NEW CAPITOL FOR THE STATE OF NEW YORK.

The site of the building at Albany illustrated in our present number is very commanding, being 170 ft. above the level of the Hudson, and has an area of ten acres. It is bounded on the south by State street, and on the north by Washington avenue, 100 feet in width. The land falling off rapidly to the north, south, and east, this building with its high walls, still higher pavilions, turrets, and towers, will be seen to advantage. In the exterior composition of the design, there is a general adherence to the style of the pavilions of the New Louvre, of the Hôtel de Ville of Paris, and the Maison de Commerce recently erected in the city of Lyons. The terrace which forms the grand approach to the east or principal front will form a striking feature.

The exterior is 290 feet long north and south, and 390 feet east and west. The floor immediately above the level of the plateau of the terrace will be entered through the porticos on Washington avenue and State street, and through the carriage entrance under the portico of the east front. The first or main entrance-floor will be reached by a flight of steps on the east front leading to the loggia, or hall of entrance, occupying an area of 60 feet by 74 feet, and 25 feet in hight.

Communicating directly with this hall are two grand staircases, which form the principal means of communication with the second and most important floor. On the left of this hall are a suite of rooms for the use of the Governor and his secretaries, and military staff. On the right are rooms for the Secretary of State, Attorney General, with corridor leading to the Court of Appeals.

On the second or principal floor will be placed the Senate and Assembly chambers, and the State library, all of which (in elevation) will occupy two stories, making 48 feet of hight. Rooms for the committees and other purposes will also be placed on this floor. The Senate Chamber will be 75 feet by 55 feet on the floor, with a gallery on three sides of 20 feet in width. The Assembly Chamber will be 92 feet by 75 feet on the floor, surrounded by a similar gallery, which in both chambers largely increases the areas of the upper portion. The library will occupy the whole of the east front of these two stories, and will be 283 feet long and 54 feet wide. This will be the most attractive room in the building. Its large area and lofty proportions, its view towards the north, east, and south, overlooking the city, and bringing in the valley of the Hudson and its western slopes for miles in each direction, will make it a favorite place of resort at all seasons of the year. The main tower is 66 feet square, and about 320 feet in hight. In the center of the building will be an open court 137 feet by 92 feet. This court will be an attractive feature, being treated in the same manner as the exterior fronts, and will no doubt ultimately have its fountains and be surrounded with statuary. The entire structure will weigh 150,000 tuns; but the great inequalities in the hights of the various walls, and the distribution of the enormously heavy fire-proof floors, and roofs sometimes laden with deep snows, will bring very unequal weights upon the parts of the foundation adjacent to each other, and without great care they would settle unequally and crack the walls, as is so frequently seen in modern private, and even many public buildings. The stone foundation of the walls commences on concrete, and is made of large blocks of close-cut limestone of from two to six tuns weight, laid in regular courses, the first one nearly the width of the concrete, and each successive one narrowed by offsets, until the wall is contracted to the width necessary to support the superstructure, arranged so that they will afford an equal bearing on each side of the line of the centre of gravity of the walls and the weights which they are to sustain. The work has been carried on very rapidly under the direction of the Commissioners, Messrs. Hamilton, Harris, John V. L. Pruyn, O. B. Latham, James S. Thayer, Alonzo B. Cornell, William A. Rice, James Terwilliger, and John T. Hulson. The architects are Messrs. Fuller & Laver, of Albany; and Mr. W. J. McAlpine is the engineer.

The buildings are being constructed by day-work, under the immediate superintendence of Mr. J. Bridgford, a well known builder.

CAPITOL OF THE STATE OF NEW YORK.

Log Dams.

These, in a locality where timber is plenty, are cheapest, and easiest to build. If the bottom be rock or other good foundation, begin by laying a large log across the stream, at the down-stream face of the intended dam; this you will extend from bank to bank, by laying one log at the end of another, having each piece as long and large as possible, taking care to clear away everything that will wash out from under, and where hollow places occur, put short logs across under, so as to give it a safe foundation. Then put short logs across this, six or eight feet apart, their butt ends lying upon the log and their top ends upon the ground, up stream from this; you will now place another tier upon these, above and parallel with the first one, but inclining slightly up stream; then another set of short ones, their butts upon the last tier, and top end upon the ground beside the first cross ties. These must be a little shorter than the first ties to admit of laying a smallish log on the ends of the first ones, and up into the angle formed by the second ones; you can now lay "skids" upon these small logs, and proceed to roll up your third tier of large logs, along the faces. Care must be taken to notch them a little where they cross each other, to insure their lying safely, or block them secure with a stone or piece of wood where the small ends come.

