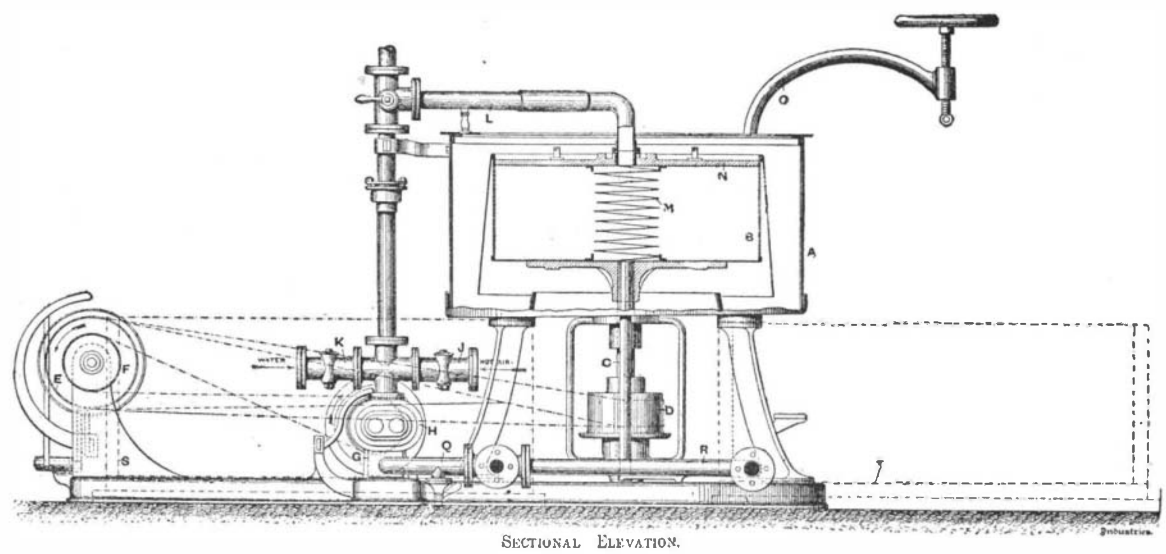
CENTRIFUGAL DYEING AND BLEACHING APPARATUS.

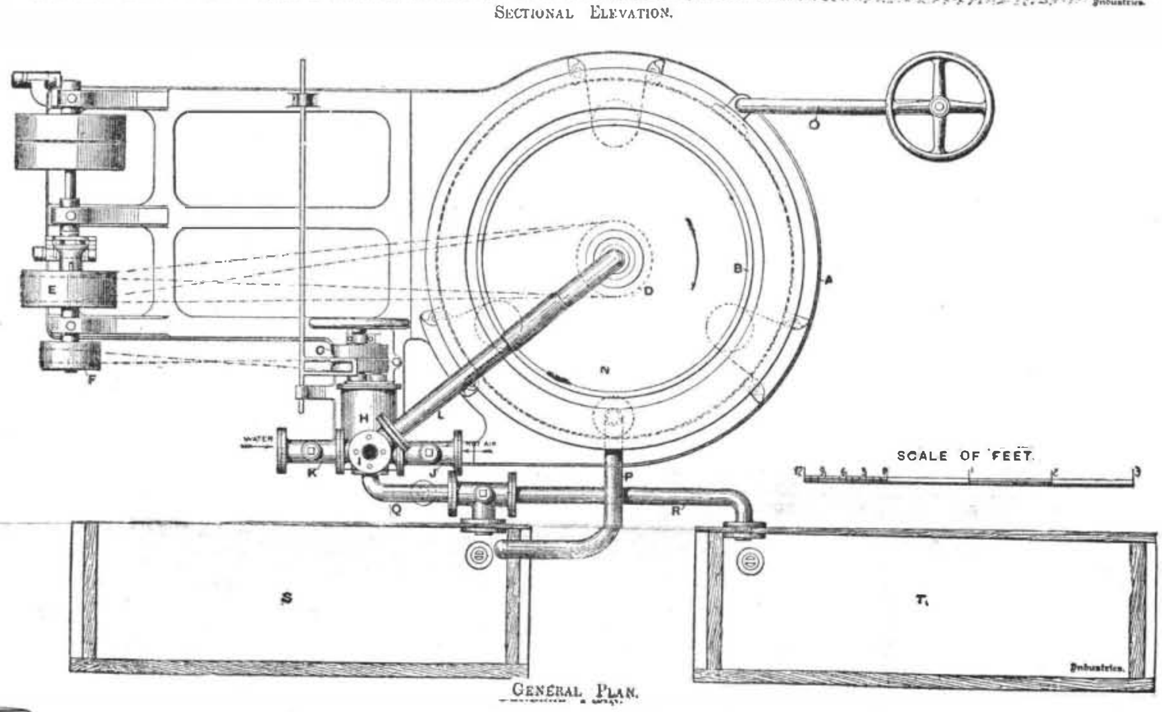
Dr. A. Waldbaur, of Stuttgart, Germany, has recently invented an apparatus in which the process of dyeing or bleaching is performed at one operation by introducing the material to be treated into a rotating basket, and forcing the operating liquid by centrifugal action from the center of the apparatus outward through the material. By this means the various processes of bleaching, dyeing, and washing may be conducted in a continuous manner, without repeatedly transferring the material from one apparatus to another. A considerable saving of time is thus effected, and there is much less liability of the material being damaged than with the ordinary method.

