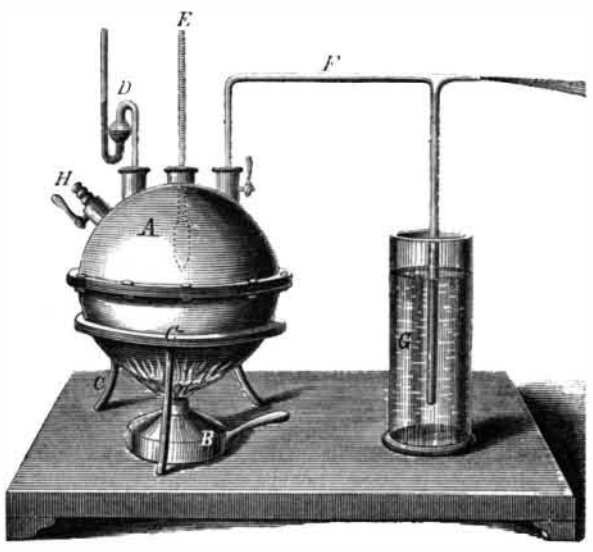
APPARATUS FOR EXHIBITING THE PROPERTIES OF VAPORS.

M. J. Benevides, a physician of repute at Lisbon, Portugal, has recently aided the teaching of physical science by inventing an apparatus for the purpose of demonstrating the chief characteristics of steam. This new arrangement consists of a hollow copper sphere, A, with nozzles in four places. In one nozzle is screwed a mercury manometer, D, graduated to ten atmospheres. To another nozzle is screwed the thermometer, E, with centigrade scale to 200° In a third, there is a glass Giffard's injector, F. The fourth nozzle can be put in connection, by means of a tube of lead or india rubber, with the air, or with a force or air pump. The third and fourth nozzles are furnished with cocks. The sphere is placed on an iron trivet, C, and heated by means of a spirit lamp or a Bunsen's gas burner, B.



The following are the principal demonstrations which can be made with M. Benevides' apparatus:

1, Of the laws of ebullition. Absorption of latent heat. If water be put into the sphere, the cock of the fourth nozzle opened, and heat applied, the water boils, vapor is disengaged, and spreads in the atmosphere. The thermometer is observed to indicate 100° Cent., and the manometer marks vapor of the tension of one atmosphere.

2. Influence of pressure on the temperature of ebullition. If the fourth nozzle be connected with a force pump, and air be forced into the sphere, it will be observed that the boiling only takes place when the temperature or the tension of the steam equals the pressure exercised on the liquid; if, on the contrary, a vacuum be created in the sphere by means of an air pump, it will be seen that the water boils at a temperature, lower to the same degree as the air is rarefied.

3. Condensation of vapor. Development of latent heat. If the fourth nozzle be connected, by means of a lead pipe, with a glass full of cold water, and heat be applied, and the cock opened, the vapor, coming in contact with the cold water, is condensed, and its force is transformed into latent heat, which warms the water in the glass, of which the temperature will soon rise to 100° Cent.

4. Variation of the tension of vapors with the heat. On closing the cock of the fourth nozzle, after having caused the water in the sphere to boil, it will be observed that the thermometer and manometer indicate higher degrees, showing pressure corresponding with the temperature of the vapor. In an ordinary apparatus of this pattern, the pressure can be raised to five atmospheres; for higher pressures, a stronger copper sphere is necessary.

5. Action of vapor on the Giffard injector. The vapor being at a high tension, the cock of the third nozzle is opened. The vapor can be observed to pass through the injector, drawing water up the tube, and throwing it out by the opening.

6. Cold produced by the condensation of vapor of high tension. If the water be heated till the steam has a tension of five atmospheres, and the cock of the fourth nozzle opened, a jet of vapor is thrown into the air. On putting the hand into the vapor, at a distance from the nozzle, a sensation of cool freshness is felt.

7. Employment of vapor as a motor. The fourth nozzle can be connected with a model steam engine, and, on raising the tension to three or four atmospheres, if the cock be opened, the vapor will be observed to give motion to the engine; the heat is transformed into specific work.

So far as the action of the Giffard injector is claimed to be shown by the apparatus, we feel bound to say that the device of M. Benevides does not appear to us to explain the, to most minds, paradoxical action of that instrument. There is a wide difference between allowing the steam jet to escape into the open air, and first condensing it and then throwing it back into the boiler from which it issues, with an additional supply of water. Had the glass tube, which represents the injector on the apparatus, as shown, been brought around to and inserted into the copper sphere, the analogy would have been more perfect; but it then would have required some essential modifications before it would satisfactorily have shown the action of the injector of Giffard.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections during the month of August, 1871.

