No. 830,201. PATENTED SEPT. 4, 1906.

A. BLONDEL.

PRESS FOR MANUFACTURING ARC LAMP ELECTRODES.

APPLICATION FILED NOV. 18, 1902.

6 SHEETS—SHEET 1.

FIG. 1.

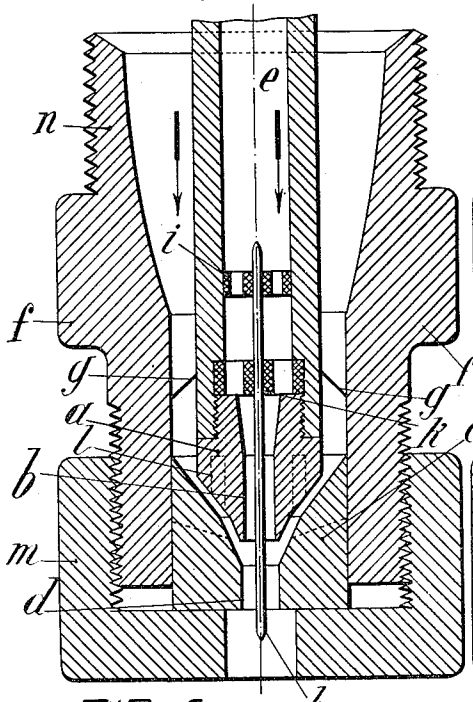


FIG. 2.

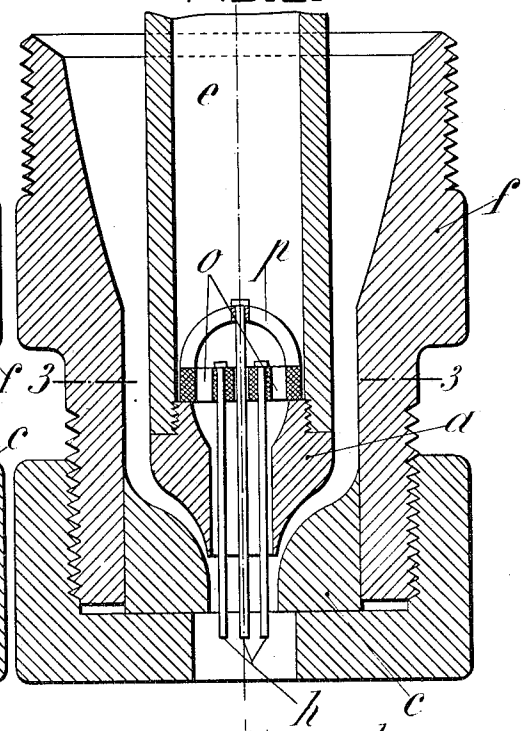


FIG. 4.

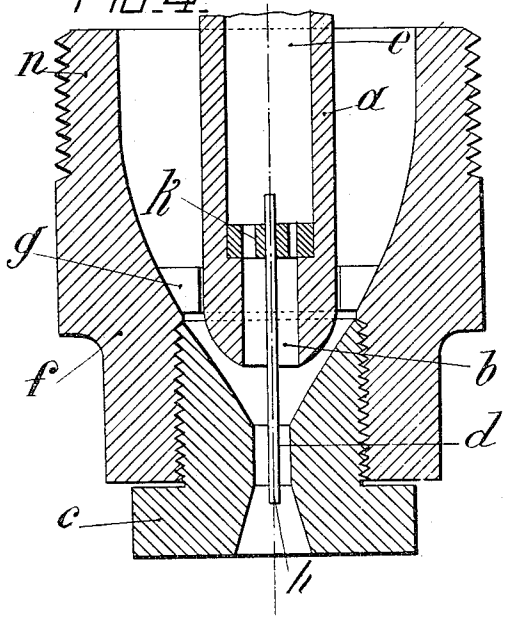
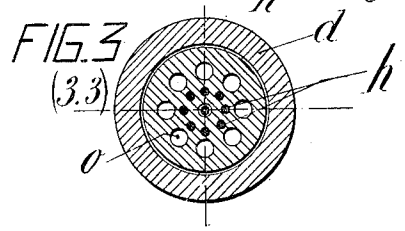


FIG. 3.



Witnesses:
Wilhelm Tost
Thomas M. Smith.

Inventor:
André Blondel,
by J. Walter Douglas
Attorney.

No. 830,201. PATENTED SEPT. 4, 1906.

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6 SHEETS—SHEET 2.

FIG. 5.

