wilson Smith, Tod Township, Ohio.
I claim, 1st, The rack, composed of side pieces, a and d, and the rungs or cross pieces, b b b, when applied to mangers, by hinging or attaching it to the top of said manger, and at the side next to the animal that feeds therefrom substantially as shown and described.
2d, The combination of manger, g, the rack, a b b d, and feed trough or troughs, f f, all as shown and described.

83,562.—Hat Hook.—C. L. Spencer, Providence, R. I.
I claim the combination of the hook, strap, and tongs, when constructed to operate substantially as set forth and for the purpose specified.

83,563.—Station Indicator.—Elihu Spencer, Ottawa, Canada.
I claim, 1st, The cutting out or otherwise constructing the plates, c, so as to form frames, over or on which a transparent or semi-transparent fabric, d, is secured, having the names of the stations upon them, in combination with a candle, lamp, or other light, D, placed at one end of the box, A, and arranged so as to throw the rays of light within the same, substantially as and for the purpose specified.
2d, The adjustable or sliding bar or stop, E, arranged and applied in the manner substantially as and for the purpose set forth.
3d, The self-operating mechanism, composed of the lever, K', spring, I, right-angular plates, H H, and hammers, G G, all arranged to operate by the turning of the heads, B, substantially as and for the purpose specified.
4th, The flaps, L, when applied to the box, A, and used in connection with the drop catch, M, substantially as and for the purpose specified.

83,564.—Cultivator.—W. H. Stratzman, Big Lick, Va.
I claim the arrangement of the standards, B B, oblique bar, C, rack bar, I, and keeper, K, with nuts, g, and plows, D, all as herein set forth.

83,565.—Beehive.—L. M. Stoops, Grandview, Ind.
I claim, 1st, The perforated tube, B, placed in the bottom of the hive, at its front side, and provided with the entrance, F, all substantially as shown and described.
2d, The ventilating tube, G, provided with openings to admit air through the sides of the hive, and other openings leading into the brood chambers and honey boxes, substantially as herein set forth.
3d, The arrangement of the brood chambers, C C, ventilating tube, G, feed box, H, and honey boxes, I I, all constructed substantially as and for the purposes herein set forth.

83,566.—Wash Boiler.—Jerome B. Sweetland, Pontiac, Mich.
I claim, 1st, The reversed bottom, B, provided with a rim, C, projecting downwards, and said rim provided with openings, covered on the inside with valves, D D, substantially as and for the purposes herein set forth.
2d, The removable cone-shaped tube, E, secured to the reversed bottom, B, by means of the notched flange, c, and keys, d d, or its equivalents, and provided at the top with a grooved flange, e, on which is placed the cap, F, with its lugs, f f, forming a loose joint, substantially as and for the purposes herein set forth.
3d, The reversed bottom, B, provided with a partition or wall, J, and hinged pallet or valve, L, the latter extending up into the tube, E, substantially as and for the purpose herein set forth.

83,567.—Corn Planter.—C. W. Thiessen, Effingham, Ill.
I claim, 1st, The drop-box, constructed as described, of the parallel ribs, d, d, one of which is provided within the seed receptacles, i m, as herein set forth and shown.
2d, The circular seed receptacle, E, constructed as described, and secured to the inner face of the wheel, B, within the flange, c, as herein set forth and shown.
3d, Pivoting the connecting rods, J, of the slides, g, by means of a common pin, K, to the stationary axle of the revolving wheel, so that, by the revolution of the wheel, the slides will receive reciprocating motion in the drop boxes, substantially as set forth.
4th, The arrangement of the circular seed receptacle, E, and slides, g, upon opposite sides of the wheel, B, as herein described, for the purpose specified.

83,568.—Harvester.—James Toay, Mineral Point, Wis.
I claim, 1st, The wheel, A, constructed substantially as shown and described.
2d, The plate, B, constructed substantially as shown and described.
3d, The combination of wheel, A, plate, B, and the framework of a harvesting machine, substantially as shown and described.

83,569.—Cultivator.—P. R. Totten, Adams, Ill.
I claim, 1st, The bow shaped lever, K, in connection with the treadle, L, combined and arranged substantially as and for the purpose specified.
2d, The connecting of the beams, G G, of the inner plows, H, by means of staples passing through oblong slots, e, to admit of the lateral movement of said plows, substantially as set forth.

