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Report of the Experiments with the Turbine Water Wheels at Philadelphia.

We have received the official report of the Chief Engineer, Henry P. M. Birkinbine, Esq., giving a full account of the experiments with turbine water wheels made at the Fairmount Water Works, Philadelphia, during the winter of 1859–'60. We have already given the general results of these experiments, but from the very important character of the information obtained, and the extensive interest which is felt in it, we are induced to give a more detailed description of them, accompanied by an illustration of the apparatus employed in trying the capacity of the wheels. We are satisfied that these experiments were as distinguished for their impartial fairness as they were for their open publicity, and the rational and satisfactory nature of the method adopted. The following is Mr. Birkinbine's description of the apparatus.

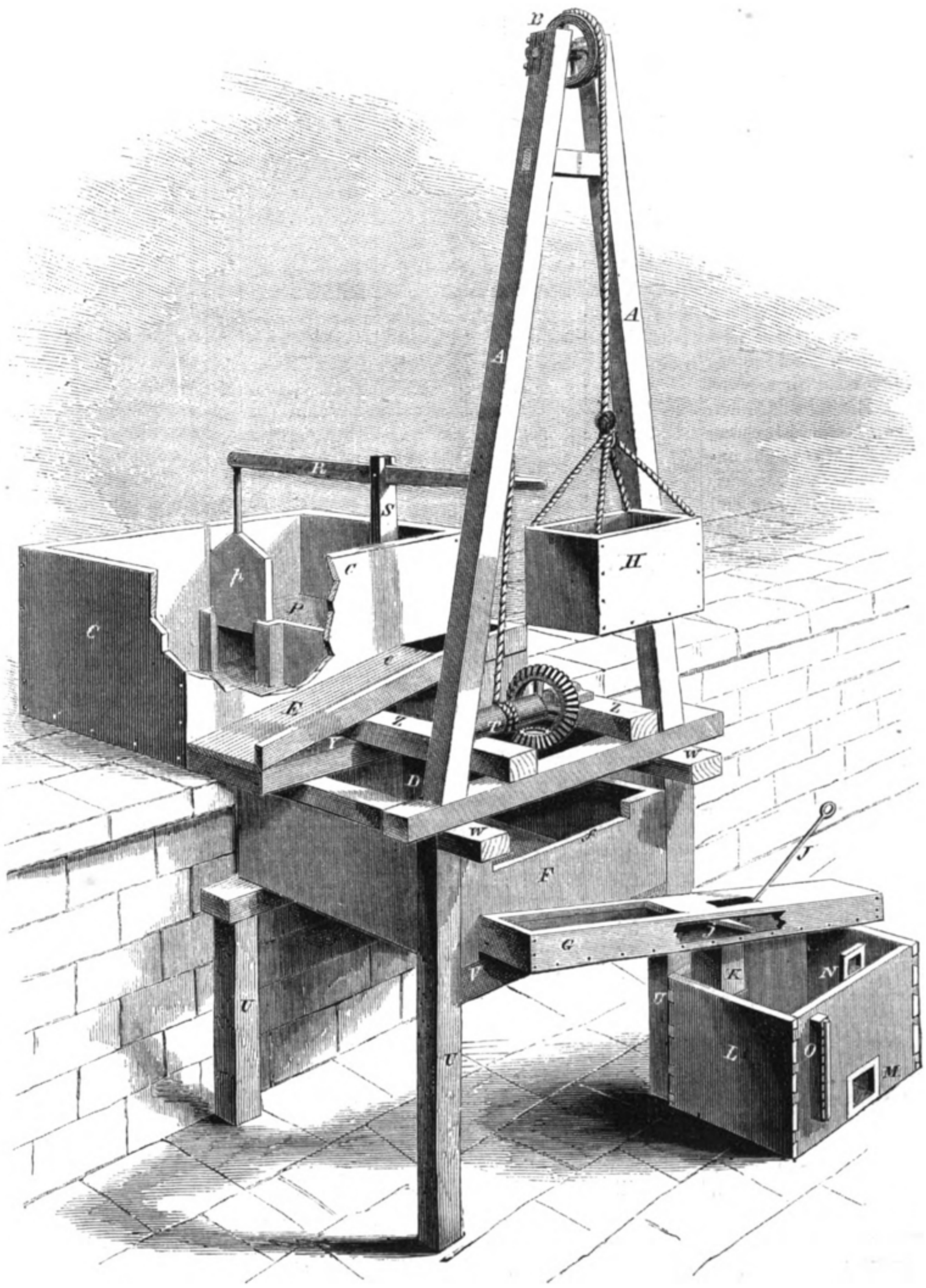
The large box, C, forms a reservoir for supplying the models with water; it communicates with the penstock, D, by way of the trunk, P, and a waste notch adapted to it, for preventing overflow of the box. The valve, *p*, operated by the lever, R, having its fulcrum in the post, S, opens and closes the communication with the trunk and reservoir at the pleasure of the operator.

The models to be tested were placed in the box, F, which served as a wheel-pit, with their inlet water ways connected directly to the side of the penstock, D. Those wheels which had no gates of their own were provided with one at the opening of the penstock into the inlet of the wheel. After the water had performed its work in the wheels, it flowed into the box, F, and escaped through the notch, *f*, into the trough, G, by which it was either conveyed from the apparatus into the river, or conducted into the measuring box, L, through the spout, K.

When the discharge valve, *j*, was open, any water passing down the trough fell into the measuring box; but when the valve was shut, the water passed over its back, and was delivered outside. This valve was operated by the rod, J, extending through a slit in the top of the trough, the side of which is removed to show the arrangement.

The measuring box, L, is emptied through the opening, M, by drawing the slide, N, and has a graduated glass tube, O, fitted to its side, for exhibiting the exact depth of the water within.

To the top of the penstock, D, was fitted an overflow spout, E, for carrying off any excess of head of water from the models, it being important to maintain an unvarying head over them. The perpendicular distance between the summit, *e*, of the overflow, E, and the notch, *f*, was six feet.



The shaft of each model was connected by suitable gearing to the shaft of the drum, T. Upon this drum was wound a rope, which, passing over the sheave, B, revolving in bearings at the tops of the posts, A A, lifted the weight box, H.

The posts, A A, were held in position by guys which extended back, and were fastened on the upper level of the wall.

The whole apparatus was supported on and connected with the framing, U U V W X Y and Z.

The box, C, received a constant supply of water, through pipes connected with one of the pump mains.

The measuring box was five feet every way, inside. The apparatus is isometrically represented to a scale of one-eighth of an inch to the foot.

The hight of the wall against which the apparatus stood is fifteen feet.

Operation.—After the model to be tested was properly connected with the penstock, D, and drum shaft, T, the reservoir, C, was filled with water, and kept constantly supplied to the point of overflow.

The weight box, H, was then charged and carefully weighed, and the valve, J, thrown upon its seat to pass the water outside the measuring box. This valve was operated by an assistant, whose business it was to open and close it promptly when the signals were given.

An assistant was stationed at the lever, R, to control the valve, *p*, and keep the water in the penstock, during the experiment, just at the point of overflow.

The rope was well stretched before it was used, and during the course of the experiments two pieces of tape were fastened around it at a convenient distance apart for observation (usually 25 feet), which distance was measured when the whole weight of the loaded box was suspended. Before trial, the box was raised and lowered several times by running the wheel, to ascertain that all the machinery was properly adjusted, and to give the rope every opportunity of becoming fully stretched for the trials. The distance between the tapes was again measured, and also frequently during the trial, to enable the operator to eliminate every possibility of error from the stretching or contracting of the rope.

When the wheel was fully underway, and at the moment the first tape was passing a fixed point, a signal was given to open the discharge valve, and direct the tail water into the measuring box; when the second tape was passing the same point, another signal was given to close the valve, and conduct the tail water away from the apparatus; after which the wheel was stopped, and the weight box allowed to run back to the place of starting.

If the depth of overflow from the top of the penstock varied in any experiment, or in different experiments, the operator at the inlet valve noted the amount of variation from observations made at the summit of the spout, and allowed for it accordingly.

An adjustable slide was fitted to the notch, *f*, to enable the operator to maintain a uniform overflow of the tail water from the wheels. Upon the surface of the water in the wheel box, F, rested a float, from which projected a rod vertically, to the top of the penstock; this rod exhibited to the operator above the level of the water in the wheel box, and served as a check to any neglect of duty on the part of the operator at the adjustable notch, *f*. For wheels which vented water more rapidly than others, the adjustable notch and float indicator were necessary to ascertain the actual difference of level of the head and tail water during every trial, which difference is the true head or fall acting on any water wheel.

It will be noticed that the amount of water which escaped from the wheel during the experiment, into the measuring box, was only that which was used to raise a known weight a measured hight, after the wheel had attained a uniform speed.

It is reasonable to assume that the amount of water required to start different wheels may vary very considerably; and it is possible that a wheel which gives a higher ratio of useful effect while in motion, may require more water to get it underway than one which gives a lower ratio. It is also certain that, at the commencement of the trials, the rope would be drawn to different tensions; perhaps, in some instances, it would hang loosely from the sheave, in which case the wheel would vent a great deal of water before the weight would be lifted at all. It was to avoid errors from these sources that the apparatus was constructed in the manner described; to ascertain the useful effect of each wheel only while in motion and during the performance of its work, omitting altogether the uncertain conditions of starting and stopping.

The different parts of the apparatus were so disposed that the observer at the penstock overflow could see the level of the water in the wheel box, as indicated by the float rod; and the observer stationed to signal the passage of the tape over the measuring point could, by his ear, note the time of closing and opening the discharge valve, and make allowance, if necessary, for any fore or after movement which might unavoidably occur while closing it. This observer was, at the same time, within sight of the float rod and penstock overflow, and, in the interim of tape transits, could detect, at a glance, the hight of head under which the wheel was working. In this manner, one observer could watch the performances of the others, and act as a check to any neglect of duty on their part; and any person interested in the correct testing of the wheels could see the ropes, water levels and discharge valve from one station point, and thus observe for himself the faithfulness of the operators and the progress of the trials. The time required for each wheel to perform its work was taken by an observer, who stationed himself on an upper platform at a point favorable for observing the exact moment of transit of the tapes.

During the whole course of the experiments the same persons gave the same signals and operated the same parts of the apparatus, and no pains were spared in securing the greatest degree of exactness in every manipulation of the machine.

The amount of weight to which the box was loaded was varied in different experiments; these weights, together with all the essential data of the trials, appear in the tables which are given under the head of each wheel. A correct platform scale for weighing the box was kept at the apparatus during the whole time of the experiments, and any person who wished to be satisfied of its correctness before trying his wheel, could have it tested upon making that wish known.

REMARKS ON THE TABLE.

Under the heading, "Ratio of Useful Effect," are the quotients, which are found by dividing the product of the weight in box and hight raised, by the product of the weight of water discharged and hight of head and fall.

The following example will show the process by which the ratio of useful effect is obtained.

The area of the bottom of the box was constantly 24.86 square feet.

A cubic foot of water was taken at 62.5 lbs. avoirdupois.

Then $1{,}000\times25=25{,}000$.

And $24.86\times3.266\times62.5\times6=30447.285$.

And $25000\div30447.285=.8210$=ratio of useful effect sought for.

SUMMARY OF EXPERIMENTS.

NOTE.—In the trials marked *, the diameters and circumferences given are *means*, measured at the centers of discharge orifices.

		4	5	6	7	8	9	10	11	12	13	14	15	16	17
		Ratio of useful effect.	Cubic feet of water discharged per second.	Area of orifices between guides.	Area of orifices in wheel.	Velocity of water through guides.	Head and fall.	Ratio of velocity of water through guides to theoretic velocity.	Velocity of water through wheel in feet per second.	Ratio of velocity of water through wheel to theoretic velocity.	Revolution of wh'l per minute.	Velocity of circumference of wheel in feet per second.	Ratio of circumferential to theoretic velocity.	Diameter of wheel.	Load upon wheel at the circumference.
Jonval and vertical discharge.				sq. in.	sq. in.	ft. pr sc.	feet.							inches.	lbs.
	*Geyelin, 2d	.8210	3.122	44.6	37.70	10.08	6.	.5129	11.92	.5929	191.4	13.9	.7074	16.62	69.29
	*Collins, 2d.	.7662	2.837	35.4	31.35	11.54	6.	.5871	13.03	.6479	144.2	11.06	.5629	17.55	73.79
	*Stevenson, 1st	.7335	3.353	41.25	30.90	11.70	6.02	.5941	15.62	.7931	169.7	13.32	.6717	18.25	70.21
	*Geyelin, 1st.	.6799	3.911	42.6	42.	13.22	6.04	.6703	13.41	.6799	222.9	12.66	.6423	13.	79.06
	*Collins, 1st.	.4734	3.372	40.	39.5	12.14	6.10	.6126	12.29	.6203	129.3	9.75	.4920	17.25	55.73
	*Stevenson, 2d	.8777	2.976	42.	32.	10.2	6.	.5204	13.39	.6831	152.	12.41	.6331	18.75	79.00
	*Andrews & Kalbach, 3d	.8197	3.065	51.5	31.	8.57	6.	.4361	14.23	.7241	297.	15.34	.7806	11.75	61.3
	*Andrews	.6205	3.116	45.	26.	12.55	6.	.6387	21.73	1.1020	276.9	14.22	.7236	11.75	53.73
	*Andrews & Kalback, 2d.	.7591	3.298	45.	31.	......	6.	......	......	......	......	......	......	11.75	......
Centrif'l or outward discharge.	*Smith's Parker's, 4th	.7569	4.963	49.	35.	14.58	6.	.7420	20.52	1.0380	235.9	18.74	.9533	18.25	75.30
	* " 3d.	.7467	4.820	49.	35.	14.19	6.	.7206	19.85	.9860	216.7	17.29	.8790	18.25	78.20
	* " 2d.	6726	3.298	40.	35.	11.87	6.10	.6035	13.56	.6897	396.8	14.74	.7493	8.50	57.94
	Littlepage	.5415	4.375	63.	50.	10.00	6.05	.5066	12.60	.6380	......	......	......	24.00	......
Centripetal or inward discharge.	Blake	.7169	3.039	37.4	52.6	11.70	6.	.5953	8.320	.4233	179.1	14.08	.7166	18.	58.10
	Tyler	.7123	3.431	34.5	103.0	14.32	6.	.7121	4.797	.2140	149.	11.73	.5965	18.	69.09
	Merchant's Goodwin	.6412	3.573	39.3	123.0	13.09	6.	.6661	4.183	.2128	79.17	10.38	.6649	30.	82.91
	Rich	.6132	2.430	50.	33.0	7.00	6.10	.3531	10.65	.5384	244.8	16.59	.8370	15.5	34.30
	Mason's Smith	.6324	2.928	36.25	......	11.63	6.05	.5894	......	......	187.6	14.72	.7410	18.	47.13
	Monroe	.5359	2.711	22.68	57.7	17.21	6.	.8756	6.775	.3441	131.6	10.22	.5085	17.75	42.28

It will be noticed that the quantity 30447.285, which expresses in pounds the whole possible effect or mechanical power of the water used in the above experiment, is greater than the quantity 25,000, which expresses in the same terms the amount of work done by the wheel. The difference between them indicates the loss of power by the use of the wheel and attached machinery.

The following proportion will express the percentage of power utilized by the model wheel, when acting under the circumstances given in the table:—
30447.285 : 25000 : : 100 : 82.10.

If the models were arranged according to the ratio of useful effect they gave, beginning with the highest, the following list would indicate the order:—

Stevenson's second wheel	.8777
Geyelin's second wheel	.8210
Andrews & Kalbach's third wheel	.8197
Collins' second wheel	.7662
Andrews & Kalbach's second wheel	.7591
Smith's Parker's, fourth trial	.7569
Smith's Parker's, third trial	.7467
Stevenson's first wheel	.7335
Blake	.7169
Tyler	.7123
Geyelin's (double) first wheel	.6799
Smith's Parker's second wheel	.6726
Merchant's Goodwin	.6412
Mason's Smith	.6324
Andrews' first wheel	.6205
Rich	.6132
Littlepage	.5415
Monroe	.5359
Collins' first wheel	.4734

It will be noticed, by reference to the tables, that the *highest* ratio obtained is given in the above list, and not the average of each series. The figures present, therefore, the best work done by each wheel.

Taking into account the fact that each and every wheel was tried under an unvarying head, and that whatever error there might be in the precise relations which should obtain between the diameter of the wheel, the number and area of its issues and weight to be raised, to make the experiment a perfect one; it was perhaps compensated for by the opportunities offered to alter the model, change the ratio of gearing and the weights to be raised. For these reasons, the results of these experiments may be considered the fairest show of the merit which the models possessed.

The wheels are classified according to the direction of discharge from the issues of their buckets.

The first class includes those in which the discharge was vertical. Geyelin's second, Collins' first and second, and Stevenson's first and second, were all Jonval wheels, and all discharged downward, while Andrews' and Andrews & Kalbach's discharged upward.

The second class includes the outward discharge wheels. The head water passed into these wheels between their hubs and the inner ends of the buckets, and thence outward centrifugally from the periphery of the wheels.

The third class includes the inward discharge wheels. They were all surrounded by scrolls, and the head water entered all of them and was discharged from the issues toward their axes, except Mason's, which discharged downward. The power of the head water was directed by the scroll around the wheel, but its motion through the wheel was centripetal.

The figures in the fourth column were found by the process explained above.

The figures of the fifth column were found by dividing the number of cubic feet of water discharged by the number of seconds which elapsed during the discharge. For example:—

$24.86\times3.266\div26=3.122$, the amount of discharge sought for.

The figures in the sixth and seventh columns were obtained from actual measurements of the models,

The "velocity of water through guides" in feet, per second, will be found in the eighth column, and is obtained as follows:—

As above, the cubic feet of discharge per second is 3.122. The area of orifices through guides is 44.6 square inches, which is $44.6\div144=.3097$ foot; and the quantity discharged in feet per second, divided by the area of discharge, gives the velocity of discharge. Therefore, $3.122\div.3097=10.08$=velocity in feet per second.

Column nine gives the hights of head and fall in feet, which were taken by measurement of the distances between the levels of head and tail water during the time each and every trial was made.

The ratios of actual to theoretic velocity of the water through the guides are given in the tenth column, and are found thus: The theoretic velocity of water issuing from an orifice under pressure, is equal to that of a falling body at a hight equal to the head which gives said pressure.

Therefore, $\sqrt{6\times64.33}=19.65$=theoretic velocity in feet per second.

The actual velocity is 10.08, found in column eight.

Hence, $10.08\div19.65=.5129$=ratio sought for.

The figures in column eleven are found in the same manner as those in column eight, by substituting the areas from column seven for those of column six; and the figures of column twelve are found by the same process as those of column ten, by substituting the velocities of column eleven for those of column eight.

The "revolutions of wheels per minute," in column thirteen, were deduced from the ratios of gearing and velocity of drums. Thus: the actual diameter of drum was $9\frac{1}{16}$ inches; the diameter of rope was $1\frac{1}{4}$ inches, but the effective circumference of the former was 2.5836 feet.

Then $25\div2.5836=9.6763$=revolutions of drums in 26 seconds.

And $9.6763\times60\div26=22.33$=revolutions of drum per minute.

Therefore $22.33\times60\div7=191.4$=revolutions of wheel per minute.

Having the revolutions of the wheels per minute, the "velocities of the circumferences of the wheels," in feet, per second, in column fourteen, are easily found.

Column sixteen contains the diameters of the model wheels, which were obtained by actual measurements of the same.

To get the velocity of circumference in feet per second, we have the diameter in inches=16.62.

Then, $16.62\times3.1416\div12=4.35$=circumference of wheel in feet.

And $191.4\times4.35\div60=13.876$=the velocity sought for.

Column fifteen gives the "ratios of circumferential to theoretic velocity." In the process for obtaining the ratios in column ten, it was shown that the theo-

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retic velocity of discharge of water under the given head was 19.65 feet per second.

Then 13.9÷19.65=.7074=ratio sought.

Column seventeen gives the "loads in pounds at the circumference of wheels," which are found by the following process:—

Above, it is stated that the revolutions of wheel and drum per minute are respectively 191.4 and 22.83, and, in this experiment the load on drum was 1,000 lbs.; therefore—

191.4 : 22.33 : : 1000 : 116.66,

which latter is the load on the wheel. Now, the diameter of the wheel is 16.62 inches, and the circumference in feet corresponding to this is 14.35, as above, while the circumference of drum is 2.5836 feet.

Therefore, 4.35 : 2.5836 : : 116.66× : 69.24, which latter is the load at the circumference of the wheel in pounds.

THE CHEMICAL HISTORY OF A CANDLE.

By Professor Faraday.

A Course of Six Lectures (adapted to a Juvenile Audience) Delivered before the Royal Institution of Great Britain.

LECTURE V.—(Continued.)

Oxygen present in the Air—Nature of the Atmosphere—Its Properties—Other Products from the Candle—Carbonic Acid—Its Properties.

Here is something that you can have a pull at when I have finished to-day. It is a little apparatus of two hollow brass hemispheres, closely fitted together, and having connected with it a pipe and a cock, through which we can exhaust the air from the inside, and though the two halves are so easily taken apart while the air is left within, yet you will see when we exhaust it by and by, no power of any two of you will be able to pull them apart. Every square inch of surface that is contained in the area of that vessel sustains fifteen pounds by weight, or nearly so, when the air is taken out; and you may try your strength presently in seeing whether you can overcome that pressure of the atmosphere.

Here is another very pretty thing—the boy's sucker, only refined by the philosopher. We young ones have a perfect right to take toys, and make them into philosophy, inasmuch as now-a-days we are turning philosophy into toys. Here is a sucker, only it is made of india-rubber; if I clap it upon the table, you see at once it holds. Why does it hold? I can slip it about, but if I try to pull it up, it seems as if it would pull the table with it. I can easily make it slip about from place to place; but only when I bring it to the edge of the table can I get it off. It is only kept down by the pressure of the atmosphere above. Here is a couple of them; if you take these two and press them together, you will see how strong they stick. And, indeed, we may use them as they are proposed to be used, to stick against windows or against walls, where they will adhere for an evening, and serve to hang anything on that you want. I think, however, that you boys ought to have experiments that you can make at home; and so here is a very pretty experiment in illustration of the pressure of the atmosphere. Here is a tumbler of water; suppose I were to propose to you to turn that tumbler upside down, so that the water should not fall out, and yet not keep it in by my hand, but merely by using the pressure of the atmosphere; could you do that? Take a wine glass, either quite full or half full of water, and put a flat card on the top; turn it upside down, and then see what becomes of the card and of the water. The air cannot get in because the water, by its capillary attraction round the edge, keeps it out.