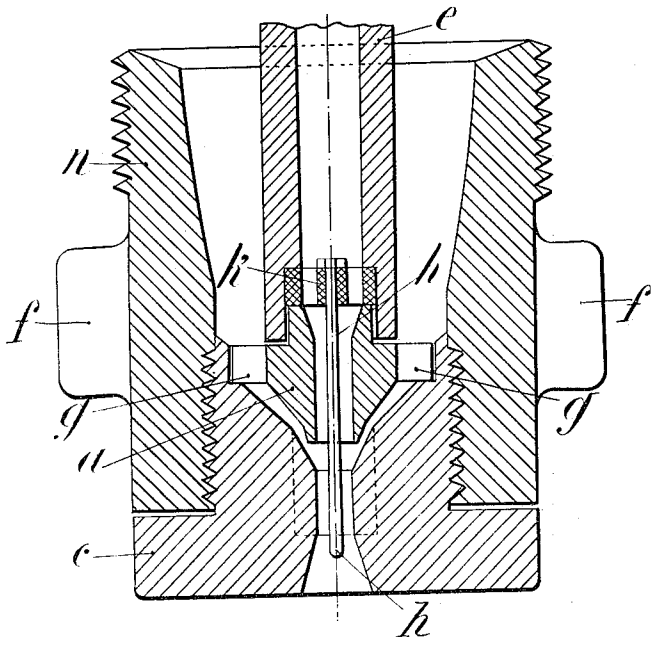
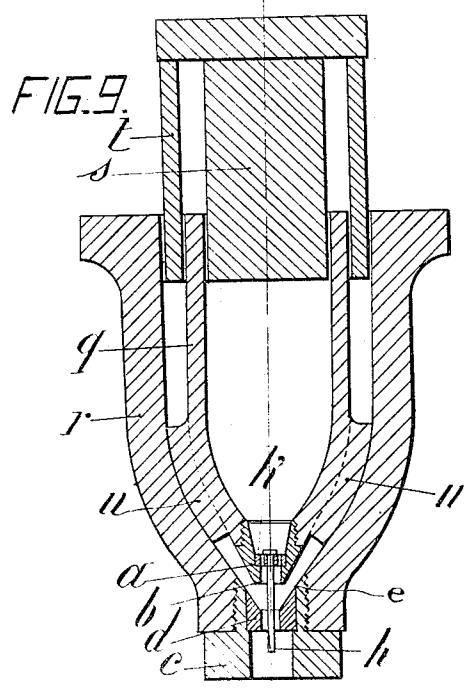


FIG. 9.



Witnesses:
Wilhelm Vogt
Thomas M. Smith

Inventor:
Andre Blondel,
By J. Walter Douglas
Attorney.

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A. BLONDEL.

PRESS FOR MANUFACTURING ARC LAMP ELECTRODES.

APPLICATION FILED NOV. 18, 1902. 6 SHEETS—SHEET 3.

FIG. 6.

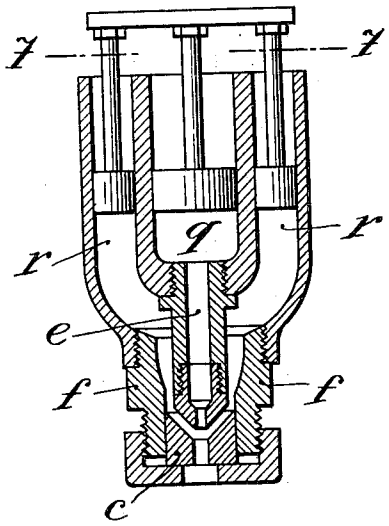


FIG. 7.

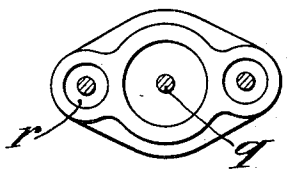
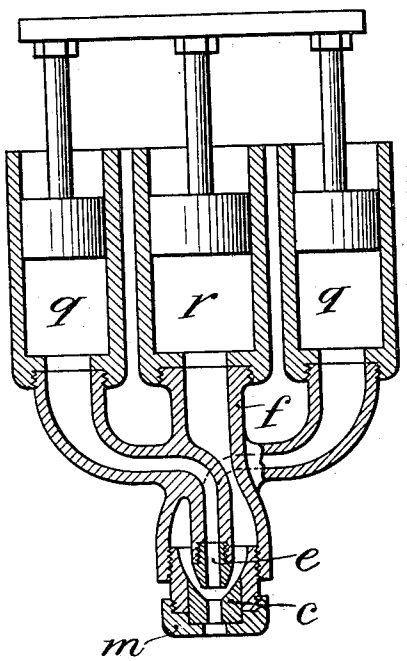


FIG. 8.



Witnesses:
Wilhelm Vogt
Thomas M Smith

Inventor:
André Blondel,
By J. Walter Douglas
Attorney.

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PRESS FOR MANUFACTURING ARC LAMP ELECTRODES.

APPLICATION FILED NOV. 18, 1902. 6 SHEETS—SHEET 4.