A general plant for carrying out this process is represented in the illustrations, which also show a sectional elevation and plan of the same arrangement. The casing, A, of the apparatus contains the rotating basket, B, which is mounted upon the vertical driving shaft, C, and is provided with a cover, N. In the middle of the rotating basket is arranged a spiral spring basket, M, serving to produce a hollow space, from which the operating liquid percolates through the material. This basket may be provided with contrivances for conducting the fluid toward its periphery. The supply pipe, L, for the liquids fits with its vertical end into a tubular boss in the cover, N, and it is provided with a connection for allowing it to be turned back or to sink with the cover.

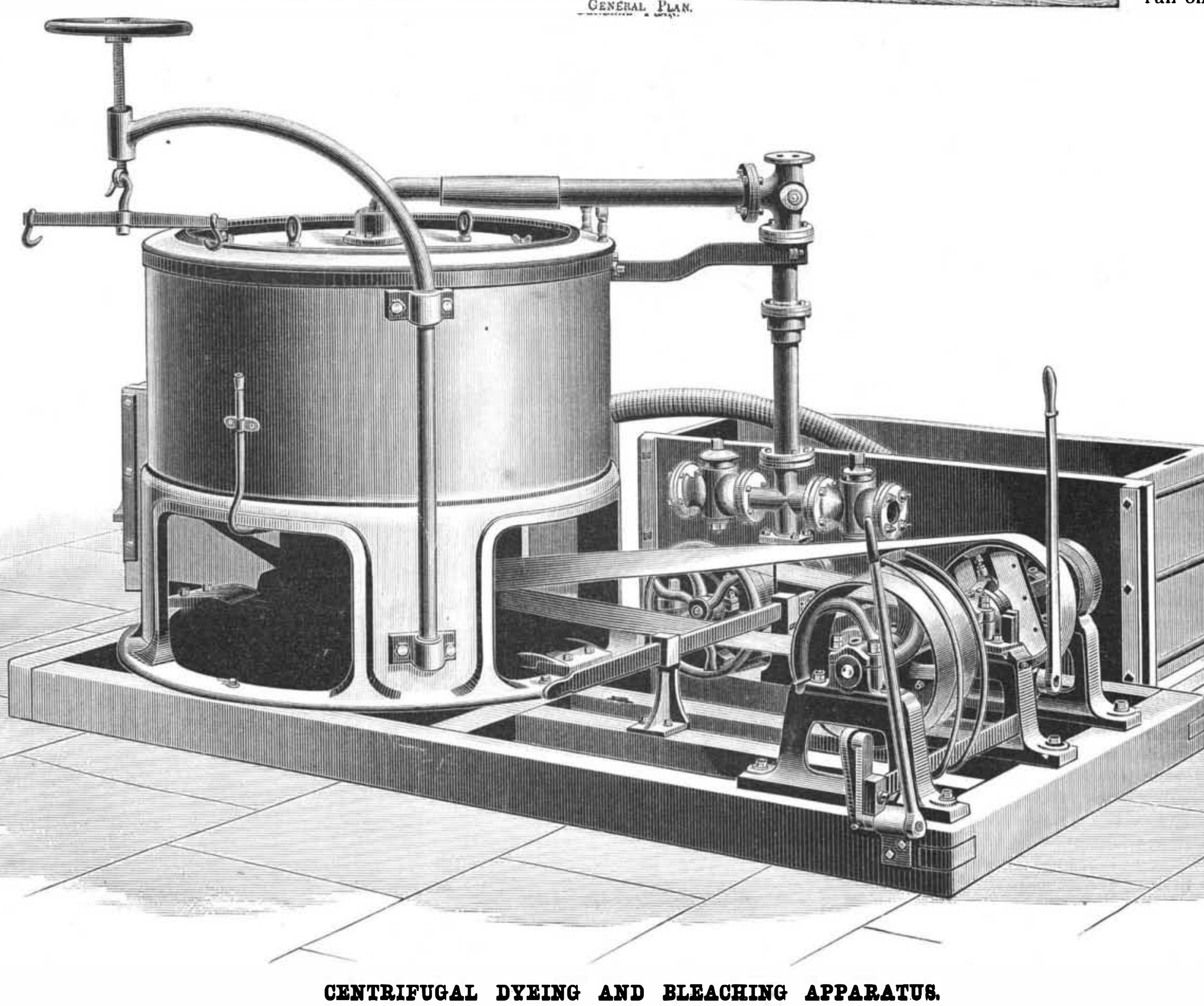
The shaft, C, carries a pulley, D, which is driven ranged on a suitable line of shafting. The pulley, F, is connected by a belt with the pulley, G, which drives a pump, H, used for effecting the circulation of the operating liquid. The tanks, S and T, are connected by pipes, R and Q, with the pump, H, and designed to hold the different liquids employed. Materials to the amount of from 100 pounds to 160 pounds, according to the size of the apparatus, are packed into the space between the basket, B, and the basket, M. The cover is then let down by a screw crane, O, and the pipe, L, is turned into position for supplying liquid. The basket is then set in motion, and the pump started to supply the desired liquid, the three-way cocks on the supply pipes being set accordingly. After passing through the apparatus the liquid is discharged through the flexible pipe, P, into either tank. The operation is continued for say twenty or thirty minutes, and the pump is then stopped, the basket continuing to rotate for about five minutes, until the remaining liquid has been completely thrown off. During this time the pump may be employed for raising the spent liquid into a reservoir for reconcentration. The material may then be similarly treated with other liquids, and finally hot air is admitted by the connection, J, for drying the material.—*Industries.*



