tended to furnish for newspaper offices, and business purposes in general, an addressing machine of exceedingly simple construction.

SATURATOR AND REGULATOR OF MEKARSKI'S COMPRESSED AIR MOTOR.

Many attempts have been made at locomotion by compressed air; but serious difficulties are encountered. Air absorbs heat or "produces cold," just in proportion as it produces work by its being used in a compressed state through a motor. This absorption of heat has many inconveniences. From a dynamic point of view, there is a considerable difference between the foot-pounds of work which the same amount of compressed air can furnish, according as the work is got out at a constant temperature or without addition of heat. From a physical point of view, the cooling causes the freezing of the water contained in the air, and of the oils and greases employed in the machine, and forms of the two a sort of mastic which prevents proper operation of the working parts.

All the means hitherto employed to combat these inconveniences have been so inefficacious that inventors had almost given up the idea, and, in consequence, the duty obtainable from compressed air machines remained very low. In the Mékarski system, which is illustrated in Figs. 1 and 2, these inconveniences are avoided by admitting to the driving cylinders air saturated with steam at a high temperature. This mixture is obtained by causing the air to pass, in the form of fine bubbles, through a column of hot water, inclosed in a receptacle at a temperature of about 150° to 160° C. at the commencement, and of which the volume is so calculated with respect to that of the air that the proportions of the mixture rest constant during the period of work. The proportion of vapor varies between $\frac{1}{6}$ and $\frac{1}{8}$. These conditions are easily realized; as, during the period of expenditure, the pressure of the air in the reservoir diminishes, as does also the temperature of the water; and, in consequence, the tension of its vapor diminishes in the saturating apparatus.

Fig. 1 shows part of this apparatus as applied to the platform of a locomotive driven by compressed air. It is without firebox, and is filled with hot water while the air reservoirs are being charged. After its force is spent the temperature is brought up again by an injection of steam. Coming from this reservoir, the gaseous mixture passes through the regulator, shown in Fig. 2. There is an orifice controlled by a conical valve, so arranged that it closes by the pressure of air in the reheater, and opens only when there is an opposite pressure put against it. This pressure can be produced by a flywheel connected with the piston of a small hydraulic press with air spring. The pressure is transmitted to the conical valve by a rubber diaphragm separating the two parts of the apparatus. The amount of flow being once determined, equilibrium will establish itself, when the pressures are the same above and below the diaphragm. Now the pressure above is that of the air spring of the hydraulic press;