I think this will give you a strong notion of what you may call the materiality of the air, when I tell you that that box contains a pound of it, and this room more than a tun, and you will begin to think that air is something very serious. I will make another experiment to convince you of this positive resistance. There is that beautiful experiment of the pop gun, made so well and so easily, you know, out of a quill, or a tube, or anything of that kind; where we take a slice of potato, for instance, or an apple, and take the tube and cut out a pellet, as I have now done, and push it to one end. I have made that end tight; and now I take another piece and put it in; it will confine the air that is within the tube perfectly and completely for our purpose; and now I shall find it absolutely impossible, by any force of mine, to drive that little pellet close up to the other. It cannot be done; I may press the air to a certain amount, but if I go on pressing, long before it comes to the second, the confined air will drive the front one out with a force something like that of gunpowder; for gunpowder is in part dependent upon the same action that you saw in this case.

Here is an experiment which I saw the other day, and was much pleased with, as I thought it would answer our purpose here. (I ought to have held my tongue for four or five minutes before I began this experiment, because I depend upon the strength of my lungs for the success of it.) By the proper application of air, I expect to drive this egg out of one cup into the other by the force of my breath, but if I fail it is in a good cause, and I do not promise success, because I have been talking more than I ought to do, to make the experiment succeed.

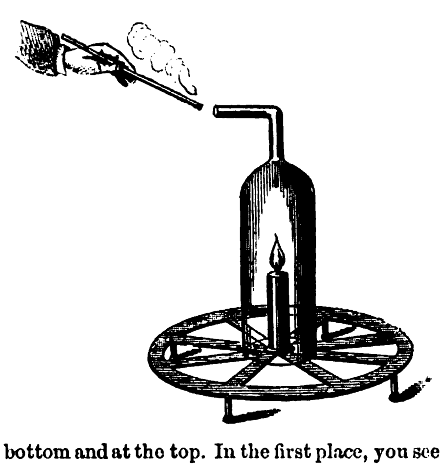
[The lecturer here tried the experiment, and succeeded in blowing the egg from one egg cup to the other.]

You see that the air which I blow goes downward between the egg and the cup, and makes a blast under the egg, and is thus able to lift a heavy thing—for a full egg is a very heavy thing for air to lift. If you want to make the experiment, you had better boil the egg quite hard first, and then you may very safely try to blow it from one cup to the others with a little care.

I think I have now kept you long enough upon this property of the weight of the air, but there is another thing I should like to mention. You saw the way in which, in this pop gun, I was able to drive the second piece of potato half or two-thirds of an inch before the first piece started, by virtue of the elasticity of the air; just as I pressed into the copper bottle the particles of air by means of the pump. Now, this depends upon a wonderful property in the air, namely, its elasticity, and I should like to give you a good illustration of this. It is this: if I take anything that confines the air properly, as this membrane, it is able to contract and expand so as to give us a measure of the elasticity of the air, and to confine in it a certain portion of air; and then, if we take the atmosphere off from the outside of it, just as in these cases we put the pressure on—if we take the pressure off, you will see how it will then go on expanding and expanding, larger and larger, until it will fill the whole of this bell jar, showing you that wonderful property of the air, its elasticity, its compressibility, and expansibility, to an exceedingly large extent; and this is very essential for the purposes and services it performs in the economy of creation.

We will now turn to another most important part of our subject, remembering that we have examined the candle in its burning, and have found that it gives rise to various products. We have the products, you know, of soot, of water, and of something else which you have not yet examined. We have collected the water, but have allowed the other things to go into the air. Let us now examine some of these other products.

Here is an experiment which, I think, will help you in part in this way. We will now put our candle there, and place over it a chimney, thus. I think my candle will go on burning, because the air passage is open at



the bottom and at the top. In the first place, you see the moisture coming—that you know about. It is water produced from the candle by the action of the air upon its hydrogen. But besides that, something is going out at the top; it is not moisture—it is not water—it is not condensible; and yet, after all, it has very singular properties. You will find that the air coming out of the top of our chimney is nearly sufficient to blow the light out I am holding to it, and if I put the light fairly opposed to the current, it will blow it quite out. You will say, that is as it should be, and I am supposing that you think it ought to do so, because the nitrogen does not support combustion, and ought to put the candle out, since the candle will not burn in nitrogen. But is there nothing else there than nitrogen? I must now anticipate—that is to say, I must use my own knowledge, to supply you with the means that we adopt for the purpose of ascertaining these things, and examining such gases as these. I will take an empty bottle—here is one—and if I hold it over this chimney, I shall get the combustion of the candle below sending its results into the bottle above; and we shall soon find that this bottle contains, not merely an air that is bad as regards the combustion of a taper put into it, but having other properties.

Let me take a little quick lime and pour some common water on to it—the commonest water will do. I will stir it a moment, then pour it upon a piece of filtering paper in a funnel, and we shall very quickly have a clear water proceeding to the bottle below, as I have here. I have plenty of this water in another bottle, but, nevertheless, I should like to use the lime water that was prepared before you, so that you may see what its uses are. If I take some of this beautiful clear lime water, and put that into this jar, which has collected the air from the candle, you will see a change coming about. Do you see that that water has got quite milky? Observe, that will not happen with air merely. Here is a bottle filled with air, and if I put a little lime water into it, neither the oxygen nor the nitrogen, nor anything else that is in that quantity of air will make any change in the lime water—it remains clear and perfect, and no shaking of that quantity of lime water with that quantity of air in its common state will cause any change; but if I take this bottle with the lime water and hold it so as to get the general products of the candle in contact with it, in a very short time, you see, we shall have it milky—there is the chalk, consisting of the lime which we used in making the lime water, combined with something that came up from the candle—that other product which we are in search of, and which I want to tell you about to-day. This is a substance made visible to us by its action, which is not the action of the lime water itself, but it is something new to us from the candle. And then we find this white powder produced by the lime water and the vapor from the candle, appears to us very much like whiting or chalk, and when examined it does not prove to be exactly the same substance as whiting or chalk. So we are led, or have been led, to observe upon the various circumstances of this experiment, and to trace this production of chalk to its various causes to give us the true knowledge of the nature of this combustion of the candle—to find that this substance issuing from the candle is exactly the same as that substance which would issue from a retort if I were to put some chalk into it and make it red hot with a little moisture; you would then find that exactly the same substance would issue from it as from the candle.

But we have a better means of getting this substance, and in greater quantity, so as to ascertain what its general characters are. We find this substance in very great abundance in a multitude of cases where you would least expect it. All limestones contain a great deal of this gas which issues from the candle, and which we call *carbonic acid*. All chalks, all shells, all corals, contain a great quantity of this curious air. We find it fixed in these stones, for which reason Dr. Black called it "fixed air"—finding in these fixed things like marble and chalk—he called it fixed air because it lost its quality of air, and assumed the condition of a solid body. We can easily get this air from marble. Here is a jar containing a little muriatic acid, and here is a taper which, if I put it to that jar, will show only the presence of common air. There is, you see, pure air down to the bottom; the jar is full of it. Here is a substance—marble, a very beautiful and superior marble, and if I put these pieces of marble into that jar, a great boiling apparently goes on. That, however, is not steam; it is a gas that is rising up, and if I now search the jar by a candle, I shall have exactly the same effect produced upon the taper as I had from the air which issued from the end

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of the chimney over the burning candle. It is exactly the same action, and caused by the very same substance that issued from the candle; and in this way we can get carbonic acid in great abundance—we have already nearly filled the jar. We also find that this gas is not merely contained in marble. Here is a vessel in which I have put some common whiting chalk, which has been washed in water, and deprived of its coarser particles, and so supplied to the plasterer as whiting. Here is a large jar containing this whiting and water, and I have here some strong sulphuric acid, which is the acid you might have to use if you were to make these experiments (only in using this acid with limestone, the body that is produed is an insoluble substance, whereas the muriatic acid produces a soluble substance that does not so much thicken the water). And you will seek out a reason why I take this kind of apparatus for the purpose of showing this experiment. I do it because you may repeat in a small way what I am about to do in a large one. You will have just the same kind of action, and I am evolving in this large jar carbonic acid exactly the same in its nature and properties as the gas which we obtained from the combustion of the candle in the atmosphere. And no matter how different the two methods by which we prepare this carbonic acid, you will see, when we get to the end of our subject, that it is all exactly the same, whether prepared in the one way or in the other.

We will now proceed to the next of our experiments with respect to this gas. What is its nature? Here is one of the vessels full, and we will try it as we have done so many other gases—by combustion. You see it is not combustible, nor does it support combustion. Neither, as we know, does it dissolve much in water, because we collect it over water very easily. Then you know that it has an effect and becomes white in contact with lime water, and when it does become white in that way, it becomes one of the constituents to make carbonate of lime or limestone.

Now, the next thing is to show you that it does dissolve a little in water, and therefore that it is unlike oxygen and hydrogen in that respect. I have here an apparatus by which we can produce this solution. In the lower part of this apparatus is marble and acid, and in the upper part cold water. The valves are so arranged that the gas can get from one to the other. I will set it in action now, and you see the gas bubbling up through the water, as it has been doing all night long, and by this time we shall find that we have this substance dissolved in the water. If I take a glass and draw off some of the water, I find that it tastes a little acid to the mouth; it is impregnated with carbonic acid; and if I now apply a little lime water to it, that will give us a test of its presence. This water will make the lime water turbid and white, which is the carbonic acid test.

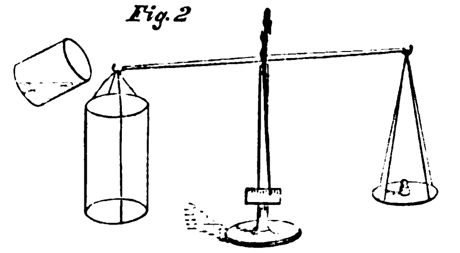
Then it is a very weighty gas; it is heavier than the atmosphere. I have put their respective weights at the lower part of this table, along with, for comparison, the weights of the other gases we have been examining:—

	PINT.	CUBIC FOOT.
Hydrogen..............	$\frac{3}{4}$ grs.	$\frac{1}{12}$ oz.
Oxygen................	$11\frac{9}{10}$	$1\frac{1}{3}$
Nitrogen...............	$10\frac{4}{10}$	$1\frac{1}{6}$
Air.....................	$10\frac{7}{10}$	$1\frac{1}{5}$
Carbonic acid...........	$16\ \frac{1}{3}$	$1\frac{9}{10}$

A pint of it weighs $16\frac{1}{3}$ grains, and a cubic foot weighs $1\ \frac{9}{10}$ ounces, almost two ounces. You can see by many experiments that this is a heavy gas. Suppose I take a glass containing nothing else but air, and this vessel containing the carbonic acid; and suppose I pour a little of this gas into that glass, I wonder whether any has gone in or not; I cannot tell by the appearance, but I can in this way [introduces the taper]. Yes, there it is, you see; and if I were to examine it by lime water, I should find it in the same way. I will take this little bucket, and put it down into the well of carbonic acid—indeed we too often have real wells of carbonic acid—and now, if there is any carbonic acid I must have got to it by this time, and it will be in this bucket, which we will examine with a taper. There it is, you see; it is full of carbonic acid.

I have another experiment by which I will show you its weight. I have here a jar suspended at one end of a balance—it is now equipoised, but when I pour this carbonic acid into the jar on the one side, which now contains air, you will see it sink down at once, because of the carbonic acid that I pour into it. And now I examine this jar with the lighted taper. I

Fig. 2



will find that the carbonic acid has fallen into it, and it no longer has any power of supporting combustion. If I blow a soap bubble, which, of course, will be filled with air, and let it fall into this jar of carbonic acid, it will float. But I shall, first of all, take one of these little balloons filled with air. I am not exactly sure where the carbonic acid is; we will just try the depth, and see whereabouts is its level. There you see we have this bladder floating on the carbonic acid, and if I evolve some more of the carbonic acid, you will see the bladder lifted up higher. There it goes; the jar is nearly full, and now I will see whether I can blow a soap bubble on that and float it in the same way. [The lecturer here blew a soap bubble, and allowed it to fall into the jar of carbonic acid, when it floated in it midway.] It is floating as the balloon floated, by virtue of the greater weight of the carbonic acid than of the air. And now, having so far given you the history of the carbonic acid, as to its sources in the candle, as to its physical properties and weight, when we next meet I shall show you of what it is composed, and where it gets its elements from.

ROMANCE OF THE STEAM ENGINE.

ARTICLE XVIII.

IMMENSE INCREASE OF ENGINES.

Our article this week being principally of a statistical and reflective character, is not, as usual, illustrated with an engraving. We have now brought down the chronicles of the steam engine to 1800, when the patent, extended to Watt, by the Act of Parliament, for twenty-five years, expired and was thrown open to the public. It was supposed that numerous new improvements would at once be brought into the field by other inventors, and that the firm of Bolton & Watt, which had enjoyed the monopoly so long, would be eclipsed. A new era in steam improvements was announced to commence, and, assuredly, this was really the case, but not in the sense anticipated. Owing to the exclusive manufacture of engines being in the hands of the Soho company, a public prejudice prevailed against its members, and many manufacturers, who were not aware of the great benefits conferred upon the world by the invention, hung back, as it were, from using steam engines, under the idea that when the patent expired they would obtain engines at much lower prices. It is stated that in London, in 1800, engine power to the extent of only 650 horses was all that was in operation; in Manchester, 450-horse power; in Leeds, 300; while on the whole continent of America there were only four steam engines—all Watt's. One of these was in New York, two in Philadelphia, and the other in Virginia.

When the patent was opened to the public, there was certainly a considerable rush made by millwrights—the only mechanical engineers of the time—to make and improve the engine, but the whole of them failed of success excepting those who copied Watt's engine in every essential particular. There was, however, a great and sudden demand made for new engines, and it is stated as an extraordinary fact, in proof of the long-continued monopoly of a patent not being beneficial to the patentees themselves, that in the first five years after the patent had expired, Bolton & Watt sold twice the number of engines that they had during an equal time when they possessed the sole right to manufacture them in England. The same company has transmitted the business to their descendants, who still carry on the manufacture at Soho on a most extensive scale, and they furnished the screw engines for the *Great Eastern*.

Since their first engine was built, in 1770, up to the present date, they have constructed 1,650 engines, of an united power equal to 177,000 horses; and the steam power of Great Britain, in ships, locomotives, and manufactories, is estimated at no less than 10,000,000 horses, or about one hundred millions of men.

It is not alone by the development and application of a new power to arts and commerce, for abridging human labor, that the steam engine has proven to be the modern apostle of civilization, but by the concentration of so vast a power into a very limited space. Results are now achieved that would have been deemed miraculous two hundred years ago. Some idea of this may be formed when we conceive a steamship, such as the *Vanderbilt*, driven across the ocean with a power equal to that of 2,000 horses drawing it; or a locomotive weighing only 24 tuns snorting along at the rate of 40 miles an hour, with a power equal to more than 200 horses. At the present day we cannot justly estimate what the steam engine has done for us. Had we lived before it was introduced, and had we seen the clumsy and inefficient machines which it superseded, we could have formed a more intelligent opinion of its benefits. There is one interesting case on record, however, which throws much curious light on this particular; it is that of the celebrated water engines at Marly, France.

In 1682, Louis XIV. had machinery erected at the village of Marly, upon the Seine, by the great engineer Rennequin, of Liège, to raise water for the town of Versailles. It was a gigantic specimen of the race of mechanical megalosaurians. The water was raised by fourteen large water wheels and a series of pumps, pipes, cranks and rods, remarkable for their ingenious complexity and the wonderful noise which they made while working. Dessaguliers said "the engine at Marly covers a mile in length of ground, its breadth is greater than that of the river Seine. It is a stupendous machine. It is stated to have cost over eighty million of French livres"—about $20,000,000. This machinery for raising water was held to be one of the glories of old France; no other country could show such a vast, ingenious and powerful machine. No sooner, however, was Watt's engine in successful operation than France became ashamed of what its people were formerly proud of, and Watt himself was sent for to construct an engine for Marly. It is said that one of his 50-horse engines, afterwards erected there, raised more water than the whole mile in length of the old machinery.

French Treatment of Croup.

A paper on this dangerous malady was lately communicated to the French Academy of Sciences, by Dr. Ozanan, who has devoted especial attention to this disease since 1849, and has made a great number of experiments with chemical agents in treating it. It is stated in a report of his paper that the chloride of potassium dissolves the false membrane in the throat in the course of 24 hours; chloride of sodium dissolves it in 36 hours; a solution of bromide potassium (1 part to 99 of water) dissolves it in 12 hours, and glycerine has the effect of softening it in 24 hours. Dr. Ozanan prefers alkalies as dissolvents in treating croup, but he quotes a peculiar case of successful treatment with a solution of common salt. A country physician in France, in 1860, while attempting to cauterize the throat of a patient with a stick of caustic, to his great dismay found the caustic sucked out of his fingers, and swallowed. In terror, he hastily prepared a strong solution of common salt as an antidote to counteract the effects of the poison, when to his own surprise it not only effected this object, but cured the croup also. Common salt, then, is a most simple and excellent agent for croup.

SPIRALS OF PLANTS.—It is a well known fact that certain plants grow spirally, some tending to the right and others to the left. Some new light has lately been shed upon this subject by Professor Wiedeman, who, in a communication to the Royal Society, London, attributes the phenomena to positive and negative electric currents. He states that in some experiments made by him with iron wire, he found that when he twisted it in the manner of a right-handed screw, after the passage of an electric current through it, the point at which the current entered always became a positive pole; and when he twisted it to the left hand, the point of entrance became a negative pole, and the wire magnetized. Currents of electricity flow through all plants.

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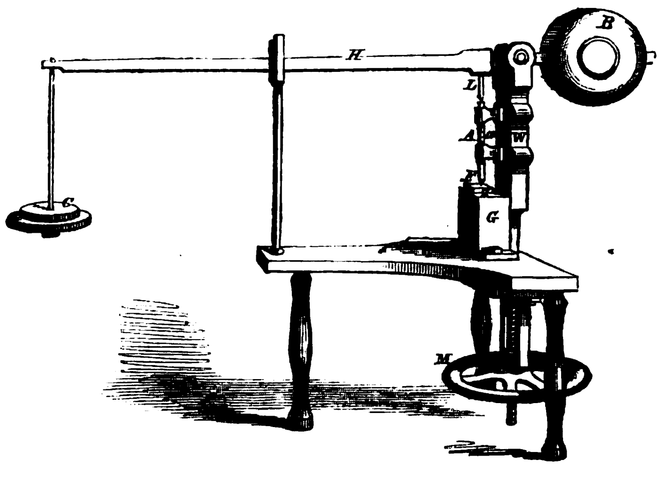
The Hardness of Metals and their Alloys.

[From Dingler's Polytechnic Journal.]

Formerly, in order to determine the hardness of different bodies, the bodies had been rubbed against one another, and that one which cut the others was considered the hardest. In this manner the following series was obtained :—Diamond, topaz, quartz, steel, iron, copper, tin, lead. This method is insufficient in its results, and, furthermore, it cannot be used to determine the hardness of metals and their alloys. A new method has therefore been thought of and used by Professor T. C. Calvert and B. Johnson, which allows of representing the hardness of the different metals and their alloys by figures.

For this purpose they used an apparatus consisting essentially of a lever, arranged so that the pressure exerted by the same on the piece of metal in question can be diminished by a weight attached to the shorter of the two arms of said lever. The apparatus is represented in the engraving, and it consists of a lever, H, with the sliding balance weight, B, and the dish, C, which receives the weights for increasing the pressure. The point, L, rests upon a square iron rod, A, which is guided by the lugs, E. The iron rod, A, is provided with a scale at *a*, and it is furnished with a conical steel point, F, 0·275 inches long, 0·197 inches wide at the base and 0·049 inches wide at the point. This point rests upon the piece of metal, the hardness of which is to be determined. A block of iron, G, supports the latter, and the standard or fulcrum, W, can be raised or lowered by means of a screw, M. By turning this screw the entire weight of the lever is thrown upon the standard, I, and upon the screw itself, and if it is desired, by turning said screw, the effect of the balance weight on the rod can be restored.



In order to determine the hardness of a substance, it is brought upon the block, G, and while the point, F, rests on it, the position of the scale, *a*, on the rod, A, is marked. The weight on the dish, C, is now increased until, during half an hour, the point, F, has penetrated to the depth of 0·125 (1/8) inch, and then the weight is marked. In repeating all the experiments twice results have been obtained which differed but slightly from each other.

The annexed tables give the degree of hardness of the various metals. The experiments have been restricted to such metals as are used by machinists and engineers, and, for them, it is of particular value to be able to determine the hardness of the various alloys :—

Metals.	Weight used. Pounds.	Calculated. Pig iron = 1000
Staffordshire pig iron, No. 3	4800	1000
Steel	4600?	958?
Bar iron	4500	948
Platinum	1800	375
Copper (pure)	1445	301
Aluminum	1300	271
Silver (pure)	1000	208
Zinc (pure)	880	183
Gold (pure)	800	167
Cadmium (pure)	520	108
Bismuth (pure)	250	52
Tin (pure)	130	27
Lead (pure)	75	16

From this table it appears that pig iron, as compared with other metals, contains a high degree of hardness ; but, notwithstanding many alloys have a very extraordinary hardness, not one of them is equal in this respect to pig iron.

The first series of alloys which has been investigated has been that of copper and zinc ; the second, the various compositions of bronze ; the third, alloys of tin and zinc ; the fourth, alloys of lead and antimony ; and the last, alloys of lead and tin.