83,570.—Hasp for Trunk Locks.—Leonhardt Uitting (assignor to himself, G. Massa, Ch. Ammlung, and H. Zimmerman), Philadelphia, Pa.
I claim hinging the swinging hasp, B, to the upper edge of its plate, b''', so that it can be freely turned sufficiently upward to allow the plate, b''', to be fastened to the trunk-lid by rivets, b5, which will be covered by the said hasp when the trunk is closed and locked, substantially as and for the purpose set forth and described.

83,571.—Fodder Cutter.—Elias F. Varner, Harveysburg, Ohio.
I claim, 1st, The provision, in a fodder cutter, of the knife, N, having one cimeter cutting edge, n, and one hooked cutting edge, n', and being furnished with a slotted shank, O o, or its equivalent, for attachment to a driving shaft, in the manner herein described.
2d, The combination and arrangement, substantially as described herein, of the feed rollers, C C', springs, D, ratchet wheels, c c', pivoted feed hands, E E' e e', cross head, F, reciprocating bar, G, spring, H, adjustable cam, I I, driving shaft, J, and fly wheel, K, for the object explained.
3d, In combination with the knife, N n n', driving shaft, J, nut, L, and washer, l, for the purpose described.

83,572.—Door Hinge.—Anton W. Walter, Canton, Ohio.
I claim, 1st, A hinge, composed of two leaves, having eyes or lips turned up at their outer or inner edges, and combined with a hinge pin, substantially in the manner and for the purpose herein specified.
2d, In combination with a hinge, constructed as herein specified, a spiral spring, F, arranged and used substantially in the manner and for the purpose specified.

83,573.—Turning Tool.—William H. Whitlock, Rising Sun, Ind.
I claim the hand tool for turning, herein described, composed of the stock, A a a' a'', bit or cutter, B b b' b'', set screws, C C', and handle, D.

83,574.—Grist Mill.—Bennett Whitney, New Brunswick, N. J.
I claim, 1st, The arrangement of the elastic packing, H, interposed between the upper stone, E, and the curb, C, substantially as and for the purpose set forth.
2d, In combination with the stone, E, the pins, h, slotted sliding bars, I, slotted plate, g, adjustable plate, L, stationary screw, i, and nut, j, all operating as described, for the purpose of adjustably suspending the stone, E, in framing, as herein shown and described.
3d, The reversible Z-shaped bars, M, when provided with hooks, l, arranged to support the hopper and shoe of the grist mill, as herein described.

83,575.—Preparation of Roofing Fabrics.—Jay J. Wiggin, Syracuse, N. Y.
I claim, 1st, The box or bed, C, constructed as and for the purpose described.
2d, The three rollers, B B B, constructed and arranged substantially as and for the purpose described.
3d, The rolling apparatus composed of the three rollers, B B B, the frame, A A, and the parts contained in the same, constructed and arranged substantially as and for the purposes set forth and described.
4th, The heating and keeping hot the rollers, B B B, by the production into them of either hot water or steam, substantially in the manner set forth.
5th, The process herein described, of coating felt, paper, and other roofing fabrics, the same consisting in the use of heated rollers acting over a clay bed, or its equivalents, constructed substantially as described.

83,576.—Roofing Composition for Houses, Boats, Barns, etc.—Jay J. Wiggin, Syracuse, N. Y.
I claim the compound made of the ingredients before described, in the proportions above set forth, substantially as and for the purpose described.

83,577.—Combined Tools.—John D. Wilkinson and E. O. Boyle, Plattsburg, N. Y.
I claim, combining and securing or pivoting the wire gage, A, dividers, C, rule, D, square, E, and calipers, F and H, together, when made to correspond in dimensions with each other, as and for the purpose set forth.

83,578.—Harvester.—Miletus J. Wine, Long Glade, Va.
I claim, 1st, The chute, M, having its rear end left open, and attached only to the finger bar at its front end, when arranged between the grain wheel, W, and the apron, A, and below the level of the latter, in the manner and for the purpose specified.
2d, In connection with the belt, C, for moving the apron, A, and the chute, M, for receiving the grain from said apron, the rock shaft, G, the rake, J, the idle pulley, N, and the treadle, t, or arm, z, when combined and arranged to operate in the manner and for the purposes substantially as specified.