SECTIONAL ELEVATION.



GENERAL PLAN.



CENTRIFUGAL DYEING AND BLEACHING APPARATUS.

Recovery of Soap from Water.

Alderman Taylor, chemist, of Rochdale, Eng., has lately completed an invention whereby the pollution of the river Roach by a local firm of manufacturers has been prevented, and at the same time a large saving effected in the working expenses. His experiments have been conducted on behalf of Henry Tucker & Co., silk manufacturers, who feared that an injunction would be obtained against them for polluting the river by the large quantity of soap water which came from their works. Mr. Taylor's process is as follows: The water containing the dissolved soap is run into a vault large enough to hold a day's "washings." Over this vault are two elevated tanks of the same size, and beneath them a retort is fixed. The soaped water is pumped from the vault into the elevated tanks, and chlorine, generated in the retort from hydrochloric acid and manganese, is forced into the liquid. This causes the refuse and fatty matter to gather in a cake at the bottom. The water in the tanks is then run off into the river, conwith the exception of a little common salt. The pollution of the river is thus averted. The cake of fatty matter and dirt is next turned to profitable account. It is placed in what are called the filter beds, and then pressed in a machine press until the fatty matter is extracted. The oil thus obtained is next made into brown soap, exactly similar to that which is used in the process of washing the raw silk. The soap is again used for washing purposes, and is found to answer quite as well as in its first application. Only 5 per cent of the original weight of soap is lost in the reclaiming process. The value of the invention is proved by the fact that the firm has been offered £20 per ton by wholesale dealers for the reclaimed soap.—*Chem. and Drug.*