ALLOYS OF COPPER AND ZINC (BRASS).

Formulas according to the equivalents. Alloys.	Contained in 1000 parts of the alloy. Copper.	Lead.	Weights used. Pounds.	Obtained. Pig = 1000	By calculation. Pig = 1000
Zn Cu5	82·95	17·05	2050	427·08	280·83
Zn Cu4	79·56	20·44	2250	468·75	276·82
Zn Cu3	74·48	25·52	2250	468·75	276·04
Zn Cu2	66·06	33·94	2270	472.92	261·04
Zn Cu	49·32	50·68	2900	604·17	243·33
Cu Zn2	32·74	67·26	Broke with 1,500 pounds. The point did not sink in.		
Cu Zn3	24.64	75·36	Broke with 1,500 pounds. The point sunk in to the depth of 1-64th of an inch.		
Cu Zn4	19·57	80·43	Broke with 2,000 pounds. The point penetrated a little deeper than before.		
Cu Zn5	16·30	83·70	The point penetrated to the depth of 1-16th of an inch with 1,500 pounds. Broke with 2,000.		

From this table it appears that those alloys which contain a surplus of copper are much harder than the metals themselves which constitute the alloy ; and it is singular that this increase is owing to the zinc, the softer of the two metals contained in the alloy. If the quantity of zinc contained in the alloy exceeds 50 per cent, the alloy becomes so brittle that it bursts as soon as the steel point begins to sink in. It is thought that some of these alloys with a surplus of zinc merit the attention of engineers, notwithstanding, on account of their white appearance, they are not sold in the market. In particular, it is the alloy expressed by the formula Cu Zn, and containing, in 100 parts, 49·32 parts copper and 50·68 parts zinc, which deserves every attention. Notwithstanding it contains 20 per cent more zinc than any ordinary brass, its color, if the same is properly made, is much more beautiful than that of brass. The only reason why it did not come into use is probably because, if the quantity of the zinc used in the alloy exceeds 33 per cent the brass becomes so white, the manufacturers considered it advisable not to exceed this proportion. But if they had taken the quantity of zinc exactly up to 50·68 per cent, and if they had mixed the metals well, they would have obtained an alloy of a color equally rich as that containing 90 per cent of copper, and of a hardness three times greater than that of the latter. In order to make the value of this alloy better understood to engineers, we give a table of the different kinds of brass generally manufactured :—

Brass.	Contained in 100 parts. Copper.	Tin.	Zinc.	Lead.	Hardness of the alloy. Weight used. Pounds.	Pig iron = 1000 Obtained.	Cal'd.
Large bearing	82·05	12·82	5.13	—	2700	562	259
Mud plugs	80	10	10	—	3600	750	262
Yellow brass	64	—	36	—	2500	520	258
Pumps & pipes.	80	5	7.5	7.5	1650	343	257

The alloy Cu Zn contains still another quality, viz., the inclination to form prismatic crystals, that is, prisms about half an inch in length and of an extraordinary toughness. There is no doubt that this alloy is not a mixture but a chemical composition of the two metals, the same as a great many alloys, which is clearly shown in the article on the conductibility of different metals and their alloys, published on pages 36 and 87, Vol. III. (new series), of the SCIENTIFIC AMERICAN.

BRONZE ALLOYS.

Formula according to their chem. comp'tn.	Contained in 100 parts. Copper.	Tin.	Hardness. Weight used.	Pig iron = 1000 Obtained.	Calc'd.
Cu Sn5	9·73	90·27	400	83·33	51·67
Cu Sn4	11·86	88·14	460	95·81	59·56
Cu Sn3	15·21	84·79	500	104·17	68·75
Cu Sn2	21·21	78·79	650	135·42	84·79
Cu Sn	34.98	65.02	With 700 pounds the point sunk in 1-32d of an inch, and the alloy broke.		
Sn Cu2	48·17	51·83	Broke with 800 pounds. The point did not sink in.		
Sn Cu3	61·79	38·21	Broke with 800 pounds in small pieces.		
Sn Cu4	68·27	31·73	Broke in two with 1,300 pounds. The point did not sink in 1-64th of an inch.		
Sn Cu5	72·90	27·10	The same as before.		
Sn Cu10	84·32	15·68	4400	916·66	257·08
Sn Cu15	88·97	11·03	3710	772·92	270·83
Sn Cu20	91·49	8·51	3070	639·58	277·70
Sn Cu25	93·17	6·83	2890	602·08	279·16

The results obtained with this series of alloys are very remarkable. All the alloys containing a surplus of tin are very soft ; and if the quantity of copper—one of the toughest metals—is a little increased, the alloy is rendered brittle, for the alloy $Cu\,Sn^2$ is not brittle, while this is the case with the alloy Cu Sn. And the same is the case with all the other alloys up to $Sn\,Cu^5$, and the brittleness only ceases with the alloy $Sn\,Cu^{10}$, which contains 84·32 parts copper to 15·68 parts tin ; and this alloy, notwithstanding four-fifths of its weight are copper, is nearly as hard as pig iron. The small quantity of tin mixed with the copper renders this alloy, and all those which follow, remarkably hard.

Since copper and tin, mixed with tin or zinc, obtains a much larger degree of hardness than it has when pure, it was of some interest to find out whether the alloys of tin and zinc also become harder than theory would let us believe. The following table contains the results of some experiments made with such alloys :—

ALLOYS OF TIN AND ZINC.

Chemical composition.	Contains in 100 parts. Zinc.	Tin.	Hardness. Weight used.	Pig iron = 1000 Obtained.	Calc'd.
Zn Sn2	21·65	78·35	300	64·50	60·83
Zn Sn	35·60	64·40	330	68·75	82·70
Sn Zn2	55·61	47·49	400	83·33	110·00
Sn Zn3	62·43	37·57	450	93·70	124·58
Sn Zn4	68·86	31·14	505	105·20	131·22
Sn Zn5	73·43	26·57	600	125·00	142·08
Sn Zn10	84·68	15·32	580	120·83	158·33

These results show that these two metals have no influence on each other, and the figures representing their hardness are almost without exception smaller than those obtained by calculation. The same results have been obtained in regard to the conductibility of heat of these alloys, which shows conclusively that they are mere mixtures.

We add two tables of alloys, consisting of tin and antimony, and also consisting of lead and tin. We find that in the alloys of tin and lead, the tin increases the hardness of the lead, but not in the same degree as that of the copper.

ALLOYS OF LEAD WITH ANTIMONY.

Chemical composition.	Contained in 100 parts. Lead.	Ant'y.	Weight used.	Hardness.
Pb Sb5	24·31	75.69	900	The point sank in to 7·64 inches, and the block broke.
Pb Sb4	28·31	71·36	900	The block broke when the point had penetrated 7-64 inches.
Pb Sb3	34·86	65·14	875	182
Pb Sb2	44·53	55·47	600	The block broke when the point had penetrated 7-64 inches.
Pb Sb	61·61	38·39	500	109
Sb Pb2	76·32	23·68	385	80
Sb Pb3	82·80	17·20	310	66
Sb Pb4	86·52	13·48	300	64
Sb Pb5	88·92	11·07	295	63

ALLOYS OF LEAD WITH TIN.

Chemical composition.	Contained in 100 parts. Lead.	Tin.	Hardness. Weight used.	Pig iron = 1000 Obtained.	Calc'd.
Pb Sn5	26·03	73·97	200	41·67	23·96
Pb Sn4	30·57	69·43	105	21·62	23·58
Pb Sn3	36·99	63·01	160	32·33	22·83
Pb Sn2	46·82	53·18	125	26·04	20·09
Pb,Sn	63·78	36·22	100	20·83	19·77
Sn Pb2	77·89	22·11	125	26·04	18·12
Sn Pb3	84·09	15·91	135	28·12	17.23
Sn Pb4	87·57	12·43	125	26·04	17·08
Sn Pb5	89·80	10·20	110	22·92	16.77

Enormous Profits of Telegraph Companies.

At the late session of Congress an attempt was made to procure an extension of Morse's telegraph patents, and the attempt was opposed by Dr. Leverett Bradley. From Dr. Bradley's memorial in opposition to the extension, it seems that the line between Boston and New York yields sufficient profits every three months to pay for building the line ! Stock has been issued for large amounts more than the line cost, and on this artificially inflated stock great dividends are made.

The capital stock of the American Telegraph Company for their line between Boston and Washington is now $1,535,000, upon which the net profits amount to over 20 per cent per annum. It is known that responsible parties will give bonds to build a line over the same route and stock it, to do the same amount of business now done, for $75,000.

A dividend of cent per cent was paid, a few years ago, upon the inflated stock of the greatest of the Western companies, after which the stock was multiplied by five so as to amount to some millions.

No definite statement can be made of the amount of the present wealth of Professor Morse, as that is a private matter which it might be deemed to his interest to keep from the public ; but from what he has received from his patents it ought to be very great. He must, however, under any circumstances, have realized an immense sum. From the large amount of very valuable telegraph stock Mr. Morse holds now, and from the highly valuable real estate in his splendid mansion near the Fifth-avenue, New York, his estate at Poughkeepsie, and other property, it is clear that he is a rich man, and his riches have been realized from his patents. He stands on the books of one of the telegraph companies, viz.: The American Telegraph Company, as the owner of 1,007 shares of stock of $100 each, on which the net profits have been the last year from 20 to 25 per cent. (The stock of that company is over $1,600,000.) He is also the owner of a large amount of stock of other telegraph companies, owning the lines from Washington to New Orleans *via* Richmond, Charleston, Savannah and Mobile ; also the lines from New York to Buffalo, Louisville to New Orleans, and other lines. Mr. F. O. J. Smith, who owned one quarter of the Morse patent, sold that quarter with stocks acquired from it, reserving a remaining interest of $75,000, for $300,000, as appears from the contract sale with the American Telegraph Company.

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Correspondence

Hot Water as a Means of Defense.

MESSRS. EDITORS :—I have often wondered why the use of hot water has not received the attention of military engineers to a greater degree than it has. My proposition in regard to fortifications, is the extending of a line of cast-iron pipes between four and six inches in diameter protected, along the outside of the ramparts, with shot tubes like unto enlarged gas burners placed seven or eight inches apart, and screwed into the main pipes with apertures similar to fish-tail burners, so as to throw the streams in opposite directions, each stream crossing the other, care being taken that the tubes be turned slightly from the ramparts, so as to eject the streams outwardly. In this manner a constant sheet of scalding water could be poured into the ranks of the enemy. At certain distances, say thirty or forty feet, valves should be inserted, which, by a simple movement, would turn on or off the water, according to the section of pipe at which the attack would be made. In reference to vessels-of-war, particularly steamers, it could be most easily and successfully employed. I would, in that case, propose the extension of a belt, as it were, of pipe, from three to four inches in diameter, around the entire hull, outside, at a proper distance from the water, fitted with short tubes, as in the case of the fortification, the supply operated upon by means of stop-valves from the inside, at the spot or section it should be required. WALTER P. BURROW.

Norfolk, Va., March 18, 1861.

[We presume the objection to the use of hot water in warfare, here proposed, is that the opportunities for using it are so few. In a fort it could not be used during a siege, only during an assault, and might be waited for, with steam up, for months. In a war steamer the extra weight of larger boilers, and their contained water and increased consumption of fuel, would be an objection ; for water could not well be spared from the boilers commonly used, as steam must be kept up to enable them to manœuver.

We recollect reading, some years ago, of an instance in which such use of hot water and steam, made incidentally and without special appliances, was signally effective. A small British war steamer, cruising in the China seas, was attacked by a whole fleet of the pirates who infest those waters in such great numbers, and, notwithstanding the best defense that could be made with the guns and small arms, they were commencing to board in swarms, when the engineer, without orders, brought out a hose from the boiler to the deck, and by a little well directed squirting, in a very few seconds drove them all overboard into their boats or into the sea, and many who escaped scalding were drowned.

In the year 1813, the greatly distinguished Robert Fulton proposed to the President of the United States the building of a great war steamer, to be called *Demologas*, and he executed drawings and specifications for her entire construction and armament. She was to carry a great battery, furnaces for red hot shot, submarine guns to discharge hundred pound balls into an enemy's vessel below her water line, and, in addition to this, her engine was to discharge an immense column of hot water upon the decks and through the port holes, thus making her the most tremendous war vessel ever suggested by human ingenuity. The cost of the *Demologas* was estimated at $320,000. In the subsequent year, March 1814, Congress made an appropriation for building this vessel, its chief object being that of a floating battery for coast defense. Fulton was appointed chief engineer, and Adam and Noah Brown, of New York, received the contract for the hull, and in the month of October following, these enterprising shipbuilders had her safely launched in the presence of a vast multitude of people who lined the shores of the East river. In length she was 156 feet ; breadth, 56 feet ; depth, 20 feet ; and her wheels were 16 feet in diameter. In May, 1815, her engine was fitted up ; the cylinder was 48-inch bore ; stroke,60 inches ; and her capacity 2,475 tuns. The trial trip was made on the first of June, and was considered very successful, the speed attained being 6¾ miles per hour. Flaming reports of this "devil of a war ship" soon reached Europe, and in a treatise on steam vessels, which was published in Glasgow, Scotland, about that time, the author of the work, giving a full and accurate account, as he stated, of the *Demologas*, described her as being "300 feet in length ; breadth, 200 feet ; thickness of her sides, 13 feet—alternate oak plank and cork-wood—carries 40 guns, four of which are 100 pounders, can discharge 100 gallons of boiling water per minute, and by ingenious mechanism, brandishes 300 cutlasses with the utmost regularity over her gunwales, and works an equal number of heavy iron pikes of great length, darting them from her sides with prodigious force."

As this vessel was built during the excitement of the last war with England, the forgoing description shows that she was reviewed from the shores of Scotland with a telescope, far surpassing in its magnifying powers the great instrument of Lord Rosse. Under its focus, the *Demologas* swelled into proportions, beside which the *La Gloire*, the *Black Prince*, and all the recent great floating batteries of England and France are mere pigmies. Great Britain was in commotion by the news of the *Demologas* being launched, but peace being declared soon afterward, her scalding water, flashing cutlasses and thrusting pikes, never had a chance of cooking an Englishman, spiking a Scot, or decapitating an Irishman.

The *Demologas* was used as a receiving ship at the Brooklyn Navy Yard, from 1815 until the night of June 4, 1829, when she blew up, killing 24 men and wounding 19. The cause of this unfortunate accident has never been satisfactorily ascertained. The *Demologas* was the first steam vessel of war ever built.—EDS.]

A Curious Experiment.

MESSRS. EDITORS :—Why is it? Take a round piece of pasteboard (or any other shape) and insert it in a quill open at both ends, as in the drawing, and lay this on another piece of pasteboard of the same shape, in which is stuck a pin, so that the pin will enter the quill. Blow through the quill as hard as you may, but the lower piece cannot be blown off. G. B. D.

Marion, Ohio, March 14, 1861.

[A common spool, such as is used for sewing cotton, forms a suitable apparatus for trying this wonderful experiment. Take a bit of smooth writing paper a little larger than the head of the spool, and run a pin through the paper and into the bore of the spool. Now, by blowing down, as represented in the cut, it will be found impossible to blow the paper off.

By observing closely, it will be seen that the paper does not quite touch the head ot the spool. It is, of course, necessary to hold the paper up with the hand until you begin to blow.

The explanation is this :—When the currents of air are established radiating from the central tube horizontally between the disk and the paper, the greater area of the disk as compared with that of the tube, causes the air above the paper to be rarified, when the pressure of the air below, not being fully counterbalanced, holds the paper up. The pin acts as an anchor to prevent the paper from being blown away horizontally.—EDS.]

Closing the Vent in Firing Cannon.

MESSRS. EDITORS:—Why does a premature discharge take place in loading a cannon, if the vent be not closed? An answer through your paper will oblige C. F. C.

Lowell, Mass., March 28, 1861.

[There are always left in a cannon, after a discharge, pieces of the cartridge bag on fire, and if the sponge be passed down the bore without closing the vent, a draft of air is created which fans the flame ; but if the vent be closed, the smoke is compressed around the burning cloths, and the fire is smothered. Sometimes, when firing in the dark, a man cannot find the vent until the sponge is put in ; then the flame will stream from the vent as if the gun was quite full of fire.

PALACE OF WESTMINSTER.—Marcus B. Monck, publisher of the *Builder*, No. 89 Nassau-street, is presenting to his subscribers a beautiful steel plate engraving of the British Houses of Parliament.

First Locomotives in America.

MESSRS. EDITORS :—Was not the first locomotive run upon an American railway (the Schenectady) constructed in England, with brass flues, and, in consequence of the different degrees of contraction between brass and iron, did the flues not rupture, and were not copper flues put in afterward ? And did not John Hampson, who was sent to England to procure this engine, fail for some time to discover the cause ? This information I received from himself. I inclose you an article from the Scranton *Herald* in relation thereto.

GEORGE MERRICK.

Northumberland, Pa., March 15, 1861.

[Our cotemporary—the Scranton *Herald*—publishes an account obtained from Major Allen of the Novelty Works, this city, of the first locomotive trial trip made in America. This took place, it is stated, on the Deleware and Hudson Canal Railroad ; Mr. Allen was the engineer on the occasion ; the engine was purchased in England, but was soon abandoned on account of the feeble character of the bridges on the road—they could not bear its load. The date when this trial took place is not given. We have always entertained the opinion, perhaps without good reason, that the first locomotive run in America was called the *John Bull*, was obtained from England for the Albany and Schenectady Railroad, and that it did good service for several years, after being altered for burning wood fuel. Mr. D. Matthews, engineer, Philadelphia, or Mr. Walter McQueen, Superintendent of the Schenectady Locomotive Works, can, we presume, furnish accurate information on the subject. —EDS.]

Cutters of Planing Machines Should Have a Soft Temper.

MESSRS. EDITORS :—Last winter, while planing a large lot of oak plank and timber with a Daniels' machine, I learned something in regard to tempering the cutting knives, which was new to me at least, and may be of service to some of your readers. When I first began, I tempered the knives as hard as they would stand without breaking. By accident, I made one quite soft, and found that it would last nearly twice as long as the hard ones. I afterward tempered it as soft as I could and not have the edges roll or turn, and not only found much less work in grinding, but much more durability.

Why would not the same rule apply to the Woodworth planer ? I know the knives of those machines used to be tempered very hard, and may be now.

O. GUTHRIE.

Chicago, Ill., March 20, 1861.

Diaphanie, or the Art of Imitating Stained Glass.

Our readers will remember the popularity of potichomanie. Potichomanie is now adopted for decorating many articles not thought of on its first introduction. The potichomanic process is adopted for ornamenting opaque glass only, such as vases, epergnes, spillholders, &c., and thus differs from diaphanie, which is for transparent glass, such as windows, lampshades, conservatories, screens, &c.

The materials requisite for the process consist of printed designs, brushes, transparent varnishes, and colors. Almost any picture, printed either in colors or plain, will become transparent if brushed over with a bright clear varnish, such as sandrach varnish (gum sandrach in spirit), or Canada balsam in turpentine.

The method of proceeding is as follows. Suppose it is intended to ornament a staircase window : first obtain squares of glass of the proper size to fit the sash, then lay down one of the squares on a flat board, having a groove so as to prevent it moving during the operation, the first of which is to polish it quite clean and bright ; this being done, coat it over with a thin film of transparent varnish, and then allow it to partially dry. While this is doing, arrange the design of colored papers, or employ an engraving, lithograph, or photograph on paper.

In making a design of colored papers attention must be paid to the harmonious distribution of the colors ; thus the complimentary color of purple is yellow, that of blue is orange, the best contrast to red is green ; with a red ground blue and yellow borders are required ; with a blue ground yellow and red edges are most suitable. Green, orange, and purple may be used more freely than red. Red and yellow are best suited for windows of a northern aspect, while blue, purple, and green are most appropriate where there is an excess of light. Besides plain colored grounds

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diaphanie is capable of imitating works of art, such as historical subjects, both sacred and profane; portraits and animals; landscapes and flowers; armorial and mediæval devices, &c.

Presuming now that the varnish with which the glass has been coated is sufficiently dry to act as a cement for the paper, engraving, or photograph, brush over the face of the design a coat of the transparent varnish, and then proceed to lay it down on the glass in such a manner as not to require shifting. If only slightly out of place it can be rectified, but if very crooked the design must be lifted and again laid down more carefully. If there are any air-bubbles under the pattern they can be removed by scraping a stiff card over the picture, drawing the air from the center to the side. The design can also be flattened down on the glass by placing a sheet of paper upon it, and rubbing it with a soft duster.

The patterns are now left to dry for twenty-four hours, and if then the whole adheres perfectly to the glass, they must be brushed over with a coat of transparent liquid, and then left to dry, and finally varnished, when the diaphanied squares of glass may be said to be complete, and have then only to be placed into their position to show their exquisite effect, and being already cut of the size to correspond with the panes of glass in the window, they are easily held in the sash by a few small pins, or brass brads; the picture side of the glass is to be placed next to the window-pane, so that the unprepared side can be cleaned as other windows are.

In large towns there are always back windows, with anything but a "bright prospect." Now, ladies with taste can make these "look-outs" objects of admiration and elegance.

Diaphanie has the merit of combining moderate cost with durability and beauty; and there are few people but love the labor of their own hands, or of those who are bound to them by ties of love and affection. When the worker shall have passed away, these memorials of her taste and industry will still remain, and when the first grief of the mourner has become but a pleasurable recollection of the past, they will be treasured as household gods. An old map, worked in silk, hangs in our library; it is a sampler of—never mind of whom—of somebody, when she was a little girl at school. I would not change it for a work of Raphael or Hogarth. Future generations will say the same of those who now work at diaphanie!—*Septimus Piesse.*

An American Invention in England—Feed for Locomotives while Running.