83,579.—Water Wheel.—A. N. Wolf, Sheridan, and Joel Haag, Bernville, Pa.
We claim the combination of the casing, A, wheel, E, chutes, B B, hinged gates, C C, and ring, a, all constructed, arranged, and operated substantially as set forth.

83,580.—Registering Scale.—David Wolf, Easton, Kansas.
I claim the arrangement of the dial plate, E, pawl, f, shaft, C, wheel, D, with its pin, g, and waist pin, d, the hammer, j, and bell, k, as constructed, in combination with the beam, A, to be operated by a platform or weighing scale, substantially in the manner as described, for the purposes herein set forth.

83,581.—Stop for Umbrella Runner.—Joesph Wright, Philadelphia, Pa.
I claim a stop for umbrella runners consisting of a staple having legs, a a1, of different lengths, and a shoulder, a2, substantially as described.

83,582.—Extracting Gold and Silver from their Ores.—John W. Kidwell, Washington, D. C.
I claim the use of finely divided iron, prepared according to Bischoff's patent process, in connection with the amalgamation of gold and silver ores, as herein described and set forth.

REISSUES.

34,150.—Water Wheel.—Dated Jan. 14, 1862; reissue 1,791, dated Oct. 11, 1864; reissue 3,168.—Division A.—James S. Goode and John W. Bookwalter, Springfield, Ohio, executors of the estate of James Leffel, deceased.
We claim, 1st, A wheel having two series of buckets, both receiving the water horizontally, and one series discharging the water vertically and the other toward the center, substantially as described.
2d, The annular diaphragm, D, constructed and arranged to operate in combination with the buckets above and below, substantially in the manner and for the purpose set forth.

34,150.—Water Wheel.—Dated January 14, 1862; reissue 1,791, dated October 11, 1864; reissue 3,169.—Division B.—James S. Goode and John W. Bookwalter, Springfield, Ohio, executors of the estate of James Leffel, deceased.
We claim, in combination with a water wheel having two series of buckets, an upper plate, covering the wheel, with a horizontal flange, and a lower cylinder and flange, and a series of chutes for directing the water to said buckets, substantially as described.

34,150.—Case for Water Wheels.—Dated January 14, 1862; reissue 1,792, dated October 11, 1864; reissue 3,170.—Division A.—Jas. S. Goode and John W. Bookwalter, Springfield, Ohio, executors of the estate of James Leffel, deceased.
We claim, 1st, A case for a water wheel, composed substantially of a crown plate, A, with a horizontal flange, c, projecting beyond the periphery of the wheel, a cylinder, R, with a correspondingly projecting flange, e, and a series of oscillating gates, placed intermediately between the flanges, substantially as described.
2d, In combination with a case, substantially such as described, an upper and lower support for the water wheel shaft, attached to the case, substantially as described.
3d, The upper plate, A, when constructed with the flange, c, cut away to admit of the movement or oscillation of the gate plates, substantially as described.
4th, The bolts that hold the crown plate and cylinder by their flanges, in proper position, in combination with the case, and the means for sustaining the wheel, substantially as described.

34,150.—Gate for Water Wheels.—Dated January 14, 1862; reissue 1,792, dated October 11, 1864; reissue 3,171.—Division B.—Jas. S. Goode and John W. Bookwalter, Springfield, Ohio, executors of the estate of James Leffel, deceased.
We claim, 1st, The gates, H, when constructed substantially as described, so arranged around the wheel as to form converging throats, and so pivoted that when closed there shall be an equilibrium of pressure on the opposite ends thereof, substantially as set forth.
2d, Gates, H, which have their faces from, z'' to z', outwardly flaring, and their faces from, z' to z, when closed, on a curve concentric with the wheel, and pivoted to flanges, c and e, at a point, d, in the middle of the latter faces, substantially as set forth.