THE WATERTOWN ARSENAL TESTING MACHINE.

(*Continued from first page.*)

head is filled with glycerine and alcohol. When a piece of metal is tried in tension, it is clamped to the ram and also to the weighing platform. Then the hydraulic pressure is turned into the pressure cylinder. The amount brought to bear at any moment is ascertained, not, as would normally be done, by noting the gauge connected to the pump cylinder, but by noting the pressure produced within the four cylinders between the weighing platforms. The motion of the pistons and cylinders is infinitesimal. They have no packing. The pistons are held concentric, and without touching the cylinders, by brass diaphragms. Being without sensible motion and without friction, the pressure within them indicates the exact stress to which the trial sample is subjected. When a piece is to be subjected to compression, the clamping is dispensed with, and the opposite end of the weighing mechanism is acted on, so that compression is still produced within its cylinders. In other words, a traveling ram is arranged for the adjustments of length, and this ram, when in action, is secured in place and made to work against a highly sensitive hydraulic dynamometer.

Pressure is produced by a steam pump working into an accumulator. The pressure in the weighing cylinders is communicated by reducing levers and hydraulic cylinders to an elaborate weighing mechanism. For certain classes of light strains of extended longitudinal range, as in Manila rope testing, the screws alone are used to produce the stress.

By it a stress of 1,068,000 lb. in compression or 801,100 in tension can be produced. In normal working pieces 30 feet long can be received; but by a special arrangement, pieces 31 feet long for compression, and 37 feet 3 inches for tension, can be introduced.

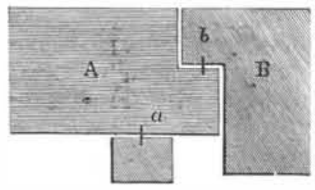
The ram or straining cylinder has an internal diameter of twenty inches and a stroke of twenty-four inches. The piston and rod are on one piece, turned up from a single forging. The cylinder is lined with rolled copper, to prevent the sperm oil used as filling from penetrating into the pores of the iron. Cup leather packings are used to prevent leakage.

The screws that hold the ram in place, and which receive the full strain and transfer it to the weighing platforms, are eight and one-half inches in diameter, measured to the outside of the thread. They are threaded with a truncated V thread, two to the inch, and are forty-eight feet long. They are horizontal, and parallel with the rails, are 50 inches apart and 47 inches above the floor. Their diameter from end to end calibrates within one thousandth of an inch. Intermediate supports are provided, which can be swung up, so as to secure them from vibration or bending.

On each side of the ram are the nuts which work on the screws and move it. These nuts are rotated by a "live head" bolted down to the foundation at the further end between the tracks. This resembles in general appearance a lathe head, and is worked by a straight or crossed belt, according to the direction of motion that may be required. It turns a long shaft, which can be seen running between the tracks close to the ground, and which is as long as the track. A groove is made in the shaft extending along its entire length. By a feathered wheel and connecting gear carried by the ram, the nuts are rotated so as to move it back and forth. The nuts are allowed a play on the screws of $\frac{8}{100}$ inch. They are made of bronze.

The ram is carried by a truck moving upon a track. The latter is made of cast iron, laid in sulphur, and bolted to the foundation.