At a recent meeting of the Institution of Mechanical Engineers, at Birmingham, England, a paper was read by Mr. John Ramsbottom, describing a method of feeding locomotive engines while running. The invention consists of a scoop or curved pipe attached on the bottom of the tender, which dips down into an open trough of water, and delivers it into the tank of the engine whilst running along. The scoop is carried on a center bearing, and when not used it is tilted up clear of the ground by a balance weight. The trough extends the length of a quarter of a mile along the line, and the hight of the water is maintained a little above the rails. The results were given of filling the tender, while running at different speeds. It was found that the delivery of water into the tender was effected when the engine was passing at the rate of 15 miles per hour, at 22 miles per hour, and at 50 miles per hour; and the quantity scooped up in each case was 1,100 gallons in passing. This mode of feeding the boiler while running was designed to carry out the quick working of the Irish mail, which is required to make a clear run of 84¾ miles without stopping—from Chester to Holyhead. The water trough is fixed half-way on the road. This plan is also designed for feeding heavy freight engines, to avoid the necessity of stopping for water; and it also renders available, without halting, good water on any part of a line, where there is no station.

This method of feeding locomotives, while on the run, with water, deserves attention. It is described as being in practical use in both the London *Engineer* and *Mechanics' Magazine*. We claim the invention as an American production, and secured by patent to Angus W. McDonald, of New Creek Depot, Va., 28th Nov., 1854. It was illustrated on page 137, Vol. X. (old series), Scientific American; but so far as we have been able to learn, it has never been used on any of our railroads. Our railroad companies ought to be ashamed of themselves for thus allowing English engineers to carry out a somewhat old American invention into successful practice before them.

Under the old tariff, wool worth 20 cents per lb. or under was free from duty, and wool worth over 20 cents, had to pay 24 per cent. The way to avoid paying this duty was as follows: The agent of the importer in this country bought a quantity of wool in France. He explained to the seller how matters stood, and he asked him to let him have the wool, which was, perhaps, worth 25 cents per lb., for 20 cents. "I will give you exchange on London for 96 in payment therefor. It is true, I could sell this exchange at 108, but I will make the sacrifice because it is for you." After the sale was complete, they went to the nearest American consul and made an affidavit that the wool had been bought and sold for 20 cents per pound, and it was imported duty free.

The difference between long and short staple cotton to the uninitiated, would seem to be but little, but that little has cost inventors of cotton gins a great deal of study. The short staple can be rapidly ginned by the Whitney or saw gin, but this device breaks and destroys the fiber of the long staple. The latter is therefore ginned by rollers, a comparatively slow and tedious process. An almost endless variety of plans have been prepared to expediate the working of the roller gin, and in this effort McCarthy and others stand preëminent. The original roller gin, through their exertions, has been much improved, and it is not improbable that eventually the long staple will be ginned as rapidly as the short staple.

In the British Provinces in the East Indies, they have an easy way of settling differences between the custom-house officers and the importers. If the custom-house officers consider the price named for a certain quantity of goods in the invoice too low, they have a right to buy the goods at the price named in the invoice, and the merchant is obliged to sell at that price. In this country importers have to submit to the opinion of the appraisers, and the only alternative left to them is to pay the duty and sue for it afterward.

Rived shingles are superior to sawed ones, on account of the former having the grain of the wood, or rather the cells, protected from the weather, the latter not being cut or ruptured as is the case with sawed shingles. This rupturing or cutting of the cells admits of the absorption of moisture, and the consequent warping and twisting of the shingles. The planing of rived shingles improves their appearance, but does not add to their durability, as in the process of planing the cells are more or less severed.

Steam boilers, iron bridges and iron ships are rated in strength only about one-fourth and one-sixth that of the iron as tested by experiment. This is for the purpose of making allowance for flaws that may be in the metal, and which cannot be detected by simple inspection. There is also such a great difference in the quality of iron plates turned out in the same establishment that it is prudent to make allowance for all defects.

Faraday has shown that it takes a current of electricity, of sufficient power to keep a platinum wire $\frac{1}{104}$ of an inch in diameter red hot, 3¾ minutes to decompose one grain of water. The quantity of frictional electricity required to produce the same effect, would be that furnished by 800,000 discharges of a battery of Leyden jars, exposing 3,500 square inches of surface.

Discovery of New Metals.—The first result of the new method of analysis by the lines of the spectrum was to inform us what substances exist in the sun; the next result is the discovery of two new metals on the earth. One of these has been named cæsium, from the color of the peculiar lines in the spectrum of its light; the other is not yet named. Cæsium resembles potassium in its properties, and exists only in exceedingly minute quantities.

New York holds the first rank not only as the chief shipping port on our continent, but the first port for shipbuilding also. Most of these vessels are steamers; the cost of building averages about $60 per ton.

Column of Varieties.

The *Gazette Medicale* states that charcoal has been discovered to be an excellent remedy for relieving the pain of burns and healing them.

The iron ore in the Lake Superior country is almost a pure oxyd. About one tun of metal may be obtained from one and a half tuns of ore.

It is said that the Austrian government has just made a contract with a firm at Trieste for the construction of two iron-plated steam frigates.

Wrinkled silk may be rendered nearly as beautiful as when new by sponging it on the surface with a weak solution of gum arabic or white glue, then ironing it on the wrong side.

A new paper mill has lately gone into operation at Santa Cruz, California, in which about one half of the wrapping paper consumed in that State can be manufactured.

The English nation is the most powerful one that ever existed; the area of England is only 50,387 square miles. The State of New York contains 47,000 square miles and the total area of the *free* States and territories of this country is over 2,000,000 square miles.

Water is composed of two gases, oxygen and hydrogen, united chemically in definite quantities. Every nine pounds of water contains one pound of hydrogen and eight of oxygen.

The *Presse Scientifique des Deux Mondes* states that the commission appointed by the Diet of Frankfort to consider the subject of a reform in the weights and measures of Germany, have just voted to adopt the French system.

The cheap moldings commonly termed "gilt," and which are employed in interior architectural decorations, railway cars, and for common mirror and picture frames, are not covered with gold leaf. Metallic leaf is used instead, and lacquered over in imitation of gilt. These frames can be made at a small cost.

A correspondent of the *Western Railroad Gazette* advocates the kyanizing of railroad sleepers to render them more enduring. He shows that a net annual saving of $1.70 per mile may be effected by thus treating railroad timber. We are glad to find an assistant advocate of this system in our cotemporary.

A valuable mine of opals has been discovered on the Snowy Range of mountains in California. Some of these gems have arrived in this city. There are several varieties of opal; the first qualities of this stone have hitherto been very rare. One weighing 17 oz. belongs to the Emperor of Austria.

Nothing surprises a visitor from New York to Havana, Cuba, more than the fish which he sees exposed for sale. Instead of the dull and drab colors which are common to the fish in northern latitudes, they exhibit the most brilliant hues. Some are striped with bands of gold and silver, the luster of which is like that of the polished metals. The very eels are covered with shining blue, white and yellow streaked.

Dr. C. T. Jackson, of Boston, Mass., has recently contributed an article to the *Medical and Surgical Journal* on a number of cases of poisoning lately brought under his notice from green-colored wall paper. Dr. F. S. Ainsworth, of Boston, also reports a case of child poisoning from sucking the surface of a green concert ticket.

On all the French and German railroads steel tyres are employed on the driving wheels of locomotives. All these are manufactured by Krupp, of Prussia. They endure so much longer than iron tyres that, although dearer at first, they are cheaper in the end.

Mitchell's *Steamshipping Journal* (British) advocates the exclusive use of iron for hooping cotton bales. Eighty bales of cotton rope bound were lately burned on the Manchester Railroad. Had these been bound with iron hoops, probably one half of them would have been saved. "In a few years," says this journal, "only the most old-fashioned houses will think of sending their cotton to sea in any other than iron-bound bales."

A railroad train ran off the track into the open draw of the bridge over the Hackensack river last week. The train consisted of a locomotive and one iron passenger car, the latter built by Cundell, of Paterson, N. J. It was filled with passengers, but not a life was lost, as the car was but slightly injured. Had it been made of wood, probably one half of the passengers would have been killed by splinters.

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THE ARMSTRONG GUN A FAILURE.

We take the following remarks, with the accompanying engravings, from the London *Mechanics' Magazine*:—

Artillery officers high in the service have watched with the liveliest interest the result of the trial of the Armstrong gun in China and elsewhere, and we believe we were the first to call attention to the confidential dispatch of Captain Hay, R.A., the officer specially charged with the duty of superintending the use of the Armstrong gun in China, and who was so well calculated, by his prior experience with the weapon at Shoeburyness, to fulfill the duty assigned.

The pith of his report may be summed up in these words:—"That though the Armstrong gun, under the most favorable circumstances, that is, where the efficiency of the shell had not been destroyed by the voltaic currents, inevitable from the construction of the shell, gave very accurate shooting, still, the casualties to our outlying riflemen were so serious that the guns were obliged to be withdrawn at the most critical part of the action in which they were engaged. Consequently other batteries, armed with the old service gun, had to be advanced in their place, and that generally the gun was inferior to the French rifle gun for the purposes of actual warfare."

With this prior knowledge, these practical artillerists naturally asked the question, "If the gun of which such sanguine expectations were formed broke down in a campaign against the Chinese, what would be the result were our national honor to be sustained in a European conflict, wherein the gun would not only have to fulfill the condition of being fired *from*, but subject also to *being fired at and struck by* the enemy's shot and shell?"

Urgent representations were consequently made to the proper authorities, and it was determined that experiments should be conducted by the select committee, with the view of ascertaining by experiment what would be the effect on the guns of the Armstrong construction when struck by shot and shell.

On Wednesday, the 20th inst., a twelve-pounder Armstrong gun was placed in position, on its carriage, opposite the proof butt at Woolwich, and a nine-pounder brass gun told off for the purpose of firing at it. The first shot fired at the Armstrong gun was so arranged that the gun fired at should occupy a position of 15° from the axial line of the nine-pounder service gun employed against it. The distance selected was 100 yards. The first shot struck the Armstrong gun immediately in front of the trunnions; the effect was to completely destroy the gun, breaking through both coils, and causing the muzzle to droop 12°. The second shot struck it behind the trunnions; the effect of this shot was to cause the whole of the gun in front of the trunnions to fall on the ground, and to completely break up the gun behind the trunnions. The third shot struck the gun in the thick part of the breech, utterly breaking the gun up in its thickest part, breaking the breech screw, and proving beyond all cavil that either of the three shots was fatal to the gun, and that it was not calculated for the purposes of European warfare.

The accompanying engravings show the effect produced.

Objection was taken that under the same condition the service nine-pounder gun would likewise be destroyed, therefore the committee, in equity, determined to put the matter to a test. A service nine-pounder gun was, on Monday last, placed in position in front of the proof butt, and was fired at by another nine-pounder gun at the distance of fifty yards. Three shots were fired under precisely the same conditions, striking the gun fairly, as shown by the engraving, one on the chase, and two behind the trunnions. As this trial did not destroy or materially injure the gun for service purposes, it was turned round, and three more shots were fired, striking it in the same position on the other side of the gun. After this severe test the gun remained intact, the only perceptible injury being a slight indentation of the bore on one side in the chase or forepart of the gun.

Fig. 1

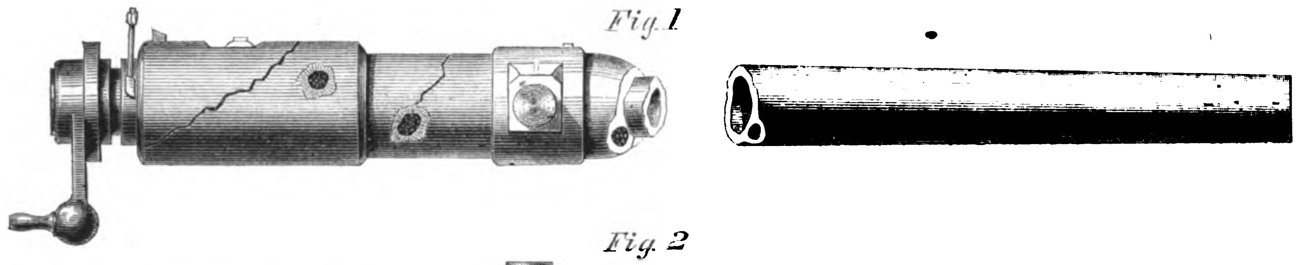


Fig. 2

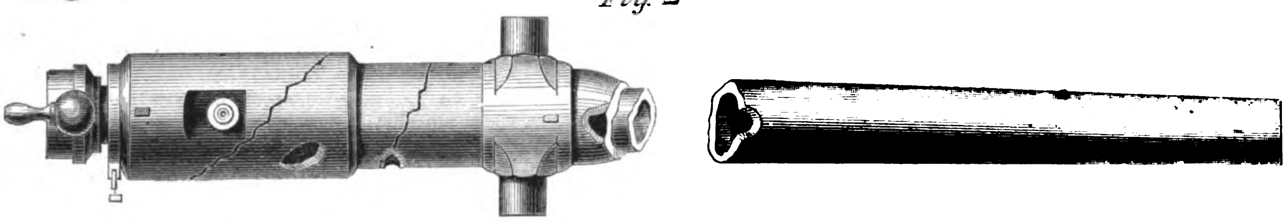
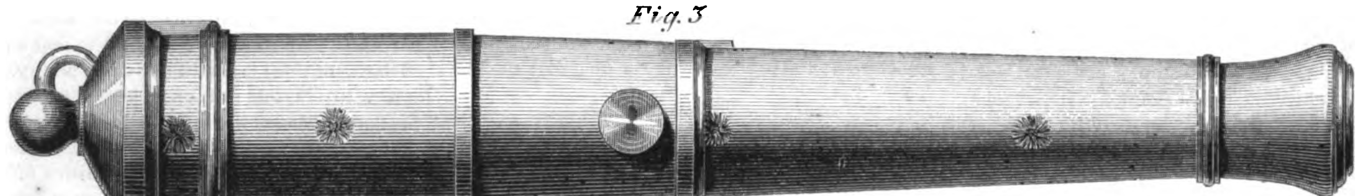


Fig. 3



The conclusions to be derived from these experiments are very important. It shows, in the first place, that the Armstrong system is not yet perfect or fit for European warfare, it entails the necessity of the condemnation of the field guns on the Armstrong principle yet produced, and it gives rise to grave doubts whether the government has not been too precipitate in giving up the use of bronze as the metal of which our field artillery should be made; we believe, we may say that the select committee are in the possession of plans, by which the whole of the brass guns of the service can be converted into rifled artillery of unsurpassed range and power, and still perfectly efficient when service ammunition is employed.

Now, in respect of the 100-pounder gun, we noticed last week its failure at Shoeburyness and its causes. Of this the talented inventor, Sir William Armstrong, appears to be perfectly convinced, inasmuch as he himself recommends that for all garrison and siege purposes heavy guns should be constructed—*not breech-loaders at all*—but muzzle-loaders, 120-pounders, made of a bore to take the service ammunition (and in this he is right), and to weigh 100 cwt.

What then, let us ask, becomes of his original proposition of light guns and breech-loaders? Let us hope that Sir William Armstrong will devote his great talents to the production of some other form of rifling than the exceedingly objectionable shunting-groove gun, the only object and aim of which appear to be the solving the proposition of—"In how few rounds can it be injured or burst, no matter of what material it may be constructed?"

From this it seems that experiments have shown the plan of constructing guns patented by Sir William Armstrong to be unsuitable for light artillery, while the inventor himself states that it is not fit for heavy cannon. In other words it is a complete failure for all purposes.

Horticulture in Japan.

Mr. Veitch, Jr., son of the eminent London nurseryman, is now in Japan, investigating the condition and method of horticulture in that country, with a view to the selection of novelties, &c. In a recent letter to the *Gardner's Chronicle*, he states that the Japanese possess great horticultural skill, and far exceed the Chinese in this respect. The Japanese nurseries are very numerous and extensive, presenting many varieties of trees, shrubs and flowers. He says: "Chrysanthemums are especial favorites with the Japanese, and at this season of the year are everywhere in full bloom, scarcely a window in the town (Yeddo) but has a plant or two, and each establishment devotes a piece of ground to their culture. They are grown to great perfection, and many varieties, exclusive of the ordinary large flowering ones, and Pompones, are met with. The fan-shape is the favorite mode of training them, their finest specimens averaging 3½ to 4 feet in hight, and often having from 25 to 30 expanded trusses of flowers on them. The great characteristic mark of a Japanese nursery is its peculiar neatness, everything clean and in order, not a weed or a pot out of place to be seen." Their mode of pot culture seems to consist:—1st, In confining the roots of their plants in as small pots as possible; 2d, in using a light open soil, generally the same for all classes of plants; 3d, supply them with unlimited quanties of manure water. Their success in dwarfing trees is mainly to be attributed to the last named cause. The soil acts merely as a means of protecting the roots from the sun and air. It is the manure-water which nourishes the plant and keeps it in a growing state.

Mr. Veitch found a new tree (fern) in the garden of the great temple of Osakusa, which thrives well in the open ground, and will, he thinks, prove hardy in England. Again he says: "The quantity and splendor of the timber trees in the neighborhood of Yeddo far exceed anything that can be described." Mr. Veitch took measurements, finding pines three feet from the ground, with a circumference of 10 feet; beech, 15 to 20 feet; spruce (very common), 10 to 12 feet; evergreen oak, 15 to 25 feet; gingko, 15 to 28 feet; cryptomeria (tens of thousands of them), 12 to 15 feet.

THE PATENT LAW.—Munn & Co., of the SCIENTIFIC AMERICAN, with their usual enterprise, have perfected every necessary arrangement for taking out patents under the new law. It is hardly necessary to say that their facilities in this specialty are wholly unrivaled, and cannot easily be approached.

We are indebted to the editor of the *American Railway Review* for the above testimonial. We value it the more as it comes from one of our neighbors, who is a frequent visitor of our establishment, and therefore cognizant of the facts whereof he speaks.

A PRACTICAL tanner in Georgetown, D. C., states, in the *Shoe and Leather Reporter*, that he has combined 53 lbs. of tannin with 47 of cleared hide.

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

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NEW YORK, SATURDAY, APRIL 13, 1861.

OUR SECESSION TROUBLES.

Several of our readers at the South have written to us of late, expressing their surprise at our seeming indifference to the political troubles that are hanging like a black cloud over the country, urging upon us to use the influence of the SCIENTIFIC AMERICAN toward their settlement. We should cheerfully make any reasonable sacrifice to bring about so desirable a result; but we do not feel willing to involve ourselves in this ugly controversy, believing, as we do, that any interference of ours could do no possible good. We have not forgotten the fate of the man who undertook to interfere in a quarrel between a turbulent neighbor and his wife, where both of them turned upon the peaceful mediator, belaboring him soundly for his intervention.

The troubles to which we allude have had their origin in partisan questions, and it is almost impossible to discuss, or even allude to them, without hitting some sore spot or treading on somebody's corns. Our readers know well enough that we are no politicians; if such were not the case, the fact would certainly "stick out" in our columns from time to time, for writers of that stamp could not have control of an independent journal very long and conceal their political proclivities. When we commenced this journal sixteen years ago, we determined unflinchingly to devote our time, talents and energies to the progress of the arts and sciences, eschewing religious and political controversies altogether. We may be confessing one of the political sins of the day, when we say we never attended a caucus in our lives, were never candidates for political honors, and never pulled wires or wools to elevate any particular man to office. We never stole sheep or treated the crowd, and hardly ever attended a political meeting. We have read a good deal about parties, and have read considerable politics, and have been made to believe that it was our Christian duty to vote. We have sweat and tugged at the ballot box, and by the exercise of this act of citizenship, have helped to elevate men to offices of high public trust, but never did regard ourselves as *favorite* constituents. In reflecting upon it, we have often thought that the act of depositing a ballot was a very excellent thing for those who got the most of them.

In reference to the *peculiar institution*, about which there is so much strife, the public mind seems to have become so very touchy, that to state even ordinary scientific or mechanical facts bearing upon it, or to make an innocent indirect allusion to it or its champions, *pro.* or *con.*, is sure to get somebody by the ears.

We will mention one or two instances, which will forcibly illustrate what we mean. Some months ago, to please the notion of an inventor in preparing an engraving of his cotton seed planter, and with a view to show its operation, we represented the figure of a healthy looking negro in the act of operating the machine. Presently some one of our Northern readers wrote to us in high dudgeon, charging that we were burlesquing the colored race, and cottoning to the South. Some months ago we published a statement, on the authority of some one who pretended to know all about it, that the inhabitants of the Southern States were more rawboned and lank than Northerners. Well, we were entirely innocent of any intended offence toward our Southern brethren; but some one of our readers in the South thought he discovered the claws projecting through the fur, and he immediately wrote to us that he thought he discovered in it a concealed attack on the physical qualities of his people.

When Abraham Lincoln was elected President of the United States, it brought to mind an invention patented by him some years previous. The thought occurred to us that the fact would interest our readers, and, in publishing an engraving of it in our columns, we also expressed the hope that he might have better success in governing the country than he appeared to have had in introducing his invention. We do not know that Mr. Lincoln ever sold any territorial rights under his patent, or that his "marine bellows" had ever been practically tried upon a vessel. We also stated, what we believe to be a fact, that for the first time in the history of our country, a patentee had been elected to the high office of the President of the United States, the truth of which, we believe, has never been disputed. We think that the nearest approach to this fact was the case of General Jackson, who acted as agent for an old soldier in procuring him a patent for an improvement in saddles. The General brought the model from the West, carried it up to the Patent Office, and told the Commissioner to make out the papers without delay, and send them right on to the old soldier.

No sooner had our paper appeared which contained the engraving of Mr. Lincoln's craft, than some Northern correspondent took the matter up, and accused us of undertaking to cast a slur upon "Honest Old Abe." This zealous friend probably thought that the invention did not amount to much; and thereupon, in the fertility of his imagination, jumped at the conclusion that we had trumped it up for the purpose of casting ridicule upon his candidate. The matter, however, did not end here, for in a few days afterward we received letters from the South, threatening, on the same state of facts, to stop the paper, "because we rejoiced over the election of a Black Republican rail-splitter," and one whole club did actually stop taking the paper for no other reason.

The best joke of all, however, was the suggestion of a Southern correspondent, that our publication of His Excellency's invention would enable the Northeners to ride into Charleston harbor at low water, and thus reinforce Fort Sumter.