Fig. 6.a

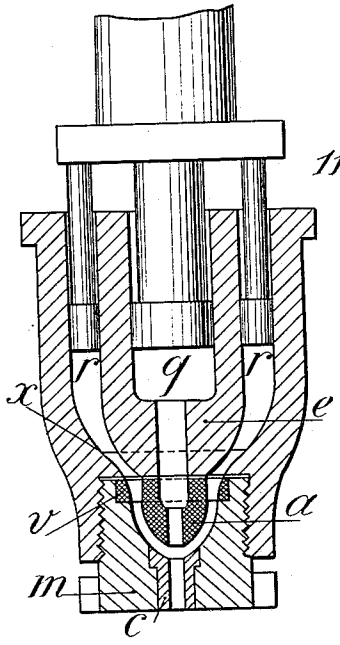


Fig. 10.a

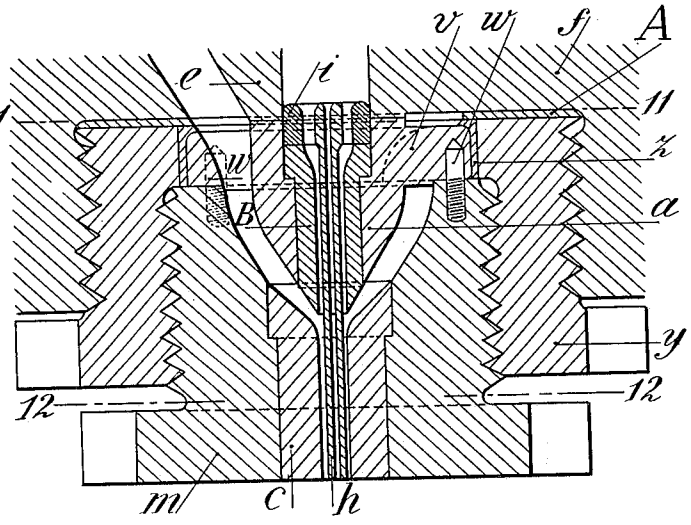


Fig. 12.

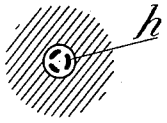


Fig. 18.

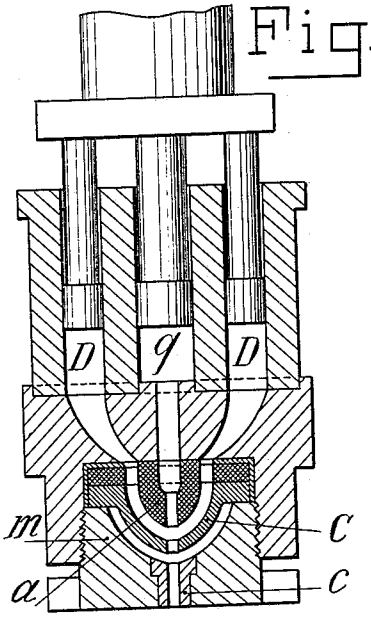
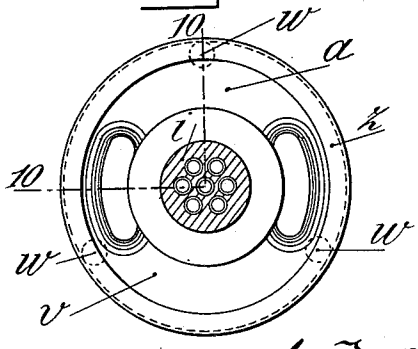


Fig. 11.



Witnesses:
Wilhelm Voigt
Thomas M. Smith

Inventor:
André Blondel.
By J. Walter Douglas
Attorney.

No. 830,201. PATENTED SEPT. 4, 1906.

A. BLONDEL.

PRESS FOR MANUFACTURING ARC LAMP ELECTRODES.

APPLICATION FILED NOV. 18, 1902.

6 SHEETS—SHEET 5.

Fig. 13.

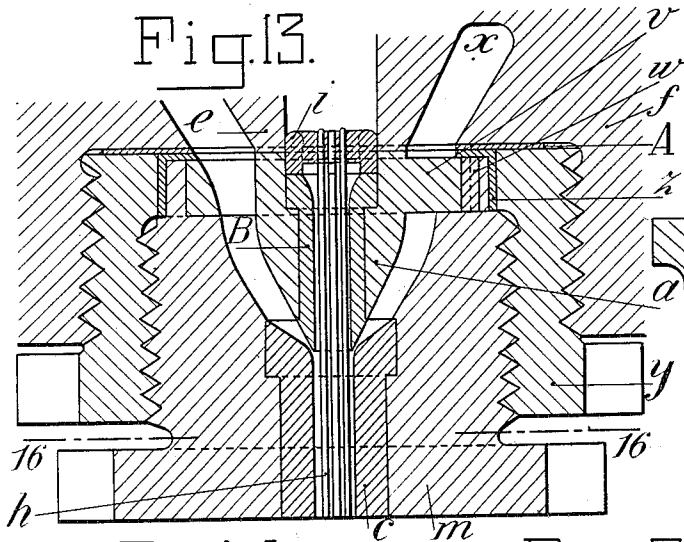


Fig. 14.

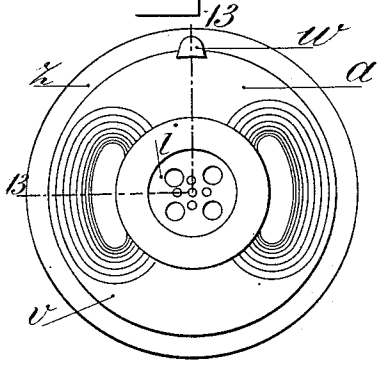


Fig. 15.