There were 716 visits of inspection made during the month, by which 1,418 boilers were examined—1,285 externally, and 358 internally,—while 127 were tested by hydraulic pressure. The number of defects in all discovered was 684, of which 121 were regarded as dangerous. These defects in detail were as follows:

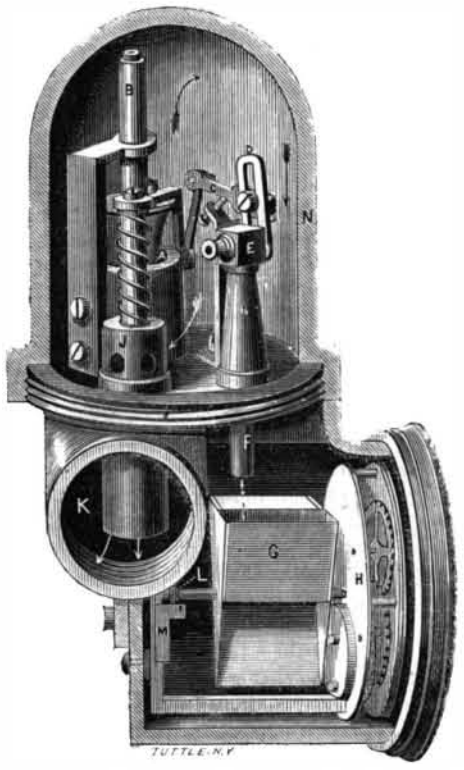
Furnaces out of shape, 47—2 dangerous; fractures in all, 42—17 dangerous; burned plates, 31—4 dangerous; blistered plates, 90—9 dangerous; cases of sediment and deposit, 132—13 dangerous; incrustation, 79—3 dangerous; external corrosion, 62—11 dangerous; internal corrosion, 49—13 dangerous; internal grooving, 35—6 dangerous; water gages out of order, 45—10 dangerous; blow out apparatus out of order, 25—1 dangerous; safety valves overloaded and out of order, 32—7 dangerous; pressure gages out of order, 88—13 dangerous, varying from — 22 to + 15; boilers without gages, 2—2 dangerous; cases of deficiency of water, 6—2 dangerous; broken braces and stays, 15—3 dangerous; boilers condemned, 13—2 dangerous.

We feel compelled to call attention again to the condition of steam gages. It will be seen in the above record, that those out of order varied from — 22 to +15. These are large variations, and when we consider how implicitly many engineers rely upon the steam gages, it is all important that they be known to be correct. We have known steam gages, that have been in use for years, to be relied on with as much confidence as when first put to use; and we have no doubt that many boilers in the country today are being used at excessive pressures simply because the steam gages are out of order, and indicate incorrectly. Steam gages are important attachments, and should receive all necessary attention. No engine or machine is expected to run for years without care and examination; and a boiler attachment so important as a steam gage should be examined frequently, that the engineer be not misled, relative to the pressure of steam carried, by incorrect indications of the steam gage. There were 10 serious explosions during the month, by which 27 persons were killed and 20 injured.

THE WATERBURY WATER METER.

The Waterbury Water Meter, manufactured by the Plume and Atwood Manufacturing Company, of Waterbury, Conn., is shown in the accompanying engraving. It received a short notice in our notes on the Fair of the American Institute in a recent issue, and our readers will now doubtless take interest in examining the details of its construction, as shown in an illustration. It claims superiority, over anything of the kind hitherto produced, on the grounds of durability, simplicity, and accuracy. It is subject to no wear of parts while measuring water, except such as occurs in the registering portion of the device.

A represents a circular orifice surrounding a cone valve, B, which is shown raised, as when measuring water, allowing enough to pass to keep the meter full and supply the outlet, J. It is evident that this valve will open more or less according to the demand made upon the water service, closing entirely when no water is drawn, and opening to its full capacity when the full flow of the outlet is maintained.



The cone or puppet valve, B, is connected by a series of levers, C and D, to a spindle valve in the post, E, which allows a proportionate amount of water to pass through the pipe, F. The meter is thus one of the proportional or differential class.