In view of facts like these, we would like to ask our kind readers, North and South, what possible good we could do by expressing our views upon the agitating and perplexing questions that now harass the public mind. We are by no means insensible to their importance. We as deeply deplore them as any other journalist in the country. We are natives "to the manor born," and can trace back our ancestry almost to the earliest settlement of the country; we therefore love our country. We have felt its power and influence in foreign lands, and have found friends under the stars and stripes when it was of more consequence to us than to look out from our office window and see the flag flying over the dome of the City Hall. We hope to see a fair and honorable settlement of every point in dispute, but we have no particular *invention* to put forth for curing the disease in the body politic. The public mind does not act like the electric current, and therefore cannot be indoctrinated by surprise into new political notions. It takes time to reach the masses, and to mold them into harmonious action; but somehow we have an abiding faith that when the people fairly weigh all the points at issue, they will be prepared to settle all matters in dispute, and will ultimately settle them upon a neighborly basis, mutually giving and mutually receiving, and shaking hands as friends once more. The people themselves are not so hostile as political demagogues and party papers would make it appear. One thing however is quite certain, namely—the industry and commerce of the whole country is suffering, and we entirely agree with the Salem (Ala.), *Register*, "that there is not a public work, a single branch of business of any kind, a single department of human enterprise in this country, or one single individual in it, but has suffered more or less by the present agitation." The loss to the country, it thinks, can scarcely be less than a thousand millions of dollars.

Before concluding our remarks upon this subject, we will offer one panacea for the national disorder, which was suggested to us the other day by a worthy mechanic from Roxbury, Mass. He called upon us for the purpose of securing a patent for a new invention, and we asked him the time-honored question, "How is business in your town?" He replied "'twas very bad some time ago, but we have nothing to complain of now. A few weeks ago we resolved to read no more political papers and to go to work. Since that time we have had much less trouble, and a good deal better times." We hope the hint will not be lost to the community in general.

THE COMMISSIONER OF PATENTS—NEW EXAMINERS, &c.

We announced, two weeks ago, that Hon. D. P. Holloway, of Indiana, had been appointed Commissioner of Patents. The appointment has now been confirmed by the Senate, and he has entered upon the duties of his office. From all that we can learn respecting the new Commissioner, we believe him to be a gentleman of strict integrity, and with sufficient independence of character to take charge of the Department. We hope his administration may prove in every way successful.

Silas H. Hodges, Esq., of Vermont, George H. Harding, Esq., of Philadelphia, and Hon. Thomas C. Theaker, of Ohio, are appointed and confirmed as Examiners-in-Chief under the new law, and will constitute the Appeal Board.

Mr. Hodges filled the office of Commissioner of Patents for a short time before the close of Mr. Fillmore's administration. He is a most worthy and estimable man, and will make an upright and faithful officer. Though lacking in experience in the details of his new office, yet we believe he has excellent mental qualifications for it. Mr. Harding, we understand, will not accept. His law practice is probably of far more value to him than the combined honors and emoluments of the new office. He is eminently qualified for the place. There is now one vacancy in the Board, and in filling it we sincerely hope that the President will rise above mere political considerations. The interests of the Patent Office and the interest of inventors call for the selection of some one who has had experience in the Patent Office, and who understands practically the duties that devolve upon the Board. It is all very well to reward friends, but we have a right to claim something for those whose interests are at stake. In reference to Mr. Theaker, our readers have already been advised. There is some question as to his eligibility, owing to the fact of his having been a member of Congress which created the Board, but we hope the objection is unfounded, and that he will retain the position conferred upon him.

CAN THE RIFLING OF GUNS BE DISPENSED WITH?

The object of rifling a gun is to make it shoot with accuracy. The reason why a ball from a smooth bore is apt to deviate from the direction in which the gun is pointed, is this:—If a ball was *perfectly* globular and homogeneous, it would probably be shot from a smooth bored gun with as much accuracy as from a rifle; but this is seldom the case. Careful experiments have shown that, if a shot has its center of gravity at one side of the center of its mass, the explosive force of the powder will cause it to deviate toward that side on which the center of gravity lies. But if a rapid rotary motion is given to the shot, the center of gravity is brought to the opposite side, and thus the tendency to deviate is counteracted. The object of rifling a gun, therefore, is to obviate the effects of imperfection, not in the gun, but in the shot; hence, it would seem that the proper mode of overcoming the necessity of rifling, is by making the shot more perfect. Some little effort has been expended in this direction; but it seems to us that it has not received the attention which its importance demands.

The objections to cutting spiral grooves in guns, we believe, have not been generally appreciated. The friction of the shot, as it is pressed with such tremendous force against the sides of these grooves, is enormously increased, and its inertia offers considerable resistance to the rapid rotary motion which is imparted to it—both of these elements consuming the power of the powder, and thus diminishing the range of the shot. There is also another objection which applies

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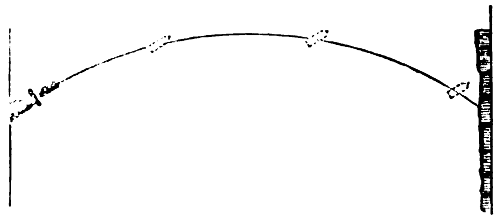
only to elongated shot. A rotating body tends, by inertia, to preserve the line of its axis parallel to itself. Hence an elongated bolt, fired from a cannon at any elevation, does not bend its head downward along the curved line of its flight, like an arrow, but continues throughout its flight in a position parallel



with that of the gun. When it strikes a wall, therefore, it does not strike it directly endwise, but at an inclination; diminishing very materially the force of its impact.

The manifest mode of making a shot perfect is to turn it in a lathe, so that its form will be symmetrical, and then to balance its weight around the axis of its mass. One simple plan of balancing the weight would be to drill four cavities in the lower or rear end of the shot, plug them with wood, and then drive nails into the one on the lightest side, till the shot would balance on the centers on which it was turned. There are, doubtless, better modes, and we leave the matter in the hands of our ingenious inventors.

WEALTH—A REVIEW OF THE SUBJECT.

Our articles on wealth have been so scattered along the weeks, that it may be well to make a brief summary of the truths already examined, before we proceed to the consideration of others.

We have seen that wealth and money are by no means synonymous terms. Money forms but a very small portion of the wealth of the world. This consists of houses, fuel, clothing, ships, machinery, horses, carriages, books, pictures, and all the other countless articles of value, which contribute to the gratification of human wants. Wealth is produced by making changes in the form or location of substances which adapt them in some way to our service. It is consumed by effecting changes in the form or location of substances which render them less fit for our uses. Wealth is in constant process of production and consumption, articles of value being eaten up or worn out, while others are being made to take their places. In most communities, more property is produced each year than is consumed, and thus the wealth of the world is constantly increasing. It will be observed that this property is increased, not by bringing money into the country, but by building manufactories, railroads, dwellings, &c., and by increasing the stocks of merchandise in our warehouses, the numbers of cattle on our farms, &c. If the State of New York was surrounded by a wall a mile high, so that no man could come in or go out, the community might increase its wealth hundreds of millions of dollars worth, without ever having one dollar of money either made or brought within its borders.

When a man accumulates property, he does not *get it out* of other people. If a man saves a little capital from his earnings, so that he is able to erect a saw mill or a small manufactory, he thus harnesses the great forces of nature to aid him in the production of wealth. The productive power of the laborers whom he employs is facilitated by improved tools or machinery, their labor is more profitably directed, and thus the property which the manufacturer accumulates is that which he has himself created. And not only so, the persons who work for him do so because they get a little better pay than they could elsewhere, or because they find some other advantage in the arrangement. Those who sell him the raw material make a profit in the trade, and those who buy the manufactured article are induced to make the purchase from some advantage in price or convenience which it presents to them. Thus the successful manufacturer not only increases his own possessions, but his operations are a pecuniary benefit to all with whom he has transactions; and he impoverishes no one. On the other hand an unsuccessful manufacturer, not only loses his own property, but he generally, by contracting debts which he is unable to pay, diminishes the property of other people. By the unwise direction of his operations he diminishes the wealth of the community. That which is true of manufacturers is also true of merchants and other business men: the successful money-maker increases the wealth of the community beyond the amount of his own accumulations, while the conductor of unsuccessful enterprises diminishes the wealth of the world to an extent greater than the amount of his own losses.

A Model Specification and Patent.

The following is a verbatim copy, from the records of the Patent Office, of a patent actually granted on the 3d of April, 1860. This patent was not secured through the Scientific American Patent Agency, and the name of the soliciting attorney is unknown to us.

To all whom it may concern:

Be it known that I, Samuel Armitage, of the city and county of St. Louis, and State of Missouri, have produced a new and original design, to be printed upon paper, and used as a trade mark upon a certain article of manufacture known as "S. Armitage's Neuralgic Pills;" and I do hereby declare that the following is a full, clear and exact description of the same, reference being had to the annexed drawing, making part of this specification, and to the letters of reference remarked thereon.

The aforesaid design consists of a picture which represents the interior of a room in a dwelling house, in which are assembled a number of persons, some of whom appear to be sick; it also represents the interior of a saleroom in which some persons are assembled, one of whom appears to be selling something to the others; and the said picture also represents the interior of a work shop in which a person is seen mixing some kind of a composition in a kind of pot, with a mudler or stick.

Each of the aforesaid representations is surrounded with a border, which separates them from each other, so as to make each representation appear distinct in itself, while they each constitute a part of the whole.

In that part of the Picture which represents the room in the dwelling house are seen five persons, all females, one of whom is in bed and appears to be sick with pain in the head; this person is marked R. Another one of the said persons is seen reclining in a Rocking chair, and appears to be sick also with pain in the head, which she has tied up with a cloth; this person is marked J. She is sitting by the side of a table, and in front of her, and on the opposite side of the said table, there are two other persons, marked T and P, that appear administering to her wants.

And behind the person marked J, there is a person marked D, who appears to have just entered the room, and she appears to be clapping her hands for joy, she having heard of Armitage's Neuralgic Pills.

To the right of the figure marked P, there is a window, and under the said window there is a table, and under the said table there is a cat marked L.

In that part of the Picture which represents the sale Room, there are three persons seen, marked A, B, C; the person B appears to be selling Pills to the person A, and the person C appears to be waiting to purchase some of the said Pills.

In that part of the Picture which represents the work shop, a person marked B' is seen, who appears to be mixing some kind of a composition, in a kind of pot which stands upon a table by the side of which there stands another pot. To complete the aforesaid, the words "S. Armitage's Neuralgic Pills" are inscribed over the said Picture, and at the side of it the words "A sure cure for Neuralgic affections" are inscribed.

What I claim as my production is the aforesaid design, consisting of Picture shown and described, in combination with the words "S. Armitage's Neuralgic Pills," and the words "a sure cure for Neuralgic affections;" all of which I respectfully submit. SAMUEL ARMITAGE.

Witnesses:
E. C. HUSSEY.
CHAS. SPIEGLE.

SCHOOL PRIZES.—Mr. M. Y. Beach, a wealthy citizen of Wallingford, Conn., offered last year a series of monthly money prizes for competition among the scholars of the various schools in his village, under the direction of the Board of School Visitors. There was a prize for the most punctual scholar in attendance, another for the most neatly kept and written copy-book, another for the best speller, and so on. The prizes varied from $1 to $1.50 per month each. The public award of the prizes has lately been made by the Board, and the New Haven *Register* describes it as having been a very interesting occasion. The scholars all joined in a procession, headed by a band of music, and proceeded to the town hall, calling *en route* at the mansion of the donor. At the hall, suitable addresses were made, and a spelling tournament took place between the scholars for which special prizes were given. The greatest excitement prevailed among the juveniles, lads and misses. The teachers of the various schools all united in stating that this system of prizes had produced a very beneficial effect upon their pupils, that it had encouraged them to effort, and there had been a marked progress in study in all the competing classes.

PATENTS FOR THE FORM.—Under the new law the *new form* of any article may become the subject of a patent, as well as the mechanical construction. In some cases, therefore, an applicant may secure a species of *double protection* upon an invention, taking one patent upon the mechanical construction and another upon the form.

Recent American Inventions.

The following inventions are among the most useful improvements lately patented:—

LITHOGRAPHIC PRESS.

The object of this invention is to obtain a lithographic press that may be operated by steam or other power than manual, so that the work may be done much more rapidly and economically than by the ordinary hand press. The operation of the press is substantially the same as that of the hand press, the parts being so arranged as to be actuated automatically by the power employed. The inking device, as well as the moistening apparatus, require no special care or manipulation on the part of the attendant, while the arrangement of the parts is such as to insure durability as well as rapidity and uniformity in the work produced. This press will doubtless create a revolution in lithographic printing. It is the invention of Robert McNie, of New York City.

PASTEBOARD DRYING FRAME.

In curing or drying paper board, or pasteboard as it is frequently termed, the plan hitherto practised has been to take the sheets, as they pass from the cylinder of the machine, and lay them on the ground, that is, when the weather is favorable for drying. This plan is attended with considerable difficulty, as the sheets as they are taken from the cylinder are very heavy, weighing about three pounds, two of which are water. In this wet state the sheets are very tender, and require to be handled with the utmost care. This mode of curing or drying the sheets is attended with considerable expense—about $5 per tun—and can be practised only a small portion of the year. The object of this invention is to facilitate the handling or conveying of the wet or green board, so that the same may not be injured by manipulation and the necessary work performed rapidly, the invention also admitting of the boards being dried by artificial heat in a revolving cylinder, or by means usually employed for drying other articles. This invention consists in placing the wet or green boards, as they are taken from the cylinder of the machine, within portable frames, whereby the sheets are fully protected while drying, and will admit of being carried or conveyed with perfect safety from place to place, as may be required during the process. This invention was patented by James H. Patterson, of Schagticoke, N. Y.

SKATE.

This invention consists in making the skate iron or runner in two parts, jointed together by a transverse joint of a suitable description, and furnished either with an elastic or a divided stock or footstand, so that, when the skate is strapped, or otherwise secured to the foot at the toe and heel thereof, the joint in the skate iron will allow the front and back parts of the footstand to accommodate themselves to the motions of the foot. The credit of this contrivance is due to A. J. Gibson, of Worcester, Mass., who has assigned it to T. G. Bancroft, of same place.

BAROMETER.

This improved barometer consists of a balance beam having a long arm, composed wholly or for the most part of wood or other light substance, and a short arm composed for the most part or wholly of metal, or other heavy substance, with a poise to counterpoise the longer arm. By reason of the lesser specific gravity and greater bulk of the longer arm as compared with the shorter one, the balance is caused to oscillate with variations in the pressure of the atmosphere, and so to indicate the pressure upon a suitably arranged and graduated scale. The patentee of this invention is J. A. Gridley, of Southampton, Mass.

HYGROMETER.

The awns of certain grasses, for instance those of the order *Stipa*, are naturally of twisted structure, and have a natural tendency to twist and untwist themselves, as the atmosphere in which they are exposed becomes less or more moist. This invention consists principally in the construction of a hygrometer by applying the twisted awn of any of such grasses, or any portion of such awn, to constitute the axis of an index suitably arranged in relation to a concentric graduated dial. It also consists in the employment, in combination with an axis composed of the twisted awn, of two indices, so applied at a distance apart that the differential movement of said indices shall serve to indicate the hygrometric condition of the atmosphere. The patentees of this invention are A. H. Black and C. R. Black, Indianoplis, Ind.

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MACHINE FOR TURNING OVAL FRAMES.

The object of this invention is to admit of a rotary cutter or a stationary chisel being used to cut out oval frames automatically, or without the usual manipulation of a cutter as used with the ordinary oval lathes. In order to turn or cut out oval frames with a rotary cutter head or a stationary chisel, it is necessary that the cutter or chisel have a position at right angles with the face of the work at all points of the rotation of the latter, in order that the moldings or beads may be cut perfectly. This result cannot be obtained by an ordinary oval lathe, as the work in such a machine has a rotary motion only, and the cutter head would have, at certain points of the rotation of the frame, an oblique position with the face of the work, and the moldings and beads of the lathe would be destroyed. To obviate this difficulty, the bed of an ordinary oval lathe has a vibratory movement given it simultaneously with its rotating one, whereby the position of the work changes relatively with the cutter head or chisel, so that the latter will at all times have a position at right angles with the face of the former. This invention was patented by Isaac P. Tice, of Baltimore, Md.

THE POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported for the Scientific American.]

The usual weekly meeting of the Polytechnic Association of the American Institute was held, at their room, in the Cooper Building, this city, on Thursday evening, March 28, 1861—Professor Mason in the chair.

COMPRESSED AIR AS A MOTIVE POWER.

W. S. Haskins read a paper on the above subject, maintaining the practicability of the use of compressed air locomotives for city railroads more especially. He adverted to the experiments of Baron Van Rathen and Arthur Parsey on the subject, and their results, as compared with the use of steam locomotives, which were summed up as follows :—

1. A reduction of 20 per cent in the cost of locomotives.
2. A reduction of one-third in the number required for service.
3. A reduction of three-fourths of the present expenses for repairs.
4. A saving from increased durability in the ratio of 50 to 1.
5. A saving of one-third of the fuel.
6. A saving of water.
7. A reduction of three-fourths in the washing and cleaning.
8. A reduction of the workshop expenses.

Total saving on prime cost amounting to one-half, to which may be added an immense saving in construction account.

The difficulty arising from supplying the power at stations, without sensible loss of time, had been obviated by a method recently devised and patented. It was now entirely practicable, in the opinion of the writer, to apply compressed air to city routes not exceeding eight miles in length, replenishing at the ends of the route. It had also been demonstrated that single cars could be propelled by this power over steeper grades than are now traversed by horse cars. The writer referred to a recent report by Thomas D. Stetson on the subject, giving a summary of the advantages of this mode of locomotion over steam.

The President believed that the most effective mode of propulsion would have to be adopted in this city, and whatever that mode might be, the least desirable would be found to be horsepower, which would be abandoned. He suggested that the report be referred to a committee, and a motion was made and adopted accordingly. The gentlemen appointed on the committee were Messrs. Fisher and Johnson.

NOVELTY CHURN.

J. E. Walter exhibited a churn patented in 1859. Sweet milk is churned at a temperature of 62° inside of five minutes, leaving the milk as sweet after churning as before. The milk is taken just after the animal heat has left it, and put into the churn. The churn has a double bottom; milk is put into the upper chamber and water in the lower one. In cold weather warm water is put in. A thermometer fixed in the end of the box indicates the temperature which should be 62°; when the milk has reached that exact temperature the warm water is drawn off and the churning commences. The churning is done by two shafts, with 24 corrugated dashers each, making 10 revolutions to one revolution of the crank outside. Cream can be churned as well as sweet milk; but sweet milk, after being churned, will retain its sweetness from three to five hours.

Mr. Dibben inquired if this was any different from other plans for violent agitation.

Mr. Walter said that it was; in this the temperature was kept at 62°, which was found to produce the best butter.

The President—In order to have this matter tested, I will try the churn at my place a few weeks and then report on it myself.

HERMISED INDIA-RUBBER.

Mr. Seely said that he had recently visited an india-rubber factory at Beverly, Mass., where he learned some very curious facts in relation to that manufacture. India-rubber had been known about a hundred years, and only within the last twenty years had it been found of much practical use. Very few people knew why it was that india-rubber posssessed the property of rubbing out pencil marks. It was generally supposed that it was done simply by friction, but a better explanation was that the rubber, becoming electrified by rubbing, attracted the powder of the pencil. As to the discovery of vulcanization, to which was due the present extensive use of that article, and without which it was almost good for nothing, Charles Goodyear had the reputation of it in this country and Charles Hancock in Europe; and though Mr. Goodyear was scarcely known in Europe in connection with the discovery, yet Mr. Hancock admitted that he was led to the discovery of his method of vulcanizing by a piece of india-rubber that he had received from America that had been subjected to such a process. In the town of Beverly, Mass., for some years past, there was a manufacturing company that used a devulcanizing process, taking old rubber and making it up chiefly into india-rubber cloth, under a patent with which Goodyear's did not interfere. And for the last four years they had been working the raw rubber by a process of vulcanization without the use of heat, as required in Goodyear's patent. The rubber is put into a solution of chloride of sulphur and sulphuret of carbon, and the change is effected in its properties in a few minutes. This process was called hermising, to distinguish it from vulcanizing. The patent was Mr. Parmalee's. The hermised rubber possesses substantially the same properties as the vulcanized. It has the advantage, however, of being made of a lighter color, and therefore of receiving quite brilliant tints. The lighter color arises from the fact of rubber being less exposed to the atmosphere during the process, which exposure in Goodyear's process turns the product almost black; and to make it lighter, zinc white or some other kind of white material is required to be added. Mr. S. exhibited some very beautiful specimens of colored rubber made by this new process, and, among others, a globe containing a map of the world, which, the President said, Goodyear, after much experimenting, was unable to produce. Mr. S. also exhibited some milk of the rubber tree, ammonia being added to it to preserve it in a liquid state. The milk in the bottle was perfectly white.

The President stated the fact that india-rubber car springs were passing out of use. It was found that the jolting of the car caused the india-rubber at last to lose its elasticity.

Mr. Churchill exhibited some pieces of vulcanized rubber which had been subjected by him to the action of steam for the space of about three hours. The reesult was that the rubber was perfectly brittle.

SELF-ADJUSTING SUBMISSIVE SPRING.

J. M. Forrest, of Virginia, exhibited and explained a carriage-spring with the above title, which he had patented. It consists of several leaves of steel, like the elliptic spring, but the form is entirely different. The advantages claimed over the elliptic spring are these :—First, there is only one hole drilled through the leaves, which is necessary to fasten it, with the addition of two clasps to the axletree; second, there is no welding, and therefore it is less troublesome to the manufacturer; third, the spring divides the weight equally on the axletree, thereby rendering the axletree less liable to break; fourth, it is self-adjusting, springing its entire length with a light weight; fifth, it is rendered submissive by a cross bar attached by hinges to the end of each spring; sixth, it weighs much less than the elliptic spring, and therefore costs less. Mr. Forrest stated that he had ridden in a carriage with a spring weighing only fourteen pounds, driven the horse, and written a letter at the same time. He regretted to say that he had to come North in order to get the springs made, and he did not succeed in finding a man who could make what he wanted till he got to New Haven, where he found a very ingenious Dutchman that did it.