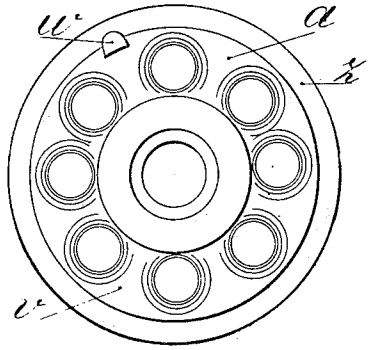


Fig. 9.

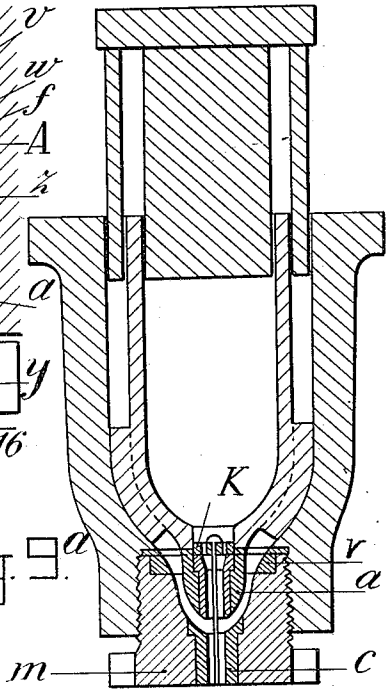


Fig. 16.

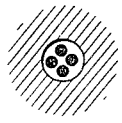


Fig. 8.

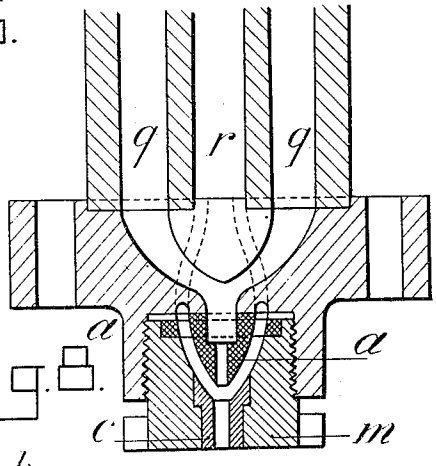
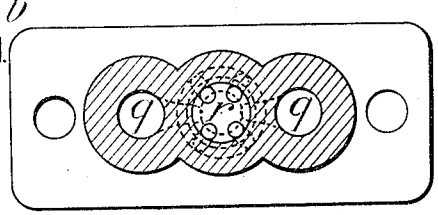


Fig. 8b.



Witnesses:
Wilhelm Vogt
Thomas M. Smith

Inventor:
André Blondel,
By J. Walter Douglass
Attorney.

No. 830,201. PATENTED SEPT. 4, 1906.

A. BLONDEL.

PRESS FOR MANUFACTURING ARC LAMP ELECTRODES.

APPLICATION FILED NOV. 18, 1902.

6 SHEETS—SHEET 6.

Fig. 17.

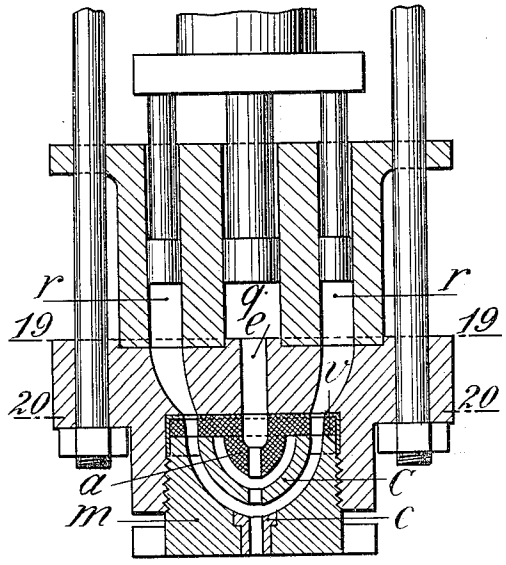


Fig. 20.