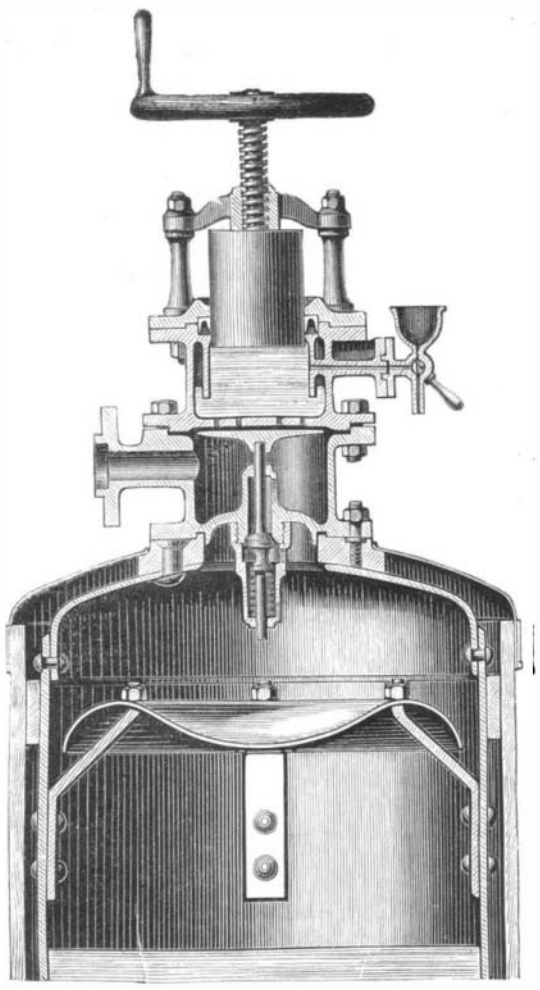
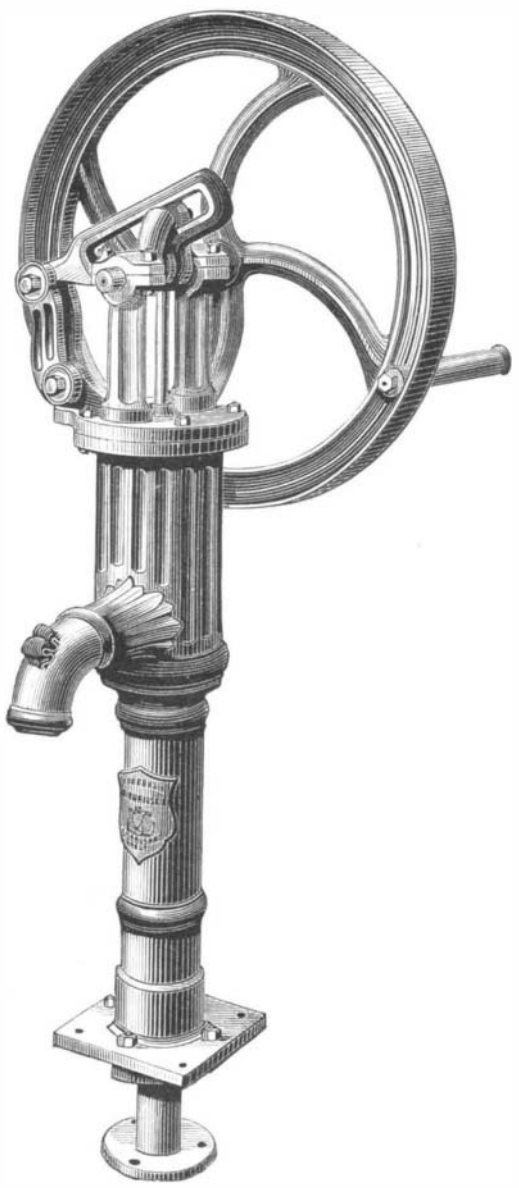


Fig. 1. SATURATOR, MEKARSKI COMPRESSED AIR LOCOMOTIVE.

and that below is that of the supply of the gaseous mixture. This last will thus remain automatically constant as long as the air spring is kept at the same tension; and is thus varied at the will of the driver, who can compress the air spring more or less by means of the flywheel.

ROTARY LIFT PUMP.

Messrs. Henry Bamford & Sons, Uttoxeter, England, have introduced to public notice a new and improved rotary lift and force pump, for which they claim several features of importance. The engraving shows the general outline of the pump, which is strongly made and compact in all its parts.



ROTARY LIFT PUMP.

The makers state that it has a very powerful and smooth action, much more so than in any of the ordinary rotary pumps. Its specialty consists in a slow upward stroke and quick downward movement, thus equalizing the work. It has double bearings, and is adapted both for hand and steam power, to be used either for shallow or deep wells, or as a force pump. The position of the pump head is reversible, so that it may be worked on any side by hand or steam power to a depth of 25 feet. The head is arranged to form an air chamber. It is fitted with heavy flywheel, wrought iron crank and turned rod, brass stuffing box, draw-off tap, and retaining valve, screwed for iron tube. The barrels vary in diameter from 3 to 4 inches, and can be had with or without copper linings.

The Electric Light in London.