Your next tier of ties must be notched well down at the small or up-stream end, and you must proportion your two parallel tiers of logs and these ties, so that the front or breast will rise enough faster than the rear to keep it like a portion of an arch, and have the cob-work, when finished, fit the rafters; that is, the larger tier of logs at the breast should support the rafters near the top, while the smaller tier at the rear should support them near the middle, and the lower ends of the rafters rest upon the rock or bottom. It will be seen that a breastwork, so constructed, is like a portion of an arch or circle, of which the foot of the rafter is the center, and the front of the breastwork the circumference; and the more weight is put upon it the stronger and more solid it becomes. Care must be taken not to carry it too high, or steep, for the length of rafter (or radius), as in that case the force of water behind might slide it away in a body.

If logs are convenient, this may be covered with them, like rafters, touching each other, taking care to fit them well and chink the cracks. The moss on trees and old logs, in damp places, is good to chink these cracks, as it grows and increases in such a place, instead of washing out. Cedar bark, pounded soft like oakum, is also good. Such a covering requires but little graveling to make it tight, as the pressure of the water forces the packing down into the seams formed by the round logs, where it is not easy to wash it out, or displace it by any other means.

Such a dam is cheap, strong, and durable, where there is a constant supply of water; but on small streams liable to dry up in summer, and allow the logs to dry, and heat, and check, they very soon rot, and are therefore not to be recommended for such a situation.—*Practical Millwright and Miller.*

Henry Ward Beecher on Interest.

No blister draws sharper than the interest does. Of all industries none is comparable to that of interest. It works all day and night, in fair weather and foul. It has no sound in its footsteps, but travels fast. It gnaws at a man's substance with invisible teeth. It binds industry with its film, as a fly is bound in a spider's web. Debts roll a man over and over, binding hand and foot, and letting him hang upon the fatal mesh until the long-legged interest devours him. There is but one thing on a farm like it, and that is the Canada thistle, which swarms new plants every time you break its roots, whose blossoms are prolific, and every flower the father of a million seeds. Every leaf is an awl, every branch a spear, and every plant like a platoon of bayonets, and a field of them like an armed host. The whole plant is a torment and vegetable curse. And yet a farmer had better make his bed of Canada thistles than attempt to be at ease upon interest.

IT is said that a good way to polish plaster of Paris castings, it is coat them with melted white wax, and then place them before a fire until the wax is absorbed; a considerable polish can then be obtained by friction.

Improved Spring Bed.

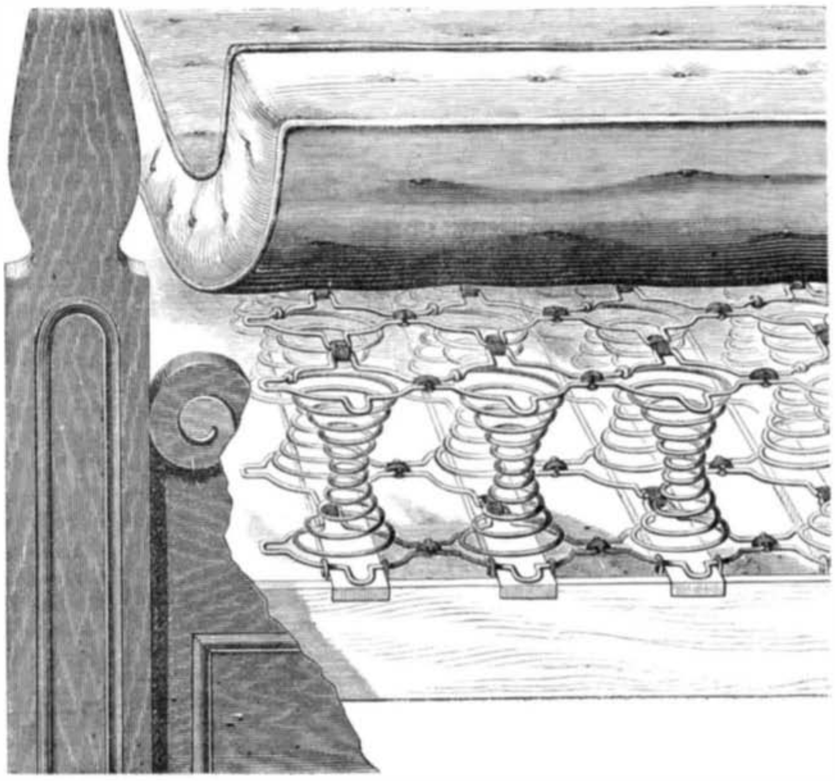
The production of a spring bed which should afford no haunt for vermin, and which should be perfectly easy and accommodating to the form, distributing the pressure equally over the entire surface, and which should at the same time be far more portable than the spring beds hitherto used, has been the object sought in the invention shown in our engraving.