At the end nearest the front of the picture are shown the scale platforms and abutments. In them the screws are held. A space is seen between the two platforms. Within this space are placed the four weighing cylinders. When the stress comes upon the sample, the screws are drawn or thrust, as the case may be, and the weighing platforms are pressed together. This tends to compress the weighing cylinders with their pistons. The free space between the cylinders and pistons is filled with a diaphragm of brass $\frac{6}{1000}$ inch thick. This keeps the piston centered and acts as packing. The extreme range of motion is $\frac{16}{1000}$ inch. The interior of the cylinders connects by a copper pipe $\frac{1}{10}$ inch internal and $\frac{18}{100}$ inch external diameter, with another smaller cylinder and piston, placed with its axis vertical within the scale box, and to one side of the machine. This pipe and smaller cylinder are also completely filled with the glycerine and alcohol mixture. The piston of the small cylinder actuates a lever, which, in its turn, connects with the scale beam on which the weighing is executed. This portion embodies in its general arrangement the principles that obtain in platform scales, with one distinguishing point of difference from ordinary practice. No knife edges are used. In their place thin strips of steel, called fulcrum plates, are employed. These vary in thickness from $\frac{8}{100}$ down to $\frac{5}{1000}$ inch. They are either set into or clamped fast to both members of the system.



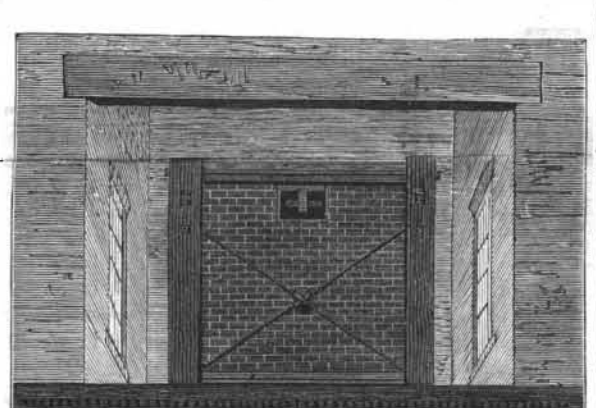
FULCRUM PLATES.

To illustrate this method, the first lever connections are shown in the cut. A represents the end of the lever. At *a* is a fulcrum plate which transmits the thrust from the smaller cylinder and piston just spoken of. Connected to the stationary abutment, B, a second fulcrum plate, at *b*, is provided. In ordinary practice knife edges would be used in both these places. These particular plates are $\frac{3}{100}$ inch thick, and are bedded $\frac{8}{100}$ inch in the metal.

As the large lever is pressed upward it communicates the pressure, reduced proportionately to the ratio of the length of its arms, to the scale beam by a vertical rod.

It will be seen that the infinitesimal movements of the pistons and original weighing cylinders are increased progressively. Above the scale beam is placed a long index beam which still further multiplies the extent of motion, so that a range 420,000 times greater than that of the pistons between the weighing platforms is obtained.

From the scale beam four rods depend, also suspended by fulcrum plates. By handles worked from outside the scale beam case, weights are added to or removed from these rods. On one rod from 700,000 to 100,000 pounds are weighed in 100,000 pounds at a time; on the next, from 100,000 to 10,000 pounds are weighed by 10,000 pounds increments; on the next, from 10,000 to 1,000 pounds are weighed by 1,000 pounds increments; and on the fourth rod, from 1,000 to 100 pounds are weighed by 100 pounds increments. A rider is provided that slides along the scale beam and weighs by single pounds up to 100 pounds. This gives a maximum of less than the full capacity. To obtain this a large counterpoise is removed, which adds at once 200,000 pounds to the effectual weights.



THE ACCUMULATOR OF THE TESTING MACHINE.

The extreme range of play of the index need not exceed a fraction of an inch, so that the movement of the weighing cylinders and pistons is quite inappreciable. As Mr. Holley, in his graphic paper, puts it, a motion of $\frac{1}{100}$ of an inch at the end of the index under the influence of a strain of one pound would indicate a motion of $\frac{1}{42000000}$ inch of the weighing pistons. The flexure of the fulcrum plates is also very slight. The accuracy of the machine hinges on these points, as by this absence of extended motion the resistance due to rigidity of fulcrum plates and diaphragms is done away with practically. There is no friction, properly speaking, in the system.