The first experiment of public lighting in London by means of electricity, commenced a short time ago at Billingsgate Market, has now received a very important extension on the Thames Embankment and the Holborn Viaduct. Between Westminster and Waterloo Bridges twenty Jablochkoff candles illuminate the Embankment and the river with a novel brilliancy, and turn the gas lamps—which perforce are kept burning—very yellow with their pure white brilliancy. On the west side of Charing Cross Railway Bridge, upon the Embankment, and about 50 yards from the river wall, a wooden shed has been erected containing the motive power and the machine. The former is supplied with one of Messrs. Ransomes, Sims & Head's semi-portable engines of 20 horse power nominal. This engine, which is an excellent example of workmanship, has two 10 inch cylinders of 13 inches stroke, and has 360 feet of heating surface. This engine is provided with a very sensitive automatic governor, and having a large margin of power beyond what is required for driving the machines now installed, is extremely well adapted for its purpose. It will, in fact, indicate from 60 to 70 horse power. At present it is worked with a steam pressure of 62 lbs., and at a speed of 140 revolutions. From the pulley on the engine a belt transmits power to an intermediate shaft mounted on a timber framing, and carrying, besides the pulley for the engine belt, two others, from one of which the Gramme continuous current machine is driven, and from the other the Gramme dividing machine. The speed at which the first machine is driven is 650 revolutions, while the dividing machine has a velocity of 700 revolutions. The current from this machine is divided into four circuits of five lights each, and the length of circuit is the greatest yet successfully reached, the furthest light being about 700 yards from the source of power, and the total distance between the extreme lights is 1,170 yards. The lamps are distributed so that there are ten between Westminster and Charing Cross Bridges, one under this bridge, and nine from this point to Waterloo. The lamps in the latter series are placed somewhat more closely together than those on the western side of Charing Cross Bridge.

Circuit No. 1 supplies the four lamps which extend from Waterloo Bridge to the Cleopatra Needle, and one on the west side of it. Circuit No. 2 provides for the remaining three lamps, east of Charing Cross Bridge, one under that bridge, and one on the west side of it. The other ten are connected with circuits 3 and 4. The wires from the machine are led underneath the road through a drain pipe into the Embankment subway. This pipe is 4 inches in diameter, and contains all the eight wires forming the four circuits. On reaching the subway the wires are taken right and left, and are attached to boards fastened to the side of the subway. Where each lamp occurs the wires are led up through the tubing let into the granite pedestal and so to the lamp. Each globe contains four candles, so as to secure a light for six hours. Circumstances rendered it necessary to place the commutator at the top of the lamp instead of near the base, a very awkward arrangement, since the attendant has now to mount a ladder to shunt the current, instead of doing so from the ground. The average distance apart of the light is 45 yards, but the spacing is irregular, the maximum distance being 120 yards between the lamp under Charing Cross Bridge and the adjacent one to it on the western side. The corresponding lamp on the eastern side is 115 yards away.

The Holborn Viaduct is illuminated by sixteen Jablochkoff candles, and are supplied from similar Gramme machines driven by a 20 horse power engine furnished by Messrs. Robey & Co. The machinery is placed in a wooden shed erected near the bridge. The wires are laid in pipes from the shed to the subway, and thence conducted to the lights. The commutators are here fixed near the ground level, a much more convenient arrangement.

The general effect produced by these lights both at the Viaduct and on the Embankment is, of course, extremely pleasing, and the contrast to the gas lamp very great. At the former place the conditions approximate to those on the Avenue de l'Opéra, in Paris, a wide street being illuminated by lamps on each side, while a good deal of reflected light is thrown from the adjacent houses. On the Embankment, however, the case is different. Here we have a single line of lamps with a great void of darkness on either side, on the one hand the river and on the other the width of the Embankment. Much of the available light is, therefore, lost, and all that radiated from the upper portion of the globes is distributed skywards, as is visible by the glow with which the air is filled for a considerable height above the ground, and more clearly by the bright illumination of the underside of the bridge. Probably when some alteration in this respect has been made, a considerable improvement will be obtained. Meantime the result can hardly be considered as highly satisfactory, more especially as an irregularity or pulsation in the light given, is too often noticeable. Possibly this defect may be overcome shortly, since at present the installation has scarcely passed out of the experimental stage. That