72,323.—Lifting Apparatus for Grain Drills.—Dated December 17, 1867; reissue 3,172.—Chas. E. Patric, Macedon, N. Y.
I claim, 1st, The employment of the racks, R, and pinions, w, in connection with the hand lever, F, and shaft, H, for the purposes set forth, whether the lifting chains are made to wind upon the shaft or not.
2d, The arrangement of the locking latch, D, with the shaft, H, when it is also made to act as a support, substantially as and for the purposes set forth.
3d, The arrangement of the guards, G, with the rack, R, and pinions, w, substantially in the manner herein shown and described, and for the purposes set forth.
4th, The combination of the shaft, H, with the devices for raising the same, when constructed in such a manner that, by turning the shaft on its axis, it is caused to rise and fall, for the purpose set forth.

66,904.—Combined Planter, Harrow, and Cultivator.—Dated July 16, 1867; reissue 3,173.—Peter P. Runyon, Johnson Letson, George J. Janeway, and J. E. McDonald, New Brunswick, N. J., assignees by mesne assignments, of David D. Stelle.
We claim, 1st, The employment, in combination with the main frame and driving wheels, of a rotatory cultivator, or harrow, arranged forward of the main axle, and in a vibratory frame hung on said axle, substantially as described, for the purposes set forth.
2d, The employment, in combination with the oscillating frame, in which the cultivator is hung, of a lever, u, and retaining bar, j, or the equivalents, for depressing the rear end of said frame, so arranged that it may be conveniently handled by the driver while in his seat, as described.
3d, The combination of the rod, k, spring, n, and vibratory valve arm, m, with the cam, l, the whole arranged to operate as and for the purpose set forth.
4th, The adjustable slides, and series of slots in tube, p, for varying the charge of seed to be deposited each time, as and for the purposes set forth.
5th, The adaptation to the same transverse cultivator shaft, g, of different sets of removable harrows and hoes, as described.

74,077.—Weather Strip.—Dated February 4, 1868; reissue 3,174.—E. S. Torrey and J. Torrey, New York city, assignees of Washington L. Gilroy.
We claim, 1st, The insertion of a flat, elastic strip into a molding, such as above described, in an inclined position to its surface, as herein set forth.
2d, Also, affixing said elastic medium into the groove in the rigid molding, by means of suitable cement, as and for the purposes specified.

14,368.—Method of Bottling Fluids under Gaseous Pressure.—Paul Schmitt, New York city, assignee of Jane Quantin and H. A. Pintard, and administrators of Alphonse Quantin, deceased. Dated March 4, 1856; reissue 3,175.
I claim, 1st, The above-described device for filling bottles or other vessels with aerated water and sirup, consisting of conduits or passages, A and R, a sirup-measuring chamber, and a discharging nozzle, or their equivalents, so arranged that the water and sirup may be discharged from said nozzles common to both, substantially as shown and described.
2d, The combination and arrangement of the sirup-measuring chamber, and a cock or valve for admitting the aerated water thereto, substantially as shown and described.
3d, The arrangement of the sirup conduit and the water conduit, as a consequence of which the sirup is expelled from its conduit, such sirup is mingled with the water at some distance from their common outlet, substantially as shown and described.
4th, The combination and arrangement of a valve or cock for drawing the water, a vessel for receiving and dispensing the sirup, and the pipe or passage connecting the same, as a consequence of which the ejection of the sirup is accomplished by the manipulation of the valve or cock for drawing the water, substantially as shown and described.
5th, The construction and arrangement of the vent opening and closing device, and the water-drawing valve or cock, as a consequence of which they are both operated simultaneously by the movement of water-drawing valve, substantially as shown and described.

18,752.—Coffee Pot.—George R. Chittenden, Chicago, Ill., and C. A. Smith, Milwaukee, Wis., assignees of J. McGregor, Jr. Dated April 11, 1854; extended seven years; reissue 3,176.
We claim, 1st, A tea or coffee pot, when made with two receptacles, one for tea or coffee, and the other for water, substantially as described.
2d, A tea or coffee pot, so arranged that the heat shall be communicated to the tea or coffee through a water or liquid medium, substantially as described.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

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2,745.—Manufacturing Gas.—Jas. Stratton, Philadelphia, Pa. Sept. 5, 1868.