It is claimed that all these objects have been attained in this device, and that it comprises all the desirable features of such beds with none of their defects. We think after a personal trial of this bed in our own residence, that these claims are fully substantiated.

The principle of construction adopted is the connection of all the springs together, so that no one can be compressed without at the same time drawing upon the others. This is accomplished by making four abrupt bends in the upper and lower convolutions of each spring, as shown, and connecting these bends by links, as indicated in the engraving.

The springs are attached at the bottom to a series of slats, as shown in the engraving, and are left entirely uncovered. In use a mattress is laid upon the springs, and when it is desired to move the bed, or pack it for transportation, the slats and springs may be rolled up together as easily as a mattress and corded together so as to be very compact.

These mattresses are on exhibition at the Fair of the American Institute. For further information address David S. Mallory, manufacturer, 385 Main street, Poughkeepsie, N.Y.



IMPROVED SPRING BED.

Manufacture of Portland Cement.

Portland cement was introduced to public notice under a patent by an Englishman nearly fifty years ago; and we have hitherto possessed a partial monopoly in its production, inasmuch as we have fortunately inexhaustible beds of the raw material from which it is made, and an abundant supply of fuel necessary for their economical manufacture. It is strange that under these conditions French engineers should have obtained the start of their professional *confreres* in this country, and that they should have been the first to demonstrate by experiments, and subsequently by the erection of magnificent harbor works on their seaboard, the valuable properties of this excellent constructive material. We may date the *extensive* employment of Portland cement in England from the commencement of the metropolitan main-drainage works. During the last fifteen years the manufacture of Portland cement has gone on steadily increasing, until at the present day we find that little short of 400,000 tuns per annum are made in the county of Kent—the center of cement manufacture—irrespective of the productions of many minor factories in different parts of the country.

The chemistry of the setting of Portland cement is by no means so well understood as it ought to be. There is no doubt, however, that, like the hydraulic lime and natural cements, it is, chemically speaking, a double silicate of lime and alumina; silicic acid is generated by the hydration of the cement, and forms insoluble salts with the lime and alumina bases. It is a curious fact that Portland cement hardens more rapidly when salt water is employed. According to Schweitzer, 1,000 grains of sea-water in the English Channel contain 27.060 grains of chloride of sodium; soluble silica has a known preference for alkaline bases, and it is not improbable, when the cement is hydrated with sea-water, that the chloride of sodium is decomposed, the silicic acid of the cement combining with the sodium and oxygen of the water, and forming thereby a silicate of soda, or a species of crude glass.

Portland cement is of two classes, which, for the sake of distinction, may be termed "Engineers'" cement and "Plasterers'" cement. The former is the more costly; it is usually described by manufacturers as "best heavy tested"; it weighs from 112lbs. to 120lbs. to the bushel, is slow setting, and of great strength: the latter is a light cement, quick setting, and of inferior strength when compared with the other. It must be understood that our remarks apply exclusively to "Engineers'" cement.