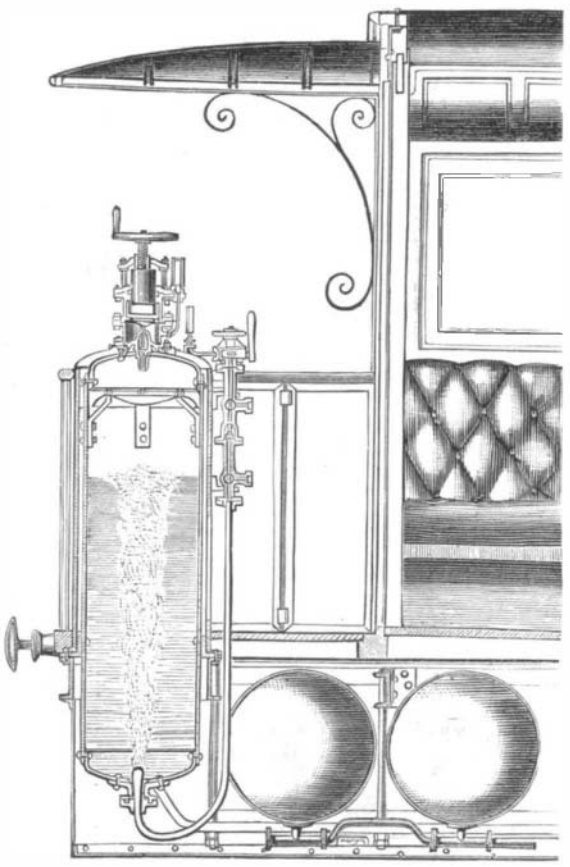


Fig. 2.—REGULATOR, MEKARSKI COMPRESSED AIR LOCOMOTIVE.

it must be overcome is certain before the light can be regarded as a success, and that this is possible appears evident from the good results obtained in many places.

When this has been satisfactorily adjusted, there will remain the important question of cost, and this question, which

has never yet been clearly answered, will doubtless receive the careful attention of the Board of Works. That it will cost far more than the present illumination of the Thames Embankment is clear, since at present the electric light there is actually supplementary to the gas lamps, still kept burning, and necessarily so. When the cost has been ascertained, two points will present themselves for consideration: first, whether the luxury of an increased light is worth paying for, and second, whether for the same extra expense an equal and better diffused light cannot be obtained by gas. Meanwhile we are glad to see that in many directions, both in the metropolis and the provinces, a wide experience will be gained in the course of the next few months with the electric light, especially with the Jablochkoff system, which for the present appears to be the most suitable for general lighting purposes that has yet been introduced.

We should not omit to mention that the installations both on the Viaduct and the Embankment have been thoroughly carried out by Messrs. Wells & Co., of Shoreditch, under the superintendence of M. J. A. Berley, the representative of the Société Générale d'Electricité, at Paris.—*Engineering.*

AMATEUR MECHANICS.

CHUCKING.

In spite of all possible appliances to be used in a general way for chucking work in the lathe, a degree of inventive skill is often required to accomplish it quickly and securely.

The accompanying cuts are designed to aid the amateur in chucking, but after all is said, there is a world of knowledge that can be gained by experience only.

The arrangement of a metal disk in the lathe so that it can be turned on its face, and upon its edge, cannot well be accomplished by means of chucks; for this purpose recourse is frequently had to cement. A good cement for this purpose consists of Burgundy pitch, 2 pounds; resin, 2 pounds; yellow wax, 2 ounces; dried whiting, 2 pounds; melt together the pitch, resin, and wax, and stir in the whiting.

To chuck work with this cement, apply a small portion of it to a face plate devoted especially to this purpose; heat the plate so that the cement will cover the greater portion of its surface. The plate may be allowed to cool. Whenever it is desirable to chuck a metallic disk, it is heated and placed against the cement on the face plate, and allowed to remain until the cement begins to stiffen, when a tool having a right-angled notch is applied to the edge of the disk, as shown in the cut, the lathe being rotated until, by the compound action of the tool pressure and the rotary motion, the disk becomes perfectly true.

To chuck a spindle or any similar object a cement chuck like that shown in section in Fig. 2 is sometimes used. The larger portion is screwed on the lathe mandrel, and the inner end of the hole in the outer portion terminates conically. The hole is filled with cement, and the article to be chucked is warmed and introduced. It may sometimes be necessary to heat the chuck with an alcohol or gas flame. The lathe is rotated and the spindle is held lightly until it becomes true and the cement begins to harden.

To remove the work from a cement chuck, it must be warmed by means of a lamp or otherwise. Most of the cement adhering to the work may be wiped off after heating it; whatever remains may be removed with a little turpentine.