STEEL-PLATED SHIPS.

Mr. Stetson adverted to the report that the Emperor Napoleon had countermanded the order for the construction of steel-plated ships, and said that that report needed confirmation before it should be credited. Sir Howard Douglas had taken the ground that iron-plated ships would not be able to withstand the immense force of modern projectiles. Other authorities were almost unanimous in the opinion that they were destined to create a revolution in naval warfare. France and England were now changing wooden for iron vessels. When ship was matched against ship, there would be no question as to the superiority of the iron-plated vessels. With regard to land batteries, however — earthwork, timber or masonry against plated ships—it became a different question. Timber ships were not expected to resist cannon balls. What would be the result with iron-plated vessels? If a ten, fifteen or twenty-inch cannon ball would make a hole sufficient to drive a horse and cart through in consequence of the crushing in of the iron, then it would become a grave question whether iron plates were practicable. Mr. Stetson referred to an attack on a fortress in the Crimea by three French iron-plated vessels, where the fortress mounted more and heavier guns and more men, and yet the attack was successful.

The President inquired if the result of the modern improvements in warfare would not be that fortresses would be found to be more than a match for ships, causing them to stay at home.

Capt. Bartlett, of the United States Navy, thought that question could be answered by the fact that the introduction of the Colt pistol had not made men any more peaceable, but the reverse. As to iron-plated vessels, he considered them vulnerable at the two ends, where they were not plated. General James, of Rhode Island, had succeeded in making a cast iron shot, of the Minié rifle ball character, and had, as he thought, perfected it. The iron shot was made explosive—that is, so as to explode when it strikes the object at which it is fired. The practical effect of this invention was to render a 24-pounder Columbiad equal to a 48-pounder, without adding one ounce to the gun, and it would last longer and fire further than if used for round shot. The rifling of the gun could be done without taking it to the foundry. The shot was cast hollow, and was provided with a plunger and percussion cap. He had seen a shot fired at a sand-bank, and it exploded at the instant of contact. And yet one of these balls could fall 80 feet and not explode; so that they could be handled and used with safety. These shot could be fired on the water, instead of at the side of the ship, just under its steel-clad sides, and the vessel thus destroyed. As regards the effect of heavy ordnance, he had seen a 12-inch shot fired from the "Peace-Maker," now at the Brooklyn Navy Yard, a distance of 658 yards, on a dead level, and it went clear through a ship, making a hole on the other side big enough to drive a horse and cart through.

The same subject will be continued at the next meeting, which will be on Wednesday evening, April 3, to which time the Association adjourned.

In order to use water economically as a motor, where a single turbine wheel is employed, and different degrees of power required at different times, it has been ascertained that the wheel should be varied in capacity to suit the power required, and the volume of water admitted to it. To this end inventors are at present actively engaged, and many ingenious plans have been devised, some of which promise well.

The Engineer-in-Chief of the Navy.—Mr. Benjamin F. Isherwood has been appointed Engineer-in-Chief of the Navy. The appointment is an excellent one, and gives general satisfaction. Mr. Isherwood is the author of "Engineering Precedents," which has attracted so much attention.

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ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING MARCH 26, 1861.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 4, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

765.—C. F. Anderson and Sylvester Davis, of Claremont N. H., for an Improvement in Water Elevators:

We claim having the flexible girdling brake, H, attached to the shifting lever, I, which operates the sliding windlass, B, when the said lever has both a lateral and longitudinal movement, and when said parts are otherwise constructed and arranged to operate with each other in the manner shown and described.

The arrangement of the adjusting hook, J, with the girdling strap in the manner shown and described.

The arrangement of the partition, O, and rear aperture, h', with the curb, A', windlass and brake, in the manner and for the purpose shown and described.

[This invention relates to an improved water-elevating device designed for domestic purposes, and has for its object the ready elevation of the water and the discharging of the same automatically from the bucket, and also has for its object the gradual lowering of the bucket in such a manner that the same will be checked automatically and allowed to descend with a moderate speed, and the bucket thereby prevented from being injured. The invention has further for its object the preventing of the accumulation of ice on the windlass or parts pertaining thereto, a contingency which would prevent the proper action of the brake.]

766.—A. M. Asay and J. L. Asay, of Philadelphia, Pa., for an Improvement in Artificial Teeth:

We claim, first, So constructing molds for artificial teeth that by the use of movable pieces, B B, and supplementary pieces, C' C', blocks of teeth any required depth of gum may be formed in the same mold.

Second, The use of a movable piece, B, with its projection, m, for the purpose of forming a depression of any required form in the base of the block.

Third, The combination of the base, A, and cap, D, of the mold with the movable pieces, B, supplementary pieces, C' C', guide rods, x, and pins, e, the whole being arranged substantially as and for the purpose set forth.

767.—H. H. Ballard and H. McClure, of Mount Pleasant, Ohio, for an Improved Plow:

We claim, first, The combination of the curved pieces, C C, with the frame, A, and mole and colter, substantially as set forth, whereby the the colter and mole can be raised and turned over above the frame, and there securely held for transportation or storage.

Second, We claim the combination of lever, E, and curved pieces, C C, with the frame, A, and colter, D, and mole, substantially as set forth, whereby the point of the mole can be raised by lever, E, at the will of the driver.

Third, We claim the fins or compressers, e e, in combination with the mole and colter, when arranged in relation thereto as and for the purposes set forth.

Fourth, We claim forming the sides of the front of the mole parallel in combination with providing the middle of the mole with conveying pins, as set forth.

768.—Leon Pierre Barre, of Paris, France, for an Improvement in Steam Boilers:

I claim, first, The fitting or fixing the tubes of tubular steam boilers by means of small flanged tubes with collars by means of cement for producing a steam and water-tight joint between the said boiler tubes and the end plates of tubular steam boilers, as described and represented in Figs. 1 to 4 of the annexed drawing.

Second, The construction and employment of a mandrel for facilitating the cleaning of tubes in tubular boilers, as described and represented in Figs. 5 and 6 of the annexed drawing.

769.—A. H. Black and C. R. Black, of Indianapolis, Ind., for an Improvement in Hygrometers:

We claim as an improved article of manufacture, a hygrometer which has its axis made of the order of grasses, "stipa," with two or more indices thereto attached and otherwise constructed as shown and described.

770.—John Blue, of Covert, N. Y., for an Improvement in Harvesters:

I claim the attaching of the finger bar, U, to a plate or frame, R, which has its front end connected by a joint to a plate, B, the back part of which is attached to the axle, C, the joint connection of the frame, R, and plate, B, being attached to the back part of the draught pole, A, and at any point in front of the axle to operate as and for the purpose specified.

[The object of this invention is to obtain a one-wheel harvester which will admit, as the machine passes along, of having its finger-bar and sickle capable of adjusting themselves parallel to the inequalities of surface over which they pass, and thereby enable the sickle to work as close to the surface of the ground as may be desired without coming in contact therewith, the front or cutting edge of the sickle being elevated and depressed to suit the surface of the ground, and without being at all effected by the vertical movement of the driving wheel produced by the inequalities of surface over which the machine passes. The invention has further for its object the ready adjustment of the finger-bar and sickle by the device to gage the hight of the cut of the sickle, and also a ready means for throwing the sickle-driving mechanism in and out of gear with the driving wheel, as well as the proper adjustment of the seats under all positions of the finger-bar and sickle.]

771.—M. E. Bollinger, of Littlestown, Pa., for an Improvement in Oscillating Engines:

I claim, first, Suspending an oscillating cylinder by a single shaft or trunnion on its upper side, as set forth.

Second, The trunnion or hollow shaft, B, containing at its respective ends the induction port, f, and the exhaust port, c, and applied to the cylinder, A, in the manner and for the purposes set forth.

Third, The combination of the segment rack, G, with the pinion, I, for rotating the trunnion, B, in the manner and for the purposes explained.

Fourth, The spring, K, or its described equivalent applied to the cylinder, A, to equalize its motion, as set forth.

[This invention consists, first, in suspending the cylinder of an oscillating engine from a continuous trunnion journalled in its upper side; second, in a new and improved construction of trunnion and valves; third, in a device serving the combined purposes of stopping and starting, reversing and cut-off gear; and, fourth, in the use of a spring or other device to equalize the motion of the cylinder.]

772.—Samuel Boorn, of Lowell, Mass., for an Improvemen in Pickers for Looms:

I claim my improved movable shuttle box picker, as made with its head, A, notched with respect to its shuttle cushion, B, substantially in the manner and for the purpose as described.

773.—E. S. Boynton, of Alexandria, Va., for an Improvement in Iron Masts, Steeples, &c.:

I claim the constructing of masts and spars and such perpendicular structures as require hight and stability by means of flat bars of wrought iron or steel, made continuous by riveting the ends of the bars together, and winding them spirally around from the bottom to the top of the structure, one portion winding around in one direction, and the other portion winding around in the reverse direction, so as to form spiral or diagonal braces throughout the structure secured together at the points of intersection, and relying on said continuous braces for their support without the aid of longitudinal or circular ribs or any internal framing, substantially as described.

774.—Felix Brunon, of Philadelphia, Pa., for an Improved Register for Omnibuses, &c.:

I claim, first, One or more levers, H, each having a spring dog, a, or its equivalent, in combination with a graduated ratchet wheel or wheels E, the screwed spindle, F, and graduated bar, G, the whole being arranged and operating substantially as and for the purpose set forth.

Second, I claim the pin, f, with its cut away or eccentric end in combination with the lever, H, a spring dog, a, and the ratchet wheel, E, the whole being arranged substantially as set forth for the purpose specified.

775.—O. H. Burdett, of Moorfield, Ohio, for an Improvement in Removing Saw-dust as it is Formed:

I claim the arrangement for or in connection with the mill and its saw of an upwardly inclining dust spout, E, and dust carrier or endless belt, F, operating to catch and convey the saw dust in the manner described, when the same is combined or the spout provided at its delivery end with a branch conductor or conductors, K, arranged between the upper and lower lengths of the carrier belt, essentially as and for the purpose or purposes set forth.

776.—Ebenezer Cate, of Franklin, N. H., for an Improved Device for Forming Horseshoes:

I claim as an improved article of manufacture, the portable device described, the parts being constructed, arranged and combined in relation to each as set forth, whereby the same tool or device used to form the iron into shape also answers the further and additional purpose of a forming block or pattern to give the desired curvature and shape to the shoe.

777.—Ebenezer Cate, of Franklin, N. H., for an Improvement in Formation of Horseshoe Iron:

I claim as an improved article of manufacture, iron or other suitable metal rolled or fabricated into the form substantially as shown in Fig, 1. as and for the purposes stated.

778.—T. W. Chatfield, of Utica, N. Y., for an Improved Refrigerator:

I claim the arrangement of the ice-box, E, cold air chamber, H, air-pipes, F F, chamber, C, air chamber, A A A A, substantially in the manner and for the purpose described.

779.—Suspended.

780.—G. M. Cooper, of Litchfield, Mich., for an Improvement in Press for Packing Wool:

I claim the two adjacent vertical fixed sides, C and D, two adjacent hinged and movable sides, E and F, supporting and guide rods, K, inged top, H, sliding yoke, L, and piston, P, the whole being comhned and operating together in the manner set forth.

781.—B. F. Cowan, of Memphis, Tenn., for an Improvement in Fire-places:

I claim, first, The arrangement of a grate, A, with an air-space, B, in the manner described, at the back thereof, and a passage, C, communicating with the outside of the apartment or house in which the grate is situated as and for the purposes set forth.

Second, The combination with the above-mentioned grate, A, air space, B, and air passage, C, of the form of radiator, D, shown as and for the purposes set forth.

782.—Rowland Cromelieu, of New York City, for an Improvement in Railroads:

I claim constructing railroads with three or more tracks on the center rail of which the driving wheels of the engine, placed perpendicular, run with smooth wheels and smooth rails on the level portion of the track, and cogged wheels and rack rails on the inclines working on the central rail track, while the side wheels of the rolling machinery are double flanged, and also the driving wheels, with short independent axles, the whole constructed, combined and arranged substantially as described.

783.—G. N. Cummings, of Meriden, Conn., for an Improvement in Stilts:

I claim constructing the stilt iron, B B', as described, and securing the same to the staff of the stilt by means of a metal ring, C, and wedge projection, D.

[The object of this invention is to secure the footstand or bracket of a boy's walking stilt to the staff of the stilt in a firm and rigid manner, and to make the fastening in such a manner that the footstand can be easily adjusted up or down on the staff, and secured thereon at any desirable hight from the ground.]

784.—E. S. Dawson and A. Weeks, of Syracuse, N. Y., for an Improved Omnibus Register:

We claim the arrangement of vibrating frame, H, with ratchet, r s2 dnd t, and arms, s v and w, friction springs, p p p, in combination with nruins, C and D, wheel, G, all constructed and operating to produce a oumerical series by revolving wheels, substantially as and for the purppases secified.

[This invention relates to an improvement in registers for city cars, omnibusses, &c., for registering the number of passengers entering the same. The object of this invention is to furnish city cars, omnibusses, &c., with a registering apparatus, which is placed under the control of the driver or conductor, who is instructed to register the entrance of each passenger; said register is to be provided with an alarm, which will serve as a tell-tale to the passengers in the conveyance, and it is also to be placed in a prominent situation where it can be seen and read by the passengers.]

785.—Alexander Dick, of Buffalo, N. Y., for an Improved Bread Slicer:

I claim the arrangement of the slide, B B, the wheel, X, the finger, Y, the lever, Z, the spring, S, the thumbscrew, T, the wire, U, the slot, W, the tooth, D, and the peg, F, substantially as and for the purpose specified.

786.—Milton Dilts, of Columbia City, Ind., for an Improvement in Water Wheels:

I claim the arrangement of the adjustable slides, D, with the peculiarly-formed buckets, C, in the manner and for the purposes shown and described.

[This invention relates to an improvement in that class of horizontal water wheels which receive the water at their center and discharge it at their periphery. The invention consists in a peculiar form of the buckets of the wheel, in connection with adjustable plates and with or without a conical deflector, whereby the discharge of the water from the wheel may be regulated according to the supply, and the best effect obtained under varying heads without an unnecessary expenditure e water.]

787.—John S. Elliott, of Philadelphia, Pa., for an Improvement in Gearing for Gas Meters:

I claim the application to gas meters the gearing described, the same being constructed and arranged to operate in combination with the openings in the face plate, substantially in the manner described and for the purpose specified.

788.—J. W. Evans, of New York City, for an Improvement in Railroad Car Springs:

I claim the arrangement and use of a concave dish-shaped cup, F, provided with a projecting lip, w, and annular recesses, m, in combination with a series of annular steel disks placed loosely upon a ferrule, E, the whole being arranged in the manner and for the purpose specified.

789.—J. W. Evans, of New York City, for an Improvement in Cushion Springs:

I claim, first, Grading the diameters of circular corrugated dishplates, in combination with the grading of the thicknesses of the plates, in the manner as described, and for the purpose of obtaining the necessary strength and stiffness.

Second, I claim the arrangement and combination of all the parts, as described, in the manner and for the purpose substantially as set forth.

790.—Thomas Evans, of Watkins, N. Y., for an Improvement in Valves:

I claim the combination and arrangement of the elastic hinge, e, and parts, f g, or their equivalents, with the metallic rim, A, substantially as set forth.

I also claim, in combination therewith, the metallic counter-lining, h, of the flap, substantially as described.

791.—Z. Feagan, of Palmyra, Mo., for an Improvement in Hemp Carts:

I claim a cart constructed with the thills pivoted at F, as set forth, and held in position when loaded by bar, D', in combination with the windlass, G, and binding cord, c, all being arranged as and for the purposes specified.

[This invention is intended more especially for handing shocks of hemp from the field to the machinery which is to break it and prepare it for market. Many hemp growers employ at this day the common hand brakes, because they are portable and can readily be moved about from place to place to the shocks of hemp, instead of taking the hemp to the machine. This invention consists in a cart of a novel construction, whereby the shocks of hemp can be moved about without disarranging or tangling the stalks; said cart is so constructed that it can be placed against the standing shocks, and these shocks secured to the cart before they are upset; then, again, in unloading the cart, the shock can be placed in a standing position before it is detached from the cart, thereby enabling it to take the shocks of hemp to the machine instead of the machine to the hemp.]

792.—P. G. Gardiner, of New York City, for an Improvement in Cotton Presses:

I claim the arrangement and combination of the right and left screws, S S', pivoted nuts, o o, and friction rollers, P P', resting on suitable ways, R R', attached to the frame, J, when operating levers, N N', in the manner and for the purpose substantially as described and set forth.

793.—A. A. Gibson, of Worcester, Mass., for an Improvement in Skates:

I claim, as an improved article of manufacture, a skate that has its runner jointed in the peculiar manner shown and described, and otherwise made as set forth.

794.—A. Giraudat, of New York City, for an Improvement in Windmills:

I claim the arrangement of radially sliding hinged sails, A A1 A2 A3, in combination with swinging weights, d E, constructed and operating in the manner and for the purpose set forth.

[This invention consists in the arrangement of radially sliding hinged sails in combination with swinging weights suspended from the ends of the arms in such a manner that, by the action of the centrifugal force of said weights, the wings are moved towards the center of the wheel whenever the force of the wind exceeds a certain point, and that the speed of the windwheel is thereby regulated.]

795.—Ralph Graham, of Brooklyn, N. Y., for an Improvement in Faucets:

I claim the combination of the plug, d, spring, b, and stem, e, in substantially the manner and for the purposes set forth.

796.—Horace Gray and W. A. Bury, of Grosse Isle, Mich., for an Improvement in Farm Gates:

We claim the arrangement of lever, E, with pawls, G and H, the ratchet wheel, B, the spring, I, and catch, M, and its concomitant parts, all as set forth.

797.—Joseph Gray, of Raymond, Miss., for an Improvement in Envelopes:

I claim, as an improved article of manufacture, a mail or package envelope composed of an envelop, A, bands, C, and address card, D, arranged as shown and described.

[The object of this invention is to supersede the ordinary paper envelopes which are used by postmasters for enclosing a plurality of letters addressed to one place, and which are distributed by the post master of the office where they are received.]

798.—J. A. Gridley, of Southampton, Mass.. for an Improvement in Aerometric Balance:

I claim a barometer composed of a balance beam having one of its two arms composed wholly or principally of wood, and the other principally or wholly of metal, a suitable support for such beam, and a scale upon which the degree of oscillation of the said beam can be indicated, substantially as set forth.

799.—H. F. Hart, of Brooklyn, N. Y., for an Improved Apparatus for Indicating the Position of the Water in Steam Boilers:

I claim, first, The application and combination of two or more hollow vessels, as A B, of any size or shape, so placed and arranged in an instrument that, when it is attached to the boiler, as specified, one of the said vessels will be higher than the other or others, and higher than the usual water level in the boiler, and one of the said vessels will be lower than the other or others and lower than the usual water level in the boiler, each vessel connected with the other by means of tubes, C C C C, or their equivalents, in such manner as to secure a continuous passage for water or steam through the said vessels and connections; the whole instrument suspended and turning on the pivot, P, or its equivalent, operating as and for the purpose of detecting high and low water in boilers, substantially as described.

Second, I claim, in combination with the above, the governing weight, H, of any size or shape, attached to the instrument at any place, as and for the purpose set forth, operating and controlling the range of water, substantially as specified, and changing the balancing power of the instrument.

800.—Dennis Hayes, of New York City, for an Improvement in Pumps:

I claim the placing of the valves, K L, in conical or taper plugs, G H, which are fitted in the water passages, B C, substantially as and for the purpose set forth.

I further claim the combination of the double valve, K, with the single valve, L, and the conical plugs, G H, arranged for joint operation as and for the purpose set forth.

[The object of this invention is to simplify and economize in the construction of double-acting or force pumps, and at the same time render the valves very accessible, so that they may be readily repaired and kept in working order, and only two of them required in the construction of the pump.]

801.—W. C. Hicks, of Boston, Mass., for an Improvement in Sewing Machines:

I claim the method, substantially as described, of raising or lowering and adjusting the feed wheel, in relation to the sewing table, by combining with it, or the shaft or stud which carries it, an eccentric or screw under operation by a hand lever, or its equivalent, essentially as shown and described, whereby the adjustment may be effected whether while the machine is operating or at rest, for the purposes set forth.

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802.—W. B. Hopkins, of Oakfield, N. Y., for an Improved Churn:

I claim the beaters, j j and k m, the latter provided with spiral arms, n n, constructed and operating substantially in the manner and for the purposes shown and described.

803.—T. D. Ingersoll, of Monroe, Mich., for an Improved Culinary Boiler:

I claim, first, A draught aperture or passage, B, applied to a covered culinary vessel, A, when used in connection with pendants or stirrers, D, attached to the cover, C, substantially as and for the purpose set forth.

Second, The tube, E, placed in the cover, C, and provided with a stopper, F, when used in connection with the draught aperture or passage, B, for the purpose set forth.

[The object of this invention is to prevent smoke and steam escaping from the contents of culinary vessels into the cooking apartment during the operation of cooking; and also to preserve the flavor of the substances being cooked and to retain the juices of succulent articles of food, while the cooking operation is greatly expedited.]

804.—Michael Johnston, of South Boston, Mass., for an Improvement in Cigar Holders:

I claim the cigar holder constructed of parts, g c b d and a, arranged as and for the purposes described and shown.

[The object of this invention and improvement in cigar holders is to obtain a means whereby the smoke will be cooled during its passage through the holder to the mouth, and also to furnish a receptacle for condensing the smoke and retaining the oil of tobacco which is usually drawn into the mouth, producing an unpleasant taste and destroying the flavor of the cigar. This invention consist in so constructing the holder that the smoke will be drawn from the cigar through a small tube into a metallic globule, and from thence through the main stem which is held in the mouth.]

805.—Eugene Lefaucheux, of Paris, France, for an Improvement in Firearms:

In combination with a fixed barrel, I claim the movable breech piece and hammer, constructed and arranged as to turn on one and the same axis, substantially as described and shown.