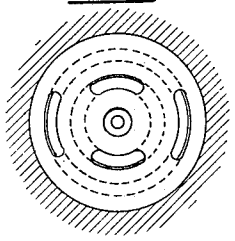


Fig. 19

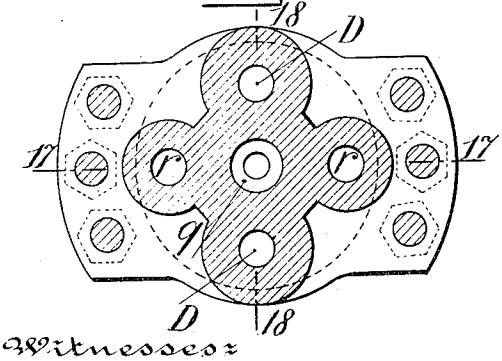


Fig. 6b

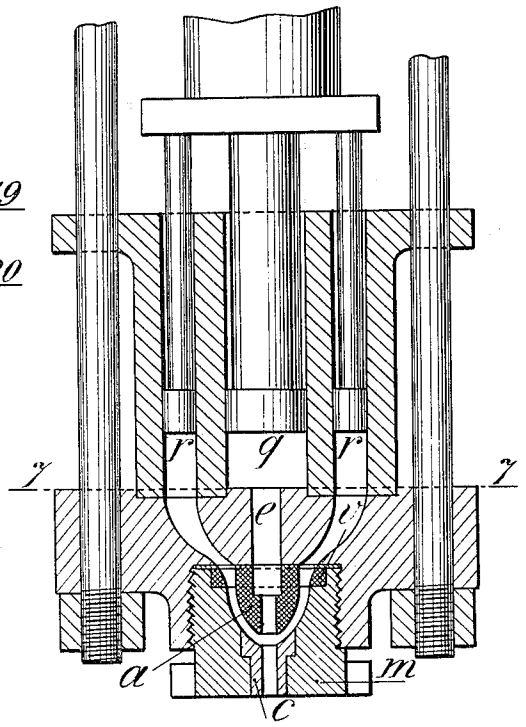
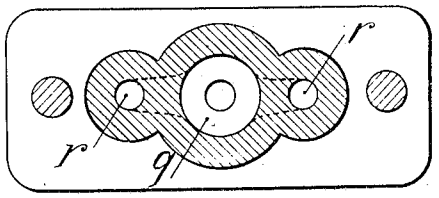


Fig. 7a



Witnesses:
Wilhelm Vogt
Thomas M. Smith

Inventor:
André Blondel,
By J. Walter Douglass
Attorney.

UNITED STATES PATENT OFFICE.

ANDRÉ BLONDEL, OF PARIS, FRANCE.

PRESS FOR MANUFACTURING ARC-LAMP ELECTRODES.

No. 830,201. Specification of Letters Patent. Patented Sept. 4, 1906.

Application filed November 18, 1902. Serial No. 131,889.

To all whom it may concern:

Be it known that I, ANDRÉ BLONDEL, a citizen of the Republic of France, residing at Paris, France, have invented certain new and useful Improvements in Presses for Manufacturing Arc-Lamp Electrodes, of which the following is a specification.

My invention relates to an improved arrangement of presses for manufacturing electrodes for arc-lamps consisting of a mineralized body, either solid or perforated, for admitting one or more inner cores or wicks and a thin concentric envelop, the said presses being adapted to effect the direct drawing of two or more different pastes in order to form an electrode comprising two or more concentric parts or zones, such as described in my former patent, No. 714,277, dated November 25, 1902.

My improved presses differ from those hitherto described or employed by the following characteristic arrangements: first, a system of two concentric dies arranged close to each other and fitted severally onto two stout tubes, both dies being capable of being readily removed from the outside in order to change the diameters as desired; second, an exact centering of the dies relatively to each other by means of spiders or of projections of fixed length holding the inner and the outer tube apart; third, supporting one or more central rods in the inner die by means of a spider-frame arranged either in the inner die or in the supporting-tube thereof in order that the paste may be forced through the spider-frame before flowing out of the central die, whereas when the supporting-frame is placed, as usual, at the inlet of the outer die the spider-arms divide the paste of the envelop and may even cause the outer and inner pastes mixing with each other; fourth, feeding uniformly the pastes to the dies by two or more holes or by two or more presses arranged, preferably, side by side parallel to each other, the rams whereof are actuated simultaneously by a single hydraulic machine in order to maintain unaltered the proportionality of the flows of the different pastes. When the diameter of the electrodes is changed, the relation between the thickness of the main body and that of the envelop remains the same. Changes in the relation of thickness, when desired, are obtained by merely adding in one of the press-cylinders a cylindrical bush to reduce its diameter and substituting to the original ram another of equal diameter with the inside of the bush.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part thereof, in which—

Figure 1 shows a die for electrodes having a single core. Fig. 2 shows a variation for the case of electrodes having several cores instead of only one. Fig. 3 is a transverse section on the line 3 3 of Fig. 2. Fig. 4 shows a variation with an inner and more contracted die. Fig. 5 is a variation showing a more perfect method of centering. Figs. 6, 6^a, and 6^b are longitudinal sections illustrating diagrammatically three slightly-different constructions of a press provided with three bodies suitable for the compression of carbonized paste and for sending the pastes under pressure into the respective nozzles of the double die. Fig. 7 is a transverse section on the line 7 7 of Fig. 6. Fig. 7^a is a cross-sectional view taken on the line 7 7 of Fig. 6^b. Figs. 8, 8^a, and 8^b, of which Fig. 8^b is a transverse section on the line 8 8 of Fig. 8^a, show two further variations of the three-cylinder press, in which the outer and inner cylinders are interverted. Figs. 9 and 9^a show another arrangement of the press-bodies provided with two concentric cylinders. In these figures, as in the preceding, a greater number of cylinders may be provided, if required. Fig. 10^a is an enlarged longitudinal section on the line 10 10 of Fig. 11 of a double die which may be inserted in the press of Fig. 6. Figs. 11 and 12 are cross-sections respectively on the lines 11 11 and 12 12 of Fig. 10^a. Figs. 13, 14, and 15 show modifications of Figs. 10^a and 11. Fig. 16 is a transverse section on the line 16 16 of Fig. 13. Figs. 17 to 20 are various sectional views of a press provided with five cylinders for the direct manufacture of electrodes comprising three concentric parts or zones. Figs. 17 and 18 are longitudinal sections on the lines 17 17 and 18 18 of Fig. 19, respectively, while Figs. 19 and 20 are respectively transverse sections on the line 19 19 and on the line 20 20 of Fig. 17.