A common method of chucking work on the face plate is shown in Fig. 3; the wheel is temporarily retained in place by a pointed rod, A, which is forced against the wheel by the tail spindle. A little rapping one way or the other readily centers the wheel. A piece of crayon held in a crayon holder supported by the tool rest may be used to discover which side of the wheel is "out." After the wheel is trued, it is fastened by the short bars, B, whose outer ends rest upon any convenient blocking while they are drawn by the bolts, so as to clamp the wheel firmly to the face plate.

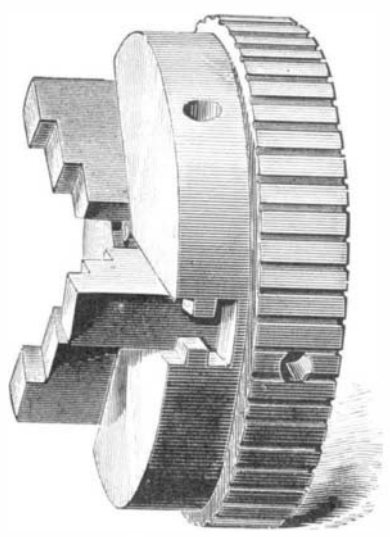


Fig. 14.—SCROLL CHUCK.

It is sometimes preferable to use the yoke shown in Fig. 4 instead of the bars shown in Fig. 3; it is placed diametrically across the wheel and secured by two bolts.

Fig. 5 represents a chuck, consisting of a wooden disk, *c*, bored to receive the wooden hoop, *d*, which may be forced inward by the common wood screws, *e*, which bear upon it. This chuck is useful where a considerable number of similar pieces are to be turned or bored.

Fig. 6 represents a simple and well known chuck. It is simply a block of wood secured to a face plate by a screw center and turned out to fit the work.

Fig. 7 represents an easily made chuck, which is useful for holding plugs of wood to be turned or bored. It consists of a piece of hard wood fitted to the mandrel, turned, bored, and split longitudinally, as shown in the engraving. Its outer end is tapered, and to it is fitted a metallic ring that serves to contract the chuck when it is forced on.

Fig. 8 represents a tapered and split mandrel, which may be either of metal or wood according to the purpose to which it is to be applied. The part F is bored conically at the smaller end before splitting, and to this hole is fitted the conical plug, G, which being forced in expands the mandrel.

In Fig. 9 the mandrel, C, has permanently attached to it the cone, D, and upon it is placed the movable cone, E, which is forced against the work held between the two cones by a nut which turns on the threaded end of the mandrel.

In Fig. 10 the manner of chucking work on the angle plate, H, is shown so clearly as to require no explanation. It may be well, however, to state that when the work is rotated rapidly a counterbalance should be attached to the face plate on the side diametrically opposite the angle plate.

Fig. 11 shows a jaw for attachment to the face plate, which consists of a right angled piece, I, a jaw, J, which has two guide pins, entering holes in the piece, I, and the screw, K, which passes through a tapped hole in the piece, I, and bears against the jaw, J. The piece, I, has a dowel, *a*, that keeps it from turning, and a screw, *b*, by which it is secured to the face plate.