Portland cement is made from chalk and alluvial clay; the factories on the banks of the Thames use white chalk, those on the Medway gray chalk; the latter is probably preferable, inasmuch as it contains large quantities of silicious matter. Mr. Read, in his treatise on "Portland Cement," says that "the present and safest proportions, provided both chalk and clay are selected free from sand, are four parts of chalk from the Medway (gray), or three parts of Thames (white), with one of clay by measure." These materials are placed in mills of simple construction, each having a circular pan, 6ft. in diameter and 2ft. deep, in which two "edge runners," 4ft. 6in. in diameter, are kept continually going; a constant stream of water flows into the pan, and as the "edge runners" revolve, the chalk and clay are thoroughly ground, and, being thus converted into a fluid state, they filter through a band of fine brass-wire gauze fixed to the side of the pan, and flow through wooden "launders" into tanks or settling reservoirs. One washmill will feed four tanks, each of which is about 100ft. long, 40ft. broad, and 4ft. deep. When one of these has been filled in the manner just described the same process is applied to the others in succession. About three weeks after the tanks are filled the whole of the materials will be precipitated, the clear water being drained off in the mean time through a small weir in the brick side of the tank; the residuum is a plastic mixture of the consistency of "putty," and not much unlike it in color. The next process is to convey this precipitate from the tank to the "drying floors," over which it is spread in a layer about 6in. thick; each floor is 40ft. by 30ft.; it consists of an outer skin of boiler plates resting on a series of brick ovens and flues. The object of this arrangement is to render the plates sufficiently hot to effect the rapid desiccation of the water from the superincumbent layer, a process generally accomplished in about twelve hours. The materials having thus been thoroughly dried are ready for conveyance to the kilns. The "charge" consists of alternate layers of coke and raw materials, the burning generally occupying thirty-six hours. When the contents of the kiln becomes sufficiently cool, the "clinkers," or cement stones—for the mixture has now assumed that form—are drawn and removed to a floor where the larger pieces are broken, and the whole of the burnt materials are then conveyed to the hoppers of the grinding-mills, where, passing under rapidly revolving horizontal burr-stones, they are ground into an almost impalpable powder. The cement issues from the mill at a temperature of about 160°, and the now manufactured material is wheeled away, and placed in a layer from 2ft. to 3ft. thick over the floor of a cool shed; it is subsequently packed in casks or sacks for conveyance from the works. The essential conditions for the manufacture of good Portland are: 1. The chalk and clay should be thoroughly mixed in the wash-mills, and the fluid materials delivered by "launders" over the *entire* area of the settling tanks. 2. The contents of the kilns ought to be burnt equally throughout. 3. The burnt materials should be ground very fine. 4. After coming from the mill the cement should be spread over the floor of a shed, and allowed to remain there for *at least* a fortnight previously to being packed into casks or sacks.

The strength of Portland cement increases as its specific gravity increases; the tensile tests are usually made with briquettes the standard size for the neck being 1½in. by 1½in.; and it must be understood that all experiments referred to have reference to the weight necessary to sever 2¼ square inches of neat cement.

It appears from Mr. Grant's valuable paper, read before the Institution of Civil Engineers in December, 1865, that Portland cement gains from 20 to 30 per cent in strength by setting under water; it is usual, therefore, to place the best briquettes in water, after gaging, and to allow them to remain there until they are to be tested. The following table has been compiled from a recent series of experiments; it shows the average tensile strength of Portland cement as compared with the natural cements; the test blocks were of standard size of 2¼ square inches, and placed in water as before described:

	Weight per bushel.	Breaking weight two days old.	Breaking weight four days old.	Breaking weight seven days old.
	lbs.	lbs.	lbs.	lbs.
Portland cement	119	598	914	1,024
Roman cement	76	200	240	280
Medina cement	69	2[illegible]0	313	313
Cement de Zumaya (Spanish)	84	206	...	409

The *Builders' Trade Circular* vouches for the accuracy of these figures.

Mr. Grant's tables show conclusively that the strength of gaged Portland cement increases with age; from his experiments it appears that the breaking weight of rest blocks, one week old, one year old, and two years old, are as 1, 1·5, and 1·62. The ultimate maximum tensile strength has not as yet been ascertained; experiments are, however, being conducted periodically with a view to determine this important point. Mr. Grant gives the average tensile strength of cement weighing 119lbs. to the bushel as 777lbs., whereas we give it as 1,024lbs., the excess of the breaking weight as recorded by us may probably be accounted for by improved manufacture since Mr. Grant's experiments were made.