2,795.—Condensing Apparatus for Steam Engines.—Franklin Ransom, Buffalo, N. Y. Sept. 10, 1868.

2,797.—Mode of Constructing Beams and Girders.—O. Coffeen Evans, United States. Sept. 11, 1868.

2,815.—Machinery for Manufacturing Brushes.—Joseph Sheldon, New Haven, Conn. Sept. 12, 1868.

2,831.—Steam Pumping Engines.—James R. Maxwell and Ezra Cope, Cincinnati, Ohio. Sept. 15, 1868.

2,833.—Toy.—Wm. W. Rose, New York city. Sept. 15, 1868.

2,839.—Machine for Hulling and Cleaning Grain.—Jas. F. B. Marshall and Augustus Jones, Boston, Mass. Sept. 15, 1868.

2,842.—Covering for Walls and Other Surfaces.—Frederick W. Armstrong, Plainfield, N. J. Sept. 16, 1868.

2,846.—Apparatus for Preserving Food, etc.—Charles Havard and Manuel X. Harmony, New York city. Sept. 16, 1868.

2,850.—Manufacture of Heads for Dolls.—Geo. H. Hawkins, New York city. Sept. 16, 1868.

2,863.—Apparatus for Raising Fluids.—Henry C. Sergeant, New York city. Sept. 17, 1868.

2,865.—Explosive Compound.—Joseph Hafenegger, San Francisco, Cal. Sept. 17, 1868.

2,885.—Wringing Machine.—C. H. Hudson, New York city. Sept. 18, 1868.

2,947.—Adhesive Stamp.—A. C. Fletcher, New York city. Sept. 25, 1868.

3,007.—Tufted or Pile Fabrics, and Machinery for Manufacturing the Same.—John T. Waring, Yonkers, N. Y. Oct. 1, 1868.

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U. S. PATENT OFFICE, WASHINGTON, D. C., Sept. 12, 1868.
Martin P. M. Cassity, of Granada, Kansas, administrator of the estate of Isaac H. Steer, deceased, having petitioned for an extension of the patent granted to Henry Carter, assignee of said Steer, the 19th day of June, 1855, antedated the 19th day of December, 1854, for an improvement in "Making Nuts," it is ordered that said petition be heard at this office on the 12th day of December next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
17 3 S. H. HODGES, Acting Commissioner of Patents.

U. S. PATENT OFFICE, WASHINGTON, D. C., Oct. 24, 1868.
Aaron Palmer, of Brockport, N.Y., having petitioned for an extension of the patent granted him on the 30th day of January, 1855, for an improvement in "The Construction of the Frame of Grass Harvesters," it is ordered that said petition be heard at this office on the 11th day of January next.
Any person may oppose this extension. Objections, depositions, and other papers should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE, WASHINGTON, D. C., Oct. 24, 1868.
William F. Shaw, of Boston, Mass., having petitioned for an extension of the patent granted to him on the 23d day of January, 1855, for an improvement in "Gas Heater;" it is ordered that said petition be heard at this office on the 11th day of January next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE, WASHINGTON, D. C., Oct. 24th, 1868.
James Easterly, of Albany, N. Y., having petitioned for the extension of a patent granted to him on the 13th day of February, 1855; reissued in two divisions, numbered respectively 3,009 and 3,010, on the 30th day of June, 1868, for an improvement in "Base-burning Stoves," it is ordered that said petition be heard at this office on the 25th day of January next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE, WASHINGTON, D. C., Oct. 16, 1868.
Jotham S. Conant, Hackensack, N. J., having petitioned for an extension of the patent granted him on the 16th day of January, 1855, for an improvement in "Sewing Machines," it is ordered that the said petition be heard at this office on the 28th day of December next.
Any person may oppose this extension. Objections, depositions, and other papers should be filed in this office twenty days before the day of hearing.
19 3 ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE, Washington, D. C., Oct. 7, 1868.
Fanny Holmes, of Whitehall, N. Y., executrix of the estate of John E. Newcomb, deceased, having petitioned for the extension of a patent granted the said John E. Newcomb on the 9th day of January, 1855, for an improvement in "Grain Harvesters," it is ordered that said petition be heard at this office on the 14th day of December next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
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