The most simple process for manufacturing carbons having an envelop consists, of course, in introducing into an already-baked carbon tube a principal body consisting of

mineralized carbon which has been previously baked with the envelop; but by these means envelops can be made neither straight nor regular unless they are made too thick to have the advantages claimed for my carbons. Moreover, when a cylinder of mineralized carbon alone be baked there is greater risk of the matters fusing during the baking. On the other hand, the envelop made by itself unites badly with the body of the carbon. Lastly, the successive manipulations and the two bakings necessarily greatly raise the cost. I manufacture my special carbons more commercially and more economically either by direct simultaneous drawing of the core and the envelop or by passing the cores previously made in a press producing a thin covering, but direct simultaneous drawing is the preferable course. I have combined a special press for directly drawing carbons having a hole for the core and provided with a thin outer envelop. It is afterward sufficient to subject the electrodes passing out to a single baking, and during this the inner cylinder is naturally protected by the envelop, which prevents the mineral matters from flowing out. This allows of baking at a higher temperature.

The die apparatus for drawing under pressure about to be described are not only novel in their objects and in their products, but, again, they present special well-defined improvements appropriate to the manufacture of the products. These improvements, the principles of which were enunciated on page 1, relate principally to the arrangement of the dies to their method of concentric centering and to the arrangement of the bodies of the presses.

Figure 1 shows the principle of the die. It is distinguished by the following characteristics. It consists of two concentric nozzles, an inner nozzle formed of a piece *a*, provided with an inner die *b*, which is provided on the outside with a more or less elongated bevel, pointed or rounded more or less, and an outer nozzle formed of a piece *c*, concentric with the piece *a*, and shaped internally in the form of a cone or a succession of cones having a straight or rounded generatrix opening out to a second die *d*. The outlet-orifice of the first die *b* is in general a little in rear, as shown in the figure, of the plane of the inlet-orifice to the second die *d* in order to cause a progressive drawing of the envelop by its flow between the pieces *a* and *c* and its meeting with the paste from the die *b* before final drawing in the die *d*, in order to insure the better union of the envelop and of the principal body. For the same object I make the die *b* without there being any absolute necessity for it of a slightly-larger diameter than that of the principal body of carbon at the inside of the envelop. The remaining portion of Fig. 1 explains itself. *e* and *f* are inner and outer tubes, through which respectively flow the mixtures of carbon and tar, either mixed with mineral matters or otherwise, which form respectively the main body of the electrodes and its envelop. *g g* are wings fixed either to *e* or to *f*, which aid in centering the inner tube *e* in the outer tube *f*. *a* is screwed or introduced frictionally into the inner tube *e* and in the same way *c* into the outer tube. *h* is a cylindrical or differently-shaped rod which forms the center hole of the core. This rod *h* is centered in the tube *e* by means of one or more circles, cross-bars, or stars *i* and *k*. The die *a*, screwed into the tube *e*, is provided either with a bolt or with holes *l*, into which an adjusting-pin is introduced for tightening purposes. The die-piece *c* is screw-threaded or retained, as shown in the drawings, by a nut *m*, the outer screw-thread of which is more easily cleaned. By unscrewing the nut the piece *c* may be taken out and by the aid of a suitable key the inner piece *a* unscrewed. The shape of the piece *c* may be modified, as shown by the dotted line or otherwise. The details of the whole construction may be modified, especially in that which concerns the arrangement of the pieces, the screw-threading, the removal of the two nozzles, &c.

In Fig. 1 the tube *f* is provided with a screw-thread *n* in order to be adapted to the multiple press which serves to compress the pastes; but it may also be cast with the press. It is the same for the tube *e*.

Figs. 2, 3, 4, and 5 show modifications. In these figures the letters designate the same parts as in Fig. 1. Fig. 2 differs from the preceding only by the employment of several rods *h* in the place of only one. They are carried, for example, by a plate *o*, provided with holes, a section of which is shown in Fig. 3, and by a cross-arm *p*. This arrangement serves for the manufacture of the electrodes having multiple wicks.