Portland cement now forms an important item in the list of our manufactures, but even now its valuable properties are not as fully appreciated as they deserve to be.—*Eng. Mech'ic*

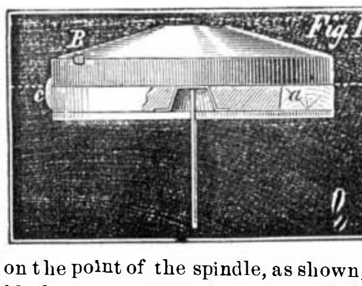
Correspondence.

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

Balancing Cylinders, pulleys, and Runner Millstones.

MESSRS. EDITORS:—I see in the SCIENTIFIC AMERICAN of Sept. 3d, page 148, present volume, W. O. Jacobi and J. G. F., are trying to instruct C. E. M. how to balance his cylinder or shaft and pulleys. But either one of the parties does not give C. E. M. the right plan to balance a cylinder perfectly, although they both have a pretty good idea of the matter. I have had a good deal of experience in balancing machine cylinders and runner millstones.

To balance a pivot millstone true is something very nice to do, and no one that does not understand it will ever get them right unless he does it by accident. No cylinder can ever be balanced perfectly true after being once built and finished, if long. If it is a narrow or thin wheel, it can be balanced true, providing its axles and everything else are done in workmanlike manner. But a long cylinder must be built and balanced all at the same time. For instance: you want to build a cylinder two feet long, with a spindle three feet long, so as to allow bearings on each side, with two heads for staves to be fastened on to form a drum; or it may be longer or shorter, with more or less head. The first thing to be done is to turn up the spindle true just as it ought to be for the purpose intended. Then make the heads, bore, and finish them just as they ought to be. Then have your balancing bars right, and put on the first head you want to go on the spindle, exactly in its proper place, and fasten it then lay the spindle on the balancing bars and balance the head perfectly. Then put on the next head and balance as before, and so on till you get everything on. In this way every head wheel or pulley gets balanced separately. Then I will warrant you this spindle and head will run in balance at any speed. It will be both in running and standing balance. The next thing is, if you want to make a drum of this, to make all the staves just as you want them, all ready to be fastened on the heads, whether iron or wood. If they are to have any attachments like spikes as a thrasher cylinder, the spikes should all be put in, and every thing finished just as they must be. To balance these staves I have two horizontal points, like lathe centers, very fine and sharp, just strong enough to bear the weight of the staves. I then find the middle of the stave lengthwise and the middle sidewise, and insert a scribing awl, if of wood, or a center punch, if of iron. I then put them in the balancing machine, with the points in these holes; one of the points is worked like a lathe, with screw, backwards and forwards to admit the center. By this means I find the heavy and light ends of each stave, then add on to the light end till they balance endwise. I don't care whether they are all of a weight or not after they are all balanced in this way. I fasten them all on cylinder heads as they are to be; I then lay the cylinder on the balancing bars, find the heavy side for standing balance, and whatever it takes to put it in standing balance, I divide it all along on the light side in three or four different parts, from end to end. Then the cylinder will be in running and standing balance. A drum or cylinder built and balanced in this way cannot help running steady.



The pivot millstone is the hardest machine to balance of any, and next in order of difficulty is the wide-cast band pulley, with one set of arms. See the mill-stone in Fig. 1. If the stone was swinging on the point of the spindle, as shown, and there was a heavy block put in at *a*, the stone would hang down at that point, while standing; but if you should run the stone up to its proper speed, the heavy block at *a* will draw that side up on a line with the cock-head. A millstone left in this way will never grind well, and the most of millers, to remedy this, will put in weight at B, to put the stone in standing balance, which is entirely wrong, it only puts them that much more out of running balance, and helps the heavy block to draw on a line with the cock-head and make the face wabble, the greatest of all faults, sure to produce bad grinding. The right way is to find the heavy side of the stone standing, as shown in the engraving. If it is heavy on one side it is always between the point of cock head and the face of the stone. If the stone is built right and the irons put in the center, I always find what weight it will take to put the stone in standing balance by laying iron at B; then I fasten that much on the stone, at *c*