The scale beams are finished in the best manner, and all their principal parts are nickel plated or gilded. They are inclosed in a glass case.

The original power is derived from a steam pump. The steam cylinder is of the Knowles pattern, but has the piston rod extended through the back cylinder head. One end of the rod works a pump of 1½ inches diameter, the other a pump of ⅜ inch diameter. Cocks are so arranged that either the small pump alone may be used as the source of power for high pressure or both together may be employed, giving a lower pressure equal to that due to the larger one. Both pumps are of brass, and are double-acting.

The pumps force sperm oil into the working cylinder, an accumulator being used to secure steady action. This structure is of the usual type. It has two concentric rams, one of 10 in., the other of 5⅛ in. diameter. Either can be made the efficient one. It carries a central square wooden beam, to which the weights, composed of brick and mortar masonry, are keyed. These weights are in three parts, and can be used singly or combined. By utilizing the combinations of rams and weights, a pressure varying from 300 to 3,400 pounds per square inch can be secured, covering a range of total pressure of 119,400 to 1,068,000 pounds on the large or compressing face of the piston of the straining cylinder, and of 89,500 to 801,100 pounds on the small or tension face. The small face is the one reduced in effective area by the piston rod. The accumulator is provided with a safety valve to prevent any possibility of the rams being driven out of the cylinder of the accumulator.

The clamps for holding samples that are to be strained in tension are hydraulic. Their jaws are forced together by the pressure of the accumulator. Gauges are provided for showing the pressure they exert.

Owing to its great size and power, this machine can be used for large samples. Examples of its utility in this direction may be cited. A link of iron, 5 inches in diameter, was broken at a total pressure of 722,800 pounds, giving away with a loud report. Its diameter at the breaking surface was slightly diminished. This reduced to a breaking strain of 36,000 pounds to the square inch. Yet the piece was supposed to have a tensile strength of 60,000 pounds. Another piece of iron, turned down to 3⅝ inches diameter, broke at a tension of 37,000 pounds to the square inch. The same metal in a 1 inch bar had stood a 50,000 pound strain. At the beginning of the present year 14,000 specimens, principally for government work, had been tested. These ran from the finest wire up to full sized members of engineering structures. From 1 to 800,000 pound stresses were applied. Some specimens were less than 1 inch in length. Upward of 320,000 pounds of material had been tested to destruction. Brick piers and wooden posts have been among the objects tested.

Elaborate sets of calipers and all necessary accessories are supplied for testing elongation under stress, and other factors and data.

The absence of friction in the weighing apparatus is shown strikingly in the case of small strains. A horse hair producing a strain of one pound will affect the index. Yet to do this the weighing platforms and other mechanism theoretically have to move. The weight of metal put in motion thus by so slight an agent is 24,000 pounds. A paper by the late Alexander H. Holley, giving a general description of the machine, is printed in the Transactions of the American Institute of Mining Engineers for 1879; and a technical description, with outline drawings in projection, is given in the Annual Report of the Chief of Ordnance, U. S. A., for 1883.

Proposed Utilization of the Rhine Falls.

Some twenty miles below the point where it issues from the Lake of Constance the Rhine, with a width of 350 feet and an average depth of about 21 feet, plunges over a barrier of rocks, varying in height from 45 feet on the right bank to about 60 feet on the left. Including the rapids, the total fall within a distance of a little over a third of a mile is estimated at 150 feet. The volume of water passing over the falls per second varies from a minimum of 118 cubic meters in February to a maximum of 502 cubic meters in July, when, in consequence of the melting of the snows in the mountains and the rise in all the tributary streams and brooks, the Rhine reaches its highest point.

In this practical age of inventions and progress very few will be surprised to hear that an application has been made for a concession to utilize these magnificent falls, so familiar to travelers, for the manufacture of aluminum. The applicants are J. G. Nethers, Son & Co., Schaffhausen, iron workers, who ask for the privilege of constructing a dam from Laufen Mill to the railroad bridges, a length sufficient to furnish them with a volume of 75 cubic meters per second. If this is