Fig. 4 shows that the inner die *b* may be provided with an orifice or nozzle larger than the outer orifice *d*, with the condition that the pieces *a* and *c* have continuous profiles which insure the perfectly-progressive drawing of the paste while passing the outlet in order to avoid mixing and to give an access between these pieces just sufficient for the arrival of the necessary paste to the envelop. The centering of the inner die may be carried out either as in Fig. 1 or as in Fig. 5, which will be mentioned later.

Fig. 5 shows another method of fixing and centering the piece *a*, which does not require the screw-threading of this piece or a perfect centering of the tube *e*. The piece *a* is provided with flanges *g*, which adapt themselves into the piece *c*, and thus perfectly center the two parts. Further, the upper

portion of the piece *a* instead of being screw-threaded is smooth and penetrates with slight friction into the tube *e*. In this manner the die *a* is put into place without a key very easily and at the same time as the piece *c*. This is shown made in a single piece in Fig. 5; but of course the "die," properly so called, may be formed of a detached piece, as shown, for example, by the dotted line.

The compression-cylinders are capable of being arranged in a more or less complicated manner. In all such cases they are characterized by being arranged in parallel relationship to each other and have the same length and that all their pistons are moved simultaneously by a single hydraulic press so as to maintain in a constant manner the relative speeds of flow of the pastes through the various openings, the area of which openings determining the relative quantities of said pastes. The cylinders are made with relatively thick walls capable of sustaining high pressure. The communication between the cylinders and the threaded parts have also relatively thick walls and the communications should be made as short as possible. Figs. 6 and 7 show in longitudinal and transverse section one method in which the inner tube *e* is fed by a press *q* and the outer tube by one or several outer presses *r*, cast around *q*. The drawings show two presses *r*. They may also properly have three or four or a greater number. The shape of the piece, more or less strangulated at its entrance, is sufficient to make the pressure uniform in the outer die.

In the arrangement illustrated in Figs. 1, 4, 5, and 6 the centering of the die-nozzles is effected mostly by means of projections *g*, fixed either on the outer or on the inner tube. A better arrangement is shown in Figs. 6^a, 10^a, and 13, in which the inner die *a* and the outer die *c* are supported both by the same part *m*. In order to effect this, the die *a* is encircled by a perforated plate or washer *v*, which is inserted in a recess of the nut *m*, Figs. 6^a and 13. It may also merely rest on the upper face of the nut, as shown in Fig. 10^a. The die *a* and nut *m* may further be connected by appropriate keys or plugs *w*. Both dies can thus be rigorously centered while in operation, and thus can further be introduced or removed simultaneously by screwing or unscrewing the nut *m*, whereby changes of dies may be readily effected. Before flowing through the washer *v*, which may be provided with two Figs. 11 and 14 or more holes, Fig. 15, the paste may be allowed to expand in an anuular chamber *x* of variable dimensions formed in the press-body at the outlet of the outer cylinders.

As shown in Figs. 10^a and 13, I provide a second nut *y* as a support for the nut *m*, and both dies *a* and *c*, which are then preferably inserted or removed by screwing or unscrewing the nut *y*. In order to obtain perfect tightness, I provide a brass obturator *z* around the washer *v*, and I also interpose a perforated copper disk A between the upper surface of the nut *y* and the lower end of the outer tube *f*. In the inner die *a* may be inserted an interchangeable bush B, which then forms the die proper.

Fig. 8 shows another arrangement, an inverse one, so to speak, in which the outer tube *f* is fed by a tube *r* directly and the inner tube *e* by tubes traversing the walls of the tube *f* or of the press *r*, and connected to two or more outer presses *q*, arranged symmetrically around the inner press *r*. Figs. 8^a and 8^b show a similar inverted arrangement in which the outer die-nozzle is fed from the inner cylinder by means of passages suitably arranged in order to pass between the tubes feeding the paste from the outer cylinder to the inner die.

Lastly, I may also employ the system above mentioned of presses having concentric cylinders by adapting to them the double dies, as shown in Figs. 9 and 9^a, in such a manner that the inner tube *e* is a simple contracted prolongation of the body of the inner cylindrical press *q*. In Figs. 9 and 9^a, *q* is the cylindrical body of the inner press; *s*, its solid piston; *r*, the outer cylinder; *t*, its hollow cylindrical piston which penetrates into the walls of *q* and *r*. *u u* are discontinuous projections distributed over the cylinder *q* and which adjust themselves into the conical or cylindro-conical portion of the cylinder *r* in order to allow the two cylinders to center themselves the one in the other and at the same time to allow the paste to pass between the projections. *a*, *b*, *c*, *d*, *h*, and *k* designate the same parts as in Fig. 1 and in the following figures. It will be seen that the arrangement in Fig. 9 is again characterized by the progressive drawing of the paste of the envelop before it applies itself upon the core a little before penetrating into the outlet-die and by the method of attaching the rods of the cores *h* in the die *a*, which avoids all cutting of the paste of the envelop during its travel around the core. In this case, again, the internal die *b* may be enlarged and further removed from the outlet-die on the condition that this latter is always of a very gradual and regular shape in order to progressively center the pastes and that the cross-bar of the cores *h* may be fixed in the inner die *b*, which should for this object be fairly near to the outlet-die. The processes of centering in Fig. 5 may also be applied in this case for forming the cores in Figs. 1 to 9.