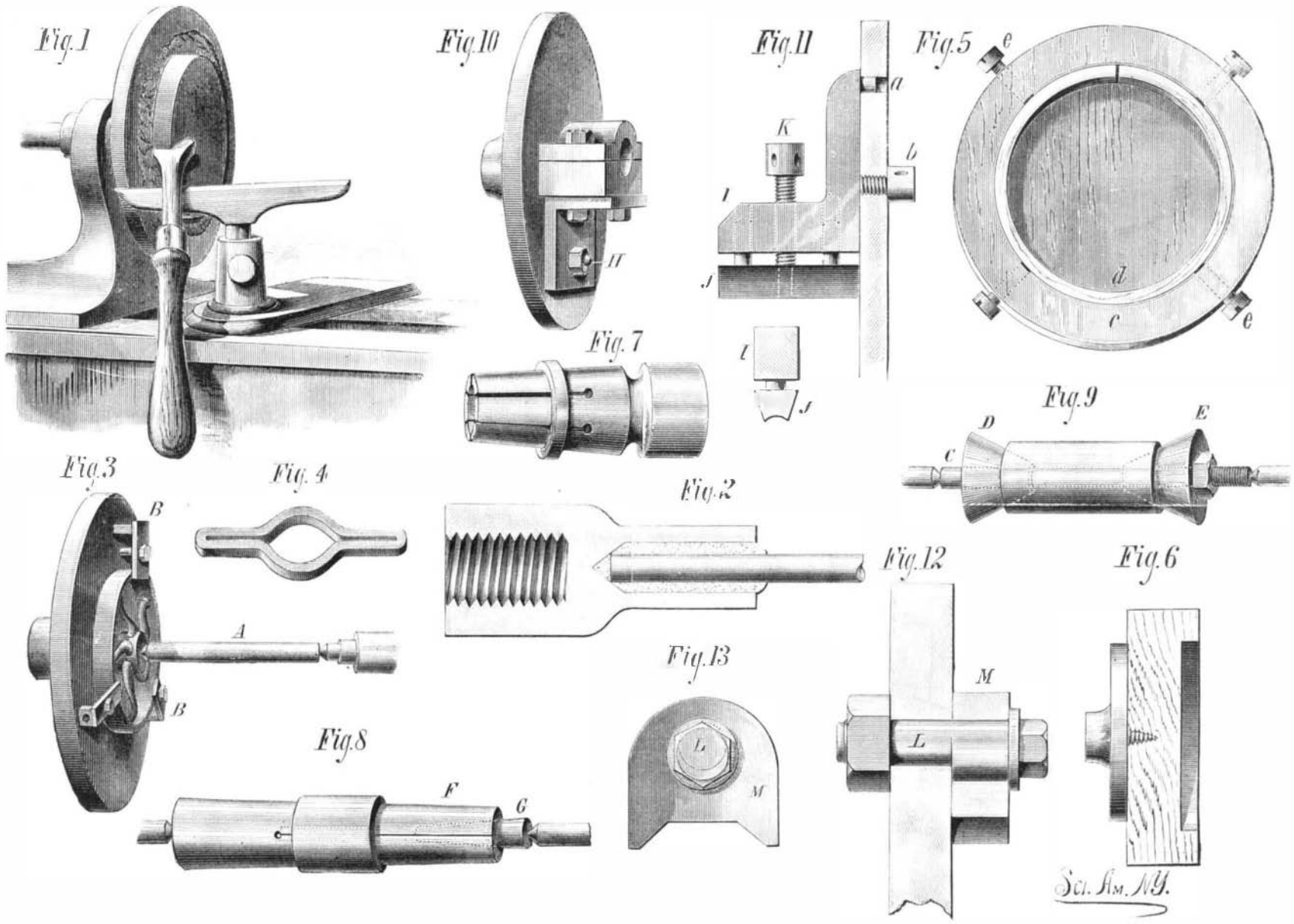
In Figs. 12 and 13 the pin, L, is fitted to the face plate, and has formed on its projecting end an eccentric which fits the jaw, M. It has also a hexagonal head for receiving the wrench by which it is turned. Three pins, L, are fitted to the face plate, which is quite thick. Two of the pins need not be turned after being adjusted for a certain kind of work; the third is loosened and turned when work is put in and taken out of the lathe. After the work is clamped tightly by turning the eccentric the nut on the back of the face plate is tightened.

In Fig. 14 is shown a type of the most convenient and most universally useful chuck in existence. Its construction and use are so well known as to need no description.

M.

Kerosene Dangers.

A correspondent mentions a source of danger in the use of kerosene lamps which seems to have been generally overlooked, namely the habit of allowing lamps to stand near hot stoves, on mantelpieces, and in other places where they become heated sufficiently to convert the oil into gas. Not unfrequently persons engaged in cooking or other work about the stove will stand the lamp on an adjacent mantelpiece, or even on the top of a raised oven; or when ironing will set the lamp near the stand on which the heated iron rests. It is needless to enlarge upon the risky character of such practices.



CHUCKS AND METHODS OF CHUCKING.