806.—W. H. Locke, of Canton, Pa., for an Improvement in Scrolls of Water Wheels:

I claim casting the joint consisting of the ear piece, m, opening, l, and pillar, n, entire with the divisions of the scroll, as set forth.

807.—S. H. Long, U. S. A., of Alton, Ill., for an Improved Dredging Machine:

I claim, first, The construction and operation of a scraper for opening channels across bars, &c., substantially such as described.

I also claim the application and use of such a scraper with a steam tug or tow boat for dragging it across the bar in the direction in which the channel is to be made, substantially as set forth and explained.

808.—J. B. Lyons, of Baltimore, Md., for an Improved Stump Extractor, &c.:

I claim, first, The combination of the double bow truck frame, A, mounted on oblique conical wheels, B, with the hoisting device formed of the screw, H, nut, J, and chain, R, all being arranged for joint operation, substantially as and for the purpose set forth.

Second, The combination of the screw, H, nut, J, gearing, L O, and the drum, Q, with chain or rope, h, attached, arranged and applied to the truck to operate as and for the purpose specified.

[See engraving on page 160 of the present volume of the SCIENTIFIC AMERICAN.]

809.—W. H. Main, of Liverpool, Ohio, for an Improvement in Rotary Harrows:

I claim the arrangement of the levers, J and K, crossbar, G, rods, E, braces, F, arms, D, harrow, H, and wheels, A, the whole being constructed, operated and operating as and for the purpose described.

810.—J. E. Malloy, of New York City, for an Improvement in the Preparation of Fiber for the Manufacture of Paper:

I claim the process of separating fiber from fiber-yielding plants, as set forth, consisting of the separate and successive steps of combining, rubbing and washing the plants in cold water; the whole forming one continuous operation performed while the fiber is fresh and plant undessicated, as set forth.

811.—C. A. McEvoy, of Richmond, Va., for an Improvement in the Mode of Loading Fire-arms:

I claim, first, The combination of a cartridge with a tubular cartridge protector, A, open at both ends, so that, in loading the gun, the charge can be pushed through and detached from the said cartridge protector, substantially as set forth.

Second, A charge receiver, provided with a series of incisions, and rolled up so as to form a top rim, C, and a closed bottom, D, substantially in the manner and for the purposes set forth.

Third, The combination of the cartridge and tubular protector described with a circular recess, F, in the muzzle end of the gun, substantially as and for the purposes set forth.

812.—Archibald McGuffie, of Rochester, N. Y., for an Improvement in Railroad Chairs:

I claim dividing the chair into two wedge-shaped sections, A and B, provided respectively with the groove or hook, h, and wedge, d, the whole operating in the manner and for the purpose substantially as described.

813.—J. L. McPherson and J. S. Harbison, of Sacramento, Cal., for an Improvement in Wind Wheels:

We claim the arrangement of two concentric wind wheels, A C, one within the other, the shaft, E, of the smaller wheel revolving within the hollow shaft, D, of the larger wheel, in combination with a spiral cam, L, strap, R, and spiral spring, Q, substantially as and for the purposes set forth.

[The subject of this invention is an ingenious and effective device applied to wind wheels, to automatically regulate the length of stroke in a pump or other object to which motion is applied, in accordance with the force of the wind.]

814.—Robert McNie, of New York City, for an Improvement in Lithographic Presses:

I claim, first, The arrangement of the ratchet, K, pawl, L′, lever, M, reciprocating rod, T, ink carriage, P, arm, V, levers, W X, upright, q, and the notched flanch, r, or its equivalent, for the purpose of forming an automatic inking device, as and for the purpose set forth.

Second, The pendent arm, F′, attached to the shaft, d′, bar, G′, provided with shoulders, f′, and attached to arm, F, in connection with the lever, H, and belt shipper, G, all being arranged as shown, for automatically shipping the belt, as set forth.

815.—Hiram Moore, of Fon du Lac, Wis., for an Improvement in Seed Drills:

I claim, first, The combination of a hinged drill bar, a series of rigid shank-trailing drills, and a corresponding series of springs to connect the shank and bar, so that by turning the latter the drills may be pressed with more or less force into the surface of the ground (as the ground is harder or softer, or a deeper or shallower furrow is required), or may be lifted above the surface, substantially as described.

Second, I claim a series of trailing drills having rigid shanks connected to a hinged drill bar by springs that will resist lateral flexure to maintain the relative distances of the drills apart, while free to flex upward and downward to enable the drills severally to conform to uneven surfaces, substantially as described.

Third, I claim curves at the upper ends of the drill shanks, as shown at R, in combination with the springs, substantially as and for the purposes set forth.

Fourth, I claim a lever, in combination with the hinged drill bar and a series of trailing drills connected to the bar by springs, the arrangement of these parts being such that, by turning the lever, all the drills will be simultaneously forced into the earth or raised therefrom, and when forced into the earth, the shank of each drill throughout its entire length will still be left free to play up and down to the extent which the elasticity of the spring will permit, to allow the drill to pass over obstructions and to conform to inequalities of the surface, substantially as described.

Fifth, I claim arranging the mouths of the conduits on the drill shanks as nearly as may be in the line of the axis of motion of the hinged drill bar, so that raising and lowering the drills will change as little as may be to the positions of the mouths of the conduits on the drill shanks, relative to the positions of the lower ends of the hopper spouts, substantially as described.

Sixth, I claim the combination of a removable driving shaft with a series of seeding cylinders, having independent bearings, whereby said shaft can, at pleasure, be removed to allow any of said cylinders to be taken out for repairs without displacing the rest, substantially as described.

Seventh, I claim a series of helical gear, having teeth of varying numbers and pitch, in combination with a shifting pinion, for purposes substantially as described.

816.—John Murdock, of New York City, for an Improvement in Bank Notes:

I claim a bank note in which all of the printing, engraving and writing are embodied in the form of a numeral, designating the denomination of the note, substantially as described, for the purpose specified.

817.—Asahel Osborn, of Morris, N. Y., for an Improved Quilting Frame:

I claim the combination of the rolls, E, arms, B, slides, C, with the frame, A, substantially as and for the purpose specified.

818.—J. H. Patterson, of Schagticoke, N. Y., for an Improvement in Drying Paste Boards:

I claim the facilitating of the curing or drying of wet paper or paste board sheets, in the manufacture of the same, by placing or inclosing the sheets in frames constructed substantially as set forth.

819.—Thomas Phillips, of Ann Arbor, Mich., for an Improved Arrangement of Carriage Springs:

I claim the combination and arrangement of the compound lever spring, the rollers attached to the spring, and the two standards, as described, for the purpose set forth.

820.—W. G. Reed, of Chelsea, Mass., for an improvement in Metallic Roofing:

I claim the tubular rafters, C, when constructed of two longitudinal parts, a a, provided with flanches, b b, and used in connection with plates, D, the edges or sides of which are secured between the flanches, b, and bent so as to form gutters, d d, within the rafters, to operate as and for the purpose set forth.

[This invention consists in the employment of tubular metallic rafters, tie beams, stringers and braces, so constructed and arranged as to effect the desired end.]

821.—W. C. Rentgen and P. H. Humes, of Keokuk, Iowa, for an Improved Fan Attachment to Threshing Machines:

We claim a fan arrangement, consisting of a fan placed in a proper case, to which there is a suitable induction and eduction passage, the whole constituting a single trunk extending from the front to the rear of the machine, and so arranged that the draft at the orifice of the induction passage shall be vertical, or nearly so, substantially in the manner described.

[The object of this invention is to prevent dust being blown from threshing machines into the face of the feeder or attendant while feeding the machine, a result due to the blast generated by the rotation of the beaters. The invention consists in placing a fan, which is inclosed within a suitable case or box, directly over the cylinder or beater box, and so arranged as to draw in the dust as it is ejected from the beater box, and force it in a direction from the feeder or attendant.]

822.—C. H. Reynolds, of New York City, for an Improved Wrench:

I claim the collar, B, having a longitudinal play or movement on the cylindrical part, b, of the shank, A, provided with the screw thread, c, and fitted in the nut, e, of the sliding jaw, E, in connection with the pivoted handle, F, arranged in relation with the collar B, to operate as and for the purpose set forth.

[This invention has for its object the facilitating of the adjustment of the wrench to the nut, and also the obtaining of a firm hold of the jaws of the wrench on the nut, so as to effectually prevent the slipping of the former on the latter. The invention consists in operating the movable or sliding jaw of the wrench by means of a rotating screw collar, which is allowed a certain degree of longitudinal play on the wrench, and is used in connection with a handle secured to the shank of the wrench by a joint or pin, and so arranged as to perform the function of a lever and act upon the screw collar and movable or sliding jaw, so as to cause the nut to be firmly grasped between the jaws as the wrench is turned.]

823.—G. C. Robinson, of Boston, Mass., for an Improvement in Apparatuses for Drying Salt. Ante-dated Oct. 8, 1860:

I claim, first, The revolving platen, a, in combination with the teeth or scrapers, j, or their equivalents, constructed and arranged substantially as described.

Second, The discharging scarpers, p, for the purposes set forth.

Third, The supplementary scraper or levler, r, arranged in my machine, substantially as described.

Fourth, Packing the outer periphery of the revolving platen of my rotary salt-dryer with sand or other incombustible powder, substantially as described and for the purposes set forth.

824.—Martin Roe, of Townsend, Ohio, for an Improvement in Sugar Mills:

I claim the crushing bar, P, operated as set forth, in combination with the apron, O, and rollers, H K, when operating conjointly in the manner and for the purpose described.

825.—N. G. Ross, of Cincinnati, Ohio, for an Improvement in Sewing Machines:

I claim the obliquely-slotted looper, J, adapted to traverse, when in action, a fulcrum, c, its lower end receiving a circular motion from a crank, I, and its upper end the described combined rocking and up and down motion, so as to enter the upper loop at its widest part, and to shed its own loop near the cloth, in the manner and for the objects stated.

826.—J. S. Shailer and G. F. Folsom, of Roxbury, Mass., for an Improvement in Water Meters:

We claim the described arrangement of the induction chamber, B, the two float chambers, C C′, the eduction chamber, E, the chambered valve, F, and its ports, the two floats, D D′, and the valve-tripping apparatus, the whole operating together in manner and under circumstances substantially as specified.

827.—Minard Snell, of Medina, N. Y., for an Improvement in Stave Machines:

I claim the centering dogs, h h′, spur wheel, P, and wormshaft, J, in combination with the pivoted arms, k k, and adjusting rod, H, the same being arranged on the sliding head blocks, G G′, and constructed substantially as set forth, for the purpose described.

[This invention relates to certain improvements in circular sawmills for sawing round logs into boards, staves, &c., wherein two circular saws are employed, one cutting at right angles to the other, thereby sawing a board or stave from the log of the proper width and thickness at one and the same operation. The object of the present invention is to secure logs or sections of logs, of various lengths and diameters, between two adjustable centers or dogs, which have their bearings on the head blocks of the carriage, and are so constructed and arranged that a log may be rotated and also adjusted laterally up to the saws.]

828.—Richard Solis, of New Brunswick, N. J., for an Improvement in Machinery for Making Elastic Shirred Goods:

I claim the combination of the circumferential grooves, i, and longitudinal or other crimping grooves, j, in roller, B, when used in connection with the roller, C, to operate substantially as and for the purpose set forth.

829.—John Stevens and Francis Stevens, of New York City, for an Improvement in Hemmers and Folders:

We claim, first, The combination with the plaiters, 8 9 10 and 11 12 and 13, of the feed rollers, 18 and 22, by which the cloth is drawn forward and plaited, as set forth.

Second, The combination with the plaiters, 8 9 10 and 11 12 and 13, of a hemmer, 1 2, constructed and operating substantially as set forth.

Third, The combination of a stretching, smoothing or straightening edge, 6, with the hemmer, 1 2, as set forth.

Fourth, The combination of a stretching, smoothing or straightening edge, 6, with the plaiters, 8 9 10 and 11 12 and 13, as described.

Fifth, The construction, arrangement and operation of the plaiters, 8 9 10 and 11 12 and 13, as set forth.

830.—H. A. Stone, of Battle Creek, Mich., for an Improvement in Pressing Cheese:

I claim the perforated cylinder, A, in connection with the perforated heads, B B, provided with legs, d d d d, operating substantially as described, and for the purpose set forth.

831.—T. F. Taft, of Worcester, Mass., assignor to himself and A. P. Brown, of same place, and Wm. M. Page, of St. Louis, Mo., for an Improved Shear and Punch:

I claim, as an improved article of manufacture, a combined shear and punch, in which the parts, A B C D and F′, are all cast in one piece, in combination with coring out the parts, C and D, substantially as described.

832.—Robert Taylor, of New York City, for an Improvement in Canal Lock Gates:

I claim, first, A circular face gate for canal locks, the face of which is smooth and attached to side pieces or arms radiating from the journals or axle inserted in the side of the water way or sides of the lock, when used in combination with a similarly curved breast wall, which forms the lower part of the gate substantially as described.

Second, I claim, in combination with such a gate, a wicket leaf, hinged or hung thereto, and operating in the manner and for the purpose described and represented.

833.—I. P. Tice, of Baltimore, Md., for an Improved Machine for Turning Oval Frames:

I claim the giving of the bed, H, of an oval lathe, a vibratory movement simultaneously with its rotating and sliding movements, so as to admit of a rotary cutter or a stationary chisel, having, at all points of the rotation of the work, R, a position at right angles with the face thereof, substantially as described.

834.—A. G. Tompkins, of New York City, for an Improved Screw Propeller:

I claim constructing the propeller with a flaring-edged felloe or continuous rim, a, supported upon separate spokes or arms, c, that radiate from the driving shaft, b, all in the manner and for the purpose shown and described.

[This invention relates to an improvement in what is generally known as the screw propeller, and has for its object the obviating of friction and consequent loss of power attending the working of the ordinary submerged screw propeller.]

835.—Mathew Trimble, of Princeton, Ill., for an Improvement in Corn Shellers:

I claim the arrangement of hopper, A, in combination with cylinder, B, pulley, C, troughs, D D, standard, e, spikes, g g, shaft, h, cores, P P, bearers, j j, boxes, d d, caps, f f, substantially as shown and described.

836.—Arthur Wadsworth, of New York City, for an Improved Method of Operating the Second Hand in Stop Watches:

I claim the manner of operating the intermediate wheel, F, by means of a lever, I, in combination with a spring, J, when arranged for the purpose substantially as specified.

837.—Roswell Wakeman, of Port Deposit, Md., for an Improvement in Presses:

I claim the arrangement of the double top doors, being secured by a cross bar held at the ends under yokes or stirrups, in combination with springs, sliding rods, pulleys and windlasses, operating on both ends of the moving platform, substantially as described and for the purposes set forth.

838.—P. D. Wesson, of Providence, R. I., for an Improved Steam Trap:

I claim the use or employment of the tubes, A B, valve rod, C, and valve, J, when arranged and operating substantially as described, and for the purpose set forth.

839.—Martha Willis, of Rochester, N. Y., for an Improvement in Obstetrical Bandages:

I claim the arrangement of the open hip spaces and elastic hip bands, d d, and the prime and auxiliary elastic straps, h h and j j, for obstetrical bandages and supporters, substantially in the manner and for the purposes specified.

840.—T. H. Willson, of Harrisburg, Pa., for an Improvement in Blowers:

I claim, first, The employment of the blower wheel as constructed, composed of a series of wings or arms, D, cast in the form represented and being secured together by means of the devices described, all as and for the purpose set forth.

Second, In combination with the subject of the first claim, I claim the fan case, constructed in the manner and shape represented.

841.—Ross Winans and Thomas Winans, of Baltimore, Md., for an Improved Steering Apparatus for Navigable Vessels:

We claim the combination of a vessel having a spindle-formed bottom, two rudders located below the bottom thereof, at opposite sides of the longitudinal center, and mechanism to impart opposite movements to the rudders, substantially as described.

842.—Ross Winans and Thomas Winans, of Baltimore, Md., for an Improvement in Stuffing Boxes:

We claim a stuffing box consisting of a combination of radiating sockets with independent compressors, substantially as described.

843.—Jesse Young, of Franklin Furnace, Ohio, for an Improvement in the Packing of Pistons for Steam Engines:

I claim the application of spiral springs for holding metallic packing against the surface of the cylinder, in the manner substantially as described.

844.—O. C. Evans (assignor to himself and L. D. Towsley) of New York City, for an Improvement in Fastenings of Metallic Bands for Cotton Tubes:

I claim the combination of the slots, s s, in the plate, A, with the angular tongues, t t t, more or less as described and for the purposes set forth.

845.—A. H. Knapp, of Newton Center, N. H., assignor to himself and G. W. Tisdale, of Walpole, Mass., for an Improvement in Scissors:

I claim the combination of the guide slot, C, and pivot, D, with the curved slot, F, and pin, G, for producing any regular or irregular drawing cut desired, substantially in the manner and for the purposes specified.

I also claim the bush sleeves, f f, applied to and in combination with the screw pivot, D, pin, G, and the slots, C F, substantially as and for the purposes set forth.

846.—W. A. N. Long (assignor to J. B. Bland), of Fisherville, N. H., for an Improved Bed Foundation.

I claim the described bed foundation made of the basket springs, slat supporters, and conical bearers, constructed, arranged and combined together and with the cross rails and slats of a bedstead, substantially in the manner specified.

847.—J. W. Nye, of Fairfield, Vt., assignor to himself and G. W. Ball, of St. Albans, Vt., for an Improvement in Dumping Wagons:

I claim the improved dumping wagon as constructed with the divisional partitions, G G1, G2, G3, arranged and combined and so as to operate as described, with hinged bottoms or platforms, H, H1, H2, H3, applied to the wagon body, A, and disposed therein and with respect to one another, substantially as specified.

848.—S. J. Olmsted, of Binghamton, N. Y., assignor to John Ellis, of Detroit, Mich., for an Improved Gate Hinge:

I claim the special arrangement of the rack, P, the pinion, N, and adjustable arm, F, in combination with a gate, in the manner and for the purpose substantially as set forth.

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849.—Edward Roberts (assignor to Code, Hopper & Gratz) of Philadelphia. Pa., for an Improved Time Tell Table:

I claim, first, The detachable graduated disk, F, applied to the works of the clock, substantially as set forth, in combination with the lid, B, its openings, b and a, and the pointer, x, or its equivalent, when the said openings and pointer are arranged in respect to each other and to the disk as and for the purpose described.

Second, I claim the spring lever, I, with its adjustable pin, K, in combination with the adjustable graduated disk and the lid, B, and its openings, b and a.

850.—D. H. Thayer (assignor to himself and S. A. Baker), of Lansing, N. Y., for an Improvement in the Cutting Apparatus of Harvesters:

I claim the arrangement of the cutters, e, and cutter bar, C, with the supporting projections, f, knife-edged backward-opening recesses, b, space between projections and fingers and finger bar, A, in the manner and for the purpose shown and described.

[The object of this invention is to prevent the choking or clogging of the sickle, a contingency of frequent occurrence in all grain and grass harvesters.]

851.—Godfried Weiland (assignor to himself and Francis Fisher), of Buffalo, N. Y., for an Improved Straw Carrier for Threshing Machines:

I claim the arrangement of the lever, F, and spring, J, within the carrying apron, in connection with the cam, M, for operating the same for the purposes and substantially as described.

851.—J. B. Wilson (assignor to J. F. Bodine), of Williamston, N. J., for an Improvement in Stoppers for Sealing Cans and Jars:

I claim the combination of the two clamping disks, A B, expanding segments, D, and elastic ring, E, constructed, arranged and operating together in the manner and for the purpose set forth.

[This improved stopper consists of two metallic disks clamping an ndia-rubber ring between their peripheries, and a set of metallic segments between the said disks, which segments are expanded radially within the ring by means of a conical screw plug, simultaneously with the clamping action. The advantages are that the lower disk, being imperforate, constitutes an airtight center for the stopper, avoiding the necessity of a web of gum or other ductile substance; the ring is confined in position by the clamping disks, and the metallic segments employed to expand the ring cannot be forced into actual contact with the neck of the jar, so as to endanger fracture.]

853.—James Higgins and T. S. Whitworth, of Salford, England, for an Improvement in Spinning Machines. Patented in England October 13, 1860:

We claim, first, Giving support to a stationary tube or "bolster" through which the spindle passes, by a sliding bearing attached to the copping rail.

Second, So arranging the spindles and their tubes or bolsters that they may oscillate separately upon joints or other apparatus for the purpose of adjusting themselves to a sliding bearing.

Third, Connecting the spindle to the pinion by which it is driven so that it may be withdrawn therefrom without disturbing top bearings or other parts requiring re-adjustment.

854.—Luther Atwood, of New York City, for an Improvement in the Manufacture of Hydro-carbon Oils:

I claim the direct application of ice or ice and salt to the condensation of hydro-carbon oil vapors, substantially as described and substantially for the purpose set forth.

I also claim bringing the vapors by a descending current in contact with the surface of the ice or ice and salt, substantially as described.

855.—G. W. Blake (assignor to himself and L. W. Blake), of East Pepperell, Mass., for an Improved Belt Fastening:

I claim the employment of the double-headed studs, a a, in combination with the belt ends, in the manner and for the purposes shown and described.

[This invention consists in the employment of a suitable number of short double headed flat studs which are introduced through slits cut lengthwise through the ends of the two sections of belting, said studs being so formed that their heads will readily enter the slits in the ends of the belt, after which they will connect the ends securely by giving the studs a slight turn.

RE-ISSUES.

51.—The Merrill Patent Fire-arm Manufacturing Company (assignees of J. H. Merrill), of Baltimore, Md., for an Improvement in Fire-arms. Patented July 20, 1858:

We claim the combination of a barrel that opens out at its top, and an open chamber behind it for receiving a cartridge, with a breech pin or plug and two levers for actuating and holding it locked, substantially as described.