In the dies illustrated in the drawings solid rods *h* are shown, the cores or wicks being then inserted or injected into the perforated

carbons when finished; but I may also make the rod or rods *h* hollow and feed the wick material to them during the drawing process of the electrode, which is thus formed at the same time with an envelop and one or more wicks or cores. The composition intended to form the wicks may be fed to the hollow rods as described in Hardmuth's French Patent, No. 185,410, of 1887, by merely arranging tubes which pass through the tubes *e* and *f* perpendicularly and open out into the upper end of the rods, an arrangement similar to that shown for the tube feeding the paste from the outer cylinder to the inner die-nozzle in Fig. 8. For electrodes with a single core, however, I prefer employing the arrangement shown in Figs. 17, 18, 19, and 20, which illustrate a press comprising five cylinders and a triple die-nozzle for the direct drawing of electrodes formed of three concentric parts or zones—viz., a core or wick, a main body surrounding the core, and an envelop (preferably thin) inclosing the whole—and if the inner die be made wider and provided with one or more central rods electrodes can be produced comprising four zones—namely, two concentric envelops, a perforated main body, and a core or cores inserted or injected in the perforations of the finished carbon. I may also by following out the same ideas increase the number of concentric nozzles according to similar arrangements and make the carbons with two, three, or more different envelops of different pastes instead of one. The central cylinder *q*, Figs. 17, 18, and 19, forces paste through the inner die *a*, while two outer cylinders *r r* feed paste to the outer die *c*, and two farther outer cylinders D D feed paste to the intermediate die-nozzle C. I may also employ the arrangement of four outer cylinders for presses having only two concentric dies in order to distribute paste more equally to the outer nozzle.

In order to facilitate the construction of the triple die-nozzle in the press for electrodes with three or more concentric zones, it is preferably made of three parts *a* C *c*, arranged concentrically and supported by the nut *m*, as shown in the drawings. It should be understood that this construction of the triple die is merely a generalization of that shown in Figs. 10ª and 13, and the supporting-washers are perforated to correspond with the outlet-orifices of the press-cylinders.

In Figs. 6 to 9 and 17 to 20 the different press-bodies may be arranged at any angles, but the parallel arrangement of the cylinders shown is the most practicable. In those figures the speed of advance of the several pistons may be independent and determined according to the section of the press-bodies in such a manner that the pastes flow with the relative speeds corresponding to the delivery required in the inner and outer dies, but I prefer in order to automatically maintain the proportions of the core and of the envelop to always give the same speed to all the pistons and alter according to the case their diameter and the diameter of the cylinders by adding inner tubes to the latter.

A great number of other variations are possible, and I only indicate the arrangement of the principle which I intend to claim.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for making cored carbon electrodes, two superposed concentric dies arranged in close relationship to each other, an outlet arranged below said dies, means for securing each die above said outlet, said means permitting each die to be removed through said outlet, and a rod projecting from one die and traversing the other die, whereby a carbon-tube with an aperture may be pressed from said dies.

2. In an apparatus for making cored carbon electrodes, two superposed concentric tubular dies arranged in close relationship to each other, a spider projecting from one of the dies to hold the other die concentric therewith, a frame arranged within the inner tubular die, and a rod projecting from said frame and traversing the outer die.

3. In an apparatus for making carbon electrodes, consisting of massive cylinders in which the carbon-pastes are highly compressed by means of hydraulic presses; a divided die formed by two concentric superposed nozzles in close relationship to each other, each nozzle having its exit end tapering, tubular extensions leading from each of said nozzles to cylinders, plungers traversing said cylinders and means connecting rigidly said plungers at their free ends.

4. In an apparatus for making carbon electrodes, consisting of massive cylinders in which the carbon pastes are highly compressed by means of hydraulic presses, in combination with a divided concentric tubular die formed by two concentric superposed nozzles having their lower tapered exit ends relatively close together, tubular extensions leading to the upper open end of said nozzles and symmetrically disposed around a central extension, and plungers connected rigidly at their free ends adapted to traverse said extensions with uniform speed to feed the carbon to and through said nozzles with a constantly proportional velocity.

5. In an apparatus for making carbon electrodes, consisting of massive cylinders in which the carbon pastes are highly compressed by means of hydraulic presses, formed of a plurality of concentric parts, a plurality of tubular superposed concentric die-nozzles projecting within each other and arranged

complementally to said concentric parts, each of said die-nozzles having a lower tapered exit end in alinement with and in close relationship to the exit end of the other die-nozzles, and the inner die-nozzles being centered in and supported by the supporting part of the outer die-nozzle so as to be readily removable either severally or simultaneously.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ANDRÉ BLONDEL.

Witnesses:
GAËTAN DOBKEVITCH,
EDWARD P. MACLEAN.