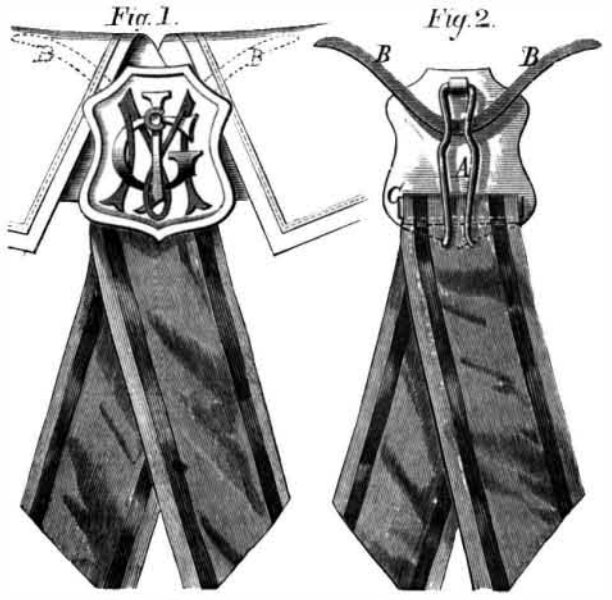
The water flowing through the pipe, F, is measured by a bucket wheel, G, the measurement being indicated, for the quantity passing through the valve, B, and outlet, J, by the register, H, the latter being a train of wheelwork with a dial, similar to that used on gas meters. The amount of this drip which is thus allowed to waste in operating the register, is about one ounce to every sixty-two and a half pounds delivered, that is, to one cubic foot.

Each bucket, when it has received its prescribed weight of water, gives place to its successor, and in so doing transmits motion to the register train. The intermittent motion of the bucket wheel is accomplished by a triangular piece of metal on its shaft, one of the sides of which rests upon the glass shelf, M.

The direction of flow through the cylinder or body of the meter, N, is indicated in the engraving by arrows. The patentee of this meter is Mr. J. P. Smith, of Buffalo, N. Y. The patent bears date July 12, 1870. For further information, address Plume & Atwood Manufacturing Company Waterbury, Conn.

M'GEE'S COLLAR PIN.

Our engraving illustrates a very neat, tasty, and convenient device for adjusting neckties to gentlemen's collars, the improvement being in the peculiar construction of a collar pin which attaches the necktie firmly to the collar stud or button, and which is adapted to any style of collar, the tabs or ribbon which constitute the tie being also of any fashion or pattern to suit the taste of the wearer.



Obverse sides of the pin are shown, Fig. 1 representing the appearance of the pin as attached to the button, the style of the face plate of the pin, however, not being limited to the design shown, any form consistent with good taste being admissible.

Fig. 2 shows the peculiarities of the construction. A is a bent spring, which, when the pin is adjusted, is slipped over the shank of the stud or button, and embraces it firmly. To the spring, A, is attached, by soldering or otherwise, the spring plate, B, formed, as shown, of flat or round wire, which, when the pin is worn, passes under the fold of the collar, as shown by the dotted outline in Fig. 2. This spring prevents upward and lateral movement.

The tabs or rubber are attached to a loop, C, Fig. 2, in the manner there indicated, or in any other way appropriate to the fashion of the tie. The pin, with its attached tie, are very easily adjusted, and form together a very tasty design.

Patented through the Scientific American Patent Agency, July 18, 1871, by J. McGee, whom address for further information at Lancaster, N. H.

A Novel Railroad.

A novel tramway or railroad has been lately built in Turkey, by an English engineer, the propelling power of which is not steam but animal, horses or mules being employed. A single rail is laid on sleepers, and the carriage has wheels in the center on the same longitudinal line. Through the car runs a balancing pole, the two ends of which, projecting three feet or more, are secured to saddles on the backs of mules. The animals will thus be one at each side of the load instead of in front, as ordinarily. It would be impossible for the cart to turn over, because in order to do so, it would have to force one mule to the ground and lift the other in the air; and, moreover as the floor would only be six inches above the rail, an overtip would be of no account. All the weight in the cart, if evenly distributed, would bear upon the rail, and the animals, having no load on their backs, would be able to exert considerable traction power. The inventor suggests its employment not only for military purposes but also for tramways in large cities; and says that, where space is very valuable, a horse or mule on only one side of the cart would be sufficient. In towns, on bridges, and other important places, the rail might, for a short distance, be dispensed with; and the passenger vehicles should be fitted with a small friction wheel on either side, so that if a horse should fall down, the balance of the carriage would remain undisturbed.—*National Car Builder.*

Change which Flour undergoes in Barrels.

When flour is kept for some time in barrels, it assumes a certain smell, known as the barrel odor. In order to ascertain whether the bread making properties of the meal were deleteriously affected by this modification, the *Journal of Applied Chemistry* states that Professor Poleck has subjected several specimens to a critical examination, and he finds that the flour undergoes a decided change. The pure normal flour contained 11·06 per cent gluten and 1·44 per cent soluble albumen, but, after keeping, the following results were obtained:

	No. 1.	No. 2.	No. 3.	No. 4.
Gluten.....	8·37	7·40	7·23	6·54
Albumen.....	2·14	3·90	4·44	6·46

From this table it is manifest that the relations of the constituents were materially affected by storing the flour in barrels. The author found that greater deterioration took place in the interior of the package where the air could not get access to the flour than on the surface and that meal kept in bags was less likely to undergo change.