52.—The Merrill Patent Fire-arm Manufacturing Company (assignees of J. H. Merrill), of Baltimore, Md., for an Improvement in Fire-arms. Patented July 20, 1858:

We claim, in combination with a barrel that opens out at its top, a long, open, drooping chamber in rear of it, for the purpose of easily dropping in the cartridge and the ready cleansing of the bore of the gun from the rear, substantially as represented.

53.—The Merrill Patent Fire-arm Manufacturing Company (assignees of J. H. Merrill), of Baltimore, Md., for an Improvement in Fire-arms. Patented July 20, 1858:

We claim, in combination with the levers by which the breech pin or plug is actuated, a guiding mechanism, substantially as described, by which said levers and plug are controlled in their movements, to prevent binding, chafing, or bruising, as set forth.

54.—The Merrill Patent Fire-arm Manufacturing Company (assignees of J. H. Merrill), of Baltimore, Md., for an Improvement in Fire-arms. Patented July 20, 1858:

We claim converting what is known as the "Jenk's gun" from a loose powder and ball loader to a cartridge loader, by closing up the opening through which that gun was loaded, cutting away and opening out in rear of the barrel so as to load at the rear end of the bore, and allowing the lever, toggle, and piston to come far enough back to admit a cartridge to be dropped in behind the bore, and thence run up into the chamber, as set forth.

55.—E. E. Everitt, of Philadelphia, Pa., for an Improved Bedstead Fastening. Patented March 29, 1859:

I claim the combination of the tapering wedge-formed head or tenon l, with the tapering mortise, i, one being attached to the post and the other to the rail of a bedstead, when the said tenon is less than the mortise, and when both are constructed and arranged in respect to each other, substantially as set forth, for the double purpose of readily tightening the rail to the post, when the joint has become loose through shrinkage, and of forming a coupling capable of self-adjustment laterally, as specified.

I further claim one or more fins or ribs, e, in combination with the plugs, A and A′, when these are constructed substantially as described.

56.—W. O. Hickok, of Harrisburg, Pa., for an Improvement in Mills for Grinding Apples. Patented November 20, 1855:

I claim the application of breakers, d d, along between the parallel rows of the teeth, b b, in each of the cylinders, A A′; and this I claim whether the said breakers be formed as the plain or serrated, continuous, longitudinal ridges, d d, shown in the drawings, or as a series of isolated or distinct small teeth between the said rows of the larger teeth b b, as described; and whether the helical ribs, c c, be used or not; the said teeth or breakers operating together substantially in the manner described and for the purpose specified.

57.—W. F. Ketchum, of Buffalo, N. Y., for an Improvement in Track Clearers for Harvesters. Patented May 17, 1853:

I claim, first, A track clearer or scraper placed near the outer end of the finger bar and behind the divider, at an acute angle with the finger bar, arranged in relation to the same so as to sweep the grass inward as it falls over the finger bar, and with cutters supported and guided near their outer ends wholly by stationary supports or guides, so that the mechanism for the operation of the cutting apparatus will not clog or obstruct the action of said track clearer or scraper, substantially as described.

Second, Placing the lower surfaces of the rear of the divider and front end of the track clearer close together and substantially on a level with the under surface of the cutter bar, substantially as described.

Third, And in combination therewith I claim connecting the track clearer at its front end by a vertically-yielding joint placed near its lower surface, substantially as set forth.

Fourth, The combination of the divider with a track clearer connected at the rear thereof, and standing at an acute angle with the cutter bar, while the lower edge of the track clearer is on or near the ground and its upper edge rises gradually backward from the upper surface of the divider, substantially as set forth.

Fifth, The short divider in combination with a track clearer attached close to its rear and at an acute angle with the finger bar, as set forth.

Sixth, I claim placing the front end of the inclined track clearer close to the rear of the divider, at or near its outer side and beyond its extreme cutting point, so that the grass shall fall over the cutters and finger bar inside of the track clearer, in condition to be swept inward, substantially as described,

EXTENSION.

H. R. Dunham, of New York City, for an Improvement in Connecting Side Pipes with the Steam Chests. Patented March 20, 1847. Extended March 19, 1861:

I claim the application of a plate of flexible metal in a steam pipe between two flanges of different diameters, the yielding of which plate shall give sufficient room for the expansion of the pipe, thereby avoiding the necessity of using stuffing boxes or the ordinary copper hemispherical ring joints for side pipes of steam engines.

DESIGN.

A. C. Barstow, of Providence, R. I., for a Design for Stoves.

Note.—In the above list of patents, THIRTY of the number were procured through the Scientific American Patent Agency.

Notes and Queries

A. M. H., of N. H.—As there is some doubt on our minds respecting the novelty of your stump puller, we would advise you to send us on a fee of $5, and have a preliminary examination made at the Patent Office.

J. C., of S. C.—We have never seen the secret to which you refer for extracting gold from iron pyrites and oily plumbago. If we come across it, we will publish it for your benefit.

J. P. R., of ———.—*Silliman's Journal* is a very learned work, and dry, except to those who are purely scientific. It is published at New Haven, Conn.

G. F., of Pa.—Your design for fountains is a pretty idea, and would be patentable. We are not acquainted with any person who has engaged practically in the propagation of fish; but we think Mr. Luther Tucker, of Albany, N. Y., can give the information desired.

C. W. J., of N. Y.—The most adventurous balloonist in our country has assured us that there is always danger, and never certainty, in balloon voyages. We advise you to avoid the subject, although your sketch of the new balloon is quite novel in one feature.

F. M., of Ohio.—If you communicate with Col. H. Ruttan, Coburg, C. W., you will obtain all the information desired respecting his method of ventilating railroad cars. Mousiere's gas burner is not on sale in this city.

J. B., of N. Y.—Address J. Tagliabue, No. 3 North William-street, this city, respecting the manufacture of barometers such as you desire.

A. F., of N. Y.—We cannot inform you where you can learn the light rifle drill, but you can acquire the information from any of the officers at the West Point Academy.

J. E. S., of N. Y.—By giving canvas a primary coating of size, the paint will not run upon it. If required for a transparency, give it a primary coating of white varnish; then put on the paint, which should contain considerable turpentine to make it dry quickly, or use common driers, which can be purchased in all paint stores.

E. C. B., of N. Y.—Bourne's "Catechism of the Steam Engine" will be of great advantage to you. You can obtain it of Mr. J. Wiley, bookseller, this city.

O. H. B., of Mich.—The lever, inclined plane, wedge, screw and pulley have been called the five mechanical pawers.

Wm. A. C., of N. Y.—The power to be got from a raceway with a fall of one foot in forty, without obstructing the flow of the water, to throw it back upon the wheels at the upper end of the race, would be too small to be of any practical value.

J. D., of Mass.—We suppose West Point school is the best one for teaching engineering in this country. Perhaps, though, the new practical departments at Cambridge and New Haven are just as good.

W. H. W., of Mass.—You will find the subject of water wheels running faster by night than by day fully discussed in Vol. I. new series, SCIENTIFIC AMERICAN. It is all a delusion.

E. A. B., of Conn.—If you have two feet fall and plenty of water, an undershot wheel will drive your two turning lathes and a circular saw. You would be obliged to stop in high water.

J. T., of Wis.—Your questions are very pertinent, but they would open the whole subject of expansion, and we have decided to let this matter rest until Isherwood makes his report of the experiments at Erie.

G. B., of N. Y.—We might have continued the argument on vegetable physiology, but your poetry is too much for us. We close our mouths, and have nothing more to say.

G. W. T., of Del.—Chester's form of Smee's battery is one of the best for producing magnetism. You can make magnets with Grove's battery. The greater the number of batteries, and the more whorls of the helix, the better.

G. W. D., of Maine.—Organ pipes, of any size or kind desired, may be procured of George Jardine & Son, No. 100 White street, this city.

H. N. B., of N. Y.—We find the sticks of wood which you send us very good electrics; probably because they are so dry and full of resin.

CHANGE IN THE PATENT LAWS.

NEW ARRANGEMENTS—PATENTS GRANTED FOR SEVENTEEN YEARS.

The new Patent Laws, recently enacted by Congress, are now in full force, and promise to be of great benefit to all parties who are concerned in new inventions.

The duration of patents granted under the new act is prolonged to SEVENTEEN years, and the government fee required on filing an application for a patent is reduced from $30 down to $15. Other changes in the fees are also made as follows :—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Re-issue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing Disclaimer	$10
On filing application for Design, three and a half years	$10
On filing application for Design, seven years	$15
On filing application for Design, fourteen years	$30

The law abolishes discrimination in fees required of foreigners, except in reference to such countries as discriminate against citizens of the United States—thus allowing English, French, Belgian, Austrian, Russian, Spanish, and all other foreigners except the Canadians, to enjoy all the privileges of our patent system (except in cases of designs) on the above terms.

Messrs. MUNN & CO. are very extensively engaged in the preparation and securing of Patents in the various European countries. For the transaction of this business they have Offices at Nos. 66 Chancery Lane London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we may safely say that seven-eighths of all the European Patents secured to American citizens are procured through our Agency.

A pamphlet of information concerning the proper course to be pursued in obtaining patents through their Agency, the requirements of the Patent Office, &c., may be had gratis upon application at the Principal Office, or either of the Branches. They also furnish a Circular of Information about Foreign Patents.

Consultation may be had with the firm, between NINE and FOUR o'clock, daily, at their PRINCIPAL OFFICE, No. 37 PARK-ROW, NEW YORK. We have also a BRANCH OFFICE in the CITY OF WASHINGTON, on the CORNER OF F AND SEVENTH-STREETS, opposite the United States Patent Office. This office is under the general superintendence of one of the firm, and is in daily communication with the Principal Office in New York, and personal attention will be given at the Patent Office to all such cases as may require it. Inventors and others who may visit Washington, having business at the Patent Office, are cordially invited to call at their office.

Communications and remittances should be addressed to

MUNN & CO.,
Publishers, No. 37 Park-row, New York.

Money Received

At the Scientific American Office on account of Patent

Office business, for the week ending Saturday, March 30, 1861:—

E. S. H., of Mass., $20; P. T., of N. Y., $15; J. S. G., of Maine, $30; J. H. I., of Ill., $10; N. M., of Ohio, $10; J. E. M., of Pa., $15; S. G. S., of Mass., $25; J. S. P., of Conn., $30; S. E. C., of Mass., $33; O. G. B., of N. Y., $15; H. B., of Conn., $35; J. A. M., of Mo., $10; E. G., of Mass., $15; J. D., of Ohio, $40; A. E. K., of Pa., $15; J. A. R., of Pa., $10; N. A. B., of N. Y., $15; E. R. W., of Iowa, $15; A. H. T., of N. J., $30; G. & C., of N. H., $15; W. A., of N. Y., $40; J. A. G., of Mass., $25; A. & D., of N. H., $25; M. D., of Ind., $25; L. F. M., of N. Y., $25; A. J. S., of Mass., $25; R. W., of Vt., $15; W. M., of Mass., $15; G. B., Jr., of N. Y., $15; V. D., Jr., of Va., $10; G. M., of Ill., $15; N. E. D., of Ill., $30; G. W. R., of N. Y., $100; S. & E., of N. J., $15; S. C. D., of Conn., $15; E. D. M., of Conn., $30; R. G., of Conn., $15; G. H., of Md., $15; G. K., of N. Y., $100; G. S., of N. Y., $30; W. F. S., of N. Y., $15; E. H. C., of Mich., $15; I. C. C., of Mich., $55; R. S., of N. J., $65; M. N., of Mass., $15; W. M., of Ill., $10; C. H. F., of N. Y., $15; B. S., of N. Y., $25; J. H., of Ind., $15; J. L., of N. Y., $25; H. E. W., of N. Y., $15; W. G., of Mass., $25; J. S. S., of N. Y., $40; P. M., of Ind., $15; W. C., of Iowa, $15; J. B., of Ill., $30; E. W. B., of L. I., $40; N. R. M., of N. Y., $10; A. H. F., of Ill., $30; J. C. & C. N. M., of Ill., $30; P. C., of N. Y., $15; R. H., of N. Y., $15; M. A. W., of Cal., $20; S. P., of N. Y., $15; C. S., of N. Y., $15; D. & R., of N. Y., $10; W. C. B., of N. H., $50; W. & S., of Ohio, $10; J. B. D., of Mass., $25; J. P., Jr., of N. H., $25; G. & S., of Ohio, $15; B. & D., of N. J., $25; G. P. W., of N. Y., $25; W. C. C., of Wis., $10; N. C., of N. Y., $15; A. H. & C. R. B., of Ind., $25; F. W. S., of N. Y., $25; J. C. B., of Conn., $25; P. A., of N. Y., $130; R. S., of N. J., $25; M. D. W., of Ind., $30; C. W., of Iowa, $25; M. S. G., of Wis., $30; J. McD., of N. Y., $30; H. T. C., of Conn., $25; S. D. C., of Iowa, $30; C. W. C., of N. Y., $35; A. B., of N. J., $15; C. C., of Ind., $20; N. C. S., of Conn., $25; J. W., of Ind., $15, P. A., of N. Y., $130; O. G. B., of N. Y., $25.

Specifications, drawings and models belonging to parties

with the following initials have been forwarded to the Patent Office during the week ending March 30, 1861:—

[The patents on these cases, when issued, will be granted for seventeen years under the new Patent Law.]

S. & B., of Va.; H. T. C., of Conn.; J. S. G., of Maine; N. C. S., of Conn.; R. W. & D. D., of N. Y.; B. & D., of N. J.; W. & S., of Ohio; R. T., of N. Y.; G. P. W., of N. Y.; W. A., of N. Y.; W. M., of N. Y.; C. W., of Iowa; B. S., of N. Y; J. H. J., of Ill.; S. & E., of N. J.; B. & H., of N. Y.; M. & B., of Conn.; S. E. C., of Mass.; J. P., Jr., of N. H.; H. S., Jr., of N. Y. (two cases); J. K. H., of Ind. (two cases); E. W. B., of N. Y.; R. R., of N. Y.; N. R. M., of N. Y.; V. D., Jr., of Va.; J. R. R., of Mass. (two cases): J. A. M., of Mo.; B. I., of Mass.; J. B. D., of Mass.; D. R., of N. Y.; E. S. H., of Mass.; J. S. S., of N. Y.; G. S., of N. Y.; W. C. C., of Wis.; J. D., of Ohio; S. G. S., of Mass.; O. G. B., of N. Y.

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GLACIERS.

Among the most remarkable objects on the surface of our earth are the great rivers of ice that are forever slowly creeping down the valleys of the Alps. The globe on which we live is sweeping through a region of intense cold, the warmth which is essential to animal life extending at farthest but a few miles from its surface. The rays of the sun, which produce the heats of summer, pour through the cold space above without leaving in it any traces of their power. The water which is evaporated from the ocean and rivers, as it floats upward into the cold region, is there condensed, and, falling upon the summits of the mountains, covers them with deep layers of perpetual snow. As the snow accumulates in vast masses in the valleys which furrow the steep sides of the mountains, it is pressed downward by its own weight along the valley, and when it reaches the boundary of perpetual frost, it is converted into clear solid ice. From what we know of the properties of ice we should suppose that a mass of it hundreds of feet in thickness, wedged in between the rocky and ragged sides of a crooked valley, would remain immovably fixed in its position; but careful and repeated experiments show that this is not the case. Professor Forbes, of Edinburgh, by placing rows of stakes across a glacier and observing them carefully with a theodolite, ascertained that the whole mass was moving slowly and steadily downward, at the rate of a few inches only in 24 hours.

Within a few years glaciers have been thoroughly investigated by Agassiz, Forbes, Tyndall and many others, and hundreds of observations of their motions and phenomena have been made with suitable instruments. It is found that the motion is more rapid in the middle than at the sides, at the surface than at the bottom, in the summer than in the winter—and like rivers of water, glaciers move the most rapidly in the steepest part of their course, the motion becoming very slow indeed where the ice spreads out to fill a broad part of the valley. When the earth falls down from the sides of the valley upon the edges of the glacier, it rests there, forming long lines or walls, which are called *moraines*. When two streams of ice unite, the moraines upon the contiguous edges come into the middle of the combined stream, and thus the glacier in the lower part of its course becomes marked with rows of earthy matter and broken rocks extending lengthwise along its surface. When separate masses of rock roll down from the sides of the valley and rest upon the ice, they protect the ice directly beneath them from the action of the sun's rays, and as the surface around is melted away, these rocks remain lifted up on short pillars, presenting a very singular appearance. Isolated masses of gravel also protect the ice from melting, and when that around melts away, the mass falls into a conical form, and thus the glacier becomes dotted with cones of gravel the hearts of which are of ice.

As the glacier moves down the mountain into the warm regions, it is melted on the surface, and thus its vertical depth diminishes at its lower portion, though it generally terminates abruptly with an end of considerable thickness, a stream of water usually flowing out of a deep cave in the end. In summer this end melts more rapidly than the glacier moves down, and the terminus retreats up the valley; but in winter the head of the frozen monster is pushed downward along the valley, plowing up the ground, tearing trees from the earth, and sometimes crushing in the walls of houses.

The Himilayas and other mountains which rise into the regions of perpetual frost produce glaciers, as well as the Alps. Near the pole, the glaciers are sometimes pushed quite into the sea, when their ends break off and float away, forming the icebergs, which are occasionally encountered on the voyage from this country to Europe.

Col. C. W. Saladee, patentee of the steam plow illustrated in No. 10 of the present volume of the Scientific American, writes us from Texas that he is about to start for Philadelphia, where he is having a full-sized operating machine constructed. He desires that communications may be addressed to him at the Merchants' Hotel, Philadelphia, for the next ninety days.

A single patent in England for fishing rail-joints saved $30,000,000 to the public in 14 years.

HALE'S MODE OF IMPELLING SHOT AND SHELL.

The famous congreve rocket, which was invented in 1804, was condemned by the Duke of Wellington as being more dangerous to the army that used it than to the enemy, from the uncertainty in the direction of its flight. It has often occurred to us that the principle of propelling rockets might be applied to cannon shot, in connection with a tube of sufficient length to insure the flight in the desired direction, and we here illustrate a plan invented by Mr. William Hale, of England, for accomplishing this.

The rocket-shell is represented in Figs. 1 and 2. The shell, *a*, has a long iron cylinder, *b*, attached to its rear end; this cylinder being filled with meal powder, *e*, compressed, so that it will burn slowly. The burning of this powder generates hot gases which exert a powerful pressure against the whole interior of the cylinder, and by making holes in the rear end of the cylinder, a portion of the pressure is removed from this part, leaving the pressure against the forward end not fully counterbalanced, which accordingly drives the missile forward in that direction. A central rod, *d*, holds the plate, *f*, securely against the rear end of the cylinder, and serves to distribute the propelling powder in the annular chamber around this rod. A space is left within the cylinder around the outside of the powder, so that the powder may burn from its external surface inward, and when the fire reaches the central rod, it lights a fuse which explodes the powder in the shell.

Fig. 2 Fig. 1

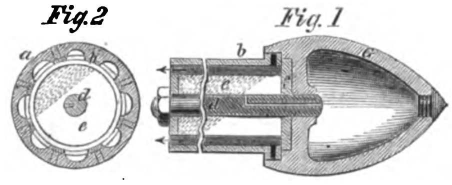

Fig. 3

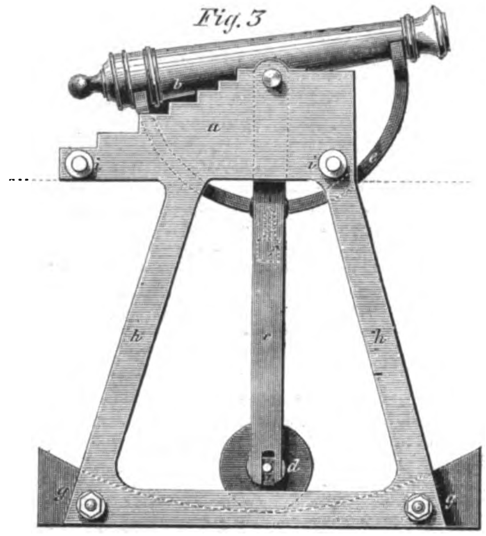

Fig. 3 represents the apparatus for starting the shell in the desired direction of its flight when used on board ship. A slit is made through the deck, *k*, of the vessel for the sliding back and forth horizontally of the frame, *h h*, and pendulum rod, *c*; the gun, *b*, being supported on the rollers, *i i*, which run upon the deck by the sides of the slit. A curved railway *g*, is fitted to support the rolling pendulum, *d*, so that as the vessel rolls, this heavy pendulum will preserve its vertical position, and thus keep the gun in a horizontal position, or at any angle of elevation desired.

Mankind were never more earnestly engaged in improving instruments for destroying each other than they are at the present time.

Improved Mode of Extracting Phosphorus from Bones

Le Génie Industriel describes a process recently patented by Mr. Carl Mantrand, of Paris, for extracting phosphorus from bones more economically than by the processes heretofore employed.

The calcined bones, reduced to a fine powder, are mingled with a sufficient quantity of pulverized charcoal to combine, as carbonic oxyd, with all the oxygen of the phosphate. The mixture is placed in an earthenware cylinder varnished on the inside, filling the cylinder to three-fourths of its capacity. The cylinder is then heated red hot, and a current of hydrochloric acid gas is blown into it. The phosphate of lime is immediately decomposed, forming chloride of calcium and carbonic oxyd, while the liberated phosphorus is evaporated and driven through a copper tube, which leads into a vessel of cold water where the phosphorus is condensed.

The chloride of calcium, disembarrassed of the charcoal, in contact with sulphuric acid, regenerates hydrochloric acid for a new operation.

The labor of pulverizing the bones may be saved by digesting them with a solution of hydrochloric acid; using for this purpose the water of the condenser from the preceding operation.

In a communication to one of the London periodicals, Mr. Wm. Bridges Adams, a writer upon practical subjects, states that the earliest iron vessels constructed on the Clyde were large, flat-bottomed, wall-sided, open troughs of sheet iron, rivetted together at the seams, precisely like a long tank fitted with a wooden lid in the shape of a deck. Had such a vessel been required to boil a whale entire, it would have formed an admirable kettle by simply removing the deck.

In his report of the London Fire Department for 1860, the engineer states there were 54 incendiary fires